TITLE V RENEWAL AND SIGNIFICANT MODIFICATION
PERMIT NO. P234-R2M1

Dairy Farmers of America

PORTALES PLANT – PORTALES DAIRY PRODUCTS, LLC

Prepared By:

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October 2020

Project 203201.0120

Trinity Consultants

Trinity Consultants
9400 Holly Ave NE, Bldg 3, Ste 300, Albuquerque, NM 87122 / P 505.266.6611 / **trinityconsultants.com**

October 05, 2020

Ted Schooley
New Mexico Environment Department
Air Quality Bureau
Permits Section
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505

RE: *Title V Renewal and Significant Modification of Permit No. P234-R2M1, Portales Plant – Portales Dairy Products, LLC*

Mr. Schooley:

On behalf of Portales Dairy Products, LLC. formerly known as Dairy Farmers of America, Trinity Consultants is submitting this application for a Title V Renewal and Significant Modification No. P234-R2M1, for the Portales Plant facility, located at 1820 South Industrial Drive, Portales, NM 88130.

Pursuant to 20.2.70.300.B.(2) NMAC and 20.2.70.404.C.(1)(a) NMAC, this modification includes the removal of a natural gas fired-dryer and the associated wet scrubber and upgrade the two (2) heater units. Updates to exempt and insignificant units are also being requested in this application

Enclosed is a hard copy of the application. Please feel free to contact either myself at (505) 266-6611 or Steve Bryant, Business Unit EHS Manager for Dairy Farmers of America, at (816) 801-6748 if you have any questions regarding this application.

Sincerely,

Adam Erenstein
Manager of Consulting Services

Cc: Mr. Steve Bryant P.E. – Kansas City, KS

Trinity Project File: 203201.0120

Mail Application To:		**For Department use only:**
New Mexico Environment Department Air Quality Bureau Permits Section 525 Camino de los Marquez, Suite 1 Santa Fe, New Mexico, 87505 Phone: (505) 476-4300 Fax: (505) 476-4375 www.env.nm.gov/aqb		AIRS No.:

Universal Air Quality Permit Application

Use this application for NOI, NSR, or Title V sources.

Use this application for: the initial application, modifications, technical revisions, and renewals. For technical revisions, complete Sections, 1-A, 1-B, 2-E, 3, 9 and any other sections that are relevant to the requested action; coordination with the Air Quality Bureau permit staff prior to submittal is encouraged to clarify submittal requirements and to determine if more or less than these sections of the application are needed. Use this application for streamline permits as well. See Section 1-I for submittal instructions for other permits.

This application is submitted as (check all that apply): ☐ Request for a No Permit Required Determination (no fee)
☑ **Updating** an application currently under NMED review. Include this page and all pages that are being updated (no fee required).
Construction Status: ☐ Not Constructed ☑ Existing Permitted (or NOI) Facility ☐ Existing Non-permitted (or NOI) Facility
Minor Source: ☐ a NOI 20.2.73 NMAC ☐ 20.2.72 NMAC application or revision ☐ 20.2.72.300 NMAC Streamline application
Title V Source: ☐ Title V (new) ☑ Title V renewal ☐ TV minor mod. ☑ TV significant mod. TV Acid Rain: ☐ New ☐ Renewal
PSD Major Source: ☐ PSD major source (new) ☐ minor modification to a PSD source ☐ a PSD major modification

Acknowledgements:
☑ I acknowledge that a pre-application meeting is available to me upon request. ☑ Title V Operating, Title IV Acid Rain, and NPR applications have no fees.
☐ $500 NSR application Filing Fee enclosed OR ☐ The full permit fee associated with 10 fee points (required w/ streamline applications).
☐ Check No.: in the amount of $500
☑ I acknowledge the required submittal format for the hard copy application is printed double sided 'head-to-toe', 2-hole punched (except the Sect. 2 landscape tables is printed 'head-to-head'), numbered tab separators. Incl. a copy of the check on a separate page.
☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance program (SBEAP) and qualifies for 50% of the normal application and permit fees. Enclosed is a check for 50% of the normal application fee which will be verified with the Small Business Certification Form for your company.
☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance Program (SBEAP) but does not qualify for 50% of the normal application and permit fees. To see if you qualify for SBEAP assistance and for the small business certification form go to https://www.env.nm.gov/aqb/sbap/small_business_criteria.html).

Citation: Please provide the **low level citation** under which this application is being submitted: **20.2.70.300.B.(2) NMAC 20.2.70.404.C.(1)(a) NMAC**
(e.g. application for a new minor source would be 20.2.72.200.A NMAC, one example for a Technical Permit Revision is 20.2.72.219.B.1.b NMAC, a Title V acid rain application would be: 20.2.70.200.C NMAC)

Section 1 – Facility Information

Section 1-A: Company Information

		AI # if known (see 1st 3 to 5 #s of permit IDEA ID No.): 1094	Updating Permit/NOI #: P234-R2M1
1	Facility Name: Portales Plant – Portales Dairy Products, LLC	Plant primary SIC Code (4 digits): 2023	
		Plant NAIC code (6 digits): 311514	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): 1820 South Industrial Drive, Portales, NM 88130		
2	Plant Operator Company Name: Portales Dairy Products, LLC (formerly known as Dairy Farmers of America, Inc.)	Phone/Fax: (575) 359-3904 / (575) 359-3905	

a	Plant Operator Address: 1820 South Industrial Drive, Portales, NM 88130	
b	Plant Operator's New Mexico Corporate ID or Tax ID: 81-0838547 (Federal Tax ID) / 5188156 (State Entity ID)	
3	Plant Owner(s) name(s): Portales Dairy Products, LLC (formerly known as Dairy Farmers of America, Inc.)	Phone/Fax: (575) 359-3904 / (575) 359-3905
a	Plant Owner(s) Mailing Address(s): 1820 South Industrial Drive, Portales, NM 88130	
4	Bill To (Company): Portales Dairy Products, LLC (formerly known as Dairy Farmers of America, Inc.) Note: Portales Dairy Products, LLC which is a jointly owned subsidiary of Dairy Farmers of America, Inc. ("DFA") and Select Milk Producers, Inc.	Phone/Fax: (575) 359-3904 / (575) 359-3905
a	Mailing Address: 1820 South Industrial Drive, Portales, NM 88130	E-mail: joeymartin@dfamilk.com
5	☐ Preparer: ☑ Consultant: Trinity Consultants, Inc.	Phone/Fax: (505) 266-6611
a	Mailing Address: 9400 Holly Ave NE Bldg Suite 300 Albuquerque, NM 87122	E-mail: aerenstein@trinityconsultants.com
6	Plant Operator Contact: Joey Martin, Plant Manager	Phone/Fax: (575) 359-3904 / (575) 359-3905
a	Address: 1820 South Industrial Drive, Portales, NM 88130	E-mail: joeymartin@dfamilk.com
7	Air Permit Contact: Steve Bryant, P.E.	Title: Business Unit EHS Manager
a	E-mail: sbryant@dfamilk.com	Phone/Fax: (816) 801-6748 / (816) 541-0666
b	Mailing Address: 1405 N. 98th St., Kansas City, KS 66111	
c	The designated Air permit Contact will receive all official correspondence (i.e. letters, permits) from the Air Quality Bureau.	

Section 1-B: Current Facility Status

1.a	Has this facility already been constructed? ☑ Yes ☐ No	1.b If yes to question 1.a, is it currently operating in New Mexico? ☑Yes ☐ No
2	If yes to question 1.a, was the existing facility subject to a Notice of Intent (NOI) (20.2.73 NMAC) before submittal of this application? ☐ Yes ☑ No	If yes to question 1.a, was the existing facility subject to a construction permit (20.2.72 NMAC) before submittal of this application? ☑ Yes ☐ No
3	Is the facility currently shut down? ☐ Yes ☑ No	If yes, give month and year of shut down (MM/YY): N/A
4	Was this facility constructed before 8/31/1972 and continuously operated since 1972? ☐ Yes ☑ No	
5	If Yes to question 3, has this facility been modified (see 20.2.72.7.P NMAC) or the capacity increased since 8/31/1972? ☐Yes ☐No ☑N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? ☑ Yes ☐ No	If yes, the permit No. is: P234-R2M1
7	Has this facility been issued a No Permit Required (NPR)? ☐Yes ☑ No	If yes, the NPR No. is: N/A
8	Has this facility been issued a Notice of Intent (NOI)? ☐ Yes ☑ No	If yes, the NOI No. is: N/A
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? ☑ Yes ☐ No	If yes, the permit No. is: 1263-M5-R1
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? ☐ Yes ☑ No	If yes, the register No. is:

Section 1-C: Facility Input Capacity & Production Rate

1	What is the facility's maximum input capacity, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: 375,000 lb of Milk Equivalent	Daily: 9,000,000 lb of Milk Equivalent	Annually: 3.3 x 10^9 of Milk Equivalent
b	Proposed	Hourly: 375,000 lb of Milk Equivalent	Daily: 9,000,000 lb of Milk Equivalent	Annually: 3.3 x 10^9 of Milk Equivalent

2	What is the facility's maximum production rate, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: 38,000 lb of dry powder	Daily: 912,000 lb of dry powder	Annually: 3.3 x 10^8 lb of dry powder
b	Proposed	Hourly: 38,000 lb of dry powder	Daily: 912,000 lb of dry powder	Annually: 3.3 x 10^8 lb of dry powder

Section 1-D: Facility Location Information

1	Section: 4	Range: 34E	Township: 2S	County: Roosevelt	Elevation (ft): 4,009
2	UTM Zone: ☐ 12 or ☑ 13			Datum: ☐ NAD 27 ☐ NAD 83 ☑ WGS 84	
a	UTM E (in meters, to nearest 10 meters): 650,018.30 m			UTM N (in meters, to nearest 10 meters): 3,782,128.40 m	
b	**AND** Latitude (deg., min., sec.): 34°10'10.56"N°			Longitude (deg., min., sec.): 103°22'19.86"W	
3	Name and zip code of nearest New Mexico town: Portales, NM 88130				
4	Detailed Driving Instructions from nearest NM town (attach a road map if necessary): From Portales Public Library on S. Avenue B, head southeast towards W. Commercial Street. Take the second right onto W. 1st Street for 0.5 miles, continue on US-70 W. for 1.2 miles. Turn right onto W. 18th Street for 0.1 miles. The facility will be on the left side of the road.				
5	The facility is 0.6 miles southwest of Portales, NM (nearest town).				
6	Status of land at facility (check one): ☑ Private ☐ Indian/Pueblo ☐ Federal BLM ☐ Federal Forest Service ☐ Other (specify)				
7	List all municipalities, Indian tribes, and counties within a ten (10) mile radius (20.2.72.203.B.2 NMAC) of the property on which the facility is proposed to be constructed or operated: Midway, Yerba, Tinsley Crossing, Delphos, Portales (NM); Indian tribes: none; Counties: Curry, Roosevelt.				
8	**20.2.72** NMAC applications **only**: Will the property on which the facility is proposed to be constructed or operated be closer than 50 km (31 miles) to other states, Bernalillo County, or a Class I area (see www.env.nm.gov/aqb/modeling/class1areas.html)? ☐ Yes ☐No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers: N/A				
9	Name nearest Class I area: Salt Creek Wilderness.				
10	Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): 112.1 km				
11	Distance (meters) from the perimeter of the Area of Operations (AO is defined as the plant site inclusive of all disturbed lands, including mining overburden removal areas) to nearest residence, school or occupied structure: 24 m				
12	Method(s) used to delineate the Restricted Area: Fencing. "**Restricted Area**" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area.				
13	Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC? ☐ Yes ☑ No A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites.				
14	Will this facility operate in conjunction with other air regulated parties on the same property? ☑ No ☐ Yes If yes, what is the name and permit number (if known) of the other facility?				

Section 1-E: Proposed Operating Schedule (The 1-E.1 & 1-E.2 operating schedules may become conditions in the permit.)

1	Facility **maximum** operating ($\frac{\text{hours}}{\text{day}}$): 24	($\frac{\text{days}}{\text{week}}$): 7	($\frac{\text{weeks}}{\text{year}}$): 52	($\frac{\text{hours}}{\text{year}}$): 8,760		
2	Facility's maximum daily operating schedule (if less than 24 $\frac{\text{hours}}{\text{day}}$)? Start: N/A		☐AM ☐PM	End: N/A	☐AM ☐PM	
3	Month and year of anticipated start of construction: N/A					
4	Month and year of anticipated construction completion: N/A					
5	Month and year of anticipated startup of new or modified facility: N/A					

6	Will this facility operate at this site for more than one year? ☑ Yes ☐ No

Section 1-F: Other Facility Information

1	Are there any current Notice of Violations (NOV), compliance orders, or any other compliance or enforcement issues related to this facility? ☐ Yes ☑ No If yes, specify: N/A		
a	If yes, NOV date or description of issue: N/A		NOV Tracking No: N/A
b	Is this application in response to any issue listed in 1-F, 1 or 1a above? ☐ Yes ☑ No If Yes, provide the 1c & 1d info below:		
c	Document Title: N/A	Date: N/A	Requirement # (or page # and paragraph #): N/A
d	Provide the required text to be inserted in this permit: N/A		
2	Is air quality dispersion modeling or modeling waiver being submitted with this application? ☑ Yes ☐ No		
3	Does this facility require an "Air Toxics" permit under 20.2.72.400 NMAC & 20.2.72.502, Tables A and/or B? ☐ Yes ☑ No		
4	Will this facility be a source of federal Hazardous Air Pollutants (HAP)? ☑ Yes ☐ No		
a	If Yes, what type of source? ☐ **Major** (☐ ≥10 tpy of any single HAP **OR** ☐ ≥25 tpy of any combination of HAPS) **OR** ☑ **Minor** (☑ <10 tpy of any single HAP **AND** ☑ <25 tpy of any combination of HAPS)		
5	Is any unit exempt under 20.2.72.202.B.3 NMAC? ☐ Yes ☑ No		
a	If yes, include the name of company providing commercial electric power to the facility: _____ Commercial power is purchased from a commercial utility company, which specifically does not include power generated on site for the sole purpose of the user.		

Section 1-G: Streamline Application

(This section applies to 20.2.72.300 NMAC Streamline applications only)

1	☐ I have filled out Section 18, "Addendum for Streamline Applications." ☑ N/A (This is not a Streamline application.)

Section 1-H: Current Title V Information - Required for all applications from TV Sources

(Title V-source required information for all applications submitted pursuant to 20.2.72 NMAC (Minor Construction Permits), or 20.2.74/20.2.79 NMAC (Major PSD/NNSR applications), and/or 20.2.70 NMAC (Title V))

1	Responsible Official (R.O.): Joey Martin (20.2.70.300.D.2 NMAC):	Phone: (575) 359-3904
a	R.O. Title: Plant Manager	R.O. e-mail: joeymartin@dfamilk.com
b	R. O. Address: 1820 South Industrial Drive, Portales, NM 88130	
2	Alternate Responsible Official: Keith Mason (20.2.70.300.D.2 NMAC):	Phone: (816) 801-6048
a	A. R.O. Title: Vice President, Manufacturing Operations	A. R.O. e-mail: kmason@dfamilk.com
b	A. R. O. Address: 1405 N. 98th Street, Kansas City, KS, 66111	
3	Company's Corporate or Partnership Relationship to any other Air Quality Permittee (List the names of any companies that have operating (20.2.70 NMAC) permits and with whom the applicant for this permit has a corporate or partnership relationship): N/A; Portales Dairy Products, LLC have no other companies within New Mexico.	
4	Name of Parent Company ("Parent Company" means the primary name of the organization that owns the company to be permitted wholly or in part.): Dairy Farmers of America, Inc.	
a	Address of Parent Company: 1405 N. 98th Street, Kansas City, KS, 66111	
5	Names of Subsidiary Companies ("Subsidiary Companies" means organizations, branches, divisions or subsidiaries, which are owned, wholly or in part, by the company to be permitted.): Subsidiaries of the "Parent Company" include: DairiConcepts, LP; Kemps; DFA Dairy Brands; Oakhurst Dairy; Guida-Seibert Dairy, Dairy Maid Dairy; Berkshire; Southwest Cheese, and Semo Tank / Baker Equipment.	
6	Telephone numbers & names of the owners' agents and site contacts familiar with plant operations: Please contact the R.O. or A.R.O.	

7	Affected Programs to include Other States, local air pollution control programs (i.e. Bernalillo) and Indian tribes: Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B)? If yes, state which ones and provide the distances in kilometers: Texas at ~30.23 km east.

Section 1-I – Submittal Requirements

Each 20.2.73 NMAC (**NOI**), a 20.2.70 NMAC (**Title V**), a 20.2.72 NMAC (**NSR** minor source), or 20.2.74 NMAC (**PSD**) application package shall consist of the following:

Hard Copy Submittal Requirements:

1) One hard copy **original signed and notarized application package** **printed double sided** **'head-to-toe'** **2-hole punched** as we bind the document on top, not on the side; except Section 2 (landscape tables), which should be head-to-head. Please use **numbered tab separators** in the hard copy submittal(s) as this facilitates the review process. For NOI submittals only, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required. Please include a copy of the check on a separate page.

2) If the application is for a minor NSR, PSD, NNSR, or Title V application, include one working hard **copy** for Department use. This copy should be printed in book form, 3-hole punched, and **must be double sided**. Note that this is in addition to the head-to-to 2-hole punched copy required in 1) above. Minor NSR Technical Permit revisions (20.2.72.219.B NMAC) only need to fill out Sections 1-A, 1-B, 3, and should fill out those portions of other Section(s) relevant to the technical permit revision. TV Minor Modifications need only fill out Sections 1-A, 1-B, 1-H, 3, and those portions of other Section(s) relevant to the minor modification. NMED may require additional portions of the application to be submitted, as needed.

3) The entire NOI or Permit application package, including the full modeling study, should be submitted electronically. Electronic files for applications for NOIs, any type of General Construction Permit (GCP), or technical revisions to NSRs must be submitted with compact disk (CD) or digital versatile disc (DVD). For these permit application submittals, **two** CD copies are required (in sleeves, not crystal cases, please), with additional CD copies as specified below. NOI applications require only a single CD submittal. Electronic files for other New Source Review (construction) permits/permit modifications or Title V permits/permit modifications can be submitted on CD/DVD or sent through AQB's secure file transfer service.

Electronic files sent by (check one):

☑ CD/DVD attached to paper application

☐ secure electronic transfer. Air Permit Contact Name_____

Email_____

Phone number _____

a. If the file transfer service is chosen by the applicant, after receipt of the application, the Bureau will email the applicant with instructions for submitting the electronic files through a secure file transfer service. Submission of the electronic files through the file transfer service needs to be completed within 3 business days after the invitation is received, so the applicant should ensure that the files are ready when sending the hard copy of the application. The applicant will not need a password to complete the transfer. **Do not use the file transfer service for NOIs, any type of GCP, or technical revisions to NSR permits.**

4) Optionally, the applicant may submit the files with the application on compact disk (CD) or digital versatile disc (DVD) following the instructions above and the instructions in 5 for applications subject to PSD review.

5) If **air dispersion modeling** is required by the application type, include the **NMED Modeling Waiver** and/or electronic air dispersion modeling report, input, and output files. The dispersion modeling ***summary report only*** should be submitted as hard copy(ies) unless otherwise indicated by the Bureau.

6) If the applicant submits the electronic files on CD and the application is subject to PSD review under 20.2.74 NMAC (PSD) or NNSR under 20.2.79 NMC include,
   a. one additional CD copy for US EPA,
   b. one additional CD copy for each federal land manager affected (NPS, USFS, FWS, USDI) and,
   c. one additional CD copy for each affected regulatory agency other than the Air Quality Bureau.

   If the application is submitted electronically through the secure file transfer service, these extra CDs do not need to be submitted.

Electronic Submittal Requirements [in addition to the required hard copy(ies)]:

1) All required electronic documents shall be submitted as 2 separate CDs or submitted through the AQB secure file transfer service. Submit a single PDF document of the entire application as submitted and the individual documents comprising the application.

2) The documents should also be submitted in Microsoft Office compatible file format (Word, Excel, etc.) allowing us to access the text and formulas in the documents (copy & paste). Any documents that cannot be submitted in a Microsoft Office compatible

format shall be saved as a PDF file from within the electronic document that created the file. If you are unable to provide Microsoft office compatible electronic files or internally generated PDF files of files (items that were not created electronically: i.e. brochures, maps, graphics, etc,), submit these items in hard copy format. We must be able to review the formulas and inputs that calculated the emissions.

3) It is preferred that this application form be submitted as 4 electronic files (3 MSWord docs: Universal Application section 1 [UA1], Universal Application section 3-19 [UA3], and Universal Application 4, the modeling report [UA4]) and 1 Excel file of the tables (Universal Application section 2 [UA2]). Please include as many of the 3-19 Sections as practical in a single MS Word electronic document. Create separate electronic file(s) if a single file becomes too large or if portions must be saved in a file format other than MS Word.

4) The electronic file names shall be a maximum of 25 characters long (including spaces, if any). The format of the electronic Universal Application shall be in the format: "A-3423-FacilityName". The "A" distinguishes the file as an application submittal, as opposed to other documents the Department itself puts into the database. Thus, all electronic application submittals should begin with "A-". Modifications to existing facilities should use the core permit number (i.e. '3423') the Department assigned to the facility as the next 4 digits. Use 'XXXX' for new facility applications. The format of any separate electronic submittals (additional submittals such as non-Word attachments, re-submittals, application updates) and Section document shall be in the format: "A-3423-9-description", where "9" stands for the section # (in this case Section 9-Public Notice). Please refrain, as much as possible, from submitting any scanned documents as this file format is extremely large, which uses up too much storage capacity in our database. Please take the time to fill out the header information throughout all submittals as this will identify any loose pages, including the Application Date (date submitted) & Revision number (0 for original, 1, 2, etc.; which will help keep track of subsequent partial update(s) to the original submittal. Do not use special symbols (#, @, etc.) in file names. The footer information should not be modified by the applicant.

Table of Contents

Table 2-A: Regulated Emission Sources

Unit and stack numbering must correspond throughout the application package. If applying for a NOI under 20.2.73 NMAC, equipment exemptions under 2.72.202 NMAC do not apply.

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufacturer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] / Date of Construction/ Reconstruction[2]	Controlled by Unit # / Emissions vented to Stack #	Source Classification Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
B1	Natural Gas Fired Boiler	Seattle Boiler	HPTWB-3000	L75405-1	25.2 MMBtu/hr	25.2 MMBtu/hr	Unknown / 1993	N/A / B1	10200602	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		N/A
B2	Natural Gas Fired Boiler	Seattle Boiler	HPTWB-3000	L75405-2	25.2 MMBtu/hr	25.2 MMBtu/hr	Unknown / 1993	N/A / B2	10200602	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		N/A
B3	Natural Gas Fired Boiler	Johnson Boiler	PFTA1000-4G200S	10097-02	40 MMBtu/hr	40 MMBtu/hr	Unknown / 12/5/2002	N/A / B3	10200602	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		N/A
B4	Natural Gas Fired Boiler	Johnson Boiler	PFTA1000-4G200S	10097-01	40 MMBtu/hr	40 MMBtu/hr	Unknown / 12/5/2002	N/A / B4	10200602	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		N/A
D1	Natural Gas Fired Dryer	Niro Filtermat Dryer	FM 1000	Unknown	22.05 MMBtu/hr	22.05 MMBtu/hr	Unknown / 1995	N/A / D1	30203001	☐ Existing (unchanged) ☑ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		N/A
D2	Natural Gas Fired Dryer	CE Rogers Vertical Dryer	TCF 542	24235	50 MMBtu/hr	50 MMBtu/hr	Unknown / 12/5/2002	N/A / NDS, SDS, BVS	30203001	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		N/A
V1	Nuisance Dust Collector (Product Packaging)	Nuisance Dust Collector	NYB20GI	M10667100	13,400 CFM	13,400 CFM	Unknown / 6/18/1995	N/A / V1	30288801	☐ Existing (unchanged) ☑ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		N/A
AHU-1	Niro Air Handling Unit Heater	Johnson Controls / Powerflame Burner	DF-300-G (burner)	AKCM XT0054 (air handling system)	3.75 MMBtu/hr	3.75 MMBtu/hr	2015 / 2015	N/A / AHU-1	30290003	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		N/A
AHU-2	Niro Air Handling Unit Heater	Johnson Controls / Powerflame Burner	DF-300-G (burner)	AKCM XT0055 (air handling system)	3.75 MMBtu/hr	3.75 MMBtu/hr	2015 / 2015	N/A / AHU-2	30290003	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		N/A
MAU-1001	CER Makeup Air Heater	Greenheck	TSU-230-H50	Unknown	8 MMBtu/hr	8 MMBtu/hr	Unknown / 12/5/2002	N/A / MAU-1001	30290003	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced		N/A
MAU-1002	CER Makeup Air Heater	Greenheck	TSU-230-H50	02J07267	8 MMBtu/hr	8 MMBtu/hr	Unknown / 12/5/2002	N/A / MAU-1002	30290003	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced		N/A

[1] Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.

[2] Specify dates required to determine regulatory applicability.

[3] To properly account for power conversion efficiencies, generator set rated capacity shall be reported as the rated capacity of the engine in horsepower, not the kilowatt capacity of the generator set.

[4] "4SLB" means four stroke lean burn engine, "4SRB" means four stroke rich burn engine, "2SLB" means two stroke lean burn engine, "CI" means compression ignition, and "SI" means spark ignition

Table 2-B: Insignificant Activities[1] (20.2.70 NMAC) OR Exempted Equipment (20.2.72 NMAC)

All 20.2.70 NMAC (Title V) applications must list all Insignificant Activities in this table. All 20.2.72 NMAC applications must list Exempted Equipment in this table. If equipment listed on this table is exempt under 20.2.72.202.B.5, include emissions calculations and emissions totals for 202.B.5 "similar functions" units, operations, and activities in Section 6, Calculations. Equipment and activities exempted under 20.2.72.202 NMAC may not necessarily be Insignificant under 20.2.70 NMAC (and vice versa). Unit & stack numbering must be consistent throughout the application package. Per Exemptions Policy 02-012.00 (see http://www.env.nm.gov/aqb/permit/aqb_pol.html), 20.2.72.202.B NMAC Exemptions do not apply, but 20.2.72.202.A NMAC exemptions do apply to NOI facilities under 20.2.73 NMAC. List 20.2.72.301.D.4 NMAC Auxiliary Equipment for Streamline applications in Table 2-A. The List of Insignificant Activities (for TV) can be found online at https://www.env.nm.gov/air-quality/air-quality-title-v-operating-permits-guidance-page/. TV sources may elect to enter both TV Insignificant Activities and Part 72 Exemptions on this form.

Unit Number	Source Description	Manufacturer	Model No. Serial No.	Max Capacity Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
HRMT-E	Haul Road Milk Truck (Entering)	N/A	N/A N/A	N/A N/A	20.2.72.202.B.(5) IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
HRMT-L	Haul Road Milk Truck (Leaving)	N/A	N/A N/A	N/A N/A	20.2.72.202.B.(5) IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
HRPT	Haul Road Production Trucks	N/A	N/A N/A	N/A N/A	20.2.72.202.B.(5) IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
NF-CT	New Finisher Cooling Tower	Unknown	N/A N/A	700 gpm	20.2.72.202.B.(5) IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Niro-CT	Niro Cooling Tower	Unknown	N/A N/A	500 gpm	20.2.72.202.B.(5) IA List Item #1.a	N/A N/A	☐ Existing (unchanged) ☑ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
CER-CT	CER Evap Cooling Tower	Unknown	N/A N/A	670 gpm	20.2.72.202.B.(5) IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
MW-CT	MW Cooling Tower	Unknown	N/A N/A	760 gpm	20.2.72.202.B.(5) IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
RWT-WS	Recirculation Water Tank from Wet Scrubber	Unknown	N/A N/A	≈1000 gallon	20.2.72.202.B.(2) IA List Item #1.a	N/A N/A	☐ Existing (unchanged) ☑ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
N-H	Niro Hasting	Niro	Unknown Unknown	1.3 MMBtu/hr	20.2.72.202.B.(5) IA List Item #1.a	N/A N/A	☐ Existing (unchanged) ☑ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
M-Oven	Maxon Ovenpack	Maxon	Unknown Unknown	1.3 MMBtu/hr	20.2.72.202.B.(5) IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
UFRO	UFRO Heater On Roof	UFRO	Unknown Unknown	3.6 MMBtu/hr	20.2.202.B.(1)(a) IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
REN 1 to 9	REZNOR - Heaters (Multiple comform heating units at the plant)	RENZOR	Unknown Unknown	100 MBtu/hr	20.2.202.B.(1)(a) IA List Item #3	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
FPDE	Fire Pump Diesel Engine	Cummins	6BTA 5.9F2 45171501	208 HP	20.2.72.202.A.(4) IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
FPDFT	Fire Pump Diesel Fuel Tank	N/A	N/A N/A	120 gallon	20.2.72.202.B.(2) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
TRBA-CH 1 to 10	Truck Receiving Bay Area Comfort Heaters (Multiple units at the trucks receiving area)	Unknown	Unknown Unknown	100 MBtu/hr	20.2.202.B.(1)(a) IA List Item #3		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
YDFT	Yard Diesel Fuel Tank	Unknown	Unknown Unknown	250 gallon	20.2.72.202.B.(2) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Sodium H-Tk	Sodium Hypochlorite Tank	Unknown	Unknown Unknown	3050 gallon	20.2.72.202.B.(2) IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
Mandate-S Tank	Mandate Storage Tank	Unknown	Unknown Unknown	3050 gallon	20.2.72.202.B.(2) IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
D1-C1	Niro Dryer Conveyor Vent	Unknown	Unknown Unknown	N/A N/A	20.2.72.202.B.(2) IA List Item #1.a		☐ Existing (unchanged) ☑ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
D1-C2	Niro Dryer Conveyor Vent Also known as: "Powder Room Vent"	Unknown	Unknown Unknown	N/A N/A	20.2.72.202.B.(2) IA List Item #1.a		☐ Existing (unchanged) ☑ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Raw Silo 1	Whole Raw Milk	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Raw Silo 2	Whole Raw Milk	Unknown	Unknown Unknown	1190 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Raw Silo 3	Whole Raw Milk	Unknown	Unknown Unknown	1190 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Raw Silo 4	Whole Raw Milk	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Raw Silo 5	Whole Raw Milk	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Raw Silo 6	Whole Raw Milk	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Raw Silo 7	Whole Raw Milk	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
Raw Silo 8	Whole Raw Milk	Unknown	Unknown / Unknown	1429 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Raw Silo 9	Whole Raw Milk	Unknown	Unknown / Unknown	1429 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Cream Silo 14	Pasteurized Cream	Unknown	Unknown / Unknown	714 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
Cream Silo 15	Pasteurized Cream	Unknown	Unknown / Unknown	714 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Cream Silo 17	Pasteurized Cream	Unknown	Unknown / Unknown	714 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Cream Silo 18	Pasteurized Cream	Unknown	Unknown / Unknown	714 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SK1	Pasteurized Skim Milk	Unknown	Unknown / Unknown	1190 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SK2	Pasteurized Skim Milk	Unknown	Unknown / Unknown	1667 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
SK3	Pasteurized Skim Milk	Unknown	Unknown / Unknown	1190 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SK4	Pasteurized Skim Milk	Unknown	Unknown / Unknown	1667 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
SK5	Pasteurized Skim Milk	Unknown	Unknown / Unknown	1667 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
SK6	Pasteurized Skim Milk	Unknown	Unknown / Unknown	1667 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
UFP1	Pasteurized Skim Milk / Permeate	Unknown	Unknown / Unknown	714 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
UFP2	Pasteurized Skim Milk / Permeate	Unknown	Unknown / Unknown	714 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
LO1	Condensed Milk, Retentate, or Permeate	Unknown	Unknown / Unknown	714 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
LO2	Condensed Milk, Retentate, or Permeate	Unknown	Unknown / Unknown	714 / bbl	20.2.72.202.B.(5) / IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
LO10	Condensed Milk, Retentate	Unknown	Unknown Unknown	1190 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
LO11	Condensed Milk, Retentate	Unknown	Unknown Unknown	1190 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
HT3	Condensed Milk, Retentate	Unknown	Unknown Unknown	357 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
ECW1	RO Feed Water / Condensate	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
ECW2	RO Feed Water / Condensate	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
ECW3	RO Feed Water / Condensate	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
UCW2	Ultra Clean Water	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
UCW3	Ultra Clean Water	Unknown	Unknown Unknown	1429 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Crystallizer 1	Condensed Permeate	Unknown	Unknown Unknown	476 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Crystallizer 2	Condensed Permeate	Unknown	Unknown Unknown	476 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Crystallizer 3	Condensed Permeate	Unknown	Unknown Unknown	476 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Crystallizer 4	Condensed Permeate	Unknown	Unknown Unknown	476 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Crystallizer 5	Condensed Permeate	Unknown	Unknown Unknown	476 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Crystallizer 6	Condensed Permeate	Unknown	Unknown Unknown	476 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Raw CIP Potable Water	Potable Water	Unknown	Unknown Unknown	14 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
Post Rinse Recovery	CIP Solution	Unknown	Unknown Unknown	14 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Wash Solution	CIP Solution	Unknown	Unknown Unknown	14 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Pasteurized CIP 2,3 Potable Water	Potable Water	Unknown	Unknown Unknown	48 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Pasteurized CIP 2,3 Caustic Re-Use	Caustic Wash Solution	Unknown	Unknown Unknown	48 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Pasteurized CIP 2,3 Post Rinse	Caustic Wash Solution	Unknown	Unknown Unknown	95 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Pasteurized CIP 1 Potable Water	Potable Water	Unknown	Unknown Unknown	13 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Pasteurized CIP 1 Caustic Wash	Caustic Wash Solution	Unknown	Unknown Unknown	13 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Pasteurized CIP 1 Acid Wash	Acid Wash Solution	Unknown	Unknown Unknown	13 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Polyphosphate	Process Additive	Unknown	Unknown Unknown	107 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Ultrasil 110	Liquid Alkaline Membrane Cleaner	Unknown	Unknown Unknown	3050 gallon	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Principal	Chlorinated Alkaline Cleaner	Unknown	Unknown Unknown	3050 gallon	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
AC 55-5 (north tank)	Acid Cleaner	Unknown	Unknown Unknown	5250 gallon	20.2.72.202.B.(5) IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
AC 55-5 (west tank)	Acid Cleaner	Unknown	Unknown Unknown	5250 gallon	20.2.72.202.B.(5) IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
AC 103 (north tank)	Caustic Cleaner	Unknown	Unknown Unknown	5250 gallon	20.2.72.202.B.(5) IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
AC 103 (south tank)	Caustic Cleaner	Unknown	Unknown Unknown	5250 gallon	20.2.72.202.B.(5) IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
CER CIP System Potable Water	Potable Water	Unknown	Unknown Unknown	119 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
CER CIP System Caustic Wash	Caustic Wash Solution	Unknown	Unknown Unknown	119 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
CER CIP System Acid Wash	Acid Wash Solution	Unknown	Unknown Unknown	119 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
New Finisher CIP Caustic	Caustic Wash Solution	Unknown	Unknown Unknown	39 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
New Finisher CIP Acid	Acid Wash Solution	Unknown	Unknown Unknown	39 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Past 4 CIP Chemical Tank	Caustic or Acid Wash Solution	Unknown	Unknown Unknown	71 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Past 4 CIP Potable Water	Potable Water	Unknown	Unknown Unknown	71 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Past 4 CIP Belt Wash	Caustic Wash Solution	Unknown	Unknown Unknown	71 bbl	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
V1	Nuisance Dust Collector (Product Packaging)	Nuisance Dust Collector	DFE3-6 Unknown	3,000 ACFM	20.2.72.202.B.(5) IA List Item #1.a		☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
PCE-2	Process Screw	Unknown	Unknown Unknown	N/A N/A	20.2.72.202.B.(5) IA List Item #1.a		☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

[1] Insignificant activities exempted due to size or production rate are defined in 20.2.70.300.D.6, 20.2.70.7.Q NMAC, and the NMED/AQB List of Insignificant Activities, dated September 15, 2008. Emissions from these insignificant activities do not need to be reported, unless specifically requested.

[2] Specify date(s) required to determine regulatory applicability.

Table 2-C: Emissions Control Equipment

Unit and stack numbering must correspond throughout the application package. Only list control equipment for TAPs if the TAP's maximum uncontrolled emissions rate is over its respective threshold as listed in 20.2.72 NMAC, Subpart V, Tables A and B. In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions.

Control Equipment Unit No.	Control Equipment Description	Date Installed	Controlled Pollutant(s)	Controlling Emissions for Unit Number(s)[1]	Efficiency (% Control by Weight)	Method used to Estimate Efficiency
PCE-3	Baghouse, CER Shop Order 24235	2002	PM (Product Collection)	D2	99.9%	Engineering Estimate
PCE-4	Baghouse, CER Shop Order 24235	2002	PM (Product Collection)	D2	99.9%	Engineering Estimate
PCE-5	Baghouse, CER Shop Order 24235	2002	PM (Product Collection)	D2	99.9%	Engineering Estimate
	The above "emission controls" have been listed for information purposes only. In reality, the powdered milk product dust collection units are process equipment intrinsic to producing powdered milk. These units collect the valuable powdered milk product to be bagged & sold. Any problem with any of these units could cause a partial or total shutdown of operations of this facility. Under no circumstance this facility will operate without any of these components because it will be impossible to collect the powder milk without them in service					

[1] List each control device on a separate line. For each control device, list all emission units controlled by the control device.

Table 2-D: Maximum Emissions (under normal operating conditions)

☑ **This Table was intentionally left blank because it would be identical to Table 2-E.**

Maximum Emissions are the emissions at maximum capacity and prior to (in the absence of) pollution control, emission-reducing process equipment, or any other emission reduction. Calculate the hourly emissions using the worst case hourly emissions for each pollutant. For each pollutant, calculate the annual emissions as if the facility were operating at maximum plant capacity without pollution controls for 8760 hours per year, unless otherwise approved by the Department. List Hazardous Air Pollutants (HAP) & Toxic Air Pollutants (TAPs) in Table 2-I. Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		PM[1]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals																		

[1]**Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but PM is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

Table 2-E: Requested Allowable Emissions

Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E^{-4}).

Unit No.	NOx		CO		VOC		SOx		PM[1]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
B1	2.40	10.51	2.02	8.83	0.13	0.58	0.34	1.50	0.18	0.80	0.18	0.80	0.18	0.80	-	-	-	-
B2	2.40	10.51	2.02	8.83	0.13	0.58	0.34	1.50	0.18	0.80	0.18	0.80	0.18	0.80	-	-	-	-
B3	5.57	24.40	1.38	6.04	0.21	0.92	0.54	2.38	0.29	1.27	0.29	1.27	0.29	1.27	-	-	-	-
B4	5.57	24.40	1.38	6.04	0.21	0.92	0.54	2.38	0.29	1.27	0.29	1.27	0.29	1.27	-	-	-	-
D2	8.04	35.20	11.96	52.37	0.26	1.15	0.75	3.28	0.39	1.73	0.39	1.73	0.39	1.73	-	-	-	-
AHU-1	0.33	1.45	0.14	0.61	0.020	0.089	0.051	0.22	0.18	0.79	0.18	0.79	0.18	0.79	-	-	-	-
AHU-2	0.33	1.45	0.14	0.61	0.020	0.089	0.051	0.22	0.18	0.79	0.18	0.79	0.18	0.79	-	-	-	-
MAU-1001	0.20	0.86	1.19	5.23	0.043	0.19	0.11	0.48	0.060	0.26	0.060	0.26	0.06	0.26	-	-	-	-
MAU-1002	0.20	0.86	1.19	5.23	0.043	0.19	0.11	0.48	0.060	0.26	0.060	0.26	0.06	0.26	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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Totals	25.03	109.63	21.41	93.80	1.07	4.69	2.84	12.45	1.82	7.96	1.82	7.96	1.82	7.96	-	-	-	-

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but it is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

Table 2-F: Additional Emissions during Startup, Shutdown, and Routine Maintenance (SSM)

☑ This table is intentionally left blank since all emissions at this facility due to routine or predictable startup, shutdown, or scehduled maintenance are no higher than those listed in Table 2-E and a malfunction emission limit is not already permitted or requested. If you are required to report GHG emissions as described in Section 6a, include any GHG emissions during Startup, Shutdown, and/or Scheduled Maintenance (SSM) in Table 2-P. Provide an explanations of SSM emissions in Section 6 and 6a.

All applications for facilities that have emissions during routine our predictable startup, shutdown or scheduled maintenance (SSM)[1], including NOI applications, must include in this table the Maximum Emissions during routine or predictable startup, shutdown and scheduled maintenance (20.2.7 NMAC, 20.2.72.203.A.3 NMAC, 20.2.73.200.D.2 NMAC). In Section 6 and 6a, provide emissions calculations for all SSM emissions reported in this table. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (https://www.env.nm.gov/aqb/permit/aqb_pol.html) for more detailed instructions. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		PM[2]		PM10[2]		PM2.5[2]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals																		

[1] **For instance**, if the short term steady-state Table 2-E emissions are 5 lb/hr and the SSM rate is 12 lb/hr, enter 7 lb/hr in this table. If the annual steady-state Table 2-E emissions are 21.9 TPY, and the number of scheduled SSM events result in annual emissions of 31.9 TPY, enter 10.0 TPY in the table below.

[2] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but it is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

Table 2-G: Stack Exit and Fugitive Emission Rates for Special Stacks

☑ I have elected to leave this table blank because this facility does not have any stacks/vents that split emissions from a single source or combine emissions from more than one source listed in table 2-A. Additionally, the emission rates of all stacks match the Requested allowable emission rates stated in Table 2-E.

Use this table to list stack emissions (requested allowable) from split and combined stacks. List Toxic Air Pollutants (TAPs) and Hazardous Air Pollutants (HAPs) in Table 2-I. List all fugitives that are associated with the normal, routine, and non-emergency operation of the facility. Unit and stack numbering must correspond throughout the application package. Refer to Table 2-E for instructions on use of the "-" symbol and on significant figures.

Stack No.	Serving Unit Number(s) from Table 2-A	NOx		CO		VOC		SOx		PM		PM10		PM2.5		☐ H_2S or ☐ Lead	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals:																	

Table 2-H: Stack Exit Conditions

Unit and stack numbering must correspond throughout the application package. Include the stack exit conditions for each unit that emits from a stack, including blowdown venting parameters and tank emissions. If the facility has multiple operating scenarios, complete a separate Table 2-H for each scenario and, for each, type scenario name here:

Stack Number	Serving Unit Number(s) from Table 2-A	Orientation (H-Horizontal V=Vertical)	Rain Caps (Yes or No)	Height Above Ground (ft)	Temp. (F)	Flow Rate		Moisture by Volume (%)	Velocity (ft/sec)	Inside Diameter (ft)
						(acfs)	(dscfs)			
B1	B1	V	No	46	290	122	145	N/A	35	2.30
B2	B2	V	No	46	290	122	145	N/A	35	2.30
B3	B3	V	No	50	400	222	96	N/A	23	2.30
B4	B4	V	No	50	400	222	96	N/A	23	2.30
NDS	D2	V	No	150	195	95	66	N/A	39	6.50
SDS	D2	V	No	150	195	95	66	N/A	39	6.50
BVS	D2	V	No	150	90	18	15	N/A	22	3.80
AHU-1	AHU-1	V	No	14	160	15	11	N/A	38.3	0.70
AHU-2	AHU-2	V	No	14	160	15	11	N/A	38.3	0.70
MAU-1001	MAU-1001	V	No	95	120	1246	750	N/A	253.8	2.50
MAU-1002	MAU-1002	V	No	95	120	1246	750	N/A	253.8	2.50

Table 2-I: Stack Exit and Fugitive Emission Rates for HAPs and TAPs

In the table below, report the Potential to Emit for each HAP from each regulated emission unit listed in Table 2-A, only if the entire facility emits the HAP at a rate greater than or equal to one (1) ton per year For each such emission unit, HAPs shall be reported to the nearest 0.1 tpy. Each facility-wide Individual HAP total and the facility-wide Total HAPs shall be the sum of all HAP sources calculated to the nearest 0.1 ton per year. Per 20.2.72.403.A.1 NMAC, facilities not exempt [see 20.2.72.402.C NMAC] from TAP permitting shall report each TAP that has an uncontrolled emission rate in excess of its pounds per hour screening level specified in 20.2.72.502 NMAC. TAPs shall be reported using one more significant figure than the number of significant figures shown in the pound per hour threshold corresponding to the substance. Use the HAP nomenclature as it appears in Section 112 (b) of the 1990 CAAA and the TAP nomenclature as it listed in 20.2.72.502 NMAC. Include tank-flashing emissions estimates of HAPs in this table. For each HAP or TAP listed, fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected or the pollutant is emitted in a quantity less than the threshold amounts described above.

Stack No.	Unit No.(s)	Total HAPs		n-Hexane ☑ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
B1	B1	0.066	0.29	0.044	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B2	B2	0.066	0.29	0.044	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B3	B3	0.10	0.46	0.071	0.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B4	B4	0.10	0.46	0.071	0.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NVS, SDS, BVS	D2	0.13	0.57	0.089	0.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AHU-1	AHU-1	0.055	0.24	0.0053	0.023	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AHU-2	AHU-2	0.055	0.24	0.0053	0.023	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAU-1001	MAU-1001	0.014	5.77E-03	0.014	0.0031	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAU-1002	MAU-1002	0.014	5.77E-03	0.014	0.0031	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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Totals:		**0.61**	**2.55**	**0.36**	**1.45**	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 2-J: Fuel

Specify fuel characteristics and usage. Unit and stack numbering must correspond throughout the application package.

Unit No.	Fuel Type (low sulfur Diesel, ultra low sulfur diesel, Natural Gas, Coal, …)	Fuel Source: purchased commercial, pipeline quality natural gas, residue gas, raw/field natural gas, process gas (e.g. SRU tail gas) or other	Specify Units				
			Lower Heating Value	Hourly Usage	Annual Usage	% Sulfur	% Ash
B1	Natural Gas	Pipeline Quality Natural Gas	1050 Btu/scf	24,000 scf/hr	210.2 MMscf	5 gr S/100 scf	Negligible
B2	Natural Gas	Pipeline Quality Natural Gas	1050 Btu/scf	24,000 scf/hr	210.2 MMscf	5 gr S/100 scf	Negligible
B3	Natural Gas	Pipeline Quality Natural Gas	1050 Btu/scf	38,095 scf/hr	333.7 MMscf	5 gr S/100 scf	Negligible
B4	Natural Gas	Pipeline Quality Natural Gas	1050 Btu/scf	38,095 scf/hr	333.7 MMscf	5 gr S/100 scf	Negligible
D2	Natural Gas	Pipeline Quality Natural Gas	1050 Btu/scf	47619 scf/hr	417 MMscf	5 gr S/100 scf	Negligible
AHU-1	Natural Gas	Pipeline Quality Natural Gas	1050 Btu/scf	3571 scf/hr	31.3 MMscf	5 gr S/100 scf	Negligible
AHU-2	Natural Gas	Pipeline Quality Natural Gas	1050 Btu/scf	3571 scf/hr	31.3 MMscf	5 gr S/100 scf	Negligible
MAU-1001	Natural Gas	Pipeline Quality Natural Gas	1050 Btu/scf	7619 scf/hr	66.7 MMscf	5 gr S/100 scf	Negligible
MAU-1002	Natural Gas	Pipeline Quality Natural Gas	1050 Btu/scf	7619 scf/hr	66.7 MMscf	5 gr S/100 scf	Negligible

Table 2-K: Liquid Data for Tanks Listed in Table 2-L

For each tank, list the liquid(s) to be stored in each tank. If it is expected that a tank may store a variety of hydrocarbon liquids, enter "mixed hydrocarbons" in the Composition column for that tank and enter the corresponding data of the most volatile liquid to be stored in the tank. If tank is to be used for storage of different materials, list all the materials in the "All Calculations" attachment, run the newest version of TANKS on each, and use the material with the highest emission rate to determine maximum uncontrolled and requested allowable emissions rate. The permit will specify the most volatile category of liquids that may be stored in each tank. Include appropriate tank-flashing modeling input data. Use additional sheets if necessary. Unit and stack numbering must correspond throughout the application package.

Tank No.	SCC Code	Material Name	Composition	Liquid Density (lb/gal)	Vapor Molecular Weight (lb/lb*mol)	Average Storage Conditions		Max Storage Conditions	
						Temperature (°F)	True Vapor Pressure (psia)	Temperature (°F)	True Vapor Pressure (psia)
N/A									

Table 2-L: Tank Data

Include appropriate tank-flashing modeling input data. Use an addendum to this table for unlisted data categories. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary. See reference Table 2-L2. Note: 1.00 bbl = 10.159 M3 = 42.0 gal

Tank No.	Date Installed	Materials Stored	Seal Type (refer to Table 2-LR below)	Roof Type (refer to Table 2-LR below)	Capacity		Diameter (M)	Vapor Space (M)	Color (from Table VI-C)		Paint Condition (from Table VI-C)	Annual Throughput (gal/yr)	Turn-overs (per year)
					(bbl)	(M^3)			Roof	Shell			
N/A													

Table 2-L2: Liquid Storage Tank Data Codes Reference Table

Roof Type	Seal Type, Welded Tank Seal Type		Seal Type, Riveted Tank Seal Type		Roof, Shell Color	Paint Condition
FX: Fixed Roof	**Mechanical Shoe Seal**	**Liquid-mounted resilient seal**	**Vapor-mounted resilient seal**	**Seal Type**	**WH**: White	Good
IF: Internal Floating Roof	**A**: Primary only	**A**: Primary only	**A**: Primary only	**A**: Mechanical shoe, primary only	**AS**: Aluminum (specular)	Poor
EF: External Floating Roof	**B**: Shoe-mounted secondary	**B**: Weather shield	**B**: Weather shield	**B**: Shoe-mounted secondary	**AD**: Aluminum (diffuse)	
P: Pressure	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**LG**: Light Gray	
					MG: Medium Gray	
					BL: Black	
					OT: Other (specify)	

Note: 1.00 bbl = 0.159 M^3 = 42.0 gal

Table 2-M: Materials Processed and Produced (Use additional sheets as necessary.)

Material Processed				Material Produced			
Description	**Chemical Composition**	**Phase (Gas, Liquid, or Solid)**	**Quantity (specify units)**	**Description**	**Chemical Composition**	**Phase**	**Quantity (specify units)**
Milk or milk equivalent (Condensed Milk)	Varies	Varies	28,000 lb/hr Condensed Skim Milk @ 48% TS	Non Fat Dry Milk	Varies	Varies	12,500 lb/hr
Milk or milk equivalent (Condensed Milk, UF Retentate)	Varies	Varies	47,000 lb/hr Condensed Skim Milk @ 50% TS	Non Fat Dry Milk	Varies	Varies	21,000 lb/hr
Milk or milk equivalent	Varies	Varies	54,000 lb/hr Retentate @ 22% TS	Milk Protein Concentrate Powder	Varies	Varies	15,000 lb/hr
Milk or milk equivalent	Varies	Varies	16,700 lb/hr Milk Protein Concentrate Permeate @ 48% TS	Milk Permeate Powder	Varies	Varies	9,000 lb/hr
Milk or milk equivalent	Varies	Liquid	132,000 lbs/hr Raw Milk	Condensed Milk (Liquid loadout)	Varies	Liquid	33,000 lb/hr
Milk or milk equivalent	Varies	Liquid	492,000 lb/hr Raw Milk	Cream (Liquid loadout)	Varies	Liquid	44,000 lb/hr

Table 2-N: CEM Equipment

Enter Continuous Emissions Measurement (CEM) Data in this table. If CEM data will be used as part of a federally enforceable permit condition, or used to satisfy the requirements of a state or federal regulation, include a copy of the CEM's manufacturer specification sheet in the Information Used to Determine Emissions attachment. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Stack No.	Pollutant(s)	Manufacturer	Model No.	Serial No.	Sample Frequency	Averaging Time	Range	Sensitivity	Accuracy
N/A									

Table 2-O: Parametric Emissions Measurement Equipment

Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Unit No.	Parameter/Pollutant Measured	Location of Measurement	Unit of Measure	Acceptable Range	Frequency of Maintenance	Nature of Maintenance	Method of Recording	Averaging Time
N/A								

Table 2-P: Greenhouse Gas Emissions

Applications submitted under 20.2.70, 20.2.72, & 20.2.74 NMAC are required to complete this Table. Power plants, Title V major sources, and PSD major sources must report and calculate all GHG emissions for each unit. Applicants must report potential emission rates in short tons per year (see Section 6.a for assistance). Include GHG emissions during Startup, Shutdown, and Scheduled Maintenance in this table. For minor source facilities that are not power plants, are not Title V, or are not PSD, there are three options for reporting GHGs 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHG as a second separate unit; OR 3) check the following box ☐ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

		CO_2 ton/yr	N_2O ton/yr	CH_4 ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]									Total GHG Mass Basis ton/yr[4]	Total CO_2e ton/yr[5]
Unit No.	**GWPs [1]**	**1**	**298**	**25**	**22,800**	**footnote 3**										
B1	**mass GHG**	12911.47	0.024	0.24	-	-	-	-	-	-	-	-	-	-	12911.74	-
	CO_2e	12911.47	7.25	6.08	-	-	-	-	-	-	-	-	-	-	-	12924.80
B2	**mass GHG**	12911.47	0.024	0.24	-	-	-	-	-	-	-	-	-	-	12911.74	-
	CO_2e	12911.47	7.25	6.08	-	-	-	-	-	-	-	-	-	-	-	12924.80
B3	**mass GHG**	20494.39	0.04	0.39	-	-	-	-	-	-	-	-	-	-	20494.82	-
	CO_2e	20494.39	11.51	9.66	-	-	-	-	-	-	-	-	-	-	-	20515.56
B4	**mass GHG**	20494.39	0.04	0.39	-	-	-	-	-	-	-	-	-	-	20494.82	-
	CO_2e	20494.39	11.51	9.66	-	-	-	-	-	-	-	-	-	-	-	20515.56
D2	**mass GHG**	25617.99	0.048	0.48	-	-	-	-	-	-	-	-	-	-	1921.39	-
	CO_2e	25617.99	14.39	12.07	-	-	-	-	-	-	-	-	-	-	-	25644.45
AHU-1	**mass GHG**	1921.35	3.62E-03	0.036	-	-	-	-	-	-	-	-	-	-	1921.39	-
	CO_2e	1921.35	1.08	0.91	-	-	-	-	-	-	-	-	-	-	-	1923.34
AHU-2	**mass GHG**	1921.35	3.62E-03	0.036	-	-	-	-	-	-	-	-	-	-	1921.39	-
	CO_2e	1921.35	1.08	0.91	-	-	-	-	-	-	-	-	-	-	-	1923.34
MAU-1001	**mass GHG**	4098.88	7.72E-03	0.077	-	-	-	-	-	-	-	-	-	-	4098.97	-
	CO_2e	4098.88	2.30E+00	1.931	-	-	-	-	-	-	-	-	-	-	-	4103.12
MAU-1002	**mass GHG**	4098.88	7.72E-03	0.077	-	-	-	-	-	-	-	-	-	-	4098.97	-
	CO_2e	4098.88	2.30E+00	1.931	-	-	-	-	-	-	-	-	-	-	-	4103.12
-	**mass GHG**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO_2e	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	**mass GHG**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO_2e	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	**mass GHG**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO_2e	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	**mass GHG**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO2e	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**mass GHG**	104470.19	0.20	1.97	-	-	-	-	-	-	-	-	-	-	80775.22	-
	CO_2e	104470.19	58.67	49.22	-	-	-	-	-	-	-	-	-	-	-	104578.09

[1] **GWP** (Global Warming Potential): Applicants must use the most current GWPs codified in Table A-1 of 40 CFR part 98. GWPs are subject to change, therefore, applicants need to check 40 CFR 98 to confirm GWP values.

[2] For **HFCs** or **PFCs** describe the specific HFC or PFC compound and use a separate column for each individual compound.

[3] For each new compound, enter the appropriate GWP for each HFC or PFC compound from Table A-1 in 40 CFR 98.

[4] Green house gas emissions on a **mass basis** is the ton per year green house gas emission before adjustment with its GWP.

[5] **CO_2e** means Carbon Dioxide Equivalent and is calculated by multiplying the TPY mass emissions of the green house gas by its GWP.

Section 3

Application Summary

The **Application Summary** shall include a brief description of the facility and its process, the type of permit application, the applicable regulation (i.e. 20.2.72.200.A.X, or 20.2.73 NMAC) under which the application is being submitted, and any air quality permit numbers associated with this site. If this facility is to be collocated with another facility, provide details of the other facility including permit number(s). In case of a revision or modification to a facility, provide the lowest level regulatory citation (i.e. 20.2.72.219.B.1.d NMAC) under which the revision or modification is being requested. Also describe the proposed changes from the original permit, how the proposed modification will affect the facility's operations and emissions, de-bottlenecking impacts, and changes to the facility's major/minor status (both PSD & Title V).

The **Process Summary** shall include a brief description of the facility and its processes.

Startup, Shutdown, and Maintenance (SSM) routine or predictable emissions: Provide an overview of how SSM emissions are accounted for in this application. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on SSM emissions.

Portales Dairy Products, LLC is submitting this application for a renewal and Significant Modification of Title V operating permit P234-R2M1 for the Portales Plant. The Significant Modification will reflect recent changes to NSR 1263-M5-R1 which was submitted to NMED on September 24, 2020. This submittal is pursuant to 20.2.70.300.B.(2) NMAC and 20.2.70.404.C.(1)(a) NMAC. The facility will remove a natural gas fired-dryer (unit ID D1) and the associated wet scrubber (unit ID CD-1) and upgrade the two (2) heater units (unit ID's MAU-1001 and MAU-1002) from the former 2.8 MMBtu/hr to 8 MMBtu/hr. Updates to exempt and insignificant units are also being requested in this application as reported in Table 2-B.

Affected Unit	Description of Proposed Change
MAU-1001	Increasing to 8 MMBtu/hr.
MAU-1002	Increasing to 8 MMBtu/hr.
CD-1	Removed from permit.
D1	Removed from permit.
V1	Updated size and re-classified unit as exempt.

Section 4

Process Flow Sheet

A **process flow sheet** and/or block diagram indicating the individual equipment, all emission points and types of control applied to those points. The unit numbering system should be consistent throughout this application.

A process flow diagram is attached on the following page.

Dairy Farmers of America

PORTALES, NM

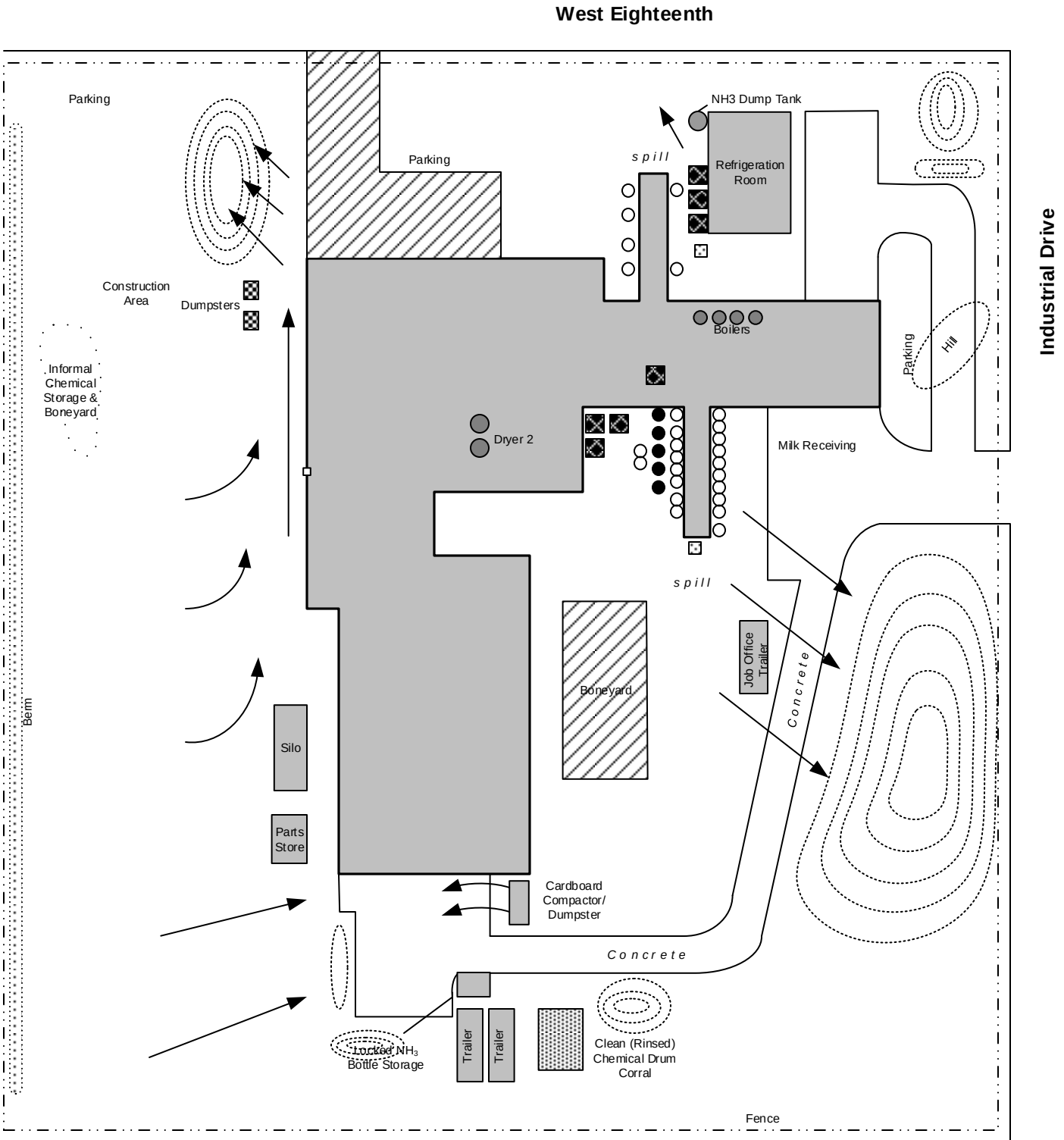
Unit AHU-1 and AHU-2 are air handling units that provide heated air to the MPC Process Area. Likewise, MAU-1001 and MAU-1001 provide heater air to the CER Dryer Room.

Section 5

Plot Plan Drawn To Scale

A **plot plan drawn to scale** showing emissions points, roads, structures, tanks, and fences of property owned, leased, or under direct control of the applicant. This plot plan must clearly designate the restricted area as defined in UA1, Section 1-D.12. The unit numbering system should be consistent throughout this application.

A plot plan is attached on the following page.



Dairy Farmers of America

N

Not To Scale

Legend

- Chemical Tank
- Product / H_2O Tank
- Cooling Tower
- Lift Station
- Stack
- Concrete
- Drainage Path

Site Map
Dairy Farmers of America
Portales, NM

Section 6

All Calculations

Show all calculations used to determine both the hourly and annual controlled and uncontrolled emission rates. All calculations shall be performed keeping a minimum of three significant figures. Document the source of each emission factor used (if an emission rate is carried forward and not revised, then a statement to that effect is required). If identical units are being permitted and will be subject to the same operating conditions, submit calculations for only one unit and a note specifying what other units to which the calculations apply. All formulas and calculations used to calculate emissions must be submitted. The "Calculations" tab in the UA2 has been provided to allow calculations to be linked to the emissions tables. Add additional "Calc" tabs as needed. If the UA2 or other spread sheets are used, all calculation spread sheet(s) shall be submitted electronically in Microsoft Excel compatible format so that formulas and input values can be checked. Format all spread sheets and calculations such that the reviewer can follow the logic and verify the input values. Define all variables. If calculation spread sheets are not used, provide the original formulas with defined variables. Additionally, provide subsequent formulas showing the input values for each variable in the formula. All calculations, including those calculations are imbedded in the Calc tab of the UA2 portion of the application, the printed Calc tab(s), should be submitted under this section.

Tank Flashing Calculations: The information provided to the AQB shall include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., NOI, permit, or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis. If Hysis is used, all relevant input parameters shall be reported, including separator pressure, gas throughput, and all other relevant parameters necessary for flashing calculation.

SSM Calculations: It is the applicant's responsibility to provide an estimate of SSM emissions or to provide justification for not doing so. In this Section, provide emissions calculations for Startup, Shutdown, and Routine Maintenance (SSM) emissions listed in the Section 2 SSM and/or Section 22 GHG Tables and the rational for why the others are reported as zero (or left blank in the SSM/GHG Tables). Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on calculating SSM emissions. If SSM emissions are greater than those reported in the Section 2, Requested Allowables Table, modeling may be required to ensure compliance with the standards whether the application is NSR or Title V. Refer to the Modeling Section of this application for more guidance on modeling requirements.

Glycol Dehydrator Calculations: The information provided to the AQB shall include the manufacturer's maximum design recirculation rate for the glycol pump. If GRI-Glycalc is used, the full input summary report shall be included as well as a copy of the gas analysis that was used.

Road Calculations: Calculate fugitive particulate emissions and enter haul road fugitives in Tables 2-A, 2-D and 2-E for:

1. If you transport raw material, process material and/or product into or out of or within the facility and have PER emissions greater than 0.5 tpy.
2. If you transport raw material, process material and/or product into or out of the facility more frequently than one round trip per day.

Significant Figures:

A. All emissions standards are deemed to have at least two significant figures, but not more than three significant figures.

B. At least 5 significant figures shall be retained in all intermediate calculations.

C. In calculating emissions to determine compliance with an emission standard, the following rounding off procedures shall be used:

(1) If the first digit to be discarded is less than the number 5, the last digit retained shall not be changed;

(2) If the first digit discarded is greater than the number 5, or if it is the number 5 followed by at least one digit other than the number zero, the last figure retained shall be increased by one unit; **and**

(3) If the first digit discarded is exactly the number 5, followed only by zeros, the last digit retained shall be rounded upward if it is an odd number, but no adjustment shall be made if it is an even number.

(4) The final result of the calculation shall be expressed in the units of the standard.

Control Devices: In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device

regardless if the applicant takes credit for the reduction in emissions. The applicant can indicate in this section of the application if they chose to not take credit for the reduction in emission rates. For notices of intent submitted under 20.2.73 NMAC, only uncontrolled emission rates can be considered to determine applicability unless the state or federal Acts require the control. This information is necessary to determine if federally enforceable conditions are necessary for the control device, and/or if the control device produces its own regulated pollutants or increases emission rates of other pollutants.

Boilers (Units B1-B2)
The current permit includes two natural gas fired 600 hp Seattle boilers (units B1 – B2). These units remain unchanged although the CO emissions were updated based on AP-42 Emission Factors.

Emission rates of NO_X and CO, VOCs and PM_{10} were calculated using the AP-42 emission factors Table 1.4-1 and 1.4-2. TSP and $PM_{2.5}$ emissions are set equal to PM_{10} emissions. SO_2 emissions were calculated based on the units' fuel consumption and a maximum sulfur content of five grains per 100 standard cubic foot (5 gr/100 scf). HAP emission rates were calculated using HAP Emissions from GRI HAPCalc 3.01 while GHG emissions were calculated using 40 CFR 98 Subpart C TIER 1 Table for natural gas values.

Exhaust parameters for these two units are based on a combination of manufacturer's and design data. Each boiler has a single emission point, and stack numbers are designated with the same notation as the unit number, as described in the forms.

Boilers (Units B3-B4)
The current permit includes two natural gas fired 1000 hp Seattle boilers (units B3 – B4). These units remain unchanged.

Emission rates of NOx and CO from these units were calculated based manufacturer's information. Emissions of VOCs, and PM_{10} were calculated using the AP-42 emission factors Table 1.4-1 and 1.4-2. TSP and $PM_{2.5}$ emissions are set equal to PM_{10} emissions. SO_2 emissions were calculated based on the units' fuel consumption and a maximum sulfur content of five grains per 100 standard cubic foot (5 gr/100 scf). HAP emission rates were calculated using HAP Emissions from GRI HAPCalc 3.01 while GHG emissions were calculated using 40 CFR 98 Subpart C TIER 1 Table for natural gas values.

Exhaust parameters for these two units are based on a combination of design and test data. As with the other boilers, each boiler has a single emission point, stack numbers are designated with the same notation as the unit number, as described in the forms.

Dryer 2 (Unit D2)
The facility includes a CE Rogers vertical dryer (D2) equipped with three integral baghouses. This unit has three stacks: the north dryer stack (NDS), south dryer stack (SDS) and fluid bed vent stack (BVS). This unit remain unchanged.

<u>For the combustion part:</u>
As with the boilers, the burners are natural gas fired. Emission rates of NO_X and CO were calculated using the burner vendor's specifications. Emission rates for VOCs, and PM_{10} were calculated using the AP-42 emission factors Table 1.4-1 and 1.4-2. $PM_{2.5}$ emissions are set equal to PM_{10} emissions. HAP emission rates were calculated using HAP Emissions from GRI HAPCalc 3.01 while GHG emissions were calculated using 40 CFR 98 Subpart C TIER 1 Table for natural gas values.

SO_2 emission estimates have been calculated based on the unit's fuel consumption and a maximum sulfur content of five grains per 100 standard cubic foot (5 gr S/100 scf).

<u>For the dryer part:</u>
Based on Stack Test data collected from 2011 to 2015 TSP emission rates were developed using the maximum emission rate obtained for each of the three stacks associated to this emission unit plus individual safety factors.

Therefore, based on the above, the emissions from this unit result from a combination of the burner emissions plus the dryer operation.

Exhaust parameters for the dryer are based on a combination of test and design data.

Niro AHU-1/AHU-2
The emission rates for NO_X, CO and Particulate Matter were determined using the Power Flame Burner® Manufacturer's Data. VOC emission rates were calculated using AP-42 Table 1.4-1 and SO_2 emissions rates were based on using the natural gas

pipeline specifications (5 gr total sulfur/100 scf). HAP emission rates were calculated using HAP Emissions from GRI HAPCalc 3.01. GHG emissions were calculated using 40 CFR 98 Subpart C TIER 1 Table for natural gas values. These units remain unchanged.

Exhaust parameters for these units are based on a combination of design data and field measurements.

CER MAU-1001 and MAU-1002
These units have been upgraded from 2.8 MMBru/hr to 8 MMBru/hr units with this application. The emission rates for NO_X and CO were determined using the ANZI Z83.18 Heater Emission limits for Direct-Fired Units.
Particulate Matter and VOC emission rates were calculated using AP-42, Table 1.4-1. SO_2 emissions rates were based on using the natural gas pipeline specifications (5 gr total sulfur/100 scf). HAP emission rates were calculated using HAP Emissions from GRI HAPCalc 3.01. GHG emissions were calculated using 40 CFR 98 Subpart C TIER 1 Table for natural gas values.

Exhaust parameters for these units are based on a combination of design data and field measurements.

HAUL ROADS
The haul road emissions were calculated using AP-42 Table 13.2.1-1 and are considered both exempt and insignificant.

COOLING TOWERS
The emission rates for the cooling towers were determined using AP-42-13.1-1 and Technical Memorandum, Daren Zigich, September 9, 2013. The cooling towers are considered exempt due to the low emissions rates.

NUISANCE DUST COLLECTOR , V1 (Exempt and Insignificant)
The nuisance dust collector is considered exempt from the facility pursuant to 20.2.72.202.B(5) NMAC and IA List Item #1.a .

HEATERS and Maxon Ovenpack (Exempt and Insignificant)
Heater emissions were calculated using emission factors from AP-42 Tables 1.4-1 and 2. The heaters are considered exempt per 20.2.72.202.B(5) NMAC and IA List Item #1.a.

Section 6.a

Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

Title V (20.2.70 NMAC), Minor NSR (20.2.72 NMAC), and PSD (20.2.74 NMAC) applicants must estimate and report greenhouse gas (GHG) emissions to verify the emission rates reported in the public notice, determine applicability to 40 CFR 60 Subparts, and to evaluate Prevention of Significant Deterioration (PSD) applicability. GHG emissions that are subject to air permit regulations consist of the sum of an aggregate group of these six greenhouse gases: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Calculating GHG Emissions:

1. Calculate the ton per year (tpy) GHG mass emissions and GHG CO_2e emissions from your facility.
2. GHG mass emissions are the sum of the total annual tons of greenhouse gases without adjusting with the global warming potentials (GWPs). GHG CO_2e emissions are the sum of the mass emissions of each individual GHG multiplied by its GWP found in Table A-1 in 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Emissions from routine or predictable start up, shut down, and maintenance must be included.
4. Report GHG mass and GHG CO_2e emissions in Table 2-P of this application. Emissions are reported in **short** tons per year and represent each emission unit's Potential to Emit (PTE).
5. All Title V major sources, PSD major sources, and all power plants, whether major or not, must calculate and report GHG mass and CO2e emissions for each unit in Table 2-P.
6. For minor source facilities that are not power plants, are not Title V, and are not PSD there are three options for reporting GHGs in Table 2-P: 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHGs as a second separate unit; 3) or check the following ☐ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

Sources for Calculating GHG Emissions:

- Manufacturer's Data
- AP-42 Compilation of Air Pollutant Emission Factors at http://www.epa.gov/ttn/chief/ap42/index.html
- EPA's Internet emission factor database WebFIRE at http://cfpub.epa.gov/webfire/
- 40 CFR 98 Mandatory Green House Gas Reporting except that tons should be reported in short tons rather than in metric tons for the purpose of PSD applicability.
- API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry. August 2009 or most recent version.
- Sources listed on EPA's NSR Resources for Estimating GHG Emissions at http://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases:

Global Warming Potentials (GWP):
Applicants must use the Global Warming Potentials codified in Table A-1 of the most recent version of 40 CFR 98 Mandatory Greenhouse Gas Reporting. The GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to that of one unit mass of CO_2 over a specified time period.

"Greenhouse gas" for the purpose of air permit regulations is defined as the aggregate group of the following six gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. **(20.2.70.7 NMAC, 20.2.74.7 NMAC).** You may also find GHGs defined in 40 CFR 86.1818-12(a).

Metric to Short Ton Conversion:
Short tons for GHGs and other regulated pollutants are the standard unit of measure for PSD and title V permitting programs. 40 CFR 98 Mandatory Greenhouse Reporting requires metric tons.
1 metric ton = 1.10231 short tons (per Table A-2 to Subpart A of Part 98 – Units of Measure Conversions)

Dairy Farmers of America - Portales Plant

Emission Summary

Uncontrolled / Controlled Emissions

Unit	Stack No.	Description/Source	NOx		CO		VOCs		SO_2		TSP		PM_{10}		$PM_{2.5}$		HAPs		CO_2e	
			pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy
B1	B1	Boiler	2.4	10.5	2.0	8.8	0.13	0.58	0.34	1.5	0.18	0.80	0.18	0.80	0.18	0.80	0.066	0.29	2,950.9	12,924.8
B2	B2	Boiler	2.4	10.5	2.0	8.8	0.13	0.58	0.34	1.5	0.18	0.80	0.18	0.80	0.18	0.80	0.066	0.29	2,950.9	12,924.8
B3	B3	Boiler	5.6	24.4	1.4	6.0	0.21	0.92	0.54	2.4	0.29	1.3	0.29	1.3	0.29	1.3	0.10	0.46	4,683.9	20,515.6
B4	B4	Boiler	5.6	24.4	1.4	6.0	0.21	0.92	0.54	2.4	0.29	1.3	0.29	1.3	0.29	1.3	0.10	0.46	4,683.9	20,515.6
D2	NVS, SDS, BVS	Dryer	8.0	35.2	12.0	52.4	0.3	1.1	0.75	3.3	8.1	35.7	0.39	1.7	0.39	1.7	0.13	0.57	5,854.9	25,644.5
AHU-1	AHU-1	Air Handling Unit Heater	0.33	1.4	0.14	0.61	0.020	0.089	0.051	0.22	0.18	0.79	0.18	0.79	0.18	0.79	0.055	0.24	439.1	1,923.3
AHU-2	AHU-2	Air Handling Unit Heater	0.33	1.4	0.14	0.61	0.020	0.089	0.051	0.22	0.18	0.79	0.18	0.79	0.18	0.79	0.055	0.24	439.1	1,923.3
MAU-1001	MAU-1001	Makeup Air Heater	0.20	0.86	1.19	5.2	0.043	0.189	0.109	0.48	0.060	0.261	0.060	0.261	0.060	0.261	0.014	0.01	936.8	4,103.1
MAU-1002	MAU-1002	Makeup Air Heater	0.20	0.86	1.19	5.2	0.043	0.189	0.109	0.48	0.060	0.261	0.060	0.261	0.060	0.261	0.014	0.01	936.8	4,103.1
Totals			**25.0**	**109.6**	**21.4**	**93.8**	**1.1**	**4.7**	**2.8**	**12.4**	**9.6**	**41.9**	**1.8**	**8.0**	**1.8**	**8.0**	**0.61**	**2.5**	**23,876.3**	**104,578.1**

"*" Indicates that an hourly limit is not appropriate for this operating situation and is not being requested.

"-" Indicates emissions of this pollutant are not expected

Dairy Farmers of America - Portales Plant

Heater

Emission unit number(s): Niro AHU-1/AHU-2
Source description: Air Handling Unit Heater
Manufacturer: Johnson Controls (Burner from Power Flame Incorporated)

Fuel Consumption

Input heat rate:	3.75	MMBtu/hr	Design Specification[1]
Fuel heat value:	1050	Btu/scf	Natural Gas HHV
Fuel rate:	3571	scf/hr	Input heat rate / fuel heat value
Annual fuel usage:	31.3	MMscf/yr	8760 hrs/yr operation

Exhaust Parameters

Heat Rate:	3750	MBtu/hr	Design Specification
Exhaust temp (Tstk):	160	°F	Field Verified
Site Elevation:	3012	ft MSL	
Ambient pressure (Pstk):	26.78	in. Hg	Calculated based on elevation
F factor:	10610	wscf/MMBtu	40 CFR 60 Appx A Method 19
Exhaust flow	663.1	scfm	Calculated from F factor and heat rate
	11.1	scfs	
Exhaust flow:	883.3	acfm	scfm * (Pstd/Pstk)*(Tstk/Tstd), Pstd = 29.92 "Hg, Tstd = 520 °R
	14.7	acfs	
Stack diameter:	0.7	ft	Field Verified
Stack height:	14	ft	Field Verified
Exhaust velocity:	38.3	ft/sec	Exhaust flow ÷ stack area

Emission Rates

Uncontrolled Heater Emissions

NOx	CO	VOC	SO_2[1]	PM [2]		
0.088	0.037			0.048	lb/MMBtu	mfg. data
		5.5			lb/MMscf	AP-42 Table 1.4-1 & 2
		5.7			lb/MMscf	EF Conversion, per AP-42 = Fuel Heat Value / EF Heat Value * EF
			5		gr Total Sulft	Pipeline specification
0.33	**0.14**	**0.02**	**0.05**	**0.18**	**lb/hr**	Hourly emission rate
1.4	**0.6**	**0.09**	**0.22**	**0.79**	**tpy**	Annual emission rate (8760 hrs/yr)

HAP Emissions[4]

HCHO	Methanol	Benzene	Toluene	Ethylbenzene	Xylene	
0.003	**0.00**	**0.00**	**0.004**	**0.01**	**0.01**	**lb/hr**
0.014	**0.016**	**0.013**	**0.017**	**0.035**	**0.022**	**tpy**

Acetaldehyde	2,2,4-Trimethylpentane	n-Hexane	Styrene	Total HAPs	
0.003	**0.011**	**0.005**	**0.008**	**0.055**	**lb/hr**
0.012	**0.047**	**0.023**	**0.035**	**0.24**	**tpy**

GHG Emissions

CO_2	CH_4	N_2O	CO_2e [3]		
53.06	0.001	0.0001		kg/MMbtu	40 CFR 98 Subpart C TIER 1
1,743.02	**3.29E-02**	**3.285E-03**	**1,745**	tonnes/yr	(1*10^-3)*EF*Fuel Heat Value*Annual Fuel Usage
1,921.35	**3.62E-02**	**3.621E-03**	**1,923**	tons/yr	

[1] *5 gr S/100scf. SO_2 calculation assumes 100% conversion of fuel elemental sulfur to SO_2.*

[2] *Assumes PM (Total) = TSP = PM-10 = PM-2.5*

[3] *Warming potential of CH4 is 25 times greater than CO2; warming potential of N2O is 298 times greater than CO2 (40 CFR 98 Subpart C)*

[4] *HAP Emissions from GRI HAPCalc 3.01*

[5] *HAP Emissions from GRI HAPCalc 3.01*

Dairy Farmers of America - Portales Plant

Heater

Emission unit number(s): MAU-1001 & MAU-1002
Source description: Makeup Heater
Manufacturer: Greenheck TSU-230-H50

Fuel Consumption

Input heat rate:	8.0	MMBtu/hr	Design Specification[1]
Fuel heat value:	1050	Btu/scf	Natural Gas HHV
Fuel rate:	7619	scf/hr	Input heat rate / fuel heat value
Annual fuel usage:	66.7	MMscf/yr	8760 hrs/yr operation

Exhaust Parameters

Heat Rate:	8000	MBtu/hr	Design Specification
Exhaust temp (Tstk):	120	°F	Field Verified
Site Elevation:	3012	ft MSL	
Ambient pressure (Pstk):	26.78	in. Hg	Calculated based on elevation
Exhaust flow	60000.0	scfm	Design Specification.
	1000.0	scfs	
Exhaust flow:	74762.3	acfm	scfm * (Pstd/Pstk)*(Tstk/Tstd), Pstd = 29.92 "Hg, Tstd = 520 °R
	1246.0	acfs	
Stack diameter:	2.5	ft	Field Verified
Stack height:	95	ft	Field Verified
Exhaust velocity:	253.8	ft/sec	Exhaust flow ÷ stack area

Emission Rates

Uncontrolled Heater Emissions

	NOx[6]	CO[6]	VOC	SO_2[1]	PM [2]		
	0.5	5				ppm	ANSI Z83.18
			5.5		7.6	lb/MMscf	AP-42 Table 1.4-1 & 2
			5.7		7.8	lb/MMscf	EF Conversion, per AP-42 = Fuel Heat Value / EF Heat Value * EF
				5		gr Total Sulfur/100 scf	Pipeline specification
	0.196	**1.195**	**0.04**	**0.11**	**0.06**	**lb/hr**	Hourly emission rate
	0.86	**5.23**	**0.19**	**0.5**	**0.26**	**tpy**	Annual emission rate (8760 hrs/yr)

0.04

HAP Emissions[4]	HCHO	2-Methylnapthalene	Benzene	Dichlorobenzene	Naphthalene	Dimethylbenz(a)anthracene	Phenanathrene		
	0.075	0.000024	0.0021	0.0012	0.00061	0.000016	0.000017	lb/MMscf	AP-42 Table 1.4-3
	5.71E-04	**1.83E-07**	**1.60E-05**	**9.14E-06**	**4.65E-06**	**1.22E-07**	**1.30E-07**	**lb/hr**	
	2.50E-03	**8.01E-07**	**7.01E-05**	**4.00E-05**	**2.04E-05**	**5.34E-07**	**5.67E-07**	**tpy**	

Toluene	n-Hexane	Total HAPs		
0.0034	1.80	-	lb/MMscf	AP-42 Table 1.4-3
2.59E-05	**1.37E-02**	**1.43E-02**	**lb/hr**	
5.91E-06	**3.13E-03**	**5.77E-03**	**tpy**	

GHG Emissions	CO_2	CH_4	N_2O	CO_2e [3]		
	53.06	0.001	0.0001		kg/MMbtu	40 CFR 98 Subpart C TIER 1
	3,718.44	**7.01E-02**	**7.008E-03**	**3,722**	tonnes/yr	(1*10^-3)*EF*Fuel Heat Value*Annual Fuel Usage
	4,098.88	**7.72E-02**	**7.725E-03**	**4,103**	tons/yr	

[1] *5 gr S/100scf. SO_2 calculation assumes 100% conversion of fuel elemental sulfur to SO_2.*

[2] *Assumes PM (Total) = TSP = PM-10 = PM-2.5*

[3] *Warming potential of CH4 is 25 times greater than CO2; warming potential of N2O is 298 times greater than CO2 (40 CFR 98 Subpart C)*

[4] *Ideal Gas Law: n = PV/RT*

Pressure *1 atm*

Gas Constant ***1.314***

ppm = scfm (1 atm/ 298.15 k) *(lb-mol*k/ 1.31 sft* (atm*ft3)/(lb-mole*K)

Dairy Farmers of America - Portales Plant

Boiler

Emission Unit: B1, B2
Stack Number: B1, B2

Description

Manufacturer: Seattle
Model: HPTWB-3000
Fuel: Natural gas
Serial Number: B1: L75405-1
B2: L75405-2

Fuel Consumption

Parameters	Value	Unit	Note
Input heat rate	25.2	MMBtu/hr	Mfg data
Fuel heat value	1050	Btu/scf	Nominal, natural gas
Fuel rate	24000	Scf/hr	Input heat rate / fuel heat value
	0.02	MMscf/hr	
Annual fuel usage	210.2	MMscf/yr	8760 actual hrs/yr operation

Emission Rates

	NOx	CO	VOC	SO_2[1]	TSP[2]	PM-10[2]	PM-2.5[2]	HAPs[3]	CO_2	CH_4	N_2O	CO_2e [4]	Units	Note
Emission Factors	100	84	5.5		7.6	7.6	7.6						lb/MMscf	AP-42 Tables 1.4-1 and 1.4-2 (7/98)
	2.4	2.0	0.13		0.18	0.18	0.18						lb/hr	Unit emissions*Input heat rate
				0.34									lb/hr	Fuel Consumption * sulfur content
									53.06	0.001	1.0E-04		kg/MMBtu	Table C-1 and C-2 of 40 CFR Part 98
									116.98	0.002205	2.2E-04		lb/MMBtu	
Emission Rates	2.4	2.0	0.13	0.34	0.18	0.18	0.18		2,947.8	0.056	0.0056	2,950.9	lb/hr	
	10.5	8.8	0.58	1.5	0.80	0.80	0.80	0.2874	12,911.5	0.24	0.024	12,924.8	tpy	lb/hr * 8760 hrs/yr / 2000lb/ton

Controlled emissions same as Uncontrolled

[1] SO_2 emissions based on fuel consumption and fuel sulfur content of 5 grains of sulfur per 100 standard cubic ft
5 gr S/100 scf * fuel scf/hr * 1 lb/7000 gr * 64 lb SO_2/32 lb S = lb/hr SO_2

[2] It has been assumed that TSP = PM_{10} = $PM_{2.5}$. ●All PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM1 emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

[3] HAPs estimated with GRI-HAPCalc

[4] Global Warming Potentials (GWP) are from Table A-1 of the EPA GHG MRR under 40 CFR Part 98.
CH_4 GWP = 25
N_2O GWP = 298

HAPs Components[5]

Component	ton/yr
Formaldehyde	0.0081
Methanol	0.0478
Acetaldehyde	0.0321
Benzene	0.0002
Toluene	0.0004
Xylenes (m,p,o)	0.0001
2,2,4-Trimethylpentane	0.0036
Napthalene	0.0001
Biphenyl	0.0001
n-Hexane	0.1948
Lead	0.0001
	0.2874

Exhaust Parameters

Parameters	Value	Unit	Note
Exhaust temp	290	°F	Currently Permitted
Stack height	46	ft	Currently Permitted
Stack diameter	2.3	ft	Currently Permitted
F factor	10610	wscf/10e6 Btu	40 CFR 60 Appx A Method 19
Exhaust flow	4456	scfm	Heat input * F factor/60
Exhaust flow	7331	acfm	Va = Vs*(Ps/Pa)*(Ta/Ts)
Exhaust velocity	29	ft/sec	F factor method
Site Elevation	4002	ft MSL	
Standard Pressure (Ps)	29.92	in Hg	
Pressure at Elevation (Pa)	25.84	in Hg	Hess, Introduction to Theoretical Meteorology, eqn. 6.8
Standard Temperature (Ts)	528	R	

Dairy Farmers of America - Portales Plant

Boiler

Emission Unit: B3, B4
Stack Number: B3, B4

Description

Manufacturer: Seattle
Model PFTA1000-4G200S
Fuel: Natural gas
Serial No.: B3: 10097-02
B4: 10097-01

Fuel Consumption

Parameters	Value	Unit	Note
Heat Rate	40.0	MMBtu/hr	Mfg data
Fuel Heat Value	1050	Btu/scf	Nominal, natural gas
Fuel rate	38095	Scf/hr	Input heat rate / fuel heat value
	0.038	MMscf/hr	
Annual fuel usage	333.7	MMscf/yr	8760 actual hrs/yr operation

Emission Rates

	NOx [1]	CO [1]	VOC	SO_2 [2]	TSP [3]	PM-10 [3]	PM-2.5 [3]	HAPs [4]	CO_2	CH_4	N_2O	CO_2e [5]	Units	Note
	5.57	1.38											lbs/hr	Manufactures information
			5.5		7.6	7.6	7.6						lb/MMscf	Unit emission from AP-42 Table 1.4-1&2
Emission Factors			0.21		0.29	0.29	0.29						lb/hr	Unit emissions * Input heat rate
				0.54									lb/hr	Fuel Consumption * sulfur content
									53.06	0.0010	1.0E-04		kg/MMBtu	Table C-1 and C-2 of 40 CFR Part 98
									117.0	0.0022	2.2E-04		lb/MMBtu	
Emission Rates	5.6	1.4	0.21	0.54	0.29	0.29	0.29		4,679.1	0.088	0.0088	4,683.9	lb/hr	
	24.4	6.0	0.92	2.4	1.3	1.3	1.3	0.4563	20,494.4	0.39	0.039	20,515.6	tpy	lb/hr * 8760 hrs/yr / 2000lb/ton

Controlled emissions same as Uncontrolled

[1] Information obtained from NSR Permit application 1263M3.

[2] SO_2 emissions based on fuel consumption and fuel sulfur content of 5 grains of sulfur per 100 standard cubic ft

5 gr S/100 scf * fuel scf/hr * 1 lb/7000 gr * 64 lb SO_2/32 lb S = lb/hr SO_2

[3] It has been assumed that TSP = PM_{10} = $PM_{2.5}$. lAll PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM1 emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

[4] HAPs estimated with GRI-HAPCalc

[5] Global Warming Potentials (GWP) are from Table A-1 of the EPA GHG MRR under 40 CFR Part 98.

CH_4 GWP = 25
N_2O GWP = 298

HAPs Components[5]

Component	ton/yr
Formaldehyde	0.0129
Methanol	0.0759
Acetaldehyde	0.051
Benzene	0.0004
Toluene	0.0006
Xylenes (m,p,o)	0.0002
2,2,4-Trimethylpentane	0.0057
Napthalene	0.0001
Biphenyl	0.0002
n-Hexane	0.3092
Lead	0.0001
	0.4563

Exhaust Parameters

Parameters	Value	Unit	Note
Exhaust temp	400	°F	Currently Permitted
Stack height	50	ft	Currently Permitted
Stack diameter	2.3	ft	Currently Permitted
F factor	10610	wscf/10e6 I	40 CFR 60 Appx A Method 19
Exhaust flow	7073	scfm	Heat input * F factor/60
Exhaust flow	13342	acfm	Va = Vs*(Ps/Pa)*(Ta/Ts)
Exhaust Velocity	53.5	ft/sec	F factor method
Site Elevation	4002	ft MSL	
Standard Pressure (Ps)	29.92	in Hg	
Pressure at Elevation (Pa)	25.84	in Hg	Hess, Introduction to Theoretical Meteorology, eqn. 6.8
Standard Temperature (Ts)	528	R	

Dairy Farmers of America - Portales Plant

Dryer 2

Emission Unit: D2
Stack Numbers: NDS, SDS, BVS

Description

Unit Description: CE Rogers Dryer
Source Description: Natural gas-fired milk dryer
Manufacturer: CE Rogers
Control Device: Baghouse (B3, B4, B5)
Model No. CER Shop Order 24235
Serial No. TCF 542

Fuel Consumption

Parameters	Value	Unit	Note
Maximum Production Rate	24000	lbs/hr	NSR Permit Condition A601 E.
	12	tons/hr	
Drier Burner	50	MMBtu/hr	Mfg data
Fuel Heat Value	1050	Btu/scf	Nominal, natural gas
Hourly fuel usage	47619	scf/hr	Input heat rate / fuel heat value
	0.048	MMscf/hr	
Annual fuel usage	417.1	MMscf/yr	8760 actual hrs/yr operation

Emission Rates

	NOx	CO	VOC [1]	SO_2 [2]	TSP [3]	PM10 [3]	PM2.5 [3]	HAPs [4]	CO_2	CH_4	N_2O	CO_2e [5]	Units	Notes
Dryer System Emissions - Natural Gas Combustion	0.16	0.24											lb/MMBtu	Vendor emission factors provided for the NSR 2001 Permit application. In that case, the burner had a capacity of 40 MMBtu/hr, therefore a emission factor was selected between the provided emission range: 0.1 to 0.2 lb/MMBtu fo NO_X & 0.2 to 0.3 lb/MMBtu for CO. As shown, this is a conservative approach if compared to NO_X and CO emission rates calculates with AP-42.
	8.0	**12**											lb/hr	lb/MMBtu * MMBtu/hr
	100	84	5.5			7.6	7.6						*lb/MMscf*	AP-42 Table 1.4-1 & 2 - natural gas (Filterable PM Only)
	4.8	4.00	0.26	0.68		**0.36**	**0.36**						lb/hr	lb/MMscf * MMscf/hr
									53.1	0.0010	1.0E-04		kg/MMBtu	Table C-1 and C-2 of 40 CFR Part 98
									117.0	0.0022	2.2E-04		lb/MMBtu	
North Stack (NDS) Stack Test History					1.78	-	-						lb/hr	2011 Maximum Stack Test Reading
					1.42	-	-						lb/hr	2012 Maximum Stack Test Reading
					0.41	-	-						lb/hr	2013 Maximum Stack Test Reading
					0.43	-	-						lb/hr	2014 Maximum Stack Test Reading
					2.07	-	-						lb/hr	2015 Maximum Stack Test Reading
					2.07	-	-						lb/hr	**2011-2015 Maximum Stack Reading**
					50%	-	-						%	Safety Factor
					3.11	-	-						lb/hr	**Emission Rate with Safety Factor**
South Stack (SDS) Stack Test History					1.58	-	-						lb/hr	2011 Maximum Stack Test Reading
					1.67	-	-						lb/hr	2012 Maximum Stack Test Reading
					0.64	-	-						lb/hr	2013 Maximum Stack Test Reading
					0.39	-	-						lb/hr	2014 Maximum Stack Test Reading
					3.19	-	-						lb/hr	2015 Maximum Stack Test Reading
					3.19	-	-						lb/hr	**2011-2015 Maximum Stack Reading**
					50%	-	-						%	Safety Factor
					4.79	-	-						lb/hr	**Emission Rate with Safety Factor**
Fluid Bed Vent Stack (BVS) Stack Test History					0.16	-	-						lb/hr	2011 Maximum Stack Test Reading
					0.35	-	-						lb/hr	2012 Maximum Stack Test Reading
					0.11	-	-						lb/hr	2013 Maximum Stack Test Reading
					0.02	-	-						lb/hr	2014 Maximum Stack Test Reading
					0.02	-	-						lb/hr	2015 Maximum Stack Test Reading
					0.35	-	-						lb/hr	**2011-2015 Maximum Stack Reading**
					50%	-	-						%	Safety Factor
					0.53	-	-						lb/hr	**Emission Rate with Safety Factor**
North Dryer Stack (NDS)	3.8	5.8	0.13	0.34	3.1	0.18	0.18						lb/hr	Accounts for 45% of the Dryer 2 produced emissions, except VOC (which is 50%), plus Safety Factor (SF): NO_X 5%, CO 7%. PM_{10} = $PM_{2.5}$ 10%
	16.6	25.3	0.6	1.5	13.6	0.8	0.8						tpy	
South Dryer Stack (SDS)	3.8	5.8	0.13	0.34	4.8	0.18	0.18						lb/hr	Accounts for 45% of the Dryer 2 produced emissions, except VOC (which is 50%), plus Safety Factor (SF): NO_X 5%, CO 7%. PM_{10} = $PM_{2.5}$ 10%
	16.6	25.3	0.57	1.5	13.6	0.8	0.8						tpy	
Fluid Bed Vent Stack (BVS)	0.48	0.40	-	0.075	0.53	0.036	0.036						lb/hr	Accounts for 10% of the produced emissions without any VOCs, plus safety factor of 10% for SO_2.
	2.1	1.75	-	0.33	2.3	0.16	0.16						tpy	
Total Emission Rates	8.0	12.0	0.26	0.75	8.4	0.4	0.4	0.13	5848.9	0.110	0.0110	5854.9	lb/hr	
	35.2	52.4	1.1	3.3	36.9	1.7	1.7	0.57	25618.0	0.48	0.048	25644.5	tpy	
	NOx	**CO**	**VOC [1]**	**SO_2 [2]**	**TSP [3]**	**PM10 [3]**	**PM2.5 [3]**	**HAPs [4]**						

Adjusted TSP (without Condensable PM) = **5.7** lbs/MMScf × **0.048** MMscf/hr = 0.27 lbs/hr AP-42 Table 1.4-1 & 2 - natural gas (Filterable) 5.7 lbs/MMScf

= **8.4** - **0.27** = 8.1 lbs/hr

= 8.1 lbs/hr × 8760 hr/yr × 1 ton/2000 lbs = 35.7 tons/year

Controlled Emissions same as Uncontrolled

[1] VOC emission rate calculated from AP-42 for whole burner; emission rate split evenly between NDS and SDS

[2] SO_2 emission rate split evenly between NDS and SDS. Emissions based on fuel consumption and fuel sulfur content of 5 grains of sulfur per 100 standard cubic ft

5 gr S/100 scf * fuel scf/hr * 1 lb/7000 gr * 64 lb SO_2/32 lb S = lb/hr SO_2

[3] Natural Gas Combustion: TSP = PM_{10} = $PM_{2.5}$

Dryer Operation: TSP emission rates were based on the AP-42 Table 9.6.1-2. According to DFA, refer to email in Section 7, 80% of the products through the this dryer will be captured by a 106 micron filter, therefore it has been assumed that 20% of the AP-42 proposed particle emission rate will correspond to the TSP. Accordingly to the 2012 Institute of Food Technologist, refer to Section 7, the mean particle size (median value of cumulative distribution), of milk powder, ranges from 85 µm for regular SMP to 230 to 250 µm for fat-filled milk powders (FFMPs; Tuohy 1989). Therefore, based on the above, there are no PM_{10} nor $PM_{2.5}$ emissions associated to this process.

[4] Total HAPs (for the unit) estimated with GRI-HAPCalc

[5] Global Warming Potentials (GWP) are from Table A-1 of the EPA GHG MRR under 40 CFR Part 98.
CH_4 GWP = 25
N_2O GWP = 298

HAPs Components[4]

Component	ton/yr
Formaldehyde	0.0161
Methanol	0.0949
Acetaldehyde	0.0637
Benzene	0.0005
Toluene	0.0007
Xylenes (m,p,o)	0.0002
2,2,4-Trimethylpentane	0.0071
Napthalene	0.0001
Biphenyl	0.0003
n-Hexane	0.3865
Lead	0.0001
	0.5702

Exhaust Parameters

Parameters	NDS	SDS	BVS	Unit	Note
Exhaust temp	195	195	90	°F	Currently Permitted
Stack height	150	150	150	ft	Currently Permitted
Stack diameter	6.5	6.5	3.8	ft	Currently Permitted
F factor	10610	10610	10610	wscf/10e6 Btu	40 CFR 60 Appx A Method 19
Exhaust flow	3979	3979	884	scfm	Heat input * F factor/60
	66	66	15	scfs	
Exhaust flow	5716	5716	1067	acfm	Va = Vs*(Ps/Pa)*(Ta/Ts)
	95	95	18	acfs	
Exhaust velocity	39	39	22	ft/sec	Currently Permitted
Site Elevation	4002	4002	4002	ft MSL	
Standard Pressure (Ps)	29.92	29.92	29.92	in Hg	
Pressure at Elevation (Pa)	25.84	25.84	25.84	in Hg	Hess, Introduction to Theoretical Meteorology, eqn. 6.8
Standard Temperature (Ts)	528	528	528	R	

Dairy Farmers of America - Portales Plant

Heater **Insignificantand Exempt Emission Source**

Comfort Heater - Exempt Unit

Emission unit number(s): Maxon Ovenpack

Source description:

Manufacturer:

Fuel Consumption

Input heat rate:	1.3	MMBtu/hr	Design Specification[1]
Fuel heat value:	1050	Btu/scf	Natural Gas HHV
Fuel rate:	1238	scf/hr	Input heat rate / fuel heat value
Annual fuel usage:	10.8	MMscf/yr	8760 hrs/yr operation

Exhaust Parameters

Heat Rate:	1300	MBtu/hr	Design Specification
Exhaust temp (Tstk):	730	°F	Eng Estimate
Site Elevation:	3012	ft MSL	
Ambient pressure (Pstk):	26.78	in. Hg	Calculated based on elevation
F factor:	10610	wscf/MMBtu	40 CFR 60 Appx A Method 19
Exhaust flow	229.9	scfm	Calculated from F factor and heat rate
Exhaust flow:	587.7	acfm	scfm * (Pstd/Pstk)*(Tstk/Tstd), Pstd = 29.92 "Hg, Tstd = 520 °R
Stack diameter:	3.0	ft	Eng Estimate
Stack height:	6	ft	Eng Estimate
Exhaust velocity:	1.4	ft/sec	Exhaust flow ÷ stack area

Emission Rates

Uncontrolled Heater Emissions

NO_x[6]	CO	VOC	SO_2[1]	PM[2]		
50	84	5.5		7.6	lb/MMscf	AP-42 Table 1.4-1 & 2
51.5	86.5	5.7		7.8	lb/MMscf	EF Conversion, per AP-42 = Fuel Heat Value / EF Heat
			5		gr Total Sulfi	Pipeline specification
0.1	**0.1**	**0.01**	**0.02**	**0.01**	**lb/hr**	Hourly emission rate
0.3	**0.47**	**0.03**	**0.1**	**0.04**	**tpy**	Annual emission rate (8760 hrs/yr)

HAP Emissions[4]

HCHO	Methanol	Benzene	Toluene	Ethylbenzene	Xylene	
0.001	**0.001**	**0.001**	**0.001**	**0.003**	**0.002**	**lb/hr**
0.005	**0.006**	**0.004**	**0.006**	**0.012**	**0.008**	**tpy**

Acetaldehyde	2,2,4-Trimethylpentane	n-Hexane	Styrene	Total HAPs	
0.00	**0.00**	**0.00**	**0.00**	**0.02**	**lb/hr**
0.0042	**0.016**	**0.0080**	**0.012**	**0.082**	**tpy**

GHG Emissions

CO_2	CH_4	N_2O	CO_2e[3]		
53.06	0.001	0.0001		kg/MMbtu	40 CFR 98 Subpart C TIER 1
604.25	**1.14E-02**	**1.139E-03**	**605**	tonnes/yr	(1*10^-3)*EF*Fuel Heat Value*Annual Fuel Usage
666.07	**1.26E-02**	**1.255E-03**	**667**	tons/yr	

[1] *5 gr S/100scf. SO_2 calculation assumes 100% conversion of fuel elemental sulfur to SO_2.*

[2] *Assumes PM (Total) = TSP = PM-10 = PM-2.5*

[3] *Warming potential of CH4 is 25 times greater than CO2; warming potential of N2O is 298 times greater than CO2 (40 CFR 98 Subpart C)*

[4] *HAP Emissions from GRI HAPCalc 3.01*

[5] *HAP Emissions from GRI HAPCalc 3.01*

[6] *Low NOx Burner*

Dairy Farmers of America - Portales Plant

Paved Haul Road — Insignificant and Exempt Emission Source

Emission unit number(s): Haul Road Milk Truck (Entering)
Source description: Paved Haul Road Emissions

Input Data

Empty vehicle weight[1]	14.05	tons	[1] Empty vehicle weight includes driver and occupants and full fuel load.
Load weight[2]	10.1	tons	[2] Cargo, transported materials, etc.
Loaded vehicle[3]	24.2	tons	[3] Loaded vehicle weight = Empty + Load Size
One way trip distance	0.11	mile/trip	Obtained from Google earth - measured from the Industrial Drive Truck's Entrance;
Trip frequency[4]	3.4	trips/hour	[5] Max trucks on road in one hour;
Trip frequency[5]	30,113	trips/yr	Annual trucks per year requested;
Surface silt content[6]	0.6	g/m^2	[7] AP-42 Table 13.2.1-2 - Paved Haul Roads < 500
Annual wet days[7]	60	days/yr	[8] AP-42 Figure 13.2.1-2
Vehicle miles traveled[8]	0.4	mile/hr	[9] VMT/hr = Vehicle Miles Traveled per hour= Trips per hour * Segment Length

Emission Factors and Constants

Parameter	PM_{30}	PM_{10}	$PM_{2.5}$	
k, lb/VMT[9]	0.011	0.0022	0.00054	[10] Table 13.2.1-1, Paved Roads
Hourly EF, lb/VMT[10]	0.18	0.036	0.009	[11] AP-42 13.2.1, Equation 1
Annual EF, lb/VMT[11]	0.17	0.034	0.0084	[12] AP-42 13.2.1, Equation 2

Haul Road Emission Calculations

	PM_{30}	PM_{10}	$PM_{2.5}$	
Hourly emissions	0.07	0.013	0.003	lb/hr = Hourly EF (lb/VMT) * VMT (mile/hr)
Annual Emissions	0.28	0.06	0.014	ton/yr =Annual EF (lb/VMT) * VMT (mile/Trip) * Trips per year (Trip/yr) / 2000 (lb/tpy)

Notes

[1] Empty vehicle weight includes driver and occupants and full fuel load.

[2] Cargo, Loaded Vehicles Minus Empty Vehicle, per site's truck weight system.

[3] Loaded vehicle weight per site's weighting system; This calculation was done one way because the truck will use a different exit road from the entrance therefore a mean weight is not calculated.

[4] Trips per hour = The average amount of trucks per hour (82.5) multiplied by 24 hours operation.

[5] Trips per year = Trips per hour multiplied by 365 days per year

[6] AP-42 Table 13.2.1-2 - Paved Haul Roads < 500

[7] AP-42 Figure 13.2.1-2

[8] VMT/hr = Vehicle Miles Traveled per hour= Trips per hour * Segment Length

[9] Table 13.2.1-1, Particle Size Multipliers for Paved Road Equation

[10] AP-42 13.2.1, Equation 1

$E = k\,(sL)^{0.91} \times (W)^{1.02}$

where: E = particulate emission factor (having units matching the units of k),

k = particle size multiplier for particle size range and units of interest,

sL = road surface silt loading (grams per square meter) (g/m^2), and

W = average weight (tons) of the vehicles traveling the road.

[11] AP-42 13.2.1, Equation 2

$E_{ext} = [\,k\,(sL)^{0.91} \times (W)^{1.02}\,]\,(1 - P/4N)$

where k , sL , W, and S are as defined in Equation 1 and

E_{ext} *= annual or other long-term average emission factor in the same units as k,*

P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and

N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

[12] lb/hr = Hourly EF (lb/VMT) * VMT (mile/hr)

[13]ton/yr =Annual EF (lb/VMT) * VMT (mile/Trip) * Trips per year (Trip/yr) / 2000 (lb/tpy)

Dairy Farmers of America - Portales Plant

Paved Haul Road — Insignificant and Exempt Emission Source

Emission unit number(s): Haul Road Milk Truck (Leaving) - Empty
Source description: Paved Haul Road Emissions

Input Data

Empty vehicle weight[1]	14.05	tons	[1] Empty vehicle weight includes driver and occupants and full fuel load.
One way trip distance	0.07	mile/trip	Obtained from Google earth - measured from the Industrial Drive Truck's Entrance;
Trip frequency[2]	3.4	trips/hour	[5] Max trucks on road in one hour;
Trip frequency[3]	30,113	trips/yr	Annual trucks per year requested;
Surface silt content[4]	0.6	g/m^2	[7] AP-42 Table 13.2.1-2 - Paved Haul Roads < 500
Annual wet days[5]	60	days/yr	[8] AP-42 Figure 13.2.1-2
Vehicle miles traveled[6]	0.2	mile/hr	[9] VMT/hr = Vehicle Miles Traveled per hour= Trips per hour * Segment Length

Emission Factors and Constants

Parameter	PM_{30}	PM_{10}	$PM_{2.5}$	
k, lb/VMT[7]	0.011	0.0022	0.00054	[10] Table 13.2.1-1, Paved Roads
Hourly EF, lb/VMT[8]	0.10	0.020	0.005	[11] AP-42 13.2.1, Equation 1
Annual EF, lb/VMT[9]	0.10	0.020	0.0048	[12] AP-42 13.2.1, Equation 2

Haul Road Emission Calculations

	PM_{30}	PM_{10}	$PM_{2.5}$	
Hourly emissions	0.02	0.005	0.001	lb/hr = Hourly EF (lb/VMT) * VMT (mile/hr)
Annual Emissions	0.10	0.02	0.005	ton/yr =Annual EF (lb/VMT) * VMT (mile/Trip) * Trips per year (Trip/yr) / 2000 (lb/tpy)

Notes

[1] Empty vehicle weight includes driver and occupants and full fuel load.

[2] Trips per hour = The average amount of trucks per hour (82.5) multiplied by 24 hours operation.

[3] Trips per year = Trips per hour multiplied by 365 days per year

[4] AP-42 Table 13.2.1-2 - Paved Haul Roads < 500

[5] AP-42 Table 13.2.1-2 - Paved Haul Roads < 500 as a conseravative estimate.

[6] VMT/hr = Vehicle Miles Traveled per hour= Trips per hour * Segment Length

[7] Table 13.2.1-1, Particle Size Multipliers for Paved Road Equation

[8] AP-42 13.2.1, Equation 1

$E = k\,(sL)^{0.91} \times (W)^{1.02}$

where: E = particulate emission factor (having units matching the units of k),

k = particle size multiplier for particle size range and units of interest,

sL = road surface silt loading (grams per square meter) (g/m^2), and

W = average weight (tons) of the vehicles traveling the road.

[9] AP-42 13.2.1, Equation 2

$E_{ext} = [\,k\,(sL)^{0.91} \times (W)^{1.02}\,]\,(1 - P/4N)$

where k , sL , W, and S are as defined in Equation 1 and

E_{ext} *= annual or other long-term average emission factor in the same units as k,*

P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and

N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

[10] lb/hr = Hourly EF (lb/VMT) * VMT (mile/hr)

[11] ton/yr =Annual EF (lb/VMT) * VMT (mile/Trip) * Trips per year (Trip/yr) / 2000 (lb/tpy)

Dairy Farmers of America - Portales Plant

Paved Haul Road — Insignificant and Exempt Emission Source

Emission unit number(s): HAUL - Production Trucks
Source description: Paved Haul Road Emissions

Input Data

Empty vehicle weight[1]	17.5	tons	[1] Empty vehicle weight includes driver and occupants and full fuel load.
Load weight[2]	22.5	tons	[2] Cargo, transported materials, etc.
Loaded vehicle[3]	40.0	tons	[3] Loaded vehicle weight = Empty + Load Size
Mean vehicle weight[4]	28.8	tons	[4] Mean Vehicle weight = (Loaded Weight + Empty Weight) / 2
Round-trip distance	0.34	mile/trip	Obtained from Google earth - measuring roundtrip truck route from fenceline;
Trip frequency[5]	1.2	trips/hour	[5] Max trucks on road in one hour;
Trip frequency[6]	2,676	trips/yr	Annual trucks per year requested;
Surface silt content[7]	0.6	g/m^2	[7] AP-42 Table 13.2.1-2 - Paved Haul Roads < 500
Annual wet days[8]	60	days/yr	[8] AP-42 Figure 13.2.1-2
Vehicle miles traveled[9]	0.4	mile/hr	[9] VMT/hr = Vehicle Miles Traveled per hour= Trips per hour * Segment Length

Emission Factors and Constants

Parameter	PM_{30}	PM_{10}	$PM_{2.5}$	
k, lb/VMT[10]	0.011	0.0022	0.00054	[10] Table 13.2.1-1, Paved Roads
Hourly EF, lb/VMT[11]	0.21	0.042	0.010	[11] AP-42 13.2.1, Equation 1
Annual EF, lb/VMT[12]	0.20	0.041	0.0100	[12] AP-42 13.2.1, Equation 2

Haul Road Emission Calculations

	PM_{30}	PM_{10}	$PM_{2.5}$	
Hourly emissions	0.08	0.017	0.004	lb/hr = Hourly EF (lb/VMT) * VMT (mile/hr)
Annual Emissions	0.09	0.02	0.005	ton/yr =Annual EF (lb/VMT) * VMT (mile/Trip) * Trips per year (Trip/yr) / 2000 (lb/tpy)

Notes

[1] Empty vehicle weight includes driver and occupants and full fuel load.

[2] Cargo, based on 45,000 lbs maximum allowed cargo

[3] Loaded = Empty weight plus maximum allowed cargo

[4] Mean Vehicle weight = (Loaded Weight + Empty Weight) / 2

[5] Trips per hour = Monthly maximum of 223 trucks working 24 days per month on a 8 hour working day shift.

[6] Trips per year = Maximum monthly rate, 223 truck multiplied by 12 months per year.

[7] AP-42 Table 13.2.1-2 - Paved Haul Roads < 500 as a conseravative estimate.

[8] AP-42 Figure 13.2.1-2

[9] VMT/hr = Vehicle Miles Traveled per hour= Trips per hour * Segment Length

[10] Table 13.2.1-1, Particle Size Multipliers for Paved Road Equation

[11] AP-42 13.2.1, Equation 1

$E = k\,(sL)^{0.91} \times (W)^{1.02}$

where: E = particulate emission factor (having units matching the units of k),
k = particle size multiplier for particle size range and units of interest,
sL = road surface silt loading (grams per square meter) (g/m^2), and
W = average weight (tons) of the vehicles traveling the road.

[12] AP-42 13.2.1, Equation 2

$E_{ext} = [\,k\,(sL)^{0.91} \times (W)^{1.02}\,]\,(1 - P/4N)$

where k , sL , W, and S are as defined in Equation 1 and
E_{ext} *= annual or other long-term average emission factor in the same units as k,*
P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and
N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

[13] lb/hr = Hourly EF (lb/VMT) * VMT (mile/hr)

[14] ton/yr =Annual EF (lb/VMT) * VMT (mile/Trip) * Trips per year (Trip/yr) / 2000 (lb/tpy)

Dairy Farmers of America - Portales Plant

Cooling Tower

Insignificant and Exempt Emission Source

Emission unit number: New Finisher CT
Source description:
Manufacturer:
Model #:

	Cooling Water Recirculation Rate (gpm)	Uncontrolled Liquid Drift %	Total Uncontrolled Drift Mass lb/min	Circulating Water Total Dissolved Solids (mg/l)	Circulating Water Total Dissolved Solids (ppm_w)
Note	1	2	3	4	
Cooling Towers	700	0.02%	1.2	2,135	2,135

Maximum Uncontrolled Emissions

	Hourly Uncontrolled Particulate Emissions (lb/hr)	Annual Uncontrolled Particulate Emissions (tpy)	Hourly Uncontrolled TSP Emissions (lb/hr)	Annual Uncontrolled TSP Emissions (tpy)	Hourly Uncontrolled PM_{10} Emissions (lb/hr)	Annual Uncontrolled PM_{10} Emissions (tpy)	Hourly Uncontrolled $PM_{2.5}$ Emissions (lb/hr)	Annual Uncontrolled $PM_{2.5}$ Emissions (tpy)
Note	5	5	6	6	6	6	6	6
Cooling Towers	0.150	0.66	0.024	0.10	0.00061	0.00267	6.28E-06	2.75E-05

Notes

1 Cooling Tower Water Recirc rate based Mfg data
2 Uncontrolled circulating water flow percent drift estimated based on AP-42 factors for induced draft cooling towers (Table 13.4-1)
3 Total Drift Mass = Recirculation rate * Drift Rate Fraction * Drift Density (8.34 lb/gal)
4 TDS calculated using maximum conductivity reading from March 2016: 2,135.4 mg/l. TDS = 0.7 σ. σ in [µs/cm] and TDS in ppm. 1 ppm = 0.998859 mg/l.
5 Total particulate emission calculated using procedure described in Section 13.4 of AP-42 (01/95), Wet Cooling Towers.
PM = Water Circulation Rate * Drift Rate* Percent drift mass escape * TDS
Particulate Hourly Emissions:

Maximum Uncontrolled Emissions

700 gal / min	60 min / hr	0.0002 gal drift / gal recirculation	8.34 lb drift / gal drift	2135 lb PM / 10^6 lb drift	=	0.15 lb / hr

Particulate annual emissions = Hourly emissions (lb/hr) * 8760 (hrs/yr) / 2000 (lb/ton)
6 Particle size distribution based on the following distribution (from Frisbie data)

Particle Distribution

Particle	Mass % of Total Particulates	
TSP (PM 30)	15.7	Frisbie data
PM10	0.4	Frisbie data
PM2.5	4.20E-03	Frisbie data

Dairy Farmers of America - Portales Plant

Cooling Tower

Insignificant and Exempt Emission Source

Emission unit number: New Finisher

Facility TDS	2,135	(mg/l)	ρ_{water} [6]	1.00E-06	µg/µm3
TDS Content	2,135	ppmw	ρ_{TDS} [6]	2.50E-06	µg/µm3

Droplet Diameter (µm)	Droplet Volume [1] (µm3)	Droplet Mass [2] (µg)	Particle Mass (Solids) [3] (µg)	Solid Particle Volume [4] (μm^3)	Solid Particle Diameter [5] (µm)	Particle % Mass Smaller
10	524	5.24E-04	1.12E-06	4.47E-01	0.95	0.00016
20	4189	4.19E-03	8.94E-06	3.58E+00	1.90	0.0014
30	14137	1.41E-02	3.02E-05	1.21E+01	2.85	0.01
40	33510	3.35E-02	7.16E-05	2.86E+01	3.80	0.02
50	65450	6.54E-02	1.40E-04	5.59E+01	4.74	0.04
60	113097	1.13E-01	2.42E-04	9.66E+01	5.69	0.07
70	179594	1.80E-01	3.83E-04	1.53E+02	6.64	0.13
90	381704	3.82E-01	8.15E-04	3.26E+02	8.54	0.24
110	696910	6.97E-01	1.49E-03	5.95E+02	10.44	0.46
130	1150347	1.15E+00	2.46E-03	9.83E+02	12.33	0.81
150	1767146	1.77E+00	3.77E-03	1.51E+03	14.23	1.35
180	3053628	3.05E+00	6.52E-03	2.61E+03	17.08	2.29
210	4849048	4.85E+00	1.04E-02	4.14E+03	19.92	3.77
240	7238229	7.24E+00	1.55E-02	6.18E+03	22.77	5.99
270	10305995	1.03E+01	2.20E-02	8.80E+03	25.62	9.15
300	14137167	1.41E+01	3.02E-02	1.21E+04	28.46	13.49
350	22449298	2.24E+01	4.79E-02	1.92E+04	33.21	20.37
400	33510322	3.35E+01	7.16E-02	2.86E+04	37.95	30.64
450	47712938	4.77E+01	1.02E-01	4.08E+04	42.70	45.27
500	65449847	6.54E+01	1.40E-01	5.59E+04	47.44	65.33
600	113097336	1.13E+02	2.42E-01	9.66E+04	56.93	100.00
		Sum	**6.97E-01**			
				PM2.5/Total	2.5	0.004
				PM10/Total	10	0.407
				TSP/Total	30	15.713

Notes

1 Droplet volume calculated with: $Droplet\ Volume = \left(\frac{4}{3}\right)\pi\left(\frac{D_d}{2}\right)^3$

2 Droplet mass calculated with: $Droplet\ Mass = Droplet\ Volume \times \rho_{water}$

3 Particle mass calculated with: $Particle\ Mass = TDS \times \rho_{water} \times \left(\frac{4}{3}\right)\pi\left(\frac{D_d}{2}\right)^3$

4 Particle volume calculated with: $Particle\ Volume = \frac{Particle\ Mass}{\rho_{TDS}}$

5 Particle diameter calculated with: $Particle\ Diameter = 2 \times \sqrt[3]{Particle\ Volume \times \left(\frac{1}{\pi}\right) \times \left(\frac{3}{4}\right)}$

6 Based on "Calculating TSP, PM10 and PM2.5 from Cooling Towers - Technical Memorandum", Daren Zigich, September 9, 2013.

Dairy Farmers of America - Portales Plant

Cooling Tower

Insignificant and Exempt Emission Source

Emission unit number: CER EVAP
Source description:
Manufacturer:
Model #:

	Cooling Water Recirculation Rate (gpm)	Uncontrolled Liquid Drift %	Total Uncontrolled Drift Mass lb/min	Circulating Water Total Dissolved Solids (mg/l)	Circulating Water Total Dissolved Solids (ppm_w)
Note	1	2	3	4	
Cooling Towers	670	0.02%	1.1	1,063	1,063

Maximum Uncontrolled Emissions

	Hourly Uncontrolled Particulate Emissions (lb/hr)	Annual Uncontrolled Particulate Emissions (tpy)	Hourly Uncontrolled TSP Emissions (lb/hr)	Annual Uncontrolled TSP Emissions (tpy)	Hourly Uncontrolled PM_{10} Emissions (lb/hr)	Annual Uncontrolled PM_{10} Emissions (tpy)	Hourly Uncontrolled $PM_{2.5}$ Emissions (lb/hr)	Annual Uncontrolled $PM_{2.5}$ Emissions (tpy)
Note	5	5	6	6	6	6	6	6
Cooling Towers	0.071	0.31	0.000	0.00	0.00063	0.00278	2.17E-02	9.50E-02

Notes

1 Cooling Tower Water Recirc rate based Mfg data
2 Uncontrolled circulating water flow percent drift estimated based on AP-42 factors for induced draft cooling towers (Table 13.4-1)
3 Total Drift Mass = Recirculation rate * Drift Rate Fraction * Drift Density (8.34 lb/gal)
4 TDS calculated using maximum conductivity reading from March 2016: 1,062.8 mg/l. TDS = 0.7 σ. σ in [µs/cm] and TDS in ppm. 1 ppm = 0.998859 mg/l.
5 Total particulate emission calculated using procedure described in Section 13.4 of AP-42 (01/95), Wet Cooling Towers.
PM = Water Circulation Rate * Drift Rate* Percent drift mass escape * TDS
Particulate Hourly Emissions:

Maximum Uncontrolled Emissions

$$\frac{670\ \text{gal}}{\text{min}} \times \frac{60\ \text{min}}{\text{hr}} \times \frac{0.0002\ \text{gal drift}}{\text{gal recirculation}} \times \frac{8.34\ \text{lb drift}}{\text{gal drift}} \times \frac{1063\ \text{lb PM}}{10^6\ \text{lb drift}} = \frac{0.07\ \text{lb}}{\text{hr}}$$

Particulate annual emissions = Hourly emissions (lb/hr) * 8760 (hrs/yr) / 2000 (lb/ton)
6 Particle size distribution based on the following distribution (from Frisbie data)

Particle Distribution

Particle	Mass % of Total Particulates	
TSP (PM 30)	0.0091	Frisbie data
PM10	0.89	Frisbie data
PM2.5	30.4	Frisbie data

Dairy Farmers of America - Portales Plant

Cooling Towers

Insignificant and Exempt Emission Source

Emission unit number: CER EVAP

Facility TDS	1,063	(mg/l)	ρ_{water} [6]	1.00E-06	µg/µm3
TDS Content	1,063	ppmw	ρ_{TDS} [6]	2.50E-06	µg/µm3

Droplet Diameter (µm)	Droplet Volume [1] (µm3)	Droplet Mass [2] (µg)	Particle Mass (Solids) [3] (µg)	Solid Particle Volume [4] (μm^3)	Solid Particle Diameter [5] (µm)	Particle % Mass Smaller
10	524	5.24E-04	5.56E-07	2.23E-01	0.75	0.00016
20	4189	4.19E-03	4.45E-06	1.78E+00	1.50	0.0014
30	14137	1.41E-02	1.50E-05	6.01E+00	2.26	0.01
40	33510	3.35E-02	3.56E-05	1.42E+01	3.01	0.02
50	65450	6.54E-02	6.96E-05	2.78E+01	3.76	0.04
60	113097	1.13E-01	1.20E-04	4.81E+01	4.51	0.07
70	179594	1.80E-01	1.91E-04	7.63E+01	5.26	0.13
90	381704	3.82E-01	4.06E-04	1.62E+02	6.77	0.24
110	696910	6.97E-01	7.41E-04	2.96E+02	8.27	0.46
130	1150347	1.15E+00	1.22E-03	4.89E+02	9.77	0.81
150	1767146	1.77E+00	1.88E-03	7.51E+02	11.28	1.35
180	3053628	3.05E+00	3.25E-03	1.30E+03	13.53	2.29
210	4849048	4.85E+00	5.15E-03	2.06E+03	15.79	3.77
240	7238229	7.24E+00	7.69E-03	3.08E+03	18.05	5.99
270	10305995	1.03E+01	1.10E-02	4.38E+03	20.30	9.15
300	14137167	1.41E+01	1.50E-02	6.01E+03	22.56	13.49
350	22449298	2.24E+01	2.39E-02	9.54E+03	26.32	20.37
400	33510322	3.35E+01	3.56E-02	1.42E+04	30.08	30.64
450	47712938	4.77E+01	5.07E-02	2.03E+04	33.84	45.27
500	65449847	6.54E+01	6.96E-02	2.78E+04	37.60	65.33
600	113097336	1.13E+02	1.20E-01	4.81E+04	45.11	100.00
		Sum	**3.47E-01**			
				PM2.5/Total	2.5	0.009
				PM10/Total	10	0.890
				TSP/Total	30	30.431

Notes

1 Droplet volume calculated with: $Droplet\ Volume = \left(\frac{4}{3}\right)\pi\left(\frac{D_d}{2}\right)^3$

2 Droplet mass calculated with: $Droplet\ Mass = Droplet\ Volume \times \rho_{water}$

3 Particle mass calculated with: $Particle\ Mass = TDS \times \rho_{water} \times \left(\frac{4}{3}\right)\pi\left(\frac{D_d}{2}\right)^3$

4 Particle volume calculated with: $Particle\ Volume = \frac{Particle\ Mass}{\rho_{TDS}}$

5 Particle diameter calculated with: $Particle\ Diameter = 2 \times \sqrt[3]{Particle\ Volume \times \left(\frac{1}{\pi}\right) \times \left(\frac{3}{4}\right)}$

6 Based on "Calculating TSP, PM10 and PM2.5 from Cooling Towers - Technical Memorandum", Daren Zigich, September 9, 2013.

Dairy Farmers of America - Portales Plant

Cooling Towers

Insignificant and Exempt Emission Source

Emission unit number: MW CT
Source description:
Manufacturer:
Model #:

	Cooling Water Recirculation Rate (gpm)	Uncontrolled Liquid Drift %	Total Uncontrolled Drift Mass lb/min	Circulating Water Total Dissolved Solids (mg/l)	Circulating Water Total Dissolved Solids (ppm_w)
Note	1	2	3	4	
Cooling Towers	760	0.02%	1.3	1,254	1,254

Maximum Uncontrolled Emissions

	Hourly Uncontrolled Particulate Emissions (lb/hr)	Annual Uncontrolled Particulate Emissions (tpy)	Hourly Uncontrolled TSP Emissions (lb/hr)	Annual Uncontrolled TSP Emissions (tpy)	Hourly Uncontrolled PM_{10} Emissions (lb/hr)	Annual Uncontrolled PM_{10} Emissions (tpy)	Hourly Uncontrolled $PM_{2.5}$ Emissions (lb/hr)	Annual Uncontrolled $PM_{2.5}$ Emissions (tpy)
Note	5	5	6	6	6	6	6	6
Cooling Towers	0.095	0.42	0.000	0.00	0.00070	0.00308	2.48E-02	1.09E-01

Notes

1 Cooling Tower Water Recirc rate based Mfg data
2 Uncontrolled circulating water flow percent drift estimated based on AP-42 factors for induced draft cooling towers (Table 13.4-1)
3 Total Drift Mass = Recirculation rate * Drift Rate Fraction * Drift Density (8.34 lb/gal)
4 TDS calculated using maximum conductivity reading from March 2016: 1,253.7 mg/l. TDS = 0.7 σ. σ in [µs/cm] and TDS in ppm. 1 ppm = 0.998859 mg/l.
5 Total particulate emission calculated using procedure described in Section 13.4 of AP-42 (01/95), Wet Cooling Towers.
PM = Water Circulation Rate * Drift Rate* Percent drift mass escape * TDS
Particulate Hourly Emissions:

Maximum Uncontrolled Emissions

$$\frac{760\ \text{gal}}{\text{min}} \times \frac{60\ \text{min}}{\text{hr}} \times \frac{0.0002\ \text{gal recirculation}}{\text{gal drift}} \times \frac{8.34\ \text{lb drift}}{10^6\ \text{lb drift}} \times \frac{1254\ \text{lb PM}}{} = \frac{0.10\ \text{lb}}{\text{hr}}$$

Particulate annual emissions = Hourly emissions (lb/hr) * 8760 (hrs/yr) / 2000 (lb/ton)
6 Particle size distribution based on the following distribution (from Frisbie data)

Particle Distribution

Particle	Mass % of Total Particulates	
TSP (PM 30)	0.0073	Frisbie data
PM10	0.74	Frisbie data
PM2.5	26.0	Frisbie data

Dairy Farmers of America - Portales Plant

Cooling Towers

Insignificant and Exempt Emission Source

Emission unit number: MW CT

Facility TDS	1,254	(mg/l)	ρ_{water} [6]	1.00E-06	µg/µm3
TDS Content	1,254	ppmw	ρ_{TDS} [6]	2.50E-06	µg/µm3

Droplet Diameter (µm)	Droplet Volume [1] (µm3)	Droplet Mass [2] (µg)	Particle Mass (Solids) [3] (µg)	Solid Particle Volume [4] (μm^3)	Solid Particle Diameter [5] (µm)	Particle % Mass Smaller
10	524	5.24E-04	6.56E-07	2.63E-01	0.79	0.00016
20	4189	4.19E-03	5.25E-06	2.10E+00	1.59	0.0014
30	14137	1.41E-02	1.77E-05	7.09E+00	2.38	0.01
40	33510	3.35E-02	4.20E-05	1.68E+01	3.18	0.02
50	65450	6.54E-02	8.21E-05	3.28E+01	3.97	0.04
60	113097	1.13E-01	1.42E-04	5.67E+01	4.77	0.07
70	179594	1.80E-01	2.25E-04	9.01E+01	5.56	0.13
90	381704	3.82E-01	4.79E-04	1.91E+02	7.15	0.24
110	696910	6.97E-01	8.74E-04	3.49E+02	8.74	0.46
130	1150347	1.15E+00	1.44E-03	5.77E+02	10.33	0.81
150	1767146	1.77E+00	2.22E-03	8.86E+02	11.92	1.35
180	3053628	3.05E+00	3.83E-03	1.53E+03	14.30	2.29
210	4849048	4.85E+00	6.08E-03	2.43E+03	16.68	3.77
240	7238229	7.24E+00	9.07E-03	3.63E+03	19.07	5.99
270	10305995	1.03E+01	1.29E-02	5.17E+03	21.45	9.15
300	14137167	1.41E+01	1.77E-02	7.09E+03	23.83	13.49
350	22449298	2.24E+01	2.81E-02	1.13E+04	27.81	20.37
400	33510322	3.35E+01	4.20E-02	1.68E+04	31.78	30.64
450	47712938	4.77E+01	5.98E-02	2.39E+04	35.75	45.27
500	65449847	6.54E+01	8.21E-02	3.28E+04	39.72	65.33
600	113097336	1.13E+02	1.42E-01	5.67E+04	47.67	100.00
		Sum	**4.09E-01**			
				PM2.5/Total	2.5	0.007
				PM10/Total	10	0.736
				TSP/Total	30	26.039

Notes

1 Droplet volume calculated with: $Droplet\ Volume = \left(\frac{4}{3}\right)\pi\left(\frac{D_d}{2}\right)^3$

2 Droplet mass calculated with: $Droplet\ Mass = Droplet\ Volume \times \rho_{water}$

3 Particle mass calculated with: $Particle\ Mass = TDS \times \rho_{water} \times \left(\frac{4}{3}\right)\pi\left(\frac{D_d}{2}\right)^3$

4 Particle volume calculated with: $Particle\ Volume = \frac{Particle\ Mass}{\rho_{TDS}}$

5 Particle diameter calculated with: $Particle\ Diameter = 2 \times \sqrt[3]{Particle\ Volume \times \left(\frac{1}{\pi}\right) \times \left(\frac{3}{4}\right)}$

6 Based on "Calculating TSP, PM10 and PM2.5 from Cooling Towers - Technical Memorandum", Daren Zigich, September 9, 2013.

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Diesel Tanks **Insignificant Emission Source**

Exempt Unit

20.2.72.202.B.(2) Exemption for VOC emissions resulting from the handling or storing of any VOC if: **(a)** Such VOC has a vapor pressure of less than two tenths (0.2) PSI at temperatures at which the compound is stored and handled; and **(b)** The owner or operator maintains sufficient record keeping to verify that the requirements of Sub-paragraph (a) of this paragraph are met.

HESS

Safety Data Sheet

Material Name: Diesel Fuel, All Types **SDS No. 9909**
US GHS

Synonyms: Ultra Low Sulfur Diesel; Low Sulfur Diesel; No. 2 Diesel; Motor Vehicle Diesel Fuel; Non-Road Diesel Fuel; Locomotive/Marine Diesel Fuel

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Clear, straw-yellow.	**Odor:**	Mild, petroleum distillate odor
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	0.009 psia @ 70 °F (21 °C)	**Vapor Density:**	>1.0
Boiling Point:	320 to 690 °F (160 to 366 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible	**Specific Gravity:**	0.83-0.876 @ 60°F (16°C)
Evaporation Rate:	Slow; varies with conditions	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	>125 °F (>52 °C) minimum	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.5	**Lower Flammability Limit (LFL):**	0.6
Burning Rate:	ND	**Auto Ignition:**	494°F (257°C)

Section 7

Information Used To Determine Emissions

Information Used to Determine Emissions shall include the following:

- ☑ If manufacturer data are used, include specifications for emissions units and control equipment, including control efficiencies specifications and sufficient engineering data for verification of control equipment operation, including design drawings, test reports, and design parameters that affect normal operation.
- ☑ If test data are used, include a copy of the complete test report. If the test data are for an emissions unit other than the one being permitted, the emission units must be identical. Test data may not be used if any difference in operating conditions of the unit being permitted and the unit represented in the test report significantly effect emission rates.
- ☑ If the most current copy of AP-42 is used, reference the section and date located at the bottom of the page. Include a copy of the page containing the emissions factors, and clearly mark the factors used in the calculations.
- ☐ If an older version of AP-42 is used, include a complete copy of the section.
- ☑ If an EPA document or other material is referenced, include a complete copy.
- ☐ Fuel specifications sheet.
- ☑ If computer models are used to estimate emissions, include an input summary (if available) and a detailed report, and a disk containing the input file(s) used to run the model. For tank-flashing emissions, include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., permit or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis.

- Units B1 and B2
  - AP-42 Table 1.4-1 and 1.4-2
  - 40 CFR Part 98 Table C-1 and C-2
  - Emissions from GRI HAPCalc 3.01
- Units B2 and B3
  - AP-42 Table 1.4-1 and 1.4-2
  - 40 CFR Part 98 Table C-1 and C-2
  - Emissions from GRI HAPCalc 3.01
- Unit D2
  - AP-42 Table 1.4-1 & 2
  - AP-42 Table 9.6.1-2
  - 40 CFR Part 98 Table C-1 and C-2
  - Emissions from GRI HAPCalc 3.01
  - Functionality of Milk Powders and Milk-Based Powder for End Use Application
  - Stack Test Report
- Units AHU-1 and AHU-2
  - Vendors Specification
  - AP-42 Table 1.4-1 & 2
  - 40 CFR Part 98 Table C-1 and C-2
- Units MAU-1001 and MAU-1002
  - Vendor Specifications
  - ANSI Z83.4/CSA 3.7 & ANSI
  - AP-42 Table 1.4-1 & 2
  - 40 CFR Part 98 Table C-1 and C-2
- Exempted Haul Road
  - AP-42 Table 13.2.1-1
- Exempted Cooling Tower
  - AP-42-13.1-1
  - Calculating TSP, PM10 and PM2.5 from Cooling Towers – Technical Memorandum, Daren Zigich, September 9, 2013.
    - NF-CT - New Finisher Cooling Tower

        - CER-CT - CER Evap Cooling Tower
        - MW-CT - MW Cooling Tower
- Exempted V1
    - Vendor Specifications
    - Calculating particle size using Functionality of Milk Powders and Milk-Based Powders for End Use Applications – A Review, Anup Sharma and et. al, 2012.
- Exempted Maxon Ovenpack
    - AP-42 Table 1.4-1 & 2

1.4 Natural Gas Combustion

1.4.1 General[1-2]

Natural gas is one of the major combustion fuels used throughout the country. It is mainly used to generate industrial and utility electric power, produce industrial process steam and heat, and heat residential and commercial space. Natural gas consists of a high percentage of methane (generally above 85 percent) and varying amounts of ethane, propane, butane, and inerts (typically nitrogen, carbon dioxide, and helium). The average gross heating value of natural gas is approximately 1,020 British thermal units per standard cubic foot (Btu/scf), usually varying from 950 to 1,050 Btu/scf.

1.4.2 Firing Practices[3-5]

There are three major types of boilers used for natural gas combustion in commercial, industrial, and utility applications: watertube, firetube, and cast iron. Watertube boilers are designed to pass water through the inside of heat transfer tubes while the outside of the tubes is heated by direct contact with the hot combustion gases and through radiant heat transfer. The watertube design is the most common in utility and large industrial boilers. Watertube boilers are used for a variety of applications, ranging from providing large amounts of process steam, to providing hot water or steam for space heating, to generating high-temperature, high-pressure steam for producing electricity. Furthermore, watertube boilers can be distinguished either as field erected units or packaged units.

Field erected boilers are boilers that are constructed on site and comprise the larger sized watertube boilers. Generally, boilers with heat input levels greater than 100 MMBtu/hr, are field erected. Field erected units usually have multiple burners and, given the customized nature of their construction, also have greater operational flexibility and NO_x control options. Field erected units can also be further categorized as wall-fired or tangential-fired. Wall-fired units are characterized by multiple individual burners located on a single wall or on opposing walls of the furnace while tangential units have several rows of air and fuel nozzles located in each of the four corners of the boiler.

Package units are constructed off-site and shipped to the location where they are needed. While the heat input levels of packaged units may range up to 250 MMBtu/hr, the physical size of these units are constrained by shipping considerations and generally have heat input levels less than 100 MMBtu/hr. Packaged units are always wall-fired units with one or more individual burners. Given the size limitations imposed on packaged boilers, they have limited operational flexibility and cannot feasibly incorporate some NO_x control options.

Firetube boilers are designed such that the hot combustion gases flow through tubes, which heat the water circulating outside of the tubes. These boilers are used primarily for space heating systems, industrial process steam, and portable power boilers. Firetube boilers are almost exclusively packaged units. The two major types of firetube units are Scotch Marine boilers and the older firebox boilers. In cast iron boilers, as in firetube boilers, the hot gases are contained inside the tubes and the water being heated circulates outside the tubes. However, the units are constructed of cast iron rather than steel. Virtually all cast iron boilers are constructed as package boilers. These boilers are used to produce either low-pressure steam or hot water, and are most commonly used in small commercial applications.

Natural gas is also combusted in residential boilers and furnaces. Residential boilers and furnaces generally resemble firetube boilers with flue gas traveling through several channels or tubes with water or air circulated outside the channels or tubes.

1.4.3 Emissions[3-4]

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO_x) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO_x burners	50	D	84	B
Controlled - Low NO_x burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

[b] Expressed as NO_2. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO_X emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO_X emission factor.

[c] NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_X burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. TOC = Total Organic Compounds. VOC = Volatile Organic Compounds.

[b] Based on approximately 100% conversion of fuel carbon to CO_2. $CO_2[lb/10^6 \text{ scf}] = (3.67)(CON)(C)(D)$, where CON = fractional conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.76), and D = density of fuel, 4.2×10^4 $lb/10^6$ scf.

[c] All PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM_1 emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

[d] Based on 100% conversion of fuel sulfur to SO_2. Assumes sulfur content is natural gas of 2,000 grains/10^6 scf. The SO_2 emission factor in this table can be converted to other natural gas sulfur contents by multiplying the SO_2 emission factor by the ratio of the site-specific sulfur content (grains/10^6 scf) to 2,000 grains/10^6 scf.

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
91-57-6	2-Methylnaphthalene[b, c]	2.4E-05	D
56-49-5	3-Methylchloranthrene[b, c]	<1.8E-06	E
	7,12-Dimethylbenz(a)anthracene[b,c]	<1.6E-05	E
83-32-9	Acenaphthene[b,c]	<1.8E-06	E
203-96-8	Acenaphthylene[b,c]	<1.8E-06	E
120-12-7	Anthracene[b,c]	<2.4E-06	E
56-55-3	Benz(a)anthracene[b,c]	<1.8E-06	E
71-43-2	Benzene[b]	2.1E-03	B
50-32-8	Benzo(a)pyrene[b,c]	<1.2E-06	E
205-99-2	Benzo(b)fluoranthene[b,c]	<1.8E-06	E
191-24-2	Benzo(g,h,i)perylene[b,c]	<1.2E-06	E
207-08-9	Benzo(k)fluoranthene[b,c]	<1.8E-06	E
106-97-8	Butane	2.1E+00	E
218-01-9	Chrysene[b,c]	<1.8E-06	E
53-70-3	Dibenzo(a,h)anthracene[b,c]	<1.2E-06	E
25321-22-6	Dichlorobenzene[b]	1.2E-03	E
74-84-0	Ethane	3.1E+00	E
206-44-0	Fluoranthene[b,c]	3.0E-06	E
86-73-7	Fluorene[b,c]	2.8E-06	E
50-00-0	Formaldehyde[b]	7.5E-02	B
110-54-3	Hexane[b]	1.8E+00	E
193-39-5	Indeno(1,2,3-cd)pyrene[b,c]	<1.8E-06	E
91-20-3	Naphthalene[b]	6.1E-04	E
109-66-0	Pentane	2.6E+00	E
85-01-8	Phenanathrene[b,c]	1.7E-05	D
74-98-6	Propane	1.6E+00	E

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION (Continued)

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
129-00-0	Pyrene[b, c]	5.0E-06	E
108-88-3	Toluene[b]	3.4E-03	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. Emission Factors preceeded with a less-than symbol are based on method detection limits.

[b] Hazardous Air Pollutant (HAP) as defined by Section 112(b) of the Clean Air Act.

[c] HAP because it is Polycyclic Organic Matter (POM). POM is a HAP as defined by Section 112(b) of the Clean Air Act.

[d] The sum of individual organic compounds may exceed the VOC and TOC emission factors due to differences in test methods and the availability of test data for each pollutant.

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of April 20, 2016

Title 40 → Chapter I → Subchapter C → Part 98 → Subpart C → Appendix

Title 40: Protection of Environment
PART 98—MANDATORY GREENHOUSE GAS REPORTING
Subpart C—General Stationary Fuel Combustion Sources

TABLE C-1 TO SUBPART C OF PART 98—DEFAULT CO_2 EMISSION FACTORS AND HIGH HEAT VALUES FOR VARIOUS TYPES OF FUEL

DEFAULT CO_2 EMISSION FACTORS AND HIGH HEAT VALUES FOR VARIOUS TYPES OF FUEL

Fuel type	Default high heat value	Default CO_2 emission factor
Coal and coke	mmBtu/short ton	kg CO_2/mmBtu
Anthracite	25.09	103.69
Bituminous	24.93	93.28
Subbituminous	17.25	97.17
Lignite	14.21	97.72
Coal Coke	24.80	113.67
Mixed (Commercial sector)	21.39	94.27
Mixed (Industrial coking)	26.28	93.90
Mixed (Industrial sector)	22.35	94.67
Mixed (Electric Power sector)	19.73	95.52
Natural gas	mmBtu/scf	kg CO_2/mmBtu
(Weighted U.S. Average)	1.026×10^{-3}	53.06
Petroleum products	mmBtu/gallon	kg CO_2/mmBtu
Distillate Fuel Oil No. 1	0.139	73.25
Distillate Fuel Oil No. 2	0.138	73.96
Distillate Fuel Oil No. 4	0.146	75.04
Residual Fuel Oil No. 5	0.140	72.93
Residual Fuel Oil No. 6	0.150	75.10
Used Oil	0.138	74.00
Kerosene	0.135	75.20
Liquefied petroleum gases (LPG)[1]	0.092	61.71
Propane[1]	0.091	62.87
Propylene[2]	0.091	67.77
Ethane[1]	0.068	59.60
Ethanol	0.084	68.44
Ethylene[2]	0.058	65.96
Isobutane[1]	0.099	64.94
Isobutylene[1]	0.103	68.86
Butane[1]	0.103	64.77
Butylene[1]	0.105	68.72
Naphtha (<401 deg F)	0.125	68.02
Natural Gasoline	0.110	66.88
Other Oil (>401 deg F)	0.139	76.22
Pentanes Plus	0.110	70.02
Petrochemical Feedstocks	0.125	71.02
Petroleum Coke	0.143	102.41
Special Naphtha	0.125	72.34
Unfinished Oils	0.139	74.54
Heavy Gas Oils	0.148	74.92
Lubricants	0.144	74.27
Motor Gasoline	0.125	70.22
Aviation Gasoline	0.120	69.25
Kerosene-Type Jet Fuel	0.135	72.22
Asphalt and Road Oil	0.158	75.36
Crude Oil	0.138	74.54

Other fuels—solid	mmBtu/short ton	kg CO_2/mmBtu
Municipal Solid Waste	9.95[3]	90.7
Tires	28.00	85.97
Plastics	38.00	75.00
Petroleum Coke	30.00	102.41
Other fuels—gaseous	mmBtu/scf	kg CO_2/mmBtu
Blast Furnace Gas	0.092×10^{-3}	274.32
Coke Oven Gas	0.599×10^{-3}	46.85
Propane Gas	2.516×10^{-3}	61.46
Fuel Gas[4]	1.388×10^{-3}	59.00
Biomass fuels—solid	mmBtu/short ton	kg CO_2/mmBtu
Wood and Wood Residuals (dry basis)[5]	17.48	93.80
Agricultural Byproducts	8.25	118.17
Peat	8.00	111.84
Solid Byproducts	10.39	105.51
Biomass fuels—gaseous	mmBtu/scf	kg CO_2/mmBtu
Landfill Gas	0.485×10^{-3}	52.07
Other Biomass Gases	0.655×10^{-3}	52.07
Biomass Fuels—Liquid	mmBtu/gallon	kg CO_2/mmBtu
Ethanol	0.084	68.44
Biodiesel (100%)	0.128	73.84
Rendered Animal Fat	0.125	71.06
Vegetable Oil	0.120	81.55

[1]The HHV for components of LPG determined at 60 °F and saturation pressure with the exception of ethylene.

[2]Ethylene HHV determined at 41 °F (5 °C) and saturation pressure.

[3]Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.

[4]Reporters subject to subpart X of this part that are complying with §98.243(d) or subpart Y of this part may only use the default HHV and the default CO_2 emission factor for fuel gas combustion under the conditions prescribed in §98.243(d)(2)(i) and (d)(2)(ii) and §98.252(a)(1) and (a)(2), respectively. Otherwise, reporters subject to subpart X or subpart Y shall use either Tier 3 (Equation C-5) or Tier 4.

[5]Use the following formula to calculate a wet basis HHV for use in Equation C-1: $HHV_w = ((100 - M)/100)*HHV_d$ where HHV_w = wet basis HHV, M = moisture content (percent) and HHV_d = dry basis HHV from Table C-1.

[78 FR 71950, Nov. 29, 2013]

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of April 20, 2016

Title 40 → Chapter I → Subchapter C → Part 98 → Subpart C → Appendix

Title 40: Protection of Environment
PART 98—MANDATORY GREENHOUSE GAS REPORTING
Subpart C—General Stationary Fuel Combustion Sources

TABLE C-2 TO SUBPART C OF PART 98—DEFAULT CH_4 AND N_2O EMISSION FACTORS FOR VARIOUS TYPES OF FUEL

Fuel type	Default CH_4 emission factor (kg CH_4/mmBtu)	Default N_2O emission factor (kg N_2O/mmBtu)
Coal and Coke (All fuel types in Table C-1)	1.1×10^{-02}	1.6×10^{-03}
Natural Gas	1.0×10^{-03}	1.0×10^{-04}
Petroleum (All fuel types in Table C-1)	3.0×10^{-03}	6.0×10^{-04}
Fuel Gas	3.0×10^{-03}	6.0×10^{-04}
Municipal Solid Waste	3.2×10^{-02}	4.2×10^{-03}
Tires	3.2×10^{-02}	4.2×10^{-03}
Blast Furnace Gas	2.2×10^{-05}	1.0×10^{-04}
Coke Oven Gas	4.8×10^{-04}	1.0×10^{-04}
Biomass Fuels—Solid (All fuel types in Table C-1, except wood and wood residuals)	3.2×10^{-02}	4.2×10^{-03}
Wood and wood residuals	7.2×10^{-03}	3.6×10^{-03}
Biomass Fuels—Gaseous (All fuel types in Table C-1)	3.2×10^{-03}	6.3×10^{-04}
Biomass Fuels—Liquid (All fuel types in Table C-1)	1.1×10^{-03}	1.1×10^{-04}

Note: Those employing this table are assumed to fall under the IPCC definitions of the “Energy Industry” or “Manufacturing Industries and Construction”. In all fuels except for coal the values for these two categories are identical. For coal combustion, those who fall within the IPCC “Energy Industry” category may employ a value of 1g of CH_4/mmBtu.

[78 FR 71952, Nov. 29, 2013]

Need assistance?

GRI-HAPCalc ® 3.01
External Combustion Devices Report

Facility ID: DFA-Portales
Operation Type:
Facility Name:
User Name:
Units of Measure: U.S. STANDARD

Notes:

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

External Combustion Devices

Unit Name: B1, B2

Hours of Operation: 8,760 Yearly
Heat Input: 25.2 MMBtu/hr
Fuel Type: NATURAL GAS
Device Type: BOILER
Emission Factor Set: EPA > FIELD > LITERATURE
Additional EF Set: -NONE-

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
3-Methylcholanthrene	0.0000	0.0000000018 lb/MMBtu	EPA
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157 lb/MMBtu	EPA
Formaldehyde	0.0081	0.0000735294 lb/MMBtu	EPA
Methanol	0.0478	0.0004333330 lb/MMBtu	GRI Field
Acetaldehyde	0.0321	0.0002909000 lb/MMBtu	GRI Field
1,3-Butadiene	0.0000	0.0000001830 lb/MMBtu	GRI Field
Benzene	0.0002	0.0000020588 lb/MMBtu	EPA
Toluene	0.0004	0.0000033333 lb/MMBtu	EPA
Ethylbenzene	0.0000	0.0000000720 lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0001	0.0000010610 lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0036	0.0000323000 lb/MMBtu	GRI Field
n-Hexane	0.1948	0.0017647059 lb/MMBtu	EPA
Phenol	0.0000	0.0000000950 lb/MMBtu	GRI Field
Naphthalene	0.0001	0.0000005980 lb/MMBtu	EPA
2-Methylnaphthalene	0.0000	0.0000000235 lb/MMBtu	EPA
Acenaphthylene	0.0000	0.0000000018 lb/MMBtu	EPA
Biphenyl	0.0001	0.0000011500 lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000018 lb/MMBtu	EPA
Fluorene	0.0000	0.0000000027 lb/MMBtu	EPA
Anthracene	0.0000	0.0000000024 lb/MMBtu	EPA
Phenanthrene	0.0000	0.0000000167 lb/MMBtu	EPA
Fluoranthene	0.0000	0.0000000029 lb/MMBtu	EPA
Pyrene	0.0000	0.0000000049 lb/MMBtu	EPA
Benz(a)anthracene	0.0000	0.0000000018 lb/MMBtu	EPA
Chrysene	0.0000	0.0000000018 lb/MMBtu	EPA

Benzo(a)pyrene	0.0000	0.0000000012	lb/MMBtu	EPA
Benzo(b)fluoranthene	0.0000	0.0000000018	lb/MMBtu	EPA
Benzo(k)fluoranthene	0.0000	0.0000000018	lb/MMBtu	EPA
Benzo(g,h,i)perylene	0.0000	0.0000000012	lb/MMBtu	EPA
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000000018	lb/MMBtu	EPA
Dibenz(a,h)anthracene	0.0000	0.0000000012	lb/MMBtu	EPA
Lead	0.0001	0.0000004902	lb/MMBtu	EPA
Total	0.2874			

Criteria Pollutants

VOC	0.5952	0.0053921569	lb/MMBtu	EPA
PM	0.8224	0.0074509804	lb/MMBtu	EPA
PM, Condensible	0.6168	0.0055882353	lb/MMBtu	EPA
PM, Filterable	0.2056	0.0018627451	lb/MMBtu	EPA
CO	9.0898	0.0823529410	lb/MMBtu	EPA
NMHC	0.9414	0.0085294118	lb/MMBtu	EPA
NOx	10.8212	0.0980392157	lb/MMBtu	EPA
SO2	0.0649	0.0005880000	lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0001	0.0000011765	lb/MMBtu	EPA
Methane	0.2489	0.0022549020	lb/MMBtu	EPA
Acetylene	0.5885	0.0053314000	lb/MMBtu	GRI Field
Ethylene	0.0581	0.0005264000	lb/MMBtu	GRI Field
Ethane	0.3355	0.0030392157	lb/MMBtu	EPA
Propylene	0.1030	0.0009333330	lb/MMBtu	GRI Field
Propane	0.1731	0.0015686275	lb/MMBtu	EPA
Butane	0.2272	0.0020588235	lb/MMBtu	EPA
Cyclopentane	0.0045	0.0000405000	lb/MMBtu	GRI Field
Pentane	0.2814	0.0025490196	lb/MMBtu	EPA
n-Pentane	0.2208	0.0020000000	lb/MMBtu	GRI Field
Cyclohexane	0.0050	0.0000451000	lb/MMBtu	GRI Field
Methylcyclohexane	0.0187	0.0001691000	lb/MMBtu	GRI Field
n-Octane	0.0056	0.0000506000	lb/MMBtu	GRI Field
n-Nonane	0.0006	0.0000050000	lb/MMBtu	GRI Field
CO2	12,985.4118	117.6470588235	lb/MMBtu	EPA

Unit Name: B3, B4

Hours of Operation: 8,760 Yearly

Heat Input: 40.0 MMBtu/hr

Fuel Type: NATURAL GAS

Device Type: BOILER

Emission Factor Set: EPA > FIELD > LITERATURE

Additional EF Set: -NONE-

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor		Emission Factor Set
HAPs				
3-Methylcholanthrene	0.0000	0.0000000018	lb/MMBtu	EPA
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157	lb/MMBtu	EPA
Formaldehyde	0.0129	0.0000735294	lb/MMBtu	EPA

Methanol	0.0759	0.0004333330	lb/MMBtu	GRI Field
Acetaldehyde	0.0510	0.0002909000	lb/MMBtu	GRI Field
1,3-Butadiene	0.0000	0.0000001830	lb/MMBtu	GRI Field
Benzene	0.0004	0.0000020588	lb/MMBtu	EPA
Toluene	0.0006	0.0000033333	lb/MMBtu	EPA
Ethylbenzene	0.0000	0.0000000720	lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0002	0.0000010610	lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0057	0.0000323000	lb/MMBtu	GRI Field
n-Hexane	0.3092	0.0017647059	lb/MMBtu	EPA
Phenol	0.0000	0.0000000950	lb/MMBtu	GRI Field
Naphthalene	0.0001	0.0000005980	lb/MMBtu	EPA
2-Methylnaphthalene	0.0000	0.0000000235	lb/MMBtu	EPA
Acenaphthylene	0.0000	0.0000000018	lb/MMBtu	EPA
Biphenyl	0.0002	0.0000011500	lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000018	lb/MMBtu	EPA
Fluorene	0.0000	0.0000000027	lb/MMBtu	EPA
Anthracene	0.0000	0.0000000024	lb/MMBtu	EPA
Phenanthrene	0.0000	0.0000000167	lb/MMBtu	EPA
Fluoranthene	0.0000	0.0000000029	lb/MMBtu	EPA
Pyrene	0.0000	0.0000000049	lb/MMBtu	EPA
Benz(a)anthracene	0.0000	0.0000000018	lb/MMBtu	EPA
Chrysene	0.0000	0.0000000018	lb/MMBtu	EPA
Benzo(a)pyrene	0.0000	0.0000000012	lb/MMBtu	EPA
Benzo(b)fluoranthene	0.0000	0.0000000018	lb/MMBtu	EPA
Benzo(k)fluoranthene	0.0000	0.0000000018	lb/MMBtu	EPA
Benzo(g,h,i)perylene	0.0000	0.0000000012	lb/MMBtu	EPA
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000000018	lb/MMBtu	EPA
Dibenz(a,h)anthracene	0.0000	0.0000000012	lb/MMBtu	EPA
Lead	0.0001	0.0000004902	lb/MMBtu	EPA
Total	0.4563			

Criteria Pollutants

VOC	0.9447	0.0053921569	lb/MMBtu	EPA
PM	1.3054	0.0074509804	lb/MMBtu	EPA
PM, Condensible	0.9791	0.0055882353	lb/MMBtu	EPA
PM, Filterable	0.3264	0.0018627451	lb/MMBtu	EPA
CO	14.4282	0.0823529410	lb/MMBtu	EPA
NMHC	1.4944	0.0085294118	lb/MMBtu	EPA
NOx	17.1765	0.0980392157	lb/MMBtu	EPA
SO2	0.1030	0.0005880000	lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0002	0.0000011765	lb/MMBtu	EPA
Methane	0.3951	0.0022549020	lb/MMBtu	EPA
Acetylene	0.9341	0.0053314000	lb/MMBtu	GRI Field
Ethylene	0.0922	0.0005264000	lb/MMBtu	GRI Field
Ethane	0.5325	0.0030392157	lb/MMBtu	EPA
Propylene	0.1635	0.0009333330	lb/MMBtu	GRI Field
Propane	0.2748	0.0015686275	lb/MMBtu	EPA
Butane	0.3607	0.0020588235	lb/MMBtu	EPA
Cyclopentane	0.0071	0.0000405000	lb/MMBtu	GRI Field
Pentane	0.4466	0.0025490196	lb/MMBtu	EPA
n-Pentane	0.3504	0.0020000000	lb/MMBtu	GRI Field
Cyclohexane	0.0079	0.0000451000	lb/MMBtu	GRI Field

Methylcyclohexane	0.0296	0.0001691000	lb/MMBtu	GRI Field
n-Octane	0.0089	0.0000506000	lb/MMBtu	GRI Field
n-Nonane	0.0009	0.0000050000	lb/MMBtu	GRI Field
CO2	20,611.7647	117.6470588235	lb/MMBtu	EPA

Unit Name: D2

Hours of Operation:	8,760	Yearly
Heat Input:	50.0	MMBtu/hr
Fuel Type:	NATURAL GAS	
Device Type:	BURNER	
Emission Factor Set:	EPA > FIELD > LITERATURE	
Additional EF Set:	-NONE-	

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
3-Methylcholanthrene	0.0000	0.0000000018 lb/MMBtu	EPA
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157 lb/MMBtu	EPA
Formaldehyde	0.0161	0.0000735294 lb/MMBtu	EPA
Methanol	0.0949	0.0004333330 lb/MMBtu	GRI Field
Acetaldehyde	0.0637	0.0002909000 lb/MMBtu	GRI Field
1,3-Butadiene	0.0000	0.0000001830 lb/MMBtu	GRI Field
Benzene	0.0005	0.0000020588 lb/MMBtu	EPA
Toluene	0.0007	0.0000033333 lb/MMBtu	EPA
Ethylbenzene	0.0000	0.0000000720 lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0002	0.0000010610 lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0071	0.0000323000 lb/MMBtu	GRI Field

n-Hexane	0.3865	0.0017647059	lb/MMBtu	EPA
Phenol	0.0000	0.0000000950	lb/MMBtu	GRI Field
Naphthalene	0.0001	0.0000005980	lb/MMBtu	EPA
2-Methylnaphthalene	0.0000	0.0000000235	lb/MMBtu	EPA
Acenaphthylene	0.0000	0.0000000018	lb/MMBtu	EPA
Biphenyl	0.0003	0.0000011500	lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000018	lb/MMBtu	EPA
Fluorene	0.0000	0.0000000027	lb/MMBtu	EPA
Anthracene	0.0000	0.0000000024	lb/MMBtu	EPA
Phenanthrene	0.0000	0.0000000167	lb/MMBtu	EPA
Fluoranthene	0.0000	0.0000000029	lb/MMBtu	EPA
Pyrene	0.0000	0.0000000049	lb/MMBtu	EPA
Benz(a)anthracene	0.0000	0.0000000018	lb/MMBtu	EPA
Chrysene	0.0000	0.0000000018	lb/MMBtu	EPA
Benzo(a)pyrene	0.0000	0.0000000012	lb/MMBtu	EPA
Benzo(b)fluoranthene	0.0000	0.0000000018	lb/MMBtu	EPA
Benzo(k)fluoranthene	0.0000	0.0000000018	lb/MMBtu	EPA
Benzo(g,h,i)perylene	0.0000	0.0000000012	lb/MMBtu	EPA
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000000018	lb/MMBtu	EPA
Dibenz(a,h)anthracene	0.0000	0.0000000012	lb/MMBtu	EPA
Lead	0.0001	0.0000004902	lb/MMBtu	EPA
Total	0.5702			

Criteria Pollutants

VOC	1.1809	0.0053921569	lb/MMBtu	EPA
PM	1.6318	0.0074509804	lb/MMBtu	EPA
PM, Condensible	1.2238	0.0055882353	lb/MMBtu	EPA
PM, Filterable	0.4079	0.0018627451	lb/MMBtu	EPA
CO	18.0353	0.0823529410	lb/MMBtu	EPA
NMHC	1.8679	0.0085294118	lb/MMBtu	EPA
NOx	21.4706	0.0980392157	lb/MMBtu	EPA
SO2	0.1288	0.0005880000	lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0003	0.0000011765	lb/MMBtu	EPA
Methane	0.4938	0.0022549020	lb/MMBtu	EPA
Acetylene	1.1676	0.0053314000	lb/MMBtu	GRI Field
Ethylene	0.1153	0.0005264000	lb/MMBtu	GRI Field
Ethane	0.6656	0.0030392157	lb/MMBtu	EPA
Propylene	0.2044	0.0009333330	lb/MMBtu	GRI Field
Propane	0.3435	0.0015686275	lb/MMBtu	EPA
Butane	0.4509	0.0020588235	lb/MMBtu	EPA
Cyclopentane	0.0089	0.0000405000	lb/MMBtu	GRI Field
Pentane	0.5582	0.0025490196	lb/MMBtu	EPA
n-Pentane	0.4380	0.0020000000	lb/MMBtu	GRI Field
Cyclohexane	0.0099	0.0000451000	lb/MMBtu	GRI Field
Methylcyclohexane	0.0370	0.0001691000	lb/MMBtu	GRI Field
n-Octane	0.0111	0.0000506000	lb/MMBtu	GRI Field
n-Nonane	0.0011	0.0000050000	lb/MMBtu	GRI Field
CO2	25,764.7059	117.6470588235	lb/MMBtu	EPA

GRI-HAPCalc ® 3.01
External Combustion Devices Report

Facility ID:	**DFA**	**Notes:**	
Operation Type:	**PRODUCTION**		
Facility Name:			
User Name:			
Units of Measure:	**U.S. STANDARD**		

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

External Combustion Devices

Unit Name: CER MAKEUP

Hours of Operation:	8,760	Yearly
Heat	2.79	MMBtu/hr
Fuel Type:	NATURAL GAS	
Device Type:	HEATER	
Emission Factor Set:	FIELD > EPA > LITERATURE	
Additional EF Set:	-NONE-	

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor		Emission Factor Set
HAPs				
3-Methylcholanthrene	0.0000	0.0000000018	lb/MMBtu	EPA
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157	lb/MMBtu	EPA
Formaldehyde	0.0103	0.0008440090	lb/MMBtu	GRI Field
Methanol	0.0118	0.0009636360	lb/MMBtu	GRI Field
Acetaldehyde	0.0090	0.0007375920	lb/MMBtu	GRI Field
1,3-Butadiene	0.0042	0.0003423350	lb/MMBtu	GRI Field
Benzene	0.0091	0.0007480470	lb/MMBtu	GRI Field
Toluene	0.0124	0.0010163310	lb/MMBtu	GRI Field
Ethylbenzene	0.0258	0.0021128220	lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0161	0.0013205140	lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0347	0.0028417580	lb/MMBtu	GRI Field
n-Hexane	0.0172	0.0014070660	lb/MMBtu	GRI Field
Phenol	0.0000	0.0000001070	lb/MMBtu	GRI Field
Styrene	0.0254	0.0020788960	lb/MMBtu	GRI Field
Naphthalene	0.0000	0.0000005100	lb/MMBtu	GRI Field
2-Methylnaphthalene	0.0000	0.0000001470	lb/MMBtu	GRI Field
Acenaphthylene	0.0000	0.0000000670	lb/MMBtu	GRI Field
Biphenyl	0.0000	0.0000004730	lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000900	lb/MMBtu	GRI Field
Fluorene	0.0000	0.0000000800	lb/MMBtu	GRI Field
Anthracene	0.0000	0.0000000870	lb/MMBtu	GRI Field
Phenanthrene	0.0000	0.0000000600	lb/MMBtu	GRI Field
Fluoranthene	0.0000	0.0000000900	lb/MMBtu	GRI Field
Pyrene	0.0000	0.0000000830	lb/MMBtu	GRI Field
Benz(a)anthracene	0.0000	0.0000000870	lb/MMBtu	GRI Field

Chrysene	0.0000	0.0000001170	lb/MMBtu	GRI Field
Benzo(a)pyrene	0.0000	0.0000000700	lb/MMBtu	GRI Field
Benzo(b)fluoranthene	0.0000	0.0000001500	lb/MMBtu	GRI Field
Benzo(k)fluoranthene	0.0000	0.0000007600	lb/MMBtu	GRI Field
Benzo(g,h,i)perylene	0.0000	0.0000002600	lb/MMBtu	GRI Field
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000001200	lb/MMBtu	GRI Field
Dibenz(a,h)anthracene	0.0000	0.0000001030	lb/MMBtu	GRI Field
Lead	0.0000	0.0000004902	lb/MMBtu	EPA
Total	0.1760			

Criteria Pollutants

VOC	0.0659	0.0053921569	lb/MMBtu	EPA
PM	0.0911	0.0074509804	lb/MMBtu	EPA
PM, Condensible	0.0683	0.0055882353	lb/MMBtu	EPA
PM, Filterable	0.0228	0.0018627451	lb/MMBtu	EPA
CO	0.3955	0.0323636360	lb/MMBtu	GRI Field
NMHC	0.1042	0.0085294118	lb/MMBtu	EPA
NOx	1.1856	0.0970167730	lb/MMBtu	GRI Field
SO2	0.0072	0.0005880000	lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0000	0.0000011765	lb/MMBtu	EPA
Methane	0.1286	0.0105212610	lb/MMBtu	GRI Field
Acetylene	0.1711	0.0140000000	lb/MMBtu	GRI Field
Ethylene	0.0116	0.0009476310	lb/MMBtu	GRI Field
Ethane	0.0322	0.0026312210	lb/MMBtu	GRI Field
Propylene	0.0287	0.0023454550	lb/MMBtu	GRI Field
Propane	0.0131	0.0010686280	lb/MMBtu	GRI Field
Isobutane	0.0179	0.0014640770	lb/MMBtu	GRI Field
Butane	0.0168	0.0013766990	lb/MMBtu	GRI Field
Cyclopentane	0.0138	0.0011304940	lb/MMBtu	GRI Field
Pentane	0.0424	0.0034671850	lb/MMBtu	GRI Field
n-Pentane	0.0174	0.0014221310	lb/MMBtu	GRI Field
Cyclohexane	0.0112	0.0009183830	lb/MMBtu	GRI Field
Methylcyclohexane	0.0269	0.0022011420	lb/MMBtu	GRI Field
n-Octane	0.0349	0.0028538830	lb/MMBtu	GRI Field
1,2,3-Trimethylbenzene	0.0418	0.0034224540	lb/MMBtu	GRI Field
1,2,4-Trimethylbenzene	0.0418	0.0034224540	lb/MMBtu	GRI Field
1,3,5-Trimethylbenzene	0.0418	0.0034224540	lb/MMBtu	GRI Field
n-Nonane	0.0447	0.0036604170	lb/MMBtu	GRI Field
CO2	1,437.6706	117.6470588235	lb/MMBtu	EPA

GRI-HAPCalc ® 3.01
External Combustion Devices Report

Facility ID:	**DFA**	**Notes:**
Operation Type:	**PRODUCTION**	
Facility Name:	**DFA**	
User Name:		
Units of Measure:	**U.S. STANDARD**	

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

External Combustion Devices

Unit Name: AHU-1 and AHU-2

Hours of Operation: 8,760 Yearly

Heat Input: 3.75 MMBtu/hr

Fuel Type: NATURAL GAS

Device Type: HEATER

Emission Factor Set: FIELD > EPA > LITERATURE

Additional EF Set: -NONE-

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
3-Methylcholanthrene	0.0000	0.0000000018 lb/MMBtu	EPA
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157 lb/MMBtu	EPA
Formaldehyde	0.0140	0.0008440090 lb/MMBtu	GRI Field
Methanol	0.0160	0.0009636360 lb/MMBtu	GRI Field
Acetaldehyde	0.0123	0.0007375920 lb/MMBtu	GRI Field
1,3-Butadiene	0.0057	0.0003423350 lb/MMBtu	GRI Field
Benzene	0.0125	0.0007480470 lb/MMBtu	GRI Field
Toluene	0.0169	0.0010163310 lb/MMBtu	GRI Field
Ethylbenzene	0.0352	0.0021128220 lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0220	0.0013205140 lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0473	0.0028417580 lb/MMBtu	GRI Field
n-Hexane	0.0234	0.0014070660 lb/MMBtu	GRI Field
Phenol	0.0000	0.0000001070 lb/MMBtu	GRI Field
Styrene	0.0346	0.0020788960 lb/MMBtu	GRI Field
Naphthalene	0.0000	0.0000005100 lb/MMBtu	GRI Field
2-Methylnaphthalene	0.0000	0.0000001470 lb/MMBtu	GRI Field
Acenaphthylene	0.0000	0.0000000670 lb/MMBtu	GRI Field
Biphenyl	0.0000	0.0000004730 lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Fluorene	0.0000	0.0000000800 lb/MMBtu	GRI Field
Anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field
Phenanthrene	0.0000	0.0000000600 lb/MMBtu	GRI Field
Fluoranthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Pyrene	0.0000	0.0000000830 lb/MMBtu	GRI Field
Benz(a)anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field

Chrysene	0.0000	0.0000001170	lb/MMBtu	GRI Field
Benzo(a)pyrene	0.0000	0.0000000700	lb/MMBtu	GRI Field
Benzo(b)fluoranthene	0.0000	0.0000001500	lb/MMBtu	GRI Field
Benzo(k)fluoranthene	0.0000	0.0000007600	lb/MMBtu	GRI Field
Benzo(g,h,i)perylene	0.0000	0.0000002600	lb/MMBtu	GRI Field
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000001200	lb/MMBtu	GRI Field
Dibenz(a,h)anthracene	0.0000	0.0000001030	lb/MMBtu	GRI Field
Lead	0.0000	0.0000004902	lb/MMBtu	EPA
Total	0.2399			

Criteria Pollutants

VOC	0.0897	0.0053921569	lb/MMBtu	EPA
PM	0.1240	0.0074509804	lb/MMBtu	EPA
PM, Condensible	0.0930	0.0055882353	lb/MMBtu	EPA
PM, Filterable	0.0310	0.0018627451	lb/MMBtu	EPA
CO	0.5387	0.0323636360	lb/MMBtu	GRI Field
NMHC	0.1420	0.0085294118	lb/MMBtu	EPA
NOx	1.6147	0.0970167730	lb/MMBtu	GRI Field
SO2	0.0098	0.0005880000	lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0000	0.0000011765	lb/MMBtu	EPA
Methane	0.1751	0.0105212610	lb/MMBtu	GRI Field
Acetylene	0.2330	0.0140000000	lb/MMBtu	GRI Field
Ethylene	0.0158	0.0009476310	lb/MMBtu	GRI Field
Ethane	0.0438	0.0026312210	lb/MMBtu	GRI Field
Propylene	0.0390	0.0023454550	lb/MMBtu	GRI Field
Propane	0.0178	0.0010686280	lb/MMBtu	GRI Field
Isobutane	0.0244	0.0014640770	lb/MMBtu	GRI Field
Butane	0.0229	0.0013766990	lb/MMBtu	GRI Field
Cyclopentane	0.0188	0.0011304940	lb/MMBtu	GRI Field
Pentane	0.0577	0.0034671850	lb/MMBtu	GRI Field
n-Pentane	0.0237	0.0014221310	lb/MMBtu	GRI Field
Cyclohexane	0.0153	0.0009183830	lb/MMBtu	GRI Field
Methylcyclohexane	0.0366	0.0022011420	lb/MMBtu	GRI Field
n-Octane	0.0475	0.0028538830	lb/MMBtu	GRI Field
1,2,3-Trimethylbenzene	0.0570	0.0034224540	lb/MMBtu	GRI Field
1,2,4-Trimethylbenzene	0.0570	0.0034224540	lb/MMBtu	GRI Field
1,3,5-Trimethylbenzene	0.0570	0.0034224540	lb/MMBtu	GRI Field
n-Nonane	0.0609	0.0036604170	lb/MMBtu	GRI Field
CO2	1,958.1176	117.6470588235	lb/MMBtu	EPA

Unit Name: MAXON

Hours of Operation: 8,760 Yearly

Heat Input: 1.3 MMBtu/hr

Fuel Type: NATURAL GAS

Device Type: HEATER

Emission Factor Set: FIELD > EPA > LITERATURE

Additional EF Set: -NONE-

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor		Emission Factor Set
HAPs				
3-Methylcholanthrene	0.0000	0.0000000018	lb/MMBtu	EPA
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157	lb/MMBtu	EPA
Formaldehyde	0.0048	0.0008440090	lb/MMBtu	GRI Field
Methanol	0.0055	0.0009636360	lb/MMBtu	GRI Field
Acetaldehyde	0.0042	0.0007375920	lb/MMBtu	GRI Field
1,3-Butadiene	0.0019	0.0003423350	lb/MMBtu	GRI Field
Benzene	0.0043	0.0007480470	lb/MMBtu	GRI Field
Toluene	0.0058	0.0010163310	lb/MMBtu	GRI Field
Ethylbenzene	0.0120	0.0021128220	lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0075	0.0013205140	lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0162	0.0028417580	lb/MMBtu	GRI Field
n-Hexane	0.0080	0.0014070660	lb/MMBtu	GRI Field
Phenol	0.0000	0.0000001070	lb/MMBtu	GRI Field
Styrene	0.0118	0.0020788960	lb/MMBtu	GRI Field
Naphthalene	0.0000	0.0000005100	lb/MMBtu	GRI Field
2-Methylnaphthalene	0.0000	0.0000001470	lb/MMBtu	GRI Field
Acenaphthylene	0.0000	0.0000000670	lb/MMBtu	GRI Field
Biphenyl	0.0000	0.0000004730	lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000900	lb/MMBtu	GRI Field
Fluorene	0.0000	0.0000000800	lb/MMBtu	GRI Field
Anthracene	0.0000	0.0000000870	lb/MMBtu	GRI Field
Phenanthrene	0.0000	0.0000000600	lb/MMBtu	GRI Field
Fluoranthene	0.0000	0.0000000900	lb/MMBtu	GRI Field
Pyrene	0.0000	0.0000000830	lb/MMBtu	GRI Field
Benz(a)anthracene	0.0000	0.0000000870	lb/MMBtu	GRI Field
Chrysene	0.0000	0.0000001170	lb/MMBtu	GRI Field
Benzo(a)pyrene	0.0000	0.0000000700	lb/MMBtu	GRI Field
Benzo(b)fluoranthene	0.0000	0.0000001500	lb/MMBtu	GRI Field
Benzo(k)fluoranthene	0.0000	0.0000007600	lb/MMBtu	GRI Field
Benzo(g,h,i)perylene	0.0000	0.0000002600	lb/MMBtu	GRI Field
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000001200	lb/MMBtu	GRI Field
Dibenz(a,h)anthracene	0.0000	0.0000001030	lb/MMBtu	GRI Field
Lead	0.0000	0.0000004902	lb/MMBtu	EPA
Total	0.0820			
Criteria Pollutants				
VOC	0.0307	0.0053921569	lb/MMBtu	EPA
PM	0.0424	0.0074509804	lb/MMBtu	EPA
PM, Condensible	0.0318	0.0055882353	lb/MMBtu	EPA
PM, Filterable	0.0106	0.0018627451	lb/MMBtu	EPA
CO	0.1843	0.0323636360	lb/MMBtu	GRI Field

NMHC	0.0486	0.0085294118	lb/MMBtu	EPA
NOx	0.5524	0.0970167730	lb/MMBtu	GRI Field
SO2	0.0033	0.0005880000	lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0000	0.0000011765	lb/MMBtu	EPA
Methane	0.0599	0.0105212610	lb/MMBtu	GRI Field
Acetylene	0.0797	0.0140000000	lb/MMBtu	GRI Field
Ethylene	0.0054	0.0009476310	lb/MMBtu	GRI Field
Ethane	0.0150	0.0026312210	lb/MMBtu	GRI Field
Propylene	0.0134	0.0023454550	lb/MMBtu	GRI Field
Propane	0.0061	0.0010686280	lb/MMBtu	GRI Field
Isobutane	0.0083	0.0014640770	lb/MMBtu	GRI Field
Butane	0.0078	0.0013766990	lb/MMBtu	GRI Field
Cyclopentane	0.0064	0.0011304940	lb/MMBtu	GRI Field
Pentane	0.0197	0.0034671850	lb/MMBtu	GRI Field
n-Pentane	0.0081	0.0014221310	lb/MMBtu	GRI Field
Cyclohexane	0.0052	0.0009183830	lb/MMBtu	GRI Field
Methylcyclohexane	0.0125	0.0022011420	lb/MMBtu	GRI Field
n-Octane	0.0163	0.0028538830	lb/MMBtu	GRI Field
1,2,3-Trimethylbenzene	0.0195	0.0034224540	lb/MMBtu	GRI Field
1,2,4-Trimethylbenzene	0.0195	0.0034224540	lb/MMBtu	GRI Field
1,3,5-Trimethylbenzene	0.0195	0.0034224540	lb/MMBtu	GRI Field
n-Nonane	0.0208	0.0036604170	lb/MMBtu	GRI Field
CO2	669.8824	117.6470588235	lb/MMBtu	EPA

Comprehensive REVIEWS in Food Science and Food Safety

Functionality of Milk Powders and Milk-Based Powders for End Use Applications—A Review

Anup Sharma, Atanu H. Jana, and Rupesh Shrikant Chavan

Abstract: Newer variants of milk powders and milk-based powders are being produced are looking for prospective end users. Powders possess physical and functional properties that are of significance in its usage notably powder structure, particle size distribution, powder density, bulk density, particle density, occluded air, interstitial air, flowability, rehydration (wettability, sinkability, dispersibility, solubility), hygroscopicity, heat stability, emulsifying ability, water activity, stickiness, caking, and others. Some of the functional properties of significance to milk powders and milk-based powders are discussed in this review. Applications with regard to specific milk powders for reconstituted cheese making, coffee creamers, and those suited for milk chocolate and for the baking industry are described.

Introduction

Dairy products are highly perishable. Converting milk into milk powder increases its shelf life and enables it to be stored for extended period (about 1 year) without substantial loss of quality, even at ambient temperatures. The dairy-based powders are not only used for recombination or reconstitution, but they can be exploited for their intrinsic functional properties for application as a food ingredient in several "value-added foods" such as confectionery, bakery, and meat products. Knowledge and a basic understanding of the functional properties of milk powder wise enable food processors to prepare "tailor-made" value-added milk-based powders. Powdered ingredients are stable and convenient for storage, and since the consumer never sees the food assembly process, any prejudices concerning the lower quality associated with dried ingredients is removed. Foods prepared from powdered ingredients are usually considered to be of lower quality (and therefore lower value) than fresh or frozen ingredients and products. In recent days there is great emphasis on adding value to powders, and therefore, an inclusive effort from dairy plant and powder processors, ingredient people, marketing experts is requisite to identify the means to add more value. Consumers are willing to pay more for milk powders if they can perceive high functionality and quality, as well as multifunctional properties.

Market Scenario of Milk Powders

World milk production is projected to increase about 1.9% during the next 10 years compared to 2.1% annual growth experienced in the past decade. World milk production is projected to increase by 153 million tons, of which 73% is expected to come from developing countries, especially India and China (Joshi 2012). Skim milk powder (SMP) worldwide exports are now expected to fall to 1186000 tons in 2009, down 2% from the previous year, largely due to a significant decline in exports from the United States to around the 350000 tons, as excess supplies of milk there have dropped. Global exports of whole milk powder (WMP) are expected to be of 1826000 tons in 2009, 1.2% lower than in 2008, largely due to a sizeable forecast decline from the European Union of 100000 tons. WMP remains the key milk product exported by surplus milk producing regions, such as the European Union, to growing developing country markets. New Zealand, the largest WMP exporter with a market share of some 38%, is set to increase exports in 2009 to a record 686000 tons. Deliveries by Australia are expected to remain near 2008 volumes, while those of Argentina, the third largest supplier, could decline (Anonymous 2009). Powder prices will also likely be lower in 2012 than last year. United States Department of Agriculture forecasts nonfat dry milk (NDM) prices averaging $1.36 to $1.42 per pound for 2012, 8% below the $1.51 per pound price in 2011. Imports of SMP by major importing countries are expected to expand by only 1% this year, following last year's record pace (Madison 2012).

Functional Properties of Milk Powders

Dairy powders are frequently used for convenience in applications for transportation, handling, processing, and for product formulations. Powders possess physical and functional properties, including powder structure, particle size distribution, powder density, bulk density, particle density, occluded air, interstitial air, flowability, rehydration (wettability, sinkability, dispersibility, solubility), hygroscopicity, heat stability, emulsifying properties, glass transition temperature, water activity, stickiness, caking, and even scorched particles. Some of the functional properties of significance to milk powders and milk-based powders are delineated below:

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Shape of powder particles

During drying, liquid milk droplets are transformed into solid particles with individual powder surfaces. A powder particle generally consists of a continuous mass of amorphous lactose and other components in which fat globules, casein micelles, and serum proteins are embedded. It also contains vacuoles of occluded air where particle surfaces are not in contact (Anonymous 2000). Three mechanisms have been suggested for the formation of the surface of powder particles, crust/skin formation during drying (Charlesworth and Marshall 1960), solid/solute segregation during drying (Kim and others 2003), and protein adsorption on an air/liquid interface during atomization (Fäldt and Bergenstahl 1995). The shape of a powder particle depends on the type of raw material, degree of heat treatment, and other compositional and processing parameters. A SMP particle has solid interior with surface folds, while a WMP particle has big vacuoles, with small particles entrapped in its porous structure (Kim and others 2003; Nijdam and Langrish 2006). The unprotected fat on particles of spray-dried WMP and SMP covers the outermost surface in the form of patches or layers and, beneath it fat bound to protein or proteins is present.

Particle size

The particle size of milk powder is related to its appearance, reconstitution property, and flow characteristic. It is influenced by the original milk characteristics, processing conditions, and the type of equipment used in the drying process (Anon 2000). Spray-dried powder particles are usually spherical with diameters ranging from 10 to 250 μm. Rapid dispersion requires a particle size of about 150 to 200 μm. The particles of agglomerated milk powder are larger and more irregular in shape (Caric 1994). Powder with large particle size has superior dispersibility. Dispersibility of powder decreases as the percentage of fine particles (<90 μm) increases (Singh and Newstead 1992). The mean particle size (median value of cumulative distribution) ranges from 85 μm for regular SMP to 230 to 250 μm for fat-filled milk powders (FFMPs; Tuohy 1989).

Density and porosity of powder. *The* bulk density of milk powder is economically, commercially, and functionally an important property. When powders are shipped over long distances, it is important that they have a high bulk density to reduce the volume. A high bulk density also saves packaging material. Density of a powder also decides the container volume, requirement of packaging materials, and selection of machinery for handling. Low bulk density, as influenced by agglomeration, is also an important characteristic of instant powders (Barbosa-Cánovas and Juliano 2005).

Apparent particle density. Apparent particle density or envelope density is the mass per unit volume of a particle, excluding the open pores but including the closed pores. Gas or liquid displacement methods like gas or liquid pycnometry are adopted for the measurement of apparent particle density.

True particle density. True particle density is the ratio of the mass of the particle to the volume of the particle, excluding open and closed pores.

Bulk density. Bulk density, also known as apparent or packing density, is a measure of the mass of milk powder which occupies a fixed volume. It is dependent on particle density, particle internal porosity, and arrangement of particles in the container. It includes the volume of solids and liquids and open and closed pores. Bulk density is categorized in 4 ways (Barbosa-Cánovas and Juliano 2005):

(1) *Compact density*: It is determined after compressing the powder's bulk mass by mechanical pressure, vibration, and impact.
(2) *Tap density*: It is determined after a volume of powder has been tapped or vibrated under specific conditions; it is most useful in describing the powder behavior during compaction.
(3) *Loose bulk density*: It is measured after a powder is freely poured into a container.
(4) *Aerated bulk density*: It is used for testing under fluidized conditions, or during pneumatic conveying applications, when particles are separated from each other by a film of air. The most loosely packed bulk density is achieved after the powder has been aerated.

The bulk density of milk powder is also important for deciding the machinery appropriate for processing. The aerated bulk densities of various milk powders, SMP, WMP, and FFMP ranged from 0.30 to 0.62 g/cm^3; whereas the packed bulk densities ranged from 0.44 to 0.88 g/cm^3. The compressibility of milk powders ranged from 32% to 40% (Tuohy 1989).

Particle porosity. It is defined as the fraction of air or void space over the total bed volume. It is affected by factors like mechanical compaction, particle size (particle size distribution), moisture, temperature, chemical nature of each constituent, processing conditions, moisture, and temperature during storage. The changes are created due to increase in adhesiveness, variation in the mass due to water sorption or evaporation, or due to the phase change of fatty components with temperature (Barbosa-Cánovas and Juliano 2005).

Flowability

The flowability of a powder refers to the ease with which the powder particles move with respect to each another, that is the resistance to flow (Royal and Carson 1991; Kim and others 2005). This property is a measure of the free-flow characteristic of a powder. Proper flow of milk powders is important for the manufacturer and the end user for proper packaging, handling, and measuring. In the dairy industry, flowablity is crucial for air transportation, bin filling and emptying, storage in silos, bag filling and storage, and dosing calculated quantities or selecting parameters for mixing and conditioning of powders (Ilari 2002). It is a determining factor for the designing of machinery to ensure proper flow of powder and to avoid the formation of clogs or rat holes (Prescott and Barnum 2000). In general, powders with good flow properties are those with large agglomerates and few fines.

Fat breaks the motion of particles by melting into an adhesive, rubbery, and viscous liquid, at elevated temperatures. Thus, powders with high-fat content possess lower flowablity than powders containing less fat. The low melting point fraction of fat can be crystallized out to obtain powder with medium- or high-melting fat fractions, resulting in better flowability (Ilari and Loisel 1991). The angle of repose and compressibility of spray-dried SMP were shown to be 32.5° and 0.029, respectively, indicative of good free-flowing characteristics (Sang-Cheon and others 1993).

A shear tester uses mechanical operation to measure flowability. Cohesion is determined and, subsequently the angle of internal friction between the surfaces of powder particles is obtained (Ilari 2002). Measurement of angle of repose to compare flowability of milk powder is still widely used (Svarovsky 1987).

Instant properties

Agglomerated milk powders are produced to give improved properties such as flowability, dispersibility, reduced dustiness, and decreased bulk density. The key function of these powders is to dissolve "instantly" upon addition to water. The instant properties of a milk powder are dependent on the following parameters: wettability, sinkability, dispersibility, and solubility (Pisecky 1997).

Wettability. It is a measure of the ability of a powder to absorb water on the surface, to be wetted, and to penetrate the surface of still water. Contact angles indicate the degree of wetting when a solid and liquid interact. The lower the contact angle, the greater the wetting. It defines the potential for a powder to wet and absorb water at a given temperature. In wetting, the voids within a powder are replaced by water. Generally, it depends on powder particle size, density, porosity, surface charge, surface area, the presence of amphipathic substances, and the surface activity of the particles. Surface coverage with hygroscopic components (such as lactose) yields good wetting properties because of the small contact angle (Fäldt and Bergenståhl 1996; Kim and others 2002).

Wettability is also determined by the temperature of the water used. Milk powders which wet easily and quickly are often termed "instant" milk powders. SMP that is wetted in less than 15 s is termed "instant." There is no requirement for WMP, but it is advantageous that WMP be wetted in about 30 to 60 s (Kelly and others 2003). Fast wetting is also favored by large particles of high porosity; this is why agglomeration of particles into larger units and addition of natural surfactants (such as soy lecithin) to powders are commonly used to enhance the wettability of milk powders (Schubert 1993). The surface composition of powders is expected to play an important role in the wetting process. WMP and cream powder (1 g/100 mL of water) could not be wetted within a reasonable time frame (15 min) by Kim and others (2002). Even greater differences in wetting times after surface fat extraction were found for spray-dried ice cream mixes (Vega and others 2005b). Swelling of the particles always results in a slower rate of wetting, which might even approach zero, as in the case of whey protein concentrate (WPC) (Kim and others 2002).

Sinkability. It is the ability of powder particles to overcome the surface tension of water and sink into the water, after passing through the surface. It is expressed as mg of powder that sink/min/cm^2 surface area (Schober and Fitzpatrick 2005).

Dispersibility. The ability of a powder to separate into individual particles when dispersed in water with gentle mixing is an important consideration in industrial settings. Dispersibility is the ease with which lumps and agglomerates of powder fall apart in the water. It is expressed as the percentage of the solids dissolved. Dispersibility of SMP ($\geq$90%) is more than that of WMP ($\geq$85%) (Tamime 2009).

Very dispersible powders typically exhibit good wettability and are agglomerated, with the absence of fine particles. They are needed to determine how easily a powder goes into solution under normal home-mixing conditions. SMPs are more dispersible in air (18% to 20%) than fat-containing powders (7% to 11%) (Tuohy 1989).

Solubility/insolubility index. Solubility is an important feature of milk powders. Poorly soluble powders can cause processing difficulties and can result in economic losses. Solubility is a measure of the final condition to which the constituents of the powder can be brought into solution or stable suspension. Solubility depends mainly on the chemical composition of the powder and its physical state. Some factors which directly influence the insolubility of milk powders are (1) the presence of lactic acid in milk, (2) the heat treatment of milk, (3) the type of spray-drying, (4) levels of salt ions in the protein of milk powder, and (5) a heat stabilizing agent added to milk prior to manufacture (Singh and Newstead 1992).

The mechanism for insolubility involves the unfolding of β-lactoglobulin, followed by its aggregation with casein. The main factor controlling the insolubility index is the particle temperature during the drying stage when the moisture content is between 10% and 30%. A kinetic model that predicts the insolubility index as a function of temperature and particle diameter was developed by Straatsma and others (1999). The solubility of spray-dried SMP, WMP, and partially skimmed milk powder (>99%) is more than that of tray-dried cheese powder (about 91%). Roller-dried milk powder has the least solubility (about 85%) (Tamime 2009).

The test to assess solubility involves adding 10 g of SMP or 13 g of WMP to100 mL of water at 25 °C with high-speed mixing for 90 s (Tamime 2009). The reconstituted milk is left standing for 15 min and then the amount of sediment at the bottom of the tube is measured in mL and is termed solubility index. Insolulbility index can be determined by adding 10 g of SMP or 13 g of WMP to 100 mL of water at 24 °C $\pm$ 0.2 °C with high-speed mixing for 90 s after adding defoaming agent (octylalchohol or diglycol laurate). The reconstituted milk is left standing for 15 min and after proper stirring 2 centrifuges are filled till 50 mL mark. After centrifugation for 5 min, suck the sediment-free liquid and again fill the tubes with water to the mark of 50 mL. After proper dispersion, recentrifuge for 5 min at 900 rpm and read the amount of sediment in mL and express it as Insolubility Index (IDF 1988).

Foaming properties

Foam formation is important in the development of the texture of foods such as ice cream, mousse, whipped topping, meringues, and even coffee (espresso coffee). While most foams are formed at low temperature, there is also interest in the foaming properties of milk at high temperature, for example, in the foams produced by steam injection for hot milk-based beverages.

Proteins have a major role in the stabilization of steam-frothed milks. The milk powders containing citrate salt are alternatives to physical blends of conventional SMPs and citrates for enhancing the foaming properties of milks at both low- and high-application temperatures. The addition of citrate at 0.1 mol/kg Milk Solid Not Fat (MSNF) to milk concentrate, during powder manufacture, has been shown to enhance the steam-frothing properties of milk. The improved foaming properties of citrated powders are attributed to the effects of added citrate on the dissociation of casein micelles (Augustin and Clarke 2008).

Certain terms of significance for the foaming property of milk powders are "foam overrun" and "foam stability."

Foam overrun: It is calculated as (Augustin and Clarke 2008):

$$\text{Foam overrun (\%)} = \frac{\text{wt. of 100 mL solution} - \text{wt. of 100 mL foam}}{\text{wt. of 100 mL foam}} \times 100.$$

Foaming stability. It refers to the relative ability of the foam to withstand spontaneous collapse or breakdown from external causes. It is calculated as (Phillips and others 1987; Augustin and Clarke 2008):

$$\text{Foam stability (\%)} = \frac{\text{wt. of 100 mL solution} - \text{wt. of liquid drained}}{\text{wt. of 100 mL foam}} \times 100.$$

Heat stability of dried milk

Heat stability is an important attribute of milk powders used in hot beverages, custards, white sauce mixes, bakery items, and, most importantly, the manufacture of recombined milk products (such as evaporated milk). Milk powder used for making recombined evaporated milk (REM) that must withstand sterilization requires adequate heat stability, otherwise the protein precipitates during or shortly after sterilization. Heat stability of milk is mainly a function of its milk protein stability (Singh 2004) and may be affected by protein content and, thus, protein standardization can be used to achieve more consistent protein content in dairy products and perhaps improve heat stability. Sikand and others (2010) concluded that heat stability is influenced by the type of NDM powder (low- or medium-heat powder) and standardization material (permeate powder or edible lactose powder). A combination of low-heat and permeate powder provides the best heat stability for reconstituted milk (Sikand and others 2010). Calcium fortification of SMPs by addition of citrate and carbonate salts improves their heat stability. The presence of calcium carbonate in reconstituted SMP with a 1.75% protein level greatly improves the heat stability which may be partially due to the neutralizing effect (Vyas and Ton 2005). A high preheat treatment of the milk is needed to ensure but is not a sufficient guarantee for heat stability. The effect of calcium ions on heat-induced gelation of recombined milk powders depends on the extent of preheat treatments (Newstead 1977; Madkor and Fox 1990). Some countries allow the use of stabilizing salts such as mono- and disodium phosphates in preparing REM prior to canning and sterilization. In the case of dried milk, the production of heat-stable SMP and coffee whitener or creamer (to prevent feathering) demands careful attention to the control of their heat-stable characteristics (Kelly 1981).

Factors Determining the Functional Properties of Dairy-Based Powders

The physicochemical characteristics of milk powders depend on the original raw milk composition and standardization, and characteristics of the concentrate before spraying (composition/physicochemical characteristics, viscosity, thermosensibility), as well as the drying parameters (type of tower spray dryer, nozzles/wheels, pressure, agglomeration, and thermodynamic conditions of the air: temperature, relative humidity, velocity), and how the powder will be used in a particular food system (Oldfield and Singh 2005). Preparation of dairy powders involves many critical parameters which affect their functional properties. These include:

Type of feed

Higher total solids (TS) of feed will require less heat treatment to remove moisture. Skim milk, buttermilk, and whey have lower TS (8% to 9%) as compared to whole milk (about 13%) and thus the former would require higher drying temperatures (200 °C instead of 190 °C for WMP).

Additives

Additives like citrates enhance the foam stability and foam overrun of low-heat SMP (Augustin and Clarke 2008). Lecithin is used to improve the properties of instantized milk powders. This involves dissolving lecithin in butter oil and spraying over the agglomerated milk powder, either internally or in a fluidized bed, and outside the dryer (Pisecky 1997).

TS of milk concentrate

The evaporators are limited to concentrating milk up to about 50% TS; higher solid concentrates produce powders with poor functional properties (Caric 1994).

Heating of concentrate

Before spray-drying, milk concentrate is heated at a temperature in the range of 65 °C to 80 °C to reduce its viscosity. This is to optimize atomization of the concentrate in the spray dryer, thereby improving spray-drying efficiency and powder properties (such as solubility index and coffee sediment) (Baldwin and others 1980; Oldfield and others 2000). Any heat-sensitive microorganisms present are also destroyed by the concentrate heating step.

Temperature during concentration

Heating under vacuum requires low temperature for drying. As the temperature of drying is lowered, there is an increase in the solubility and a decrease in the free fat content of milk powder. The bulk density of milk powder decreases with an increase in the temperature of concentration (Tamime 2009).

Preheating and homogenization of concentrate

A combination of high homogenization pressure and high temperature treatment of the concentrate before spray-drying results in poor reconstitution properties of the powder, particularly when heating is carried out after homogenization (Singh and Aiqian 2010). Homogenization of the whole milk concentrates before spray-drying helps to reduce the presence of free fat in the powder.

Type of dryers. Conventional single-stage drying is now being replaced by two- or three-stage drying in the dairy industry. Besides economy, they enhance agglomeration and instantization, resulting in improved functional properties like uniform size distribution and better flowability. Two-stage and multistage dryers are more energy-efficient and less damaging to milk powder properties than single-stage dryers (Masters 1991). The advantages of spray-drying include the following: (1) the powder specifications remain constant throughout the dryer when drying conditions are held constant; (2) it is a continuous and easy drying operation that is adaptable to full automatic control; and (3) a wide range of dryer designs is available to suit a variety of applications, especially for dehydration of heat-sensitive materials (Vega-Mercado and others 2001).

Atomization through disc or nozzle atomizer. An increase in the speed of atomizing results in finer droplet particles; drying takes place efficiently. Hence, there is an increase in the solubility and decrease in the free fat content of the milk powders with increase in the speed of the atomizer. The bulk density increases due to higher surface area-to-volume ratio (Tamime 2009). Milk powder produced using the rotary atomizer has better solubility and dispersibility properties, although milk powder produced using the nozzle atomizer has higher bulk density according to Yetismeyen and Deveci (2000).

Nozzle atomizers are preferred over disc atomizers for high-fat, milk-based powders as they help in reducing the free fat content. Reduction of nozzle size results in a powder with lower free fat content and that, too, at a lower outlet drying air temperature (69 °C) (Kelly and others 2002).

Inlet air temperature

For spray-dried powders, an increase in the inlet air temperature leads to quick removal of moisture and results in hardening on

the surface of the powder particles, leading to lower fat leakage. Hardening of the powder particle surface checks the removal of trapped air leading to low bulk density (Nijdam and Langrish 2006). High inlet air temperatures are normally desirable from an energy efficiency perspective during drying and may improve bulk density, provided that the risk of causing case hardening on the surfaces of powder particles is avoided (Pisecky 1978).

Outlet air temperature

For spray-dried powder, an increase in the outlet air temperature creates cracks on the surface of a powder particle, resulting in greater fat leakage. The cracks promote removal of moisture with air and thus there will be decreased bulk density (Nijdam and Langrish 2006). Low air outlet temperatures generally favor more uniform drying of droplets, controlled particle shrinkage, and improved powder bulk density (De Vilder and others 1976).

Agglomeration after spray-drying

The powder manufacturers desire free-flowing powders and absence of dust in such a way that it facilitates handling of the powders. Both requirements are met by applying agglomeration of food powders. Agglomeration, in general, can be defined as a process during which primary particles are joined together so that bigger porous secondary particles (conglomerates) are formed. Agglomeration is also referred to as intantizing. Rehydration and reconstitution are important properties of powders that decide its convenience in domestic as well as industrial uses. Agglomerates have both coarse and open structures varying from 0.1 to 3 mm. Agglomeration improves the dispersability of the formed products that are wetted uniformly when put in either cold or hot water (Dhanalakshmi and others 2011). Agglomeration of powder after spray-drying is used to get larger particles (50 to 80 μm in conventional to 250 to 500 μm in agglomerated powders) with a narrower size distribution in order to improve flowability; and to modify particle structure (porosity) to obtain good instant properties. In a spray dryer, agglomeration can take place within the spray of an atomizer, between sprays of various atomizers and between sprays and dry material being introduced into the drying chamber (such as by return of particles having a diameter less than 100 μm). The latter technique is often the most effective way to achieve and control agglomeration (Verdurmen and others 2005). Agglomeration of spray-dried powders is performed outside the drying chamber in a fluid bed, where the particle surface is wetted with sprayed water (or another binder solution) (Gianfrancesco and others 2008).

Storage stability

Spray-drying is a fast process that produces dry solids that often exist in an amorphous state. This gives thermoplastic and hygroscopic properties to the product being dried and, as a result, (1) it tends to stick on the walls of the dryer during processing, and (2) it shows great sensitivity to moisture and temperature fluctuations during storage. This is particularly true for systems containing high levels of low molecular weight carbohydrates (Bhandari and others 1997; Bhandari and Howes 1999). Susceptibility to deterioration during storage at high temperatures and/or relative humidities for sugar-containing products has been related to their glass transition temperature (Tg) (Aguilera and others 1995; Christensen and others 2002; Vega and others 2005a). Liquids in the amorphous state have very high viscosity ($>10^{12}$ Pa s), which makes them appear as solids. Roos and Karel (1991) correlated the Tg to critical viscosity and found that the critical viscosity was reached at a temperature of 10 °C to 20 °C above the Tg.

Properties of Milk Powders and Milk-Based Powders

The functional properties of milk powder are important when the powders are used for recombination or in the manufacture of various food products. These functional properties include emulsification, foaming, water absorption, viscosity, gelation, and heat stability, which are essentially the manifestations of the physical and chemical properties of the milk.

Moisture content

The milk powders are produced with legal specifications for maximum moisture content; high moisture content of milk powder favors nonenzymatic browning. Too low a moisture content can result in an increased fat oxidation rate (Labuza 1971; Van Mil and Jans 1991). In two- or three-stage dryers, besides final moisture content of powder, the moisture content of powder leaving the drying chamber (first stage of drying chamber) is important (Masters 1991). A combination of factors involving feed properties (TS, temperature), atomization conditions, and the conditions of drying air (inlet and outlet temperature of drying chamber/fluid beds) influences the moisture content of the resultant powder (Straatsma and others 1991).

Hygroscopicity

It is a measure of the water absorption by a powder. It is often measured by passing air of a known humidity level (usually 80% at 20 °C) over a powder until equilibrium is reached, then measuring the weight gain of the powder. Powders which absorb much moisture may cake during storage (Tamime 2009).

Free fat levels

An increase in the level of free fat may make the powder prone to oxidation and the powder will have poor rewetting properties, and it may affect the flowability of the powder. Homogenization of concentrate assists in reducing free fat. Higher outlet air temperature in the spray dryer leads to high free fat levels. A slight curvilinear relationship exists between free fat and total fat content in the powders (Kelly and others 2002). Twomey and Keogh (1998) suggested that free fat in spray-dried WMP may be increased by using smaller nozzles and higher nozzle pressures. Hansen and Hansen (1990) saw an effect on chocolate viscosity between WMP atomized from a nozzle at different pressure. Higher nozzle pressure gave lower viscosity, most likely due to the higher free fat content. Another important factor that affects free fat levels is the degree of lactose crystallinity (Haylock 1995; Twomey and Keogh 1998), as the crystalline lactose (as opposed to amorphous lactose) causes the milk fat to be expressed from the droplet.

Free fat content in WMP cannot be avoided, but it can be controlled by adopting the following:

(1) Avoid excessive pumping and agitation of the raw milk. Avoid recirculation in the evaporator.
(2) Homogenization of the concentrate, preferably in a two-stage homogenizer (70 to 100 kg/cm^2 + 25 to 50 kg/cm^2 pressure in 1st and 2nd stage, respectively).
(3) Nozzle atomization produces a powder with a lower free fat content than with the disc atomization.
(4) Two-stage drying gives a powder with a lower free fat content than the one-stage drying. Strong mechanical handling of the powder should be avoided.

Table 1–Comparison of physical and flow properties of commercial milk powders at ambient conditions (20 °C).

	Physical properties					
Type of powder	Fat (%)	Mean particle size (μm)	Moisture (%)	Bulk density (kg/m^3)	Particle density (kg/m^3)	Flow property (flow index)
SMP	0.90	53	4.7	646	1133	6.1
WMP	26.00	99	3.3	627	1180	1.45
High-fat powder	73.00	76	2.0	433	934	1.78

Source: Fitzpatrick and others (2005).

Table 2–Application of heat-classified milk powders based on functional properties.

Heat classification of powder	WPNI (mg undenatured WPN/g of powder)	Typical heat treatment	Functional properties	Applications or end use
Low-heat SMP	≥6.0	70 °C/15 s	Solubility, lack of cooked flavor	Recombined milk, cheese making, milk standardization
Medium-heat SMP or medium high-heat SMP	4.51–5.99 1.51–4.50	85 °C/60 s 90–105 °C/30 s	Emulsification, foaming, water absorption, viscosity	Ice cream, chocolate confectionery
High-heat SMP	≤1.50	90 °C/5 min or 120 °C/ 1–2 min	Heat stability, water binding, gelation, water absorption	Recombined evaporated milk, sweetened condensed milk, gulabjamun mix powder, bakery

Source: Kelly and others (2003).

Agglomeration and lecithination

This process improves the wettability but has less of an effect on the bulk density of milk powders. Such a process is adopted in the drying industry to achieve better reconstitution properties (Masters 2002; Dhanalakshmi and others 2011). Lecithination is used to improve the properties of instantized milk powders (Pisecky 1997).

The surface stickiness of powder particles depends on the surface temperature during drying, water content, and composition (carbohydrates, fats). When the surface reaches the sticking state, collisions with other particles could lead to agglomeration depending on the velocity, force, angle, and time of contact between the powder particles (Huntington 2004). Agglomeration leads to greater incorporation of air between the powder particles. During reconstitution, this air is replaced by water and thus the agglomerates readily disperse and dissolve quickly (Caric 1994).

The flowablity of all types of powders is dependent on the combined effect of primary (dispersion) and secondary structure (agglomeration). Powder with added lecithin has good instant properties, but it has lower flowablity. Convexity of agglomerates and their relative homogeneity in size is required for a powder to have good flowablity (Ilari and Loisel 1991; Gharemann and others 1994). The angle of repose was shown to range from 33° to 38° for SMP to 40° to 58° for fat-containing milk powders (Tuohy 1989). Few properties of various types of milk powders are depicted in Table 1.

Scorched particles

These occur as unsightly, discolored specks in milk powders. They are often the result of powder deposits in the spray-drying system. With a low water activity and exposure to hot air, the milk powder deposits darken through the Maillard reaction and they can be perceived as sediment or dirt particles. On reconstitution, however, they dissolve and this powder defect most often disappears but many of the times remain as sediment at the bottom. Tests for spray-dried and instant milk powders typically use the "water disc" method. The test uses a process that involves filtering a hydrated milk powder solution through a disc, and comparing the color of the mass on the dried disc with standard discs (Tamime 2009).

Dairy-Based Value-Added Powders

SMP is widely used as an ingredient in many formulated foods. Soups, sauces, and confectionery and bakery products all benefit from the functional properties provided by SMP. The powder can be tailored to a specific end use by manipulating the processing conditions. Dairy powders include conventional powders like SMP, WMP, and partial SMP; value-added ones include cheese powders, delactosed and demineralized whey powders, buttermilk powders (BMPs), dairy whiteners, and so on, although the specialty or "tailor-made" powders may include "heat-classified" SMPs, total milk proteinates (TMP), coffee creamer powder, and so on. The details of a few powders are given below:

Heat-classified milk powders

Based on the heat treatment meted out to skim milk in the preparation of SMP, mainly 3 classes, low-heat, medium-heat, and high-heat SMP can be produced. Whey protein nitrogen index (WPNI) is the result of the determination of undenatured whey proteins in nonfat dried milk (NFDM) developed by the American Dairy Products Institute. It is important in terms of functional properties and particularly in relation to the use of milk powders for the manufacture of some recombined milk products. The test measures the amount of soluble whey protein in SMP. It gives an indication of the heat treatment used on the milk prior to drying (Jana and Thakar 1996; Sikand and others 2008). The basis of classification of NFDM based on WPNI and application of such heat-classified powders is presented in Table 2.

Heat stable powders

Heat stabilization of skim milk is carried out during evaporation and drying by a high-temperature preheat treatment of the milk which denatures the whey protein and forms a heat-induced complex between κ-casein and β-lactoglobulin. The presence of native undenatured whey protein in concentrated milks has been shown to have a detrimental effect on heat stability. Various preheating temperature-time combinations have been suggested such as 85 °C to 90 °C/10 to 20 min (Griffin and others 1976; Kieseker and Pearce 1978), 99 °C to 120 °C/0.5 to 2.0 min (Newstead and others 1975), and 110 °C to 130 °C a few seconds for preparing heat-stable SMP (Kelly 1981).

Heat stability is the ability to withstand sterilization conditions or other high-heat treatments. This is especially important in the manufacture of REM products or in other high-heat applications, such as whiteners for hot beverages, soups, and sauces. The heat stability of milk powder is affected by the composition of the original milk from which the powder was made, processing conditions, additives, and the composition of the food system the

powder is used in. Commercial WMPs have been assessed on an arbitrary basis as "coffee stable" or "coffee unstable" depending on whether their sediment values were less than or greater than 1 mL, respectively (Teehan and others 1997).

Modified SMP

The instant controlled pressure-drop (ICPD) treatment greatly affects the physical, structural, and textural properties of spray-dried skim milk by texturizing the powder granule. ICPD technology is a high-temperature, short-time treatment followed by an abrupt pressure drop toward vacuum (about 5 kPa with a pressure drop speed >0.5 MPa/s). The last operation allows residual water to instantly autovaporize, inducing rapid cooling and controlled expansion of the product. Utilizing the ICPD versions (such as high air pressure-ICPD or steam-ICPD), the specific quality and properties of milk powders can be modified and controlled by mastering the microstructure. ICPD allows the specific surface area to increase (reaching 200 m^2/kg compared to 100 m^2/kg for conventional SMP) and allows the porosity, interstitial air volume, compressibility, dispersibility, and bulk density to decrease (Mounir and others 2010).

High-protein milk powder from ultrafiltered retentates

A delactosed, high-milk-protein powder (HMPP), also referred to as TMP or milk protein concentrate (MPC), has been made from skim milk through ultrafiltration (UF) and diafiltration (DF) to obtain retentate having 19.0% protein and 0.08% lactose. The UF retentate (21.0% TS) is then spray-dried (inlet and outlet air temperature of 125 °C and 80 °C, respectively) to have powder having 5.33% moisture, 2.27% fat, 88.0% total protein, 0.74% lactose, and 7.05% ash (Mistry and Hassan 1991a, b; Mistry 2002). The surface of a powder becomes smoother with reduction in the lactose content. Caking of powder is also reduced, imparting good flowability. Such powder has highest foaming capacity at pH 10 (Mistry 2002). The color of HMPP is grayish-white as compared to the yellowish-white color of SMP. The HMPP has lower loose (0.31 g/mL) and packed densities compared to SMP. Hydroxymethylfurfural (HMF), an indicator of browning index, was not detected in HMPP, even during storage, although in SMP it increased with storage (Mistry and Pulgar 1996). Heat treatment of milk prior to UF resulted in improved gel-water holding capacity of the powder. The emulsifying capacity decreased when the pH of milk was raised to 7.0 prior to drying (El-Samragy and others 1993). The absence of lactose in such HMPP makes it a useful ingredient for application in nonfat yogurt, ice cream, and cheese (Mistry 2002). The functional properties (foaming and heat stability) of spray- or freeze-dried UF skim milk retentates were found to be satisfactory (Jimenez-Flores and Kosikowski 1986).

MPC are commonly added to milk or cheese formulations to enhance the protein content and/or the yield of the final product. They are used to enhance the textural characteristics of yogurts. The use of MPCs in nutritional drinks is growing. In these applications, MPC provides both casein and whey proteins in the same ratio as existing in milk, but without a high lactose content (Baldwin and Pearce 2005). When added to make nonfat yogurt, it serves as a stabilizer to improve its body and texture (Mistry 2002).

BMP

Buttermilk can be dried into a value-added BMP, rich in lecithin, for use as a cheaper milk solids source with functional benefits in the food industry. As the severity of heat treatment is increased there is an increase in free sulfhydryl groups which results in decreased protein solubility. The foaming capacity and stability depends on the size, extent of protein denaturation, solubility, and flexibility of proteins. BMP showed limited water-holding capacity (0.75 g water/g protein), fat-absorption capacity (1.2 g of oil/g of protein), foaming capacity (0.5 mL of foam/mL of solution), and stability; the emulsifying capacity and stability were similar to those of SMP. About 0.9 g of protein from BMS was needed to emulsify an oil concentration of 50% in water. Denaturation of protein was declared a critical factor affecting the functionality of BMP by Wong and Kitts (2003).

Whey powder and its variants

Whey powder is another cheap source of milk solids for application in the dairy as well as the food industry. Whey powder in its native form has limited applicability in food because of its hygroscopicity, imparting "salty" flavor due to the high mineral content. Hence, process modification is necessary to make whey powders more compatible for uses in food applications. In the case of sweet whey powder, foaming properties showed a positive correlation to particle size and negative correlation to lipid content. The protein solubility showed positive correlation with protein content and negative correlation with turbidity of the sample (Banavara and others 2003).

Complete crystallization of lactose from the concentrated whey through seeding of the concentrate, followed by spray-drying resulted in the production of a "nonhygroscopic" whey powder (NHWP). Delactosed and demineralized whey powder can be produced by crystallizing out some of the lactose and then subjecting the mother liquor to demineralization to remove 70% to 90% of the minerals. The latter powder finds application in infant foods, diet food formulations, prepared mixes, and more (Fox and others 2000). Amorphous lactose was shown to affect the moisture sorption and caking properties of spray-dried, milk-based powders. The SMP absorbed more moisture and formed harder cakes more rapidly than the NHWP (Listiohadi and others 2005).

The protein solubility of chhana whey protein powders, produced by UF and Reverse Osmosis followed by spray-drying varied from 57% to 100% and was greatest at low pH values. Such powders had emulsifying properties similar to those of commercial cheese whey protein powders of similar protein content. However, their capacity to form gels was much lower, particularly at alkaline pH (Jindal and Grandison 1994).

A volume concentration ratio of 4 obtained by nanofiltration (NF) with simultaneous DF of acid casein whey resulted in obtaining 19% to 21% TS with demineralization up to 40% to 48%. Such concentrate was spray-dried to obtain demineralized whey powder. The reduction in the mineral content of whey powder led to an increase in lactose crystallization yield of 31% (without DF) to 60% (with DF). This lowered the hygroscopicity of the whey powder by two times for NF and three times for NF-DF (Jeantet and others 1996).

Powders for coffee

Dairy powders as whiteners or creamers have found a vital role in coffee. Popular coffee additives are dried milk concentrates, evaporated milk, coffee cream, liquid milk, and coffee whiteners. Milk proteins enter into reactions with tannins and gives coffee a pleasant, slightly creamy taste. The tart taste of coffee, which results from the presence of tannins, is considered undesirable and

unpleasant by some consumers (Kelly and others 1999). Rich taste and foam are the functional properties imparted by dairy powders. Besides coffee stability, milk powders should have whitening ability, provide body and mouthfeel, and impart a rich, creamy dairy flavor (Oldfield and Singh 2005).

Milk powders upon dissolving in a coffee solution should remain stable (show no visible precipitation). The precipitation is called "feathering," comprised of whole casein micelles attached to fat particles through micellar casein phosphate. Coffee stability is a measure of the milk powder's resistance to protein instability and resistance to "feathering." Milk protein stability is affected by high temperature, low pH (as in coffee), water hardness (high levels of Ca, Mg), other factors, etc. The denaturation of whey proteins affects the coffee stability of SMP and it is claimed that powders with WPNI equal or less than 3 exhibit the best coffee stability. Other factors such as milk protein composition, amino acid profile, and overall protein level also influence stability. The stability of such powders can be improved by removal of calcium through NF (Mc Kinnon and others 2000; Refstrup 2000).

The stability of milk powder is related to the intensity of the milk heat treatment. The amount of residues in the coffee test with milk processed at 75 °C/30 s and at 97.5 °C/2 min was 0.33 mL and 1.15 mL, respectively (Oldfield and others 2000).

Butter powder

Free-flowing butter powder was made from ripened/unripened cream or butter using SMP and/or Na caseinate as encapsulating material. The bulk density of the butter powder ranged from 0.14 to 0.29 g/cm^3, depending on the type of encapsulating material. The flowability of butter powder increased with the addition of 0.5% sodium aluminum silicate; unripened cream as raw material gave the highest flowability to the resultant butter powder. Butter powder having 80% fat, and 16.5% MSNF gave the best result. Use of 0.4% each of sodium citrate and glycerol monostearate along with SMP gave best results to Prasad and Gupta (1984). Na caseinate stabilized the fat globules in butter powder to the greatest extent, followed by WPC, MPC, and SMP (Patel and others 1987). Stability (resistance to clumping) of butter powder was improved 4-fold using Na caseinate rather than SMP as the protein carrier along with trisodium citrate (Frede and others 1987).

Evaporation of water in the preparation of butter powder is done through co-current flow with a nozzle tower or drying chamber and integrated belt or through a mixed-flow drying chamber with integrated fluid bed. Sticking of products on the walls of the drying chamber can be avoided by incorporating drying aids like NFDM or maltodextrin in the formulation, including a free-flowing agent (Masters 2002).

Cheese powder

Cheese powder is used primarily to add flavor to baked goods, biscuits, or snacks such as potato crisps. It can also be used in dip mixtures and similar products. Cheese powder can be stored at ambient temperature, unlike natural cheese which needs refrigerated storage. Cheese powder can be conveniently incorporated into savory foods. The cheese slurry is concentrated to 35% to 45% TS, followed by homogenization and spray-drying. Co-current flow tower drying chambers with external fluid beds and nozzle atomizer or integrated belt and mixed-flow drying chambers with integrated fluid beds and nozzle atomizer are preferred for drying. The main difficulties with processing cheese powder are the materials handling in the feed formulation step and the formation of deposits in the spray dryer chamber and collection system. Wall sweeps may be an advantage, or a small dryer that can be cleaned easily could be used.

The bulk density, dispersibility, flowability, and sinkability of cheese powder improved with increasing TS content of the slurry. The physical properties of cheese powder were improved by use of 3.0% disodium hydrogen orthophosphate (Kumar and Tewari 1991). Low air outlet temperature ensured flavor retention. Cheese has a higher fat content (18% to 25%) and thus secondary air cooling is required to avoid sticking of powder to the dryer walls. Minimal mechanical handling is recommended to reduce the damage to the fat globule membrane. Use of high-melting fat fractions resulted in low free fat development and enhanced the flowability of the resultant powders (Masters 2002).

Encapsulated butteroil powder (BOP)

Butteroil can be converted into dried form by encapsulating it (such as in a starch/oil emulsion). A protected soft core is used to deliver bioactive additives (usually carotenoids and ω-3 fatty acids). BOP can be subjected to single or double encapsulation. The primary encapsulant used are starches and sugars (sucrose, maltose, lactose), although a secondary encapsulant can be a mixture of vegetable waxes and linear alcohol polymers. Higher fat content or higher extractable/encapsulated fat in the slurry formulation led to lower flowability of the resultant powder in study by Onwulata (2005).

Malted milk powder

Use of malt solids in milk-based products reduces the cost and extends the supply of cereal proteins to a large population. A typical malted milk powder had 3.0% moisture, 8.4% fat, 16.5% protein, 62.5% sugar, and 4.4% ash. The physical properties of significance reported were wettability 13 s, dispersibility 33 g, flowability 62.8° (angle of repose), sinkability at 2 min 24% transmission, packed bulk density 0.65 g/mL, free fat 1.3% (as % of fat), and solubility index 0.6 to 1.0 mL (Salooja and Balachandran 1988; Dhillon 2005).

Functional Benefits of Milk Powder as an Ingredient in Food Products

Because milk powder and milk-based powders have varied functionalities, such properties are of immense significance for its use as a valued ingredient in several food products. Manufacturers can add milk powder as a functional ingredient to a wide variety of foods, for example, chocolate, bakery products, beverages, confectionery items, and yogurt. The benefits of using milk-based powders in food applications are provided in Table 3.

Milk powder for cheese making

A modified method was used to prepare milk powder by partial removal of whey protein from milk through use of combined microfiltration and UF (to concentrate permeate of microfiltered milk). Partial removal of whey protein before heat treatment probably avoided formation of a β-lactoglobulin-κ-casein complex during thermal processing. The concentrate was spray dried using inlet air of 250 °C, integrated fluid bed air at 76 °C, and an outlet air temperature of 88 °C. Mozzarella cheese when made from recombined milk using such modified powder, helped in giving 7.3% higher cheese yield, and with cheese-making abilities similar to those of raw milk (Garem and others 2000). The use of MPC for standardization of whole milk for cheese manufacture offers several advantages including high yield, high quality of the whey stream due to reduced lactose levels in MPC, and, consequently,

Table 3–Examples of functionality of milk powder and milk-based powders in food applications.

Function	Benefit	Application
Browning/color	Accentuates color development during cooking and baking. Enhances the color of viscous products such as sauces, soups. Improves opacity in low fat foods.	Baked goods, confections, recombined milk, nutritional beverages, sauces, soups, salad dressings.
Flavor enhancement	Provides baked flavor during baking and heating. Provides creamy dairy notes.	Meat and same as above.
Emulsification	Prevents fat globules from forming lumps. Improves product appearance.	Same as above.
Gelling and heat setting	Improves mouthfeel, helps provide the creamy, smooth texture of fat important for low-fat products.	Confections, recombined milk, meat, prepared foods.
Solubility	Some milk powders disperse well in food systems. Prevents sedimentation in beverages, soups, and sauces.	Bakery, beverages, confections, frozen desserts, infant formula, soup and sauces, yogurt.
Water binding and viscosity building	Provides fat-like attributes in products. Allows a reduction in fat content. Improves product texture.	Baked goods, confections, recombined milk, nutritional beverages, prepared foods, sauces, soups.
Whipping, foaming, and aeration	Maintains foam properties which enhance visual appeal as well as taste and texture.	Baked products, confections, recombined milk, nutritional beverages.

Table 4–Influence of milk powder properties on chocolate.

Milk powder properties	Effect on chocolate properties
Particle size and distribution	Flow properties
Particle shape	Refining operations
Surface characteristics of particles	Tampering conditions
Free fat level	Hardness/snap
Particle density	Bloom stability
Flavor attributes	Flavor profile

Source: Liang and Hartel (2004).

reduced residual lactose in cheese compared to using condensed skim or SMP (Shakeel-Ur-Rehman and others 2003).

Milk crumb for the chocolate industry

Milk powders are used as a vital ingredient for the preparation of "milk crumbs" for use in milk chocolates. Milk crumb is made by vacuum drying of a crystallized mixture made from milk, sugar, and cocoa liquor (Minifie 1989; Attaie and others 2003). The milk powder properties that influence chocolate properties are furnished in Table 4.

Milk fat in milk powder affects the tempering conditions, melt rheology, hardness, and bloom stability in chocolate products (Twomey and Keogh 1998). By *in situ* lecithination, it was possible to deliver polar lipids to the powder surface by means of co-spray-drying polar lipids with lactose which made SMP highly suited to chocolate manufacture (Millqvist-Fureby and Smith 2007). Characteristics of milk powders of specific importance to milk chocolate manufacture include degree of free fat, particle size and structure, and air inclusion (Twomey and Keogh 1998). Powders that contain high free fat, or fat that is easily extractable and can interact directly with the cocoa butter in chocolate, typically have been desired by milk chocolate manufacturers (Hansen and Hansen 1990). A high free fat level results in reduced chocolate viscosity, making it easier to process the chocolate and providing an economy in cocoa butter savings (cocoa butter is usually added to control viscosity) (Twomey and Keogh 1998).

Roller-dried milk powder is preferred over spray-dried milk powder as the source of milk solids for chocolate preparation due to the insufficient flow properties of the latter. Better flow properties of roller-dried powders are attributed to its higher free fat content (Dewettinck and others 1996). Roller-dried powder, being larger (about 150 μm) in size, is preferred for chocolate making.

Spray-dried milk powder has a median particle size of 30 to 80 μm. The median particle size of spray-dried milk powder containing 26% fat could be increased to 200 μm by increasing the nozzle size for atomizing the concentrate. The outlet air temperature of a spray drier was required to be raised (to about 90 °C) to have the desired low moisture content of a powder made from a large-sized atomized concentrate. Such spray-dried powder was suitable as an ingredient (instead of roller-dried milk powder) for milk chocolate manufacture (Keogh and others 2004).

Baked goods

Dried buttermilk has been used as a valuable ingredient in specialty bakery products requiring short texture, without excessive dryness; the usage levels of 3.0% flour by weight is recommended (Patel and Jana 1994). Whey solids designed for use in bakery products should preferably be demineralized and adequately heat treated to denature whey proteins (Anonymous 1994). Whey solids have been reported to provide shortening or tenderizing effect in cake and sponge products. "Breading" or "crumb coatings" used on fried products contains whey as a critical ingredient. Whey solids act as an emulsifier and have good water binding properties (Tow 1985; Pomeranz 2002).

Nonfat yogurts

Low-fat and fat-free yogurts have gained popularity because of increasing demands of consumers who seek healthy options across product categories. Production of low-fat and nonfat yogurt demands careful control of texture and flavor attributes (Haque and Ji 2003). One of the most important steps in production of low-fat and fat-free yogurts is to increase TS content to prevent specific textural defects such as poor gel firmness and surface whey separation (Lucey 2002). It is common to use SMP to fortify yogurt milk, but other dried dairy ingredients such as calcium caseinate, sodium caseinate (NaCn), WPC or whey protein isolate, and other milk protein-based ingredients have gained acceptance as a viable way to increase TS in fat-free or low-fat yogurts (Isleten and Karagul-Yuceer 2006).

Conclusions

The quality requirements of dairy powders are diverse. Technological means can serve in making the powder suitable for such diverse food applications. There are numerous applications of dairy powders in the food industry. The heating conditions throughout the powder manufacturing process results in the denaturation of whey proteins and their interaction with other proteins and fat globule membrane components that influence several properties of the milk powder that is noted during its end usage. The varied functional properties of milk and milk-based powders can be exploited judiciously to suit the needs of several food industries

including the dairy industry. The typical examples are milk powder for recombined dairy products, cheese, ice cream, coffee beverage, chocolate, and confectionery and bakery products. Tailor-made powders can be prepared according to specifications provided by the end user.

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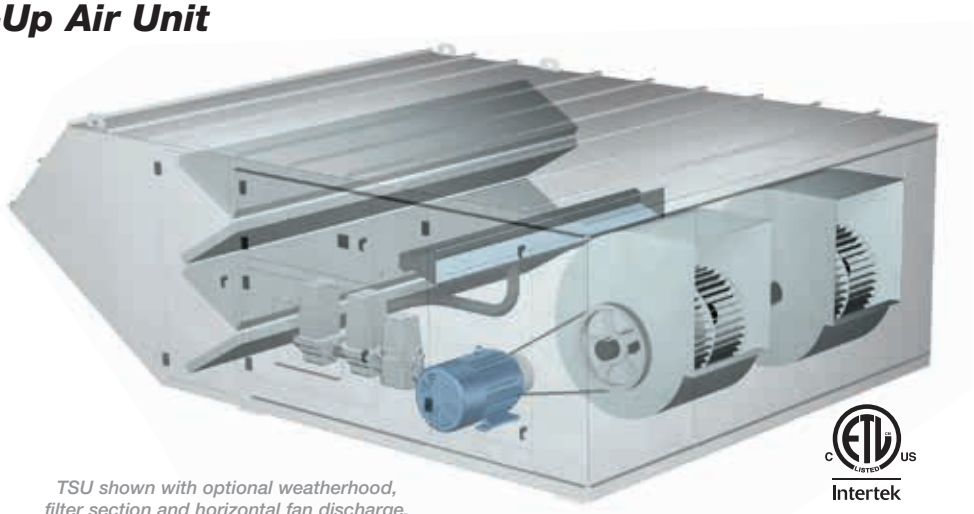
The Greenheck model TSU is a 100% efficient direct gas-fired heating and ventilating unit. Airflow options include 100% make-up air for constant volume or variable volume applications. For space heating, a recirculation option is available.

The TSU is specifically designed for providing heating and make-up air for manufacturing facilities and warehouses. Airflow volumes up to 64,000 cfm and heating capacities up to 6,050,000 Btu/hr are offered.



TSU shown with optional weatherhood, filter section and horizontal fan discharge.

Intertek

Direct Gas-Fired Heat

Durable Construction

Designed for maximum weather resistance, TSU housings are constructed of heavy gauge G90 galvanized steel. Lifting lugs are standard.

Direct Gas-Fired System

- Direct gas burners with stainless steel mixing plates
- Maxitrol burner modulation control
- Flame safeguard with digital fault indicator capability
- 25:1 turn down ratio

Control Center

The control center includes the following standard components:

- Magnetic motor starter with solid state overload protection
- Control transformer with fusing
- Integral door interlocking disconnect switch
- Separately fused motor
- Distribution terminal strip

Premium grade control components are selected for reliable operation. All electrical components are UL Listed, Recognized or Classified and factory prewired for single point power connection.

Vibration Isolators

The entire fan and motor assembly is mounted on vibration isolators to minimize noise transmission into the building.

Reliable Fan Performance

Air performance ratings from Greenheck's accredited test chamber ensure accurate data.

Double width, double inlet forward curved wheels for high efficiency and low sound levels are constructed of heavy gauge steel. Wheels are balanced to ensure vibration free operation.

Access Doors and Panels

Large access doors and panels are provided for easy inspection and maintenance of motors, drives, fan wheels, filters, and heater controls.

Factory Wired and Tested

All units are tested prior to shipment. Units are checked for vibration and proper operation.

Variable Volume

The variable volume option is recommended when a building's exhaust volumes may vary. This option enables the make-up air volume to track with the exhaust volume, providing only the amount of make-up air that is required.

The variable volume TSU saves energy in two ways. First, the fan power is reduced whenever make-up air requirements are less than the maximum. Second, whenever lower air volumes are sufficient, the TSU requires less gas to heat the outdoor air.

Airflow Control Strategies

Greenheck offers three methods of controlling the make-up air volume. All three vary the fan speed for maximum energy savings.

- **Variable Frequency Drive** controlled by **building pressure**.
- **Variable Frequency Drive** controlled **manually** with a remote potentiometer.
- **Variable Frequency Drive** controlled **manually** with a remote switch for 2 speed operation.

Recirculation

The Recirculation option is recommended when the ventilation equipment provides the primary source of heating for the space.

This option recirculates up to 80% of the supply air and efficiently heats it to maintain the desired space temperature. A minimum of 20% outdoor air is mixed with the recirculated air to provide a continuous source of fresh air.

Only outdoor air is used for combustion. This eliminates the possibility of contaminants in the recirculated air from crossing the burner.

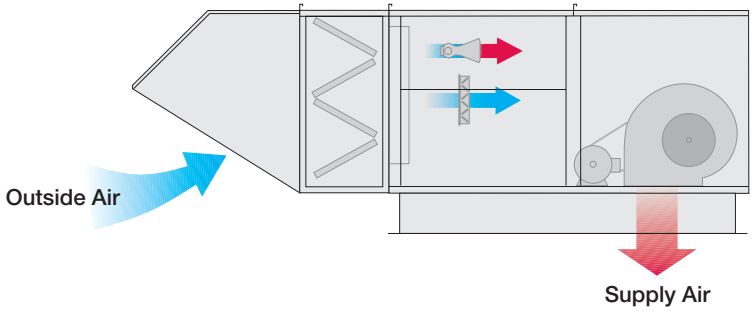
Airflow Control Strategies

Greenheck offers four methods of controlling the recirculated air to outdoor air ratio. The ratio is determined by the outdoor air and recirculated air damper positions. The methods for adjusting damper positions are outlined below:

- **Modulating actuator** controlled by **building pressure**.
- **Modulating actuator** controlled **manually** with a remote potentiometer.
- **Two position actuator** controlled **manually** with a remote switch.
- **Manually operated damper quadrants** set to a **fixed position**.

Temperature Control

A Room Temperature Control package is included with the Variable Volume systems. The space temperature is controlled by a room mounted thermostat. A factory supplied remote control panel is required.



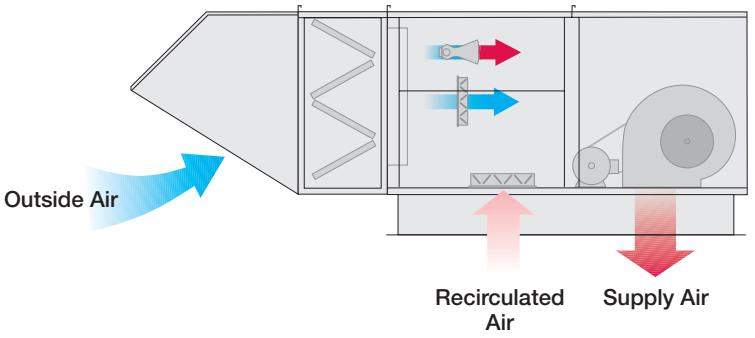
Burner Bypass Damper

Both the Variable Volume and Recirculation option include a patented burner bypass damper, which maintains the pressure drop across the burner as air volumes change. This assures that complete and proper combustion occurs. The bypass damper is self-adjusting, designed for minimal maintenance, and requires no controls.

In all cases, the fan provides a constant volume of supply air.

Temperature Control

A Room Temperature Control package is included with the Recirculation system. The space temperature is controlled by a room mounted thermostat. A factory supplied remote control panel is required.



Evaporative Cooling

The evaporative cooling section includes a galvanized steel housing with a louvered intake, 2-inch aluminum mesh filters and stainless steel evaporative cooling modules. The evaporative cooling media is Munters GLASdek and has a 90% cooling effectiveness. Airflow capacity for evaporative cooling is up to 60,000 cfm.

The entire section mounts directly to the intake end of the fan/heater section, eliminating transition or ductwork by others. Drain and overflow are conveniently tapped through the front of the cooling section. The supply line connection is field located where convenient. Freeze protection and automatic drain & fill options are also available.

Additional Accessories

V-Bank Filters
Washable 2-inch aluminum mesh filters or 2-inch disposable (30% efficient) filters are available.

Air Filter Gauge
The air filter gauge indicates when filters become dirty. An indicator light may be wall/beam mounted or provided with a remote control panel.

Motorized Dampers
Intake or discharge dampers are available to prevent backdrafts when the fan is not in operation. Intake dampers are factory mounted and wired.

Spring Vibration Isolation
Spring vibration isolators are available in lieu of neoprene isolators.

Freezestat
An on/off type discharge duct stat (with a timer) prevents the discharge of cold air into the building when the burner is not providing adequate tempering.

Inlet Air Sensor
An on/off type duct stat automatically de-energizes the gas system and interrupts the flow of gas to the burner when the inlet air temperature is above the desired setting.

Fiberglass Insulation
Fiberglass insulation is used to line the housing to prevent the formation of condensation and to form an acoustical barrier.

115 Volt GFCI Service Receptacle
A 115 volt GFCI outlet is mounted in the heater control compartment for the convenience of field service personnel. A separate 115 volt power source is required.

Roof Curbs
Factory provided roof curbs are available to ensure compatibility between make-up air unit and roof curb. Standard construction is G90 galvanized steel. Curbs ship knocked down.

Weatherhood
Standard construction is G90 galvanized steel. Weatherhood for housing size 40 ships assembled as standard.

Propane Gas
A propane heater may be provided in lieu of natural gas.

Gas Pressure Regulator
Required if building gas line pressure exceeds 5 psi.

Special Coatings
Greenheck's Permatector coating is available for a durable, long lasting finish. Decorative paints are also available in a variety of colors to match existing building fixtures. Consult your Greenheck representative for paint selections.

Remote Control Panels

A wide variety of remote control panels are available. Specify the desired combination of switches, thermostats, temperature selectors and indicator lights (see examples below). A terminal strip within the remote control panel makes connection to the TSU control center simple.

Basic remote control panel with thermostat for room temperature control option.

Remote panel with circuit analyzer and thermostat for room override option.

Temperature Controls

Discharge Temperature Control

Control of discharge air temperature is accomplished with a factory installed sensor located at the fan discharge. A Maxitrol 14 system controls the gas valve to provide the desired discharge temperature.

Room Override

This option, available with the Maxitrol 14 system, enables a room thermostat to increase the TSU supply temperature above its discharge temperature set point. Discharge sensor is factory installed. Room sensor may be wall/beam mounted or included on a remote control panel.

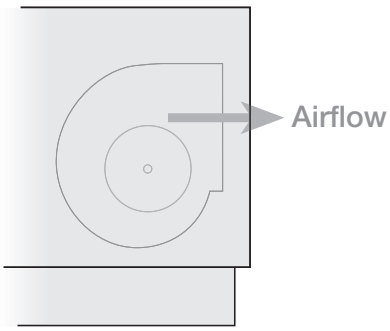
Room Temperature Control

Specify this option when the TSU has the primary responsibility for controlling the room temperature. A room mounted thermostat (shown below) senses the room temperature and provides feedback to the Maxitrol 44 control system. The gas valves are then modulated to satisfy the selected room temperature.

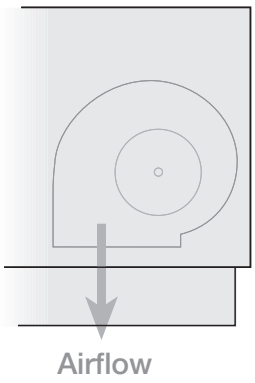
The thermostat is manually adjustable to the desired room temperature. The room thermostat may be wall/beam mounted or included on a remote control panel.

Discharge Arrangements

For installation flexibility, fan discharges are available in either Horizontal (HZ), Downblast (DB), or Upblast (UB) configuration.



Arrangement HZ



Arrangement DB

Housing Size 50

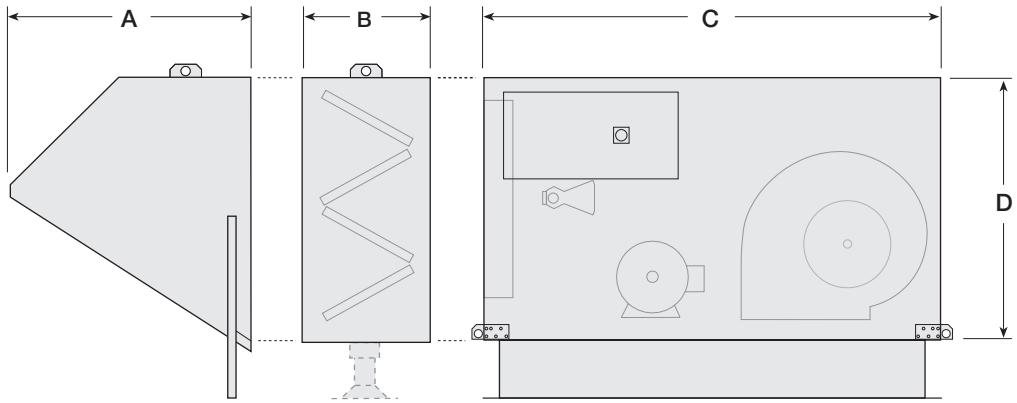
Model	CFM		Total Static Pressure in inches of wg						Maximum MBH
			0.75	1.00	1.25	1.50	1.75	2.00	
TSU-225	32,000	RPM	446	482	515	548			3,830
		BHP	12.1	13.8	15.4	16.9			
	38,000	RPM	491	523	553	582	610	638	4,550
		BHP	18.0	19.8	21.9	23.9	25.7	27.5	
	45,000	RPM	547	575	603	629	655	679	5,390
		BHP	27.4	29.5	31.6	33.9	36.3	38.7	
TSU-230	44,000	RPM	401	429	456	483	509	535	5,270
		BHP	16.8	18.9	21.2	23.7	26.3	29.0	
	52,000	RPM	446	470	494	516	539	562	6,050
		BHP	24.9	27.3	29.8	32.2	35.0	38.0	
	60,000	RPM	494	514	535	556	576	596	6,050
		BHP	36.2	38.3	40.9	43.9	46.7	49.5	

Pressure Drop Data

Housing Size	CFM	2-inch 30% Filter	Inlet Damper	Gas Burner
50	30,000	0.14	0.04	0.625
	60,000	0.28	0.15	

Note: The air performance data shown does not include internal static pressure losses due to items such as filters and dampers. For exact air performance data based on specific unit configuration, use the Greenheck CAPS selection program.

Direct Gas-Fired

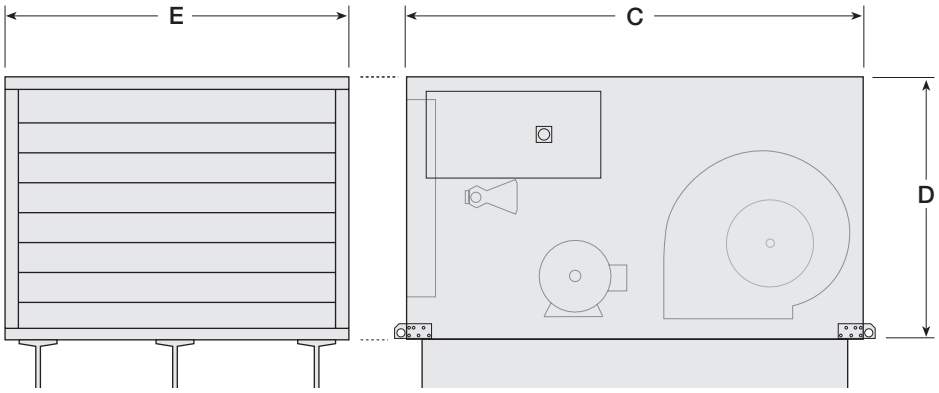


Dimensions

Housing Size	Width	A	B	C	D
50	156	71	31	100	64

All dimensions are shown in inches.

Evaporative Cooling (with or without heating)



Dimensions

Housing Size	Width	C	D	E
50	156	100	64	100

All dimensions are shown in inches.

Typical Specifications

GREENHECK
Building Value in Air.

General: Make-up air unit shall be as manufactured by Greenheck Fan Corporation or approved equal provided all specifications are met. Greenheck Model TSU equipment is used as the basis of design. Performance to be as scheduled on plans. Make-up air unit shall be ETL listed to ANSI Z83.4 - 1999, CSA 3.7 - M99 (for 100% outdoor air) or ANSI Z83.18 - 2000 (for recirculation).

Gas Train and Controls: Direct gas-fired system shall have a draw through design and field adjustable burner baffles. Gas trains shall include a pilot ignition system and shall have digital coded fault indicator capability. Fault indicator shall provide service history by storing codes for the last five faults. Dual safety shutoff valves shall be industrial duty and use 120 VAC control signals. Temperature control shall incorporate a Maxitrol electronic modulation control system.

Unit Casing and Frames: Unit shall be of internal frame type construction of galvanized steel. All frames and panels shall be G90 galvanized steel. Where top panels are joined there shall be a standing seam to insure positive weather protection. All metal-to-metal surfaces exposed to the weather shall be sealed, requiring no caulking at jobsite. All components shall be easily accessible through removable doors.

Insulation: Unit casing to be lined with 1-inch fiberglass insulation. Insulation shall be in accordance with NFPA 90A and tested to meet UL 181 erosion requirements. Double wall shall be provided if specified.

Fan Section: Centrifugal fans shall be double width, double inlet. The fan and the motor shall be mounted on a common base and shall be internally isolated. All blower wheels shall be balanced. Ground and polished steel fan shafts shall be mounted in ball bearing pillow blocks. Bearings shall be selected for a minimum L_{10} life in excess of 100,000 hours at maximum cataloged speeds.

Motors and Drives: Motors shall be energy efficient, complying with EPACT standards, for single speed ODP and TE enclosures. Motors shall be permanently lubricated, heavy duty type, matched to the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be cast and have machined surfaces, 10 horse power and less shall be supplied with an adjustable drive pulley.

Electrical: All internal electrical components shall be prewired for single point power connection. All electrical components shall be UL Listed, Recognized or Classified where applicable and wired in compliance with the National Electrical Code. Control center shall include motor starter, control circuit fusing, control transformer for 24 VAC circuit, integral disconnect switch and terminal strip. Contactors, Class 20 adjustable overload protection and single phase protection shall be standard.

Filter Section: Filters shall be mounted in a V-bank arrangement such that velocities across the filters do not exceed 550 feet per minute. Filters shall be easily accessible through a removable access panel.

Weatherhood: Weatherhood shall be constructed of G90 galvanized steel with birdscreen mounted at the intake.

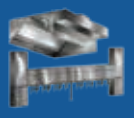
Recirculation (optional): Recirculation airflow shall be controlled by adjustment of return damper position. Input signal for return damper shall be from building pressure sensors, potentiometer or manual switch. Recirculated air shall not be permitted to pass across the burner. A self-adjusting burner bypass damper shall maintain a constant air volume across the burner to ensure proper gas combustion. Bypass damper shall operate automatically without an electronic input control signal.

Variable Volume (optional): Volume shall be varied by either a 2-speed motor or variable frequency drive. Input signal for fan speed shall be from building pressure sensors, potentiometer or manual switch. A self-adjusting burner bypass damper shall maintain a constant air volume across the burner to ensure proper gas combustion. Bypass damper shall operate automatically without an electronic input control signal.

Evaporative Cooling Section (optional): Evaporative cooling section shall include a galvanized steel housing with louvered intake, 2 inch aluminum mesh filters and a stainless steel evaporative cooling module all provided by the make-up air unit manufacturer. The louver shall be stationary type with drainable blades, designed to withstand wind loads of 25 PSF. Evaporative cooling media shall be Munters GLASdek with a depth of 12 inches for a cooling effectiveness of 90%. Drain and overflow connections shall be provided.









Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.

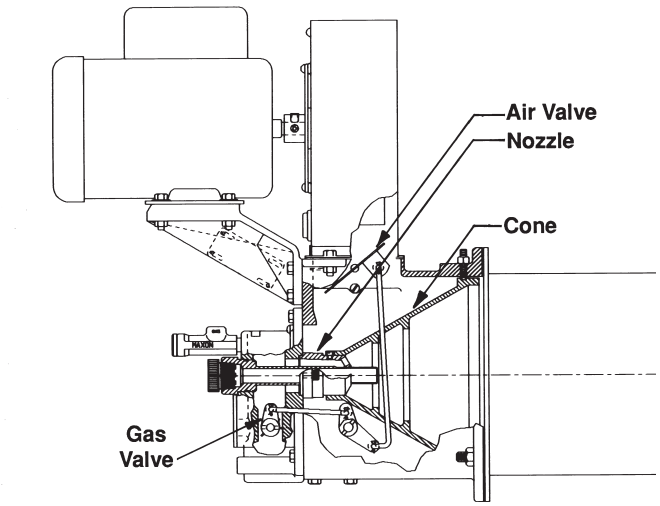
Greenheck P.O. Box 410 • Schofield, WI 54476-0410 • Phone (715) 359-6171 • greenheck.com

Design and Application Details

OVENPAK® Burners are nozzle-mixing gas burners for many industrial direct-fired applications where clean combustion and high turndown are required. They are simple and versatile for use on a variety of heating applications.

The Model “400” OVENPAK® Burner (shown at right) includes a combustion air blower with non-sparking paddle wheel-type impeller, pilot, spark ignitor, stainless steel discharge sleeve, mixing cone, self-contained internal air and gas proportioning valves, and provision for your flame safeguard sensor.

Right: Model 415 OVENPAK® Gas Burner with optional:
- combustion air filter
- connecting base and linkage assembly
- electrical control motor (by others)



Cross sectional view of a Model “400” OVENPAK® Gas Burner

Principle of operation (illustrated at left)

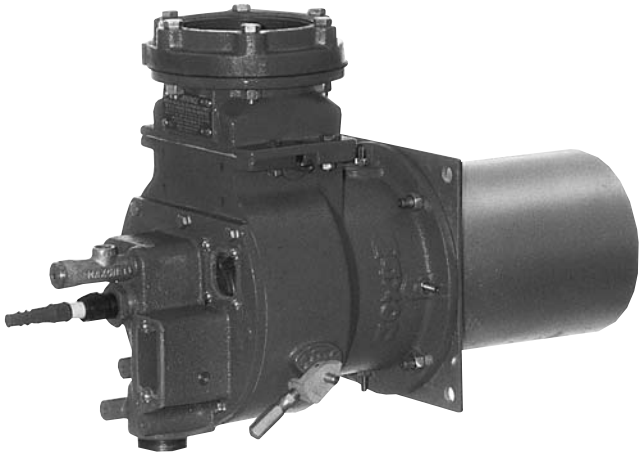
The OVENPAK® Burner is designed for industrial air heating applications. It is available in two basic versions: 1) packaged with integral combustion air blower, or 2) for use with an external blower. Both versions include a gas and air valve, internally linked together to control the gas-air ratio over the full operating range. The gas flows through the nozzle, then along the inside of the burner cone where combustion air is progressively and tangentially mixed with the gas. This produces a very wide turndown range and a highly stable flame under a variety of operating conditions.

Design and Application Details

Model “EB” (external blower) OVENPAK® Burners (shown at right), like all OVENPAK® Burner assemblies, are designed to deliver heat through a patented mixing cone and stainless steel sleeve.

Flanged burner body design on all OVENPAK® Burner assemblies simplifies mounting and installation on your application. Burner can be installed in any position that does not conflict with your control motor or flame detector requirements.

Minimal torque requirements permit use of most electric or air operators in conjunction with the optional (Maxon supplied) connecting base and linkage assemblies.



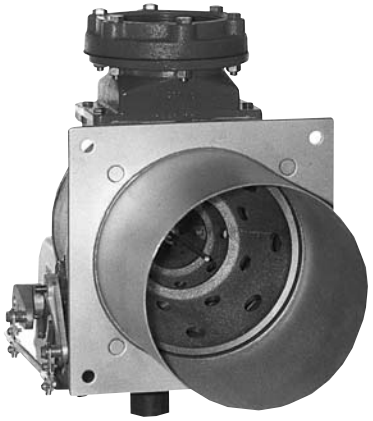
Model “EB-MA” OVENPAK® Burner with discharge sleeve and optional manual gas control

“EB-MRV” versions (photo at right)

“EB-MRV” versions of OVENPAK® Burners permit air/fuel ratio control via a Maxon MICRO-RATIO® control valve throughout the firing range. They differ from standard “EB” burners in that internal gas and air butterflies and the related shafts and linkages are omitted.

In normal operation, air and fuel will be proportioned by an external Maxon MICRO-RATIO® Control valve.

Maximum capacities match those cataloged for “EB” burners of equivalent size and differential air pressure. **Minimum capacity** and air differential pressure will vary with your application.



view into cone of EB version

Model EB-3 OVENPAK® Burner arranged for external blower source with connecting base and linkage assembly to adapt customer's automatic control motor

“400-MA” and “EB-MA” versions

Model “400-MA” versions include a combustion air blower in your choice of the voltages shown on page 2107, but provide constant combustion air volumes. They differ from “standard” versions by use of a slotted adjustable air butterfly locking device as shown in photo at left. Internally, the linkage normally cross-connecting air and gas butterflies is omitted.

In normal operation, the air butterfly is set to the desired air differential pressure, and the fuel only is throttled by a separate control valve. **Maximum capacities** match those cataloged for “standard” burners of equivalent size. **Minimum capacities** with full air flow will be higher than those of “standard” +burner.

Model “EB-MRV” OVENPAK® Burner with optional 12" discharge sleeve

Capacities and Specifications – 60 Hertz

Standard Model "400" OVENPAK® Burner includes a combustion air blower with motor.

Maximum capacity of Model "400" OVENPAK® Burner is affected by the static pressure within the combustion chamber. Data shown assumes firing in the open, or into an airstream with enough oxygen to complete the combustion process. If burner is fired into an oxygen-starved chamber or airstream, capacities may be reduced as much as 25-30%. Do not attempt to operate beyond the duct static pressure range shown. For higher back pressure applications, select from Model "EB" or "EB-MRV" OVENPAK® Burner options.

All gas pressures are differential pressures and are measured at the gas pressure test connection on the backplate of each OVENPAK® Burner. Differential pressures shown are approximate.

60 Hz Motor Voltages Available

Horsepower	Type	115/208-230/1/60	208-230/460/3/60	575/3/60
1/3 & 1/2	Totally Enclosed	X	X	X
3/4 & 1	Totally Enclosed	X	X	X
1-1/2, 2 & 3	Totally Enclosed	Not Available	X	X

Capacities and Operating Data – Model 405 through 422M

Burner Model			405	407M	408	408M	412M	413M	415	422M
Motor Specification	Horsepower:		1/3	1/2	1/3	3/4	1/2	3/4	1/3	3/4
	Frame Number:		48	48	48	56	48	56	48	56
Maximum Capacities (1000's Btu/hr) *with Natural Gas Pressures ("wc)*	DUCT STATICS	**-5.0 to -0.5" wc**	550 *2.8"*	---	880 *3.4"*	--	---	---	1650 *1.7"*	---
		±0" wc	500 *2.3"*	750 *2.5"*	800 *2.8"*	790 *2.7"*	1200 *2.8"*	1300 *3.3"*	1500 *1.4"*	2150 *2.9"*
		+1.0" wc	475 *2.1"*	700 *2.2"*	760 *2.6"*	750 *2.5"*	1100 *2.4"*	1190 *2.8"*	1425 *1.3"*	2000 *2.5"*
		+2.0" wc	450 *1.9"*	600 *1.6"*	720 *2.3"*	640 *1.8"*	925 *1.7"*	1100 *2.4"*	1350 *1.1"*	1725 *1.9"*
		+3.0" wc	---	510 *1.1"*	---	550 *1.3"*	800 *1.3"*	1000 *2.0"*	---	1610 *1.6"*
		+4.0" wc	---	450 *0.9"*	---	495 *1.1"*	750 *1.1"*	900 *1.6"*	---	1500 *1.4"*
		+5.0" wc	---	---	---	475 *1.0"*	---	800 *1.3"*	---	1420 *1.3"*
Minimum Capacities (1000's Btu/hr)	Main plus pilot		15			20			37	
	Pilot only		10			15			20	
Required natural gas differential pressure to burner inlet ("wc)			3.0		3.5	4.1	4.5	5.2	4.2	7.2
Approximate flame length in still air			1/2 to 1 ft.		1 to 1-1/2 ft.	1/2 to 1 ft.	1 to 2-1/2 ft.		2-1/2 to 3-1/2 ft.	1-1/2 to 2 ft.

Capacities and Specifications – 60 Hertz

Capacities and Operating Data – Model 425 through 487M

Burner Model			425	432M	435	442M	445	456M	470M	487M
Motor Specification	Horsepower:		3/4	3/4	3/4	1 or 1-1/2 [1]	1 or 1-1/2 [1]	1-1/2	2	3
	Frame Number:		56	56	56	56	56	143T	145T	182T
Maximum Capacities (1000's Btu/hr) *with Natural Gas Pressures ("wc)*	DUCT STATICS	**-5.0 to -0.5" wc**	2750 *2.7"*	---	3850 *2.2"*	---	5175 *3.4"*	6400 *3.6"*	8050 *3.7"*	10060 *4.6"*
		±0" wc	2500 *2.2"*	3200 *3.6"*	3500 *1.8"*	4150 *2.5"*	4500 *2.6"*	5600 *2.8"*	7000 *2.8"*	8700 *3.4"*
		+1.0" wc	2375 *2.0"*	3000 *3.2"*	3325 *1.6"*	4000 *2.4"*	4280 *2.3"*	5340 *2.5"*	6570 *2.5"*	8400 *3.2"*
		+2.0" wc	2250 *1.8"*	2800 *2.8"*	3150 *1.4"*	3800 *2.1"*	4125 *2.2"*	5200 *2.4"*	6300 *2.3"*	8200 *3.0"*
		+3.0" wc	---	2650 *2.5"*	---	3650 *1.9"*	---	5000 *2.2"*	5500 *1.7"*	7500 *2.5"*
		+4.0" wc	---	2500 *2.2"*	---	3500 *1.8"*	---	4600 *1.9"*	5000 *1.4"*	6200 *1.7"*
		+5.0" wc	---	2250 *1.8"*	---	3300 *1.6"*	---	4100 *1.5"*	4500 *1.2"*	5500 *1.4"*
		+6.0" wc	---	---	---	---	---	---	3500 *0.7"*	5000 *1.1"*
Minimum Capacities (1000's Btu/hr)	Main plus pilot		60		87		110	125	150	175
	Pilot only		35		45		90	105	115	117
Required natural gas differential pressure to burner inlet ("wc)			3.6	4.9	3.8	4.9	4.5	5.1	5.2	7.6
Approximate flame length in still air			2-1/2 to 3-1/2 ft.		3-1/2 to 5 ft.	4 to 5 ft.	4 to 6 ft.	5 to 7 ft.	6 to 8 ft.	8 to 10 ft.

[1] Horsepower will be either 1 HP or 1-1/2 HP, depending upon motor voltage

Capacities and Specifications – 50 Hertz

Standard Model "400" OVENPAK® Burner includes a combustion air blower with motor.

Maximum capacity of Model "400" OVENPAK® Burner is affected by the static pressure within the combustion chamber. Data shown assumes firing in the open, or into an airstream with enough oxygen to complete the combustion process. If burner is fired into an oxygen-starved chamber or airstream, capacities may be reduced as much as 25-30%. Do not attempt to operate beyond the duct static pressure range shown. For higher back pressure applications, select from Model "EB" or "EB-MRV" OVENPAK® Burner options.

All gas pressures are differential pressures and are measured at the gas pressure test connection on the backplate of each OVENPAK® Burner. Differential pressures shown are approximate.

50 Hz Motor Voltages Available (possible net extra cost)

Horsepower	Type	190-200/1/50	380-415/3/50	500/3/50
1/3 & 1/2	Totally Enclosed	X	X	X
3/4 & 1	Totally Enclosed	X	X	X
1-1/2, 2 & 3	Totally Enclosed	X	X	X

Capacities and Operating Data - Model 405 through 422M

Burner Model			405	407M	408	408M	412M	413M	415	422M
Motor Specification	Horsepower:		1/3	1/2	1/3	3/4	1/2	3/4	1/3	3/4
	Frame Number:		48	48	48	56	48	56	48	56
Maximum Capacities (1000's Btu/hr) *with Natural Gas Pressures ("wc)*	DUCT STATICS	**-5.0" wc**	460 *2.0"*	---	735 *2.4"*	---	---	---	1375 *1.2"*	---
		-3.0" wc	460 *2.0"*	---	735 *2.4"*	---	---	---	1375 *1.2"*	---
		±0" wc	415 *1.6"*	625 *1.7"*	670 *2.0"*	660 *1.9"*	1000 *2.0"*	1080 *2.5"*	1250 *1.0"*	1800 *2.0"*
		+1.0" wc	390 *1.4"*	585 *1.5"*	630 *1.7"*	625 *1.7"*	920 *1.7"*	990 *2.4"*	1190 *0.9"*	1670 *1.8"*
		+2.0" wc	---	---	---	---	---	920 *1.7"*	---	1440 *1.3"*
Minimum Capacities (1000's Btu/hr)	Main plus pilot		15		20	15	20		37	
	Pilot only		10				15		20	
Required natural gas differential pressure to burner inlet ("wc)			2.2	2.3	3.0	2.6	3.5	4.1	2.9	5.6
Approximate flame length in still air			1/2 to 1 ft.		1 to 1-1/2 ft.	1/2 to 1 ft.	1 to 2 ft.		1-1/2 to 2 ft.	2 to 2-1/2 ft.

Capacities and Specifications – 50 Hertz

Capacities and Operating Data - Model 425 through 487M

Burner Model			425	432M	435	442M	445	456M	470M	487M
Motor Specification	Horsepower:		3/4	3/4	3/4	1 or 1-1/2 [1]	1 or 1-1/2 [1]	1-1/2	2	3
	Frame Number:		56	56	56	56	56	143T	145T	182T
Maximum Capacities (1000's Btu/hr) *with Natural Gas Pressures ("wc)*	DUCT STATICS	**-5.0" wc**	2300 *1.9"*	---	2920 *1.3"*	---	4325 *2.4"*	5350 *2.5"*	6700 *2.6"*	8400 *3.2"*
		-3.0" wc	2300 *1.9"*	---	2920 *1.3"*	---	4325 *2.4"*	5350 *2.5"*	6700 *2.6"*	8400 *3.2"*
		±0" wc	2090 *1.6"*	2670 *2.5"*	2780 *1.1"*	3460 *1.8"*	3760 *1.8"*	4670 *1.9"*	5850 *2.0"*	7250 *2.3"*
		+1.0" wc	1970 *1.4"*	2340 *2.0"*	---	3340 *1.6"*	---	4450 *1.8"*	5500 *1.7"*	7050 *2.1"*
		+2.0" wc	---	---	---	3220 *1.5"*	---	4340 *1.7"*	5250 *1.6"*	6850 *2.1"*
		+3.0" wc	---	---	---	---	---	---	---	6250 *1.7"*
Minimum Capacities (1000's Btu/hr)	Main plus pilot		60		87		110	125	150	175
	Pilot only		35		45		90	105	115	117
Required natural gas differential pressure to burner inlet ("wc)			2.5	3.8	2.2	3.8	3.1	3.6	5.0	5.0
Approximate flame length in still air			2 to 3 ft.		3 to 4-1/2 ft.	3-1/2 to 4 ft.	4 to 5 ft.	5 to 6 ft.		7 to 8 ft.

[1] Horsepower will be either 1 HP or 1-1/2 HP, depending upon motor voltage

Capacities and Specifications
External Blower (EB) versions

EB-1 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	150	170	190	210	240	255	270	280
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**460**	**580**	**715**	**780**	**870**	**910**	**960**	**1000**
		Minimum & pilot	60	60	60	60	60	60	60	60
		Pilot only	45	45	45	45	45	45	45	45
	Natural Gas differential pressures ("wc)	At burner inlet	2.1	3.4	5.1	6.1	7.6	8.3	9.2	10.0
		At burner gas test connection	2.0	3.1	4.7	5.6	7.0	7.6	8.5	9.2
	Flame Lengths	In still air	4" to 15" beyond end of discharge sleeve							

EB-2 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	220	250	280	310	355	375	395	415
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**750**	**980**	**1200**	**1330**	**1450**	**1500**	**1550**	**1600**
		Minimum & pilot	60	60	60	60	70	70	75	80
		Pilot only	25	25	25	25	30	30	35	35
	Natural Gas differential pressures ("wc)	At burner inlet	3	5.2	7.8	9.5	11.3	12.1	12.9	13.8
		At burner gas test connection	2.5	4.2	6.3	7.7	9.2	9.8	10.5	11.2
	Flame Lengths	In still air	12" to 30" beyond end of discharge sleeve							

EB-3 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	350	405	455	495	575	615	650	675
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**1620**	**1900**	**2120**	**2320**	**2670**	**2840**	**3000**	**3150**
		Minimum & pilot	90	95	105	115	130	140	150	155
		Pilot only	45	45	50	55	65	70	75	75
	Natural Gas differential pressures ("wc)	At burner inlet	4.1	5.6	7.0	8.3	11.0	12.5	13.9	15.4
		At burner gas test connection	1.6	2.2	2.8	3.3	4.4	5.0	5.6	6.2
	Flame Lengths	In still air	2 to 3 feet beyond end of discharge sleeve							

EB-4 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	550	635	710	775	895	950	1000	1050
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**2320**	**2800**	**3230**	**3500**	**3950**	**4150**	**4330**	**4600**
		Minimum & pilot	100	115	130	140	160	170	180	190
		Pilot only	40	40	40	45	50	55	55	60
	Natural Gas differential pressures ("wc)	At burner inlet	2.5	3.7	4.9	5.8	7.4	8.1	8.8	10.0
		At burner gas test connection	1.9	2.8	3.7	4.3	5.5	6.1	6.6	7.5
	Flame Lengths	In still air	2-1/2 to 3-1/2 feet beyond end of discharge sleeve							

Capacities and Specifications
External Blower (EB) versions

EB-5 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	665	770	860	940	1080	1150	1210	1270
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**2940**	**3500**	**3980**	**4420**	**5130**	**5450**	**5740**	**6000**
		Minimum & pilot	155	180	200	220	255	270	285	300
		Pilot only	25	30	35	35	40	45	50	50
	Natural Gas differential pressures ("wc)	At burner inlet	2.2	3.1	4.0	4.9	6.6	7.5	8.3	9.1
		At burner gas test connection	1.3	1.8	2.3	2.9	3.9	4.4	4.8	5.3
	Flame Lengths	In still air	3 to 5 feet beyond end of discharge sleeve							

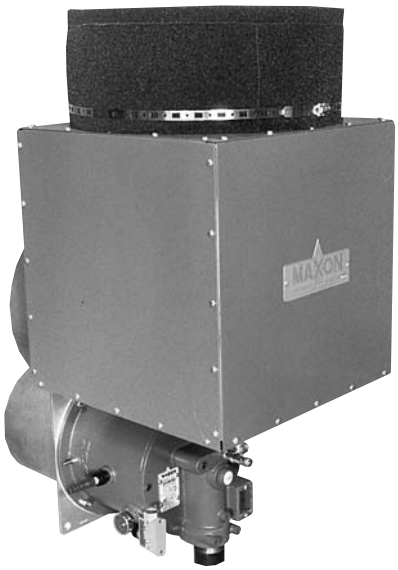
EB-6 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**5**	**8**	**11**	**16**	**18**	**22**	**24**
		Volume (SCFM)	975	1260	1590	1870	2250	2390	2640	2760
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**4710**	**6700**	**9500**	**11200**	**13500**	**14300**	**15800**	**16500**
		Minimum & pilot	335	390	490	575	695	735	815	850
		Pilot only	100	100	100	115	140	145	165	170
	Natural Gas differential pressures ("wc)	At burner inlet	2.8	5.6	11.3	15.7	22.8	25.6	31.3	34.1
		At burner gas test connection	2.0	4.0	8.1	11.2	16.3	18.3	22.3	24.3
	Flame Lengths	In still air	3 to 8 feet beyond end of discharge sleeve				8 to 12 feet beyond end of discharge sleeve			

EB-7 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**5**	**8**	**11**	**16**	**18**	**22**	**24**
		Volume (SCFM)	975	1260	1590	1870	2250	2390	2640	2760
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**4710**	**6700**	**9500**	**11200**	**13500**	**14300**	**15800**	**16500**
		Minimum & pilot	335	390	490	575	695	735	815	850
		Pilot only	100	100	100	115	140	145	165	170
	Natural Gas differential pressures ("wc)	At burner inlet	1.8	3.6	7.3	10.1	14.8	16.6	20.2	22.1
		At burner gas test connection	1.0	2.0	4.1	5.6	8.2	9.2	11.2	12.2
	Flame Lengths	In still air	3 to 8 feet beyond end of discharge sleeve				8 to 12 feet beyond end of discharge sleeve			

Accessory Options

Air filter assemblies and silencers

Air filter assemblies help to trap airborne particulate matter. They are offered with washable replaceable filter elements or with permanent metallic elements (as shown in photograph above). Filters mount onto OVENPAK® Burner's blower housing (or silencer housing of burners so equipped) and surround the blower motor and combustion air inlet.

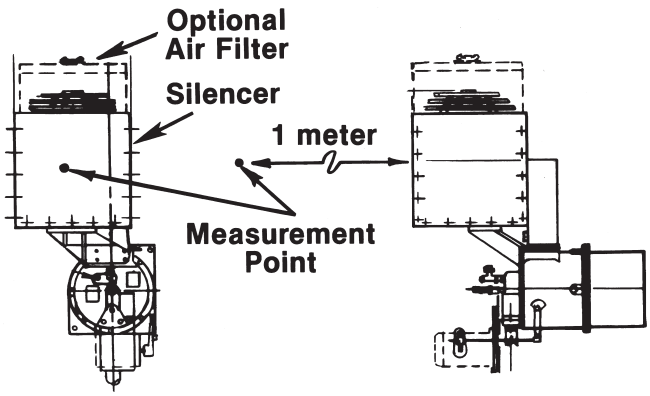


Filter silencers help reduce noise levels. They mount onto OVENPAK® Burner's blower housing and enclose the blower motor and combustion air inlet (as shown in above photograph). They can be furnished in conjunction with a permanent or replaceable filter element assembly described above.

dB(A) sound levels from actual tests conducted at full-rated 60 Hz capacity are shown in table at right. Measurement point is shown in sketch below. (Meter was set to A-scale, slow response.)

Operation on 50 Hz power results in lower rotational speed of blower, and so reduces air output, capacity, and resulting noise levels. 50 Hz noise levels should not exceed the above data measured on 60 Hz operation.

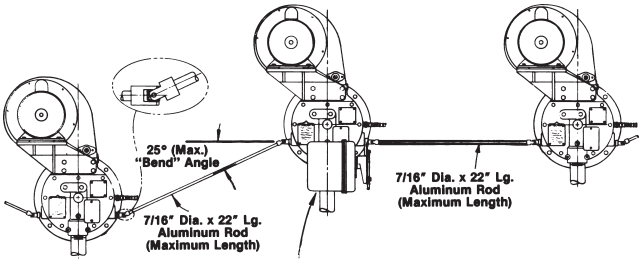
Burner Model	Sound Level dB(A)	
	Standard Burner	with Silencer
405	84	75
407M	83	77
408M	84	75
408	87	78
412M	81	73
413M	82	72
415	89	77
422M	88	79
425	89	78
432M	88	80
435	87	78
442M	89	80
445	89	81
456M	90	83
470M	92	83
487M	94	85



Accessory Options

Universal Joint Arrangements (for all versions except EB-MRV) allow control of as many as 5 burners by a single control motor. Torque requirement is 10 in-lbs for EACH burner driven. Primary burner should drive no more than 2 Secondary burners to either side of itself.

Miniature universal joints simplify burner alignment. Aluminum connecting rod can be cut to fit actual burner spacing. (Allowable distance between adjacent burner centerlines is 21" – 33" for 422M and smaller, 23.5" – 36" for larger burners.)

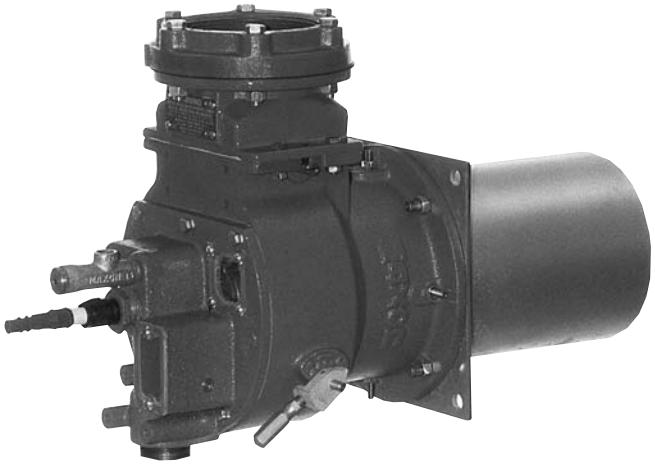


Model "400" OVENPAK® Burner with Control Motor

To order, specify:

1. **Primary and secondary burners**
2. **Any other accessories desired**
3. **Required quantity of Universal Joint Assemblies**

Manual Handle Kit permits setting and locking air and fuel valves at a constant firing rate. See photo below.

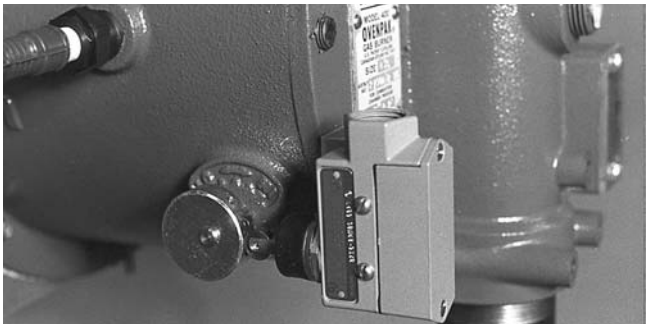


Auxiliary Switches

Maxon offers 4 types, all cam-actuated by the burner main operating shaft. (If Universal Joint Arrangements are used, switch must mount on furthest left burner.) Field installation MAY require burner modification per instructions provided in Product Information Sheet 2000-7/8.

Low Fire Start Switch Assembly (SPDT) opens the circuit when burner leaves minimum position. Also available in Weatherproof and Hazardous Location/ Weatherproof versions.

High and Low Fire Position Switch Assembly includes 2 SPDT switches. One switch may be field-set to activate at high fire position, while other is set to activate at low fire position. Switch assemblies are also available in a weatherproof version.

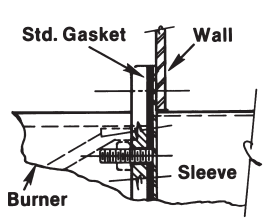


Low Fire Start Switch shown

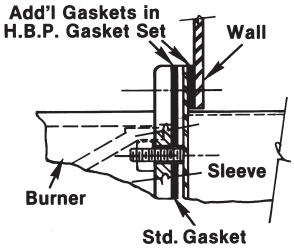
Discharge Sleeve Mounting Gaskets

Standard discharge sleeve gasket provides adequate sealing in most applications.

High Back Pressure Gasket Kit includes 2 additional gaskets to provide sealing against back pressures as shown in sketch below.



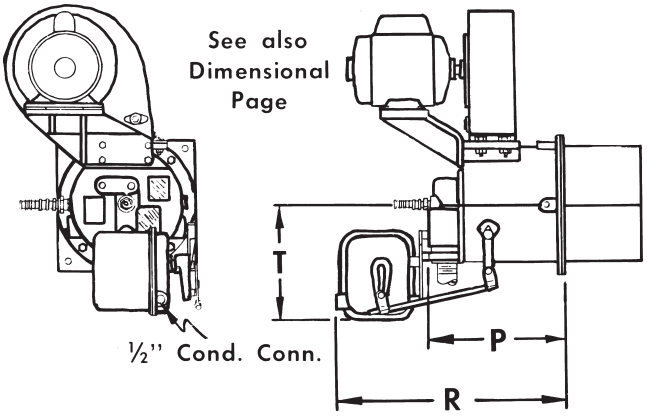
Standard Arrangement



With High Back Pressure Kit

Accessory Options

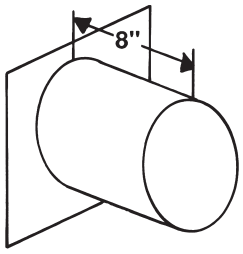
Hi/Lo Control Motor Sets for high or low firing. Optional set includes 2-position unidirectional 11-second 120v 50/60 Hz motor and connecting base with mounting linkage. See table below for dimensions which differ from standard burner.



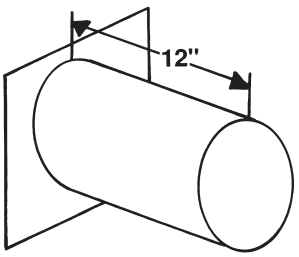
Burner Model		Dimensions in Inches		
		P	R	T
EB-1, 2	405 - 413M	10.25	17.63	7.75
EB-3	415 - 422M	10.19	17.56	7.75
EB-4, 5	425 to 442M	11.69	19.06	8.75
EB-6, 7	445 - 487M	16.69	24.06	8.75

Discharge Sleeves are available in 3 versions:

- **Standard sleeve** is 8" long, made of #310 SS, and is suitable for downstream temperatures up to 1000°F (538°C).
- **For higher velocities**, specify 12" long sleeve made of #310 SS for downstream temperatures up to 1000°F (538°C).
- **For higher downstream temperatures** between 1000°F (538°C) and 1500°F (816°C), specify 8" long, #RA 330 SS sleeve.



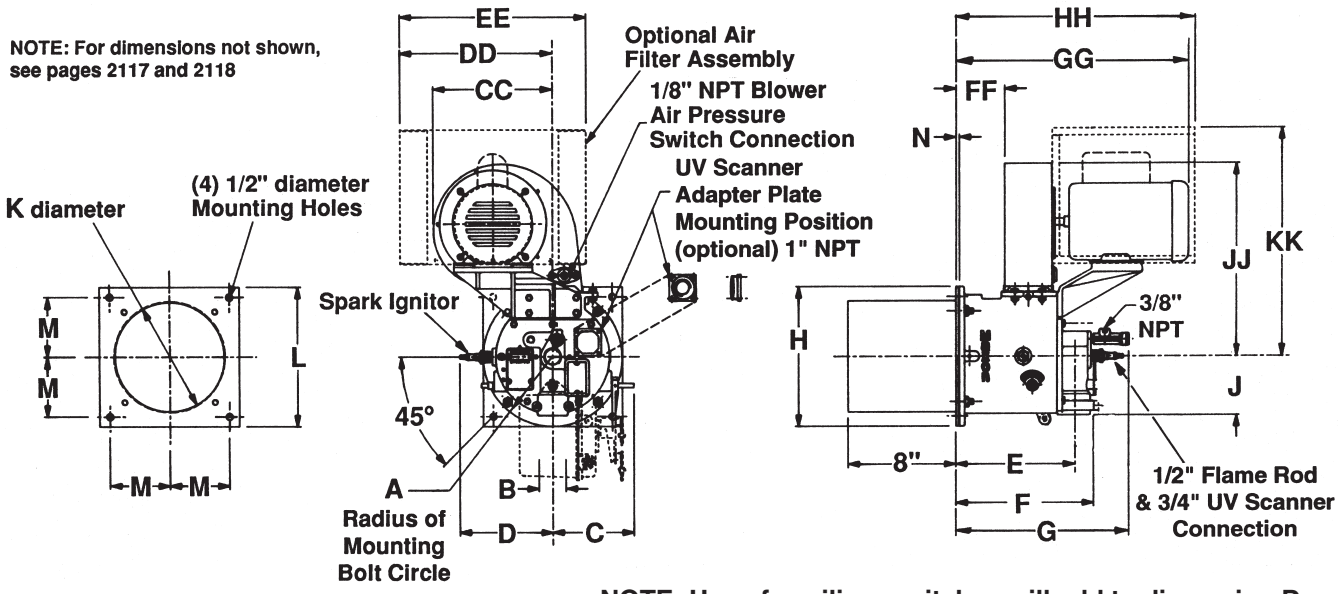
310 SS (std.) or RA 330 (Hi Temp.)



310 SS

Dimensions (in Inches)

Model "400" and "400-MA" OVENPAK® Burners



NOTE: Use of auxiliary switches will add to dimension D.

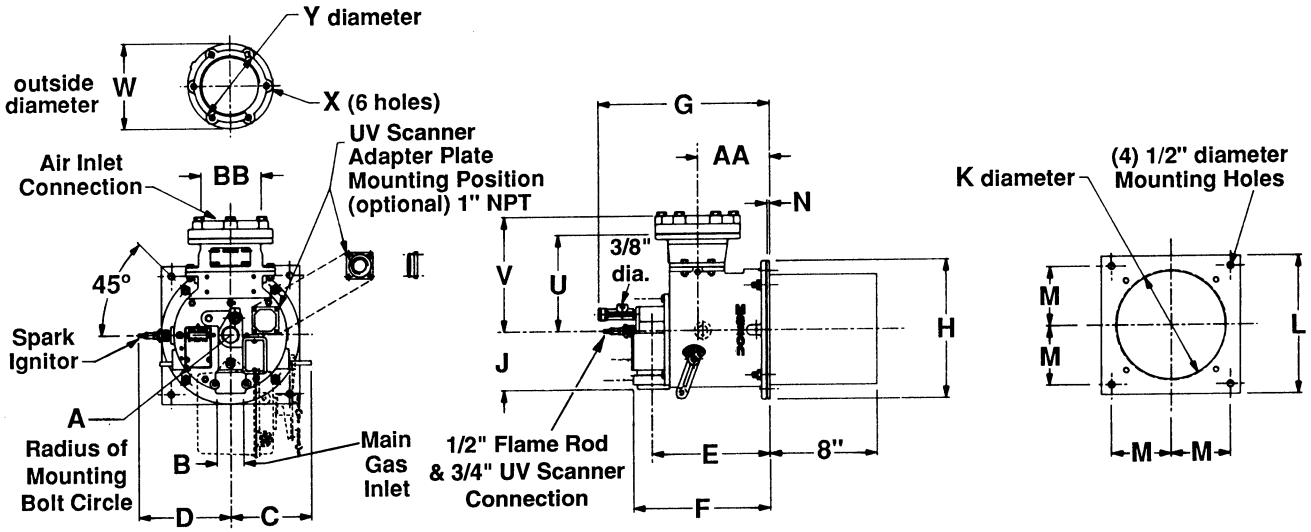
Model	A	B*	C	D	E	F	G	H	J	K	L	M	N	CC	DD	EE	FF	GG	HH	JJ	KK
405	3.75	1	5.44	6.62	8.87	10.30	13.19	8.44	4.37	6.31	8.44	3.62	0.25	8.81	11.37	14	3.66	17.31	17.81	14.37	17.06
407M														15.25	15.87	18	4.69		19.69	21.69	18.62
408														8.81	11.37	14	3.66	19.12	17.81	14.37	17.06
408M														15.25	15.87	18	4.69	17.31	19.69	21.69	18.62
412M																					
413M																		19.12			
415	4.75	1-1/4		7.69	8.81	10.25		10.37		8.25	10.37	4.44		8.81	11.37	14	3.59	17.31	17.75	14.37	17.06
422M														15.25	15.87	18			19.56	21.69	18.62
425	5.75	1-1/2	6.06	8.42	10.06	11.88	14.69	12.50	5.44	10.25	12.5	5.62	0.37	12.12	14.44		3.94	18.25	20.5	20.25	19.75
432M		2												15.25	15.87		2.81		21.25	23.56	29.62
435														12.12	14.44		3.94		20.5	20.25	19.75
442M														15.25	15.87		2.81		21.25	23.56	29.62
445	6.81			8.07	14.38	16.88	19.31	14.62	6.5	12.25	14.75	6.69					5.37	22.5	25	23.5	
456M																		24			
470M		3												17.75	17.79	19			26.81	25.94	
487M																					

*Main fuel gas inlet NPT

Pipe threads on this page conform to NPT (ANSI Standard B2.1)

Dimensions (in Inches)

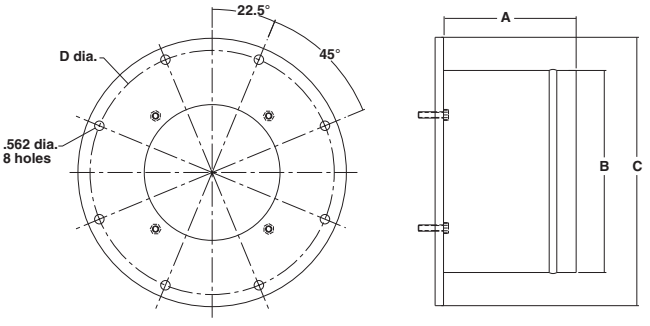
Model EB, EB-MA, and EB-MRV OVENPAK® Burners



NOTE: Use of auxiliary switches will add to dimension D.

Model	A	B	C	D	E	F	G	H	J	K	L	M	N	U	V	W	X	Y	AA	BB
EB-1	3.75	1-1/4	5.44	6.62	8.87	10.31	13.19	8.44	4.37	6.31	8.44	3.62	0.25	7.25	8.62	6.37	0.44	5.44	5.44	4
EB-2																				
EB-3	4.75			7.69				10.37		8.25	10.37	4.44							5.38	
EB-4	5.75	2	6.06	8.42	10.06	11.88	14.69	12.5	5.44	10.25	12.5	5.62	0.37	9.25	10.62	8.87	0.56	7.75	6	6
EB-5																				
EB-6	6.81	3		8.07	14.38	16.88	19.31	14.62	6.5	12.25	14.75	6.69		9.62	11.12	11.7-5		10.25	8.5	8
EB-7																				

Refractory Lined Discharge Sleeve

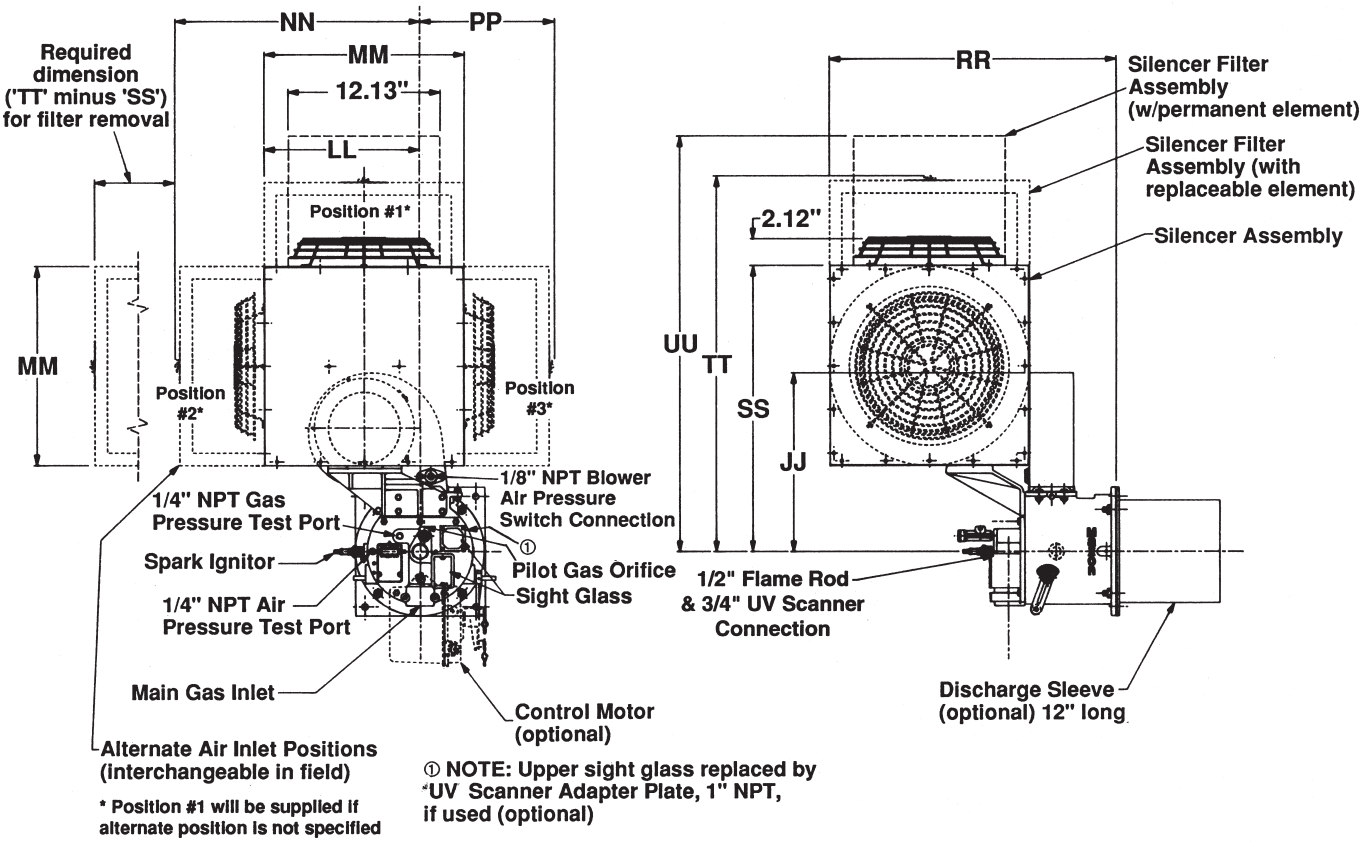


Burner Size	A	B	C	D dia.
405 - 413M EB1, EB2	8.38	10.13	14.06	12.63
415, 422M EB3	8.38	12.0	15.94	14.5
425-442M EB4, EB5	8.38	14.06	18.0	16.53
445-487M EB6, EB7	8.38	16.06	20.0	18.53

Pipe threads on this page conform to NPT (ANSI Standard B2.1)

Accessory Dimensions (in Inches)

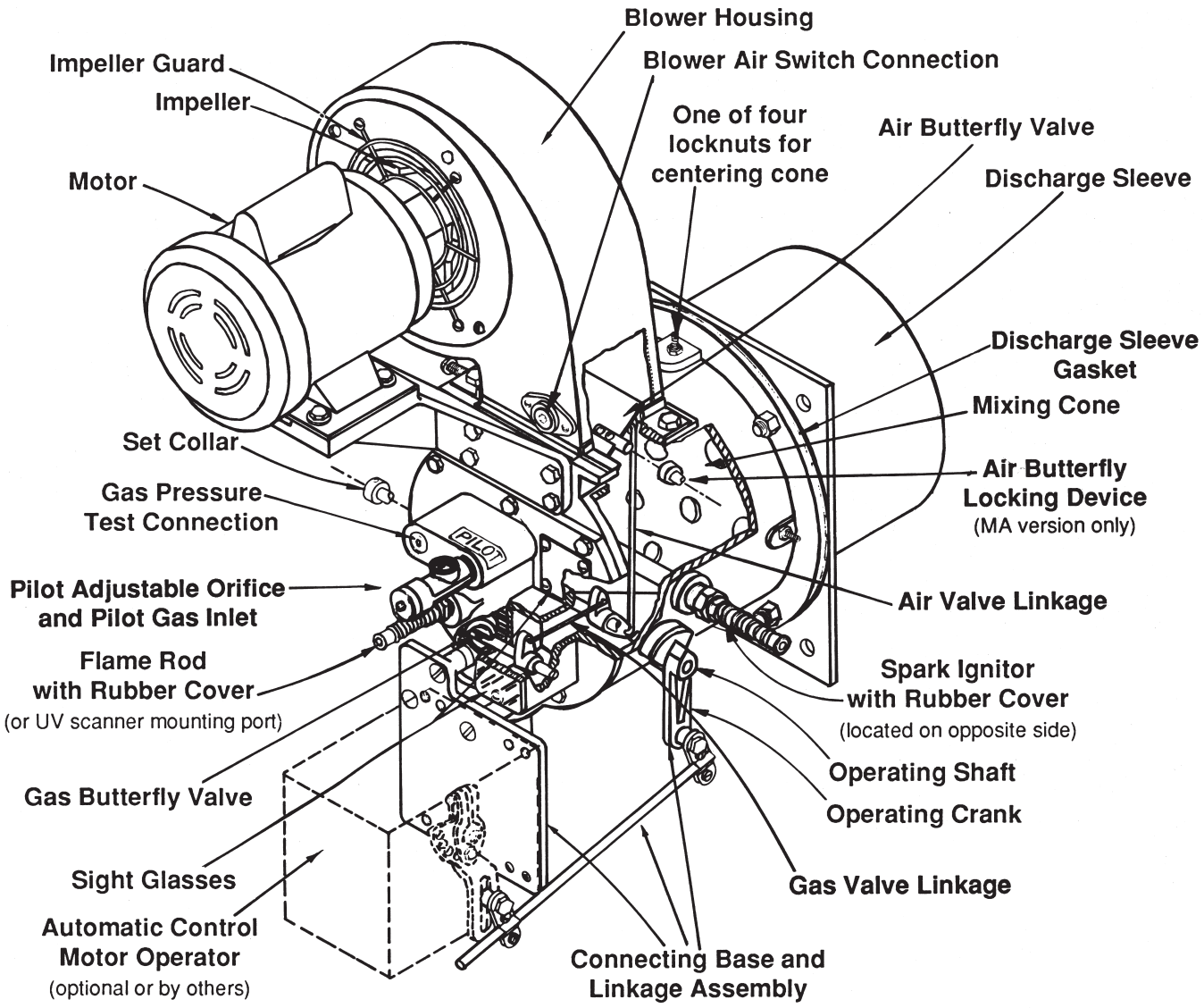
Filter with silencer for Model "400" OVENPAK® Burner



Model	JJ	LL	MM	NN	PP	RR	SS	TT	UU
405	14.4	12.4		19.3	10.4		23.2	29.9	33.6
407M	21.7	15.1		21.9	7.8		24.7	31.4	35.1
408	14.4	12.4		19.3	10.4	23.2	23.2	29.9	33.6
408M									
412M	21.7	15.1	16	21.9	7.8		24.7	31.4	35.1
413M									
415	14.4	12.4		19.3	10.4		23.2	29.9	33.6
422M	21.7	15.1		21.9	7.8	23.1	24.7	31.4	35.1
425	20.2	14.5			8.3	24	25.9	32.6	36.3
432M	23.6	18.1	22	24.9	10.8	24.9	31.9	38.5	42.3
435	20.25	14.5	16	21.4	8.3	24	25.9	32.6	36.3
442M	23.6					24.9			
445	23.5	18.1	22	24.9	10.8	28.6	31.9	38.5	42.3
456M									
470M	25.9	20.2	24	29.2	12.8	29.6	33.9	42.7	44.3
487M									

Pipe threads on this page conform to NPT (ANSI Standard B2.1)

Component Identification



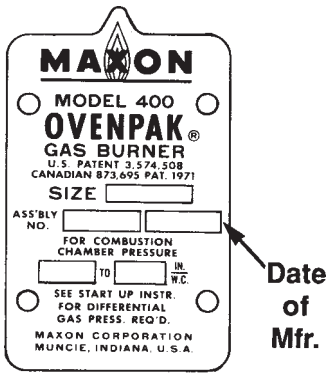
Suggested spare parts

- Spark Ignitor
- Flame Rod, if used
- Filter Elements, if used
- Mixing Cone
- Discharge Sleeve and Gasket
- Motor
- Impeller
- Gas/Air Valve Linkage Kit

To order parts for an existing OVENPAK® Burner assembly, list:

1. Name(s) of part(s) from above illustration
2. Quantity of each required
3. OVENPAK® Burner nameplate information:
   - size and model number of burner
   - assembly number
   - date of manufacture
   - if available, serial number of Maxon fuel shut-off valve in-line to OVENPAK® Burner (This serial number is on Maxon valve's nameplate.)

Nameplate



Suggested Maintenance/Inspection Procedures

Discharge sleeve and cone alignment

Centering of the mixing cone provides a small annular opening for the flow of some cooling combustion air along the discharge sleeve wall. We SUGGEST periodic inspection from the discharge side of the burner to assure that this alignment is maintained.

Caution: Tightening can lead to cone distortion and greatly reduce cone and discharge sleeve life. Cone should be free to move and allow for thermal expansion.

If re-adjustment is necessary, back out the four lock nuts and re-center mixing cone with adjusting screws handtight. Back each screw out one-half turn before re-locking. This allows for thermal expansion as cone gets hot.

Filters should be inspected regularly and cleaned, using a vacuum to remove loose/dry accumulations, then washing and/or degreasing as appropriate for the filter type used.

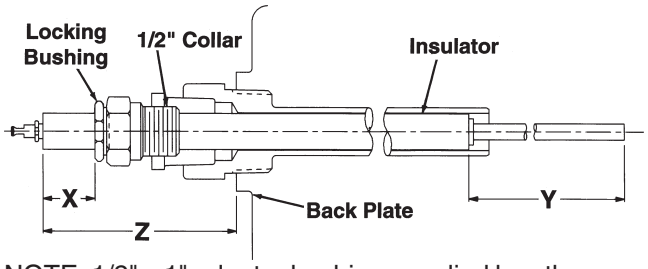
To replace flame rod or spark ignitor:

1. Check Table 1 at right for dimension "Y" and cut tip to length shown.
2. Insert 1/2" NPT collar into burner and snug into position.
3. Insert insulator through collar into burner.
4. Check table for dimension "X", position accordingly, and tighten locking bushing until insulator is held firmly.

WARNING: Over-tightening locking bushing may damage insulator.

NOTE: A full-wave 6000 volt spark ignition transformer is suggested for use with Maxon burner equipment.

Flame Rod



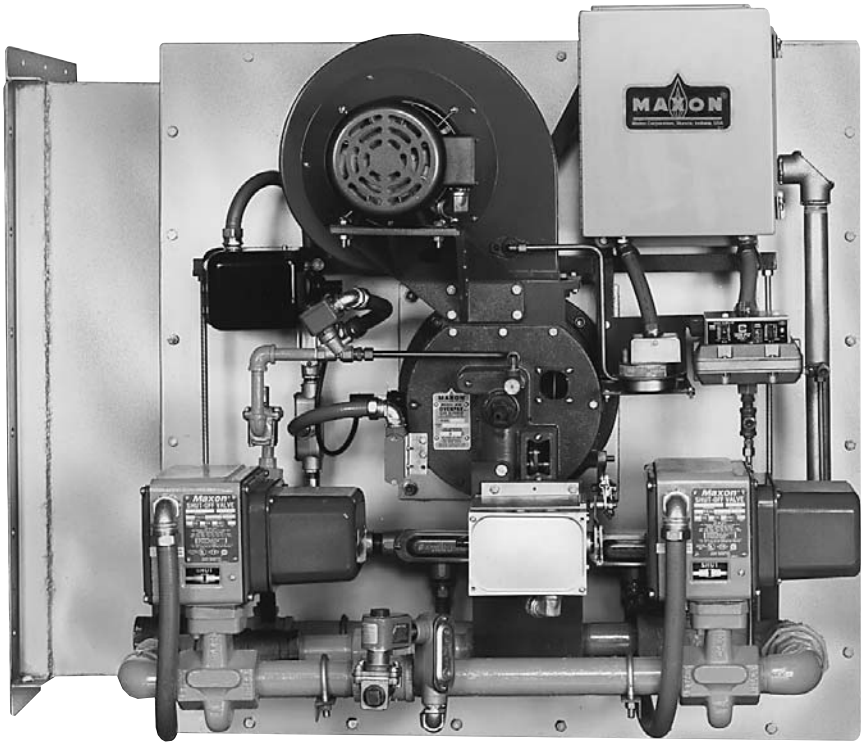
NOTE: 1/2" x 1" adapter bushing supplied by others

Table 1: Flame rod and spark ignitor dimensions for all Model "400" OVENPAK® Burners manufactured after 1/1/91 ①

Burner Model		Spark Ignitor Dimensions		Flame Rod Dimensions		
		X	Y	X	Y	Z
EB-1	405	1.3	.4	.4	6	2.9
	407M					
	408M					
	408					
	412M					
	413M					
EB-2	---	1.3	.4	.4	8.7	2.9
EB-3	415	1.5	.4	.4	6	2.9
	422M					
EB-4 EB-5	425	1.0	.4	.8	10.8	3.5
	432M					
	435					
	442M					
---	445	.75	.4	.4	12.8	2.9
	456M					
	470M					
	487M					
EB-6 EB-7	---	.75	.4	.8	18.8	3.3

① Manufactured date is stamped on metal nameplate of Model "400" OVENPAK® Burner. For specifics relative to units manufactured prior to 1/1/91, see Product Information Sheet 2100-3.

Maxon Pre-Assembled Package
Model "400" OVENPAK® Gas Burner System



425 OVENPAK® package system installed and mounted onto a Maxon pre-fabricated heater/duct section

Save time and reduce your installation costs with a completely assembled and pre-wired burner and pipe train "package".

All system components have been carefully selected to match the high performance characteristics of the Model "400" OVENPAK® Gas Burner.

The compact design of this "packaged system" makes mounting to your duct fast and easy. Connect to the gas line and bring in electricity. It's wired and piped, ready to go.

All pre-assembled package systems include a Model "400" OVENPAK® Burner and pipe train. The pipe trains are available with "Block and Bleed" arrangement options only.

Additional application flexibility is provided with five different sized systems, all with 40:1 turndown capacity ranges.

Packaged OVENPAK® Burner systems may also be mounted in a pre-fabricated combustion heater/duct section by Maxon. This option is value-engineered to give you the most for your dollar spent.

Design / Application Summary

Five Model "400" OVENPAK® pre-assembled package options:

OVENPAK® Burner Model >		405	408	415	425	435
Totally Enclosed Blower Motor	**Horsepower**	1/3			3/4	
	Frame Number	48			56	
Maximum Capacity (Btu/hr)		500,000	800,000	1,500,000	2,500,000	3,500,000
Minimum Capacity (Btu/hr) main plus pilot		15,000	20,000	37,000	60,000	87,000
Minimum natural gas pressure required at pipe train inlet		6" wc		10" wc	9" wc	14" wc
Inlet pipe train size NPT		1.25"			1.5"	
Approximate overall envelope dimensions		42" long x 40" high x 24" wide				

Pre-assembled pipe train “package” includes the following components:

– Burner gas shut-off cock
– Main inlet gas shut-off cock
– Pilot gas train consisting of:
  • Pilot gas shut-off cock
  • Pilot gas pressure regulator (maximum 1 PSIG natural gas inlet pressure)
  • Pilot gas solenoid valve, 115/60VAC
– Main gas pressure regulator (maximum 1 PSIG natural gas inlet pressure)
– Combustion air pressure switch, automatic reset, NEMA 1, 115/60VAC
– Combination high and low gas pressure switch, manual reset, NEMA 1, 115/60VAC
– Spark ignition transformer, 6000 volts, NEMA 1, 115/60VAC
– NEMA type 12 and 13 junction box with terminal wiring strip
– Normally open vent solenoid valve, 115/60VAC

A complete packaged system also includes:

• Maxon Model “400” OVENPAK® Burner assembly
  – Connecting base and linkage assembly to adapt customer-supplied automatic control motor (optional)
  – Low fire start switch (mounted to OVENPAK® Burner)
  – Air filter assembly
• Maxon main gas shut-off valve, position “L”, 115/60VAC
• Maxon main gas “blocking” shut-off valve, position “L”, 115/60VAC00000000

Factory pre-wiring includes the following components for 115 volts 60 hertz AC:

– Low fire start switch
– Combustion air pressure switch
– Combination high and low gas pressure switch
– Pilot gas solenoid valve
– Normally-open vent solenoid valve (when used)
– Spark ignition transformer
– Maxon “main” and/or “blocking” gas shut-off valve(s)
– NEMA type 12 and 13 junction box with terminal wiring strip

Field wiring is required:

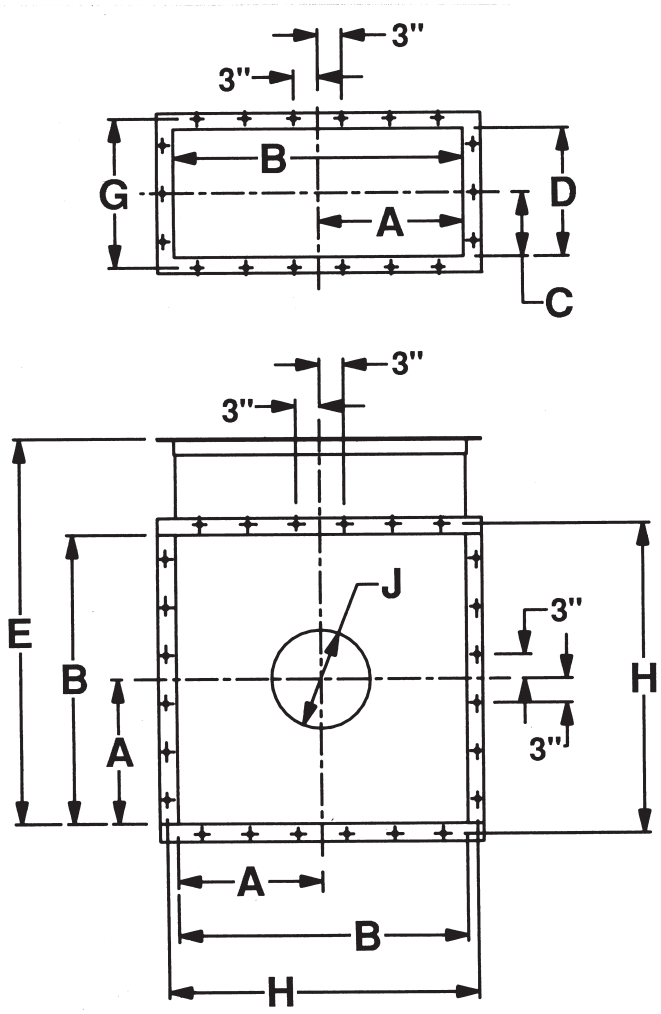
– To the packaged system's junction box wiring strip
– To the Model “400” OVENPAK® Burner's combustion air blower motor
– Between your flame safeguard relay and the OVENPAK® Burner's flame sensor
  NOTE: A flame rod may be furnished by Maxon; UV detector is a part of the control package when supplied by Maxon or may be supplied by others.
– Other field wiring connections may be required if your control circuit includes high/low temperature limits, automatic temperature controller, and/or other miscellaneous safety limit switches.

Maxon Packaged Heater/Duct Sections

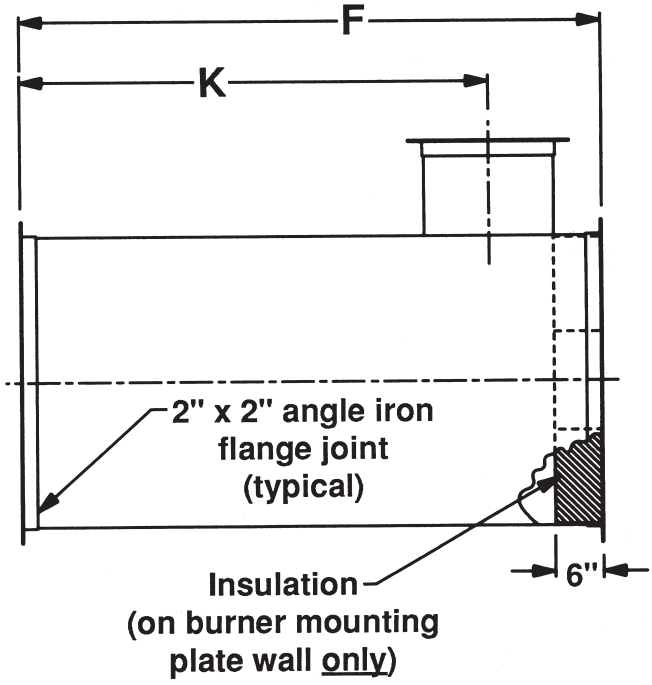
Reduce your fabrication time with a complete combustion heater/duct including the prewired and prepiped Model "400" OVENPAK® Burner system package.

Easy installation is provided by flanged duct connection joints. Burner is mounted to a .312" mild steel wall, lined with 6" thick fiber insulation. The other 16 gauge aluminized steel heater/duct walls are ready for your insulation.

Application flexibility is offered by three sizes of ducts. All sizes can be fabricated to have return/inlet opening at any 90° increment position (viewing from the back of the OVENPAK® Burner). Continuous welds on all joint seals permit duct section installation on pressure-side or suction-side applications.



NOTE:
9/16" holes located on 6" centerlines for all mounting flange joints



Approximate duct section dimensions (in inches)

Model	A	B (inside)	C	D (inside)	E	F	G	H	J (inside)	K
405 - 408	12	24	5	10	36	48	12.62	26.62	7.5	37
415	15	30	6	12	42	60	14.62	32.62	9.5	48
425 - 435	18	36	8	16	48	72	18.62	38.62	11.5	58

Maxon Packaged Heater/Duct Sections Design and Application Details

Maximum discharge temperature 600°F (316°C)
Duct static pressures may range between +2" wc and -5" wc
Optimum design parameters permit up to 3000 feet per minute air velocity through return/inlet duct.

Recommended maximum discharge air volumes

Model "400" OVENPAK® Burner	405	408	415	425	435
Maximum discharge air volume in SCFM	5000		7500	12,000	

To select your packaged system, specify:

1. **Quantity** _____

2. **Model "400" OVENPAK® Gas Burner Assembly** _____, for natural gas
   - Arranged ☐ for UV detector, or ☐ with flame rod
   - Furnished with blower motor for _____ AC
   - ☐ With **low fire start switch** _____ , General Purpose, 115/60 AC
   - ☐ With **combustion air filter assembly** _____ (optional)
   - ☐ With **connecting base and linkage assembly** _____ to adapt customer's automatic electric control motor. Specify/select which one of these electric operators will be used:
     - ☐ Barber-Colman #EA51–58, also with prefix MC, MP or MF
     - ☐ Honeywell #M644, #M744, #M941, or #M944
     - ☐ Penn/Johnson #M-80 or #M81

3. Arranged into **pre-assembled and wired pipe train package,** 115/60VAC,
   - ☐ With **Block and Bleed** arrangement assembly _____.

4. With _____ ☐ 1-1/4" or ☐ 1-1/2" Maxon Series _____ ☐ Automatic Reset, ☐ Manual Reset **Shut-Off Valve**(s), for natural gas, in top assembly position "L" for 115/60VAC
   - ☐ With electrical terminal block (option)
   - ☐ With ☐ 6 second, or ☐ 2.5 second opening time (automatic reset valve(s) only)
   - ☐ With _____ auxiliary signal switch(es) (optional)
     NOTE: Specify which switch(es) go in main valve and which switch(es) in blocking valve, if different.

5. ☐ With **heater/duct section assembly** _____ (optional)
   with return/inlet duct positioned on ☐ top, ☐ right, bottom, or ☐ left

Model "200" OVENPAK® Burners

Model "200" OVENPAK® Burner arranged with air inlet guard and optional UV scanner

Model "200" OVENPAK® Gas Burners provide a broad range of heat without a combustion blower by firing through-the-wall into your combustion chamber on the suction side of the circulating fan. An internal mixing cone blends air drawn through the burner (by chamber suction) with fuel gas delivered through its central gas nozzle. The Model "200" OVENPAK® Burner is designed for applications involving suction-side firing from -0.2" to -1.6" wc static chamber conditions. They provide:

– low initial and operating cost
– easy installation
– simple adjustment
– heavy duty cast iron construction in a compact burner configuration

Performance data

NOTE: Maximum capacity varies with the range of suction provided at operating temperature

Performance data	**Maximum capacities** (1000's Btu/hr) with corresponding fuel gas differential pressures at specific combustion chamber static pressure conditions									
Combustion chamber suction ("wc)	**-0.2**	**-0.3**	**-0.4**	**-0.5**	**-0.6**	**-0.7**	**-0.8**	**-0.9**	**-1.0**	**-1.6**
Maximum capacity (1000's Btu/hr)	100	190	275	360	450	540	625	700	800	1000
Minimum capacity (1000's Btu/hr)	10	12	13	14	15	17	18	19	20	25
Combustion air volume required (SCFM)	65	80	90	95	110	120	130	135	145	184
Natural gas differential pressure required ("wc)	0.1	0.4	0.7	1.2	1.9	2.7	3.7	4.6	6.0	9.4
Propane gas differential pressure required ("wc)	---	---	0.3	0.5	0.8	1.1	1.5	1.8	2.4	3.8
Approximate flame lengths beyond end of discharge sleeve (inches)	0 - 3	6 - 9	12 - 18	15 - 21	18 - 24	21 - 27	24 - 30			24 - 26

Air volumes shown are for burners without damper, or with damper in full-open position. If damper is used to restrict air flow, maximum capacity will be similarly reduced.

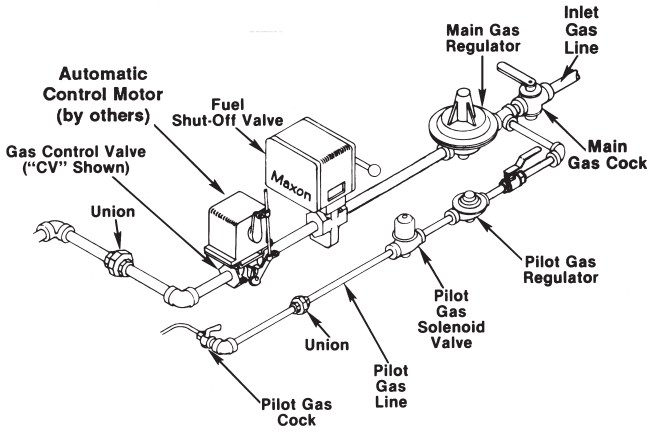
Pilot flame issues from the same gas ports as main flame, so proof of pilot gas ignition assures ignition of main gas supply.

Flame sensing can be either by flame rod or UV scanner when natural gas is the fuel, but only with UV scanner if propane is the fuel.

Installation is simple, utilizing the built-in, direct-mounting flange provided.

A complete combustion system utilizing Model "200" OVENPAK® Burners also includes gas train, fuel-throttling valve and control system. Your Maxon representative can help you choose from the broad range of options available.

Typical pipe train

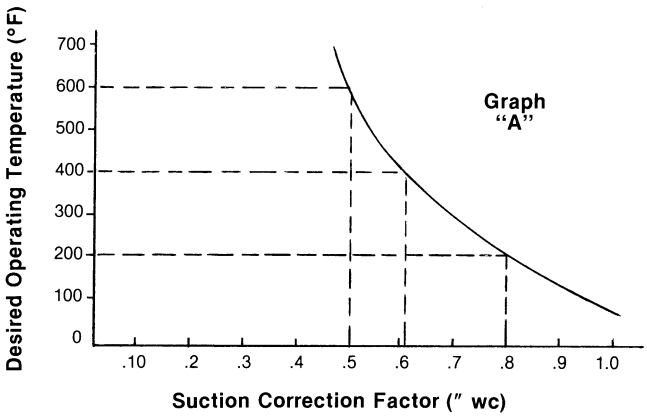


Design and Application Details

Differential gas pressures in inches water column (" wc) for both natural gas and propane are those that should be measured by connecting a manometer between test points shown in the photo below.

Model "208" OVENPAK® Burner shown with air damper and flame rod

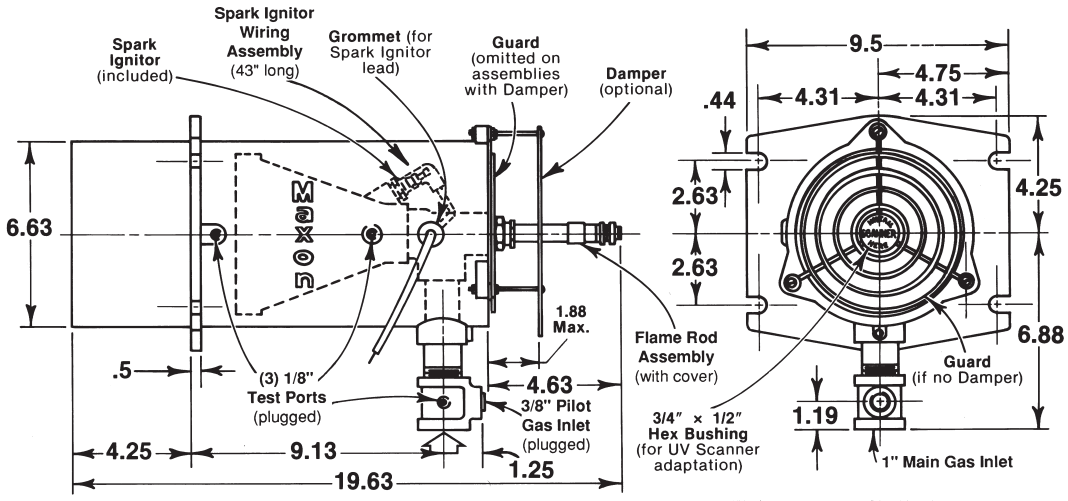
Suction (shown in inches wc) should be that available at operating temperature. It can be determined by a two-step procedure: First, measure cold suction (chamber to atmosphere). Second, multiply that reading by the correction factor shown in Graph "A" for your desired operating temperature.



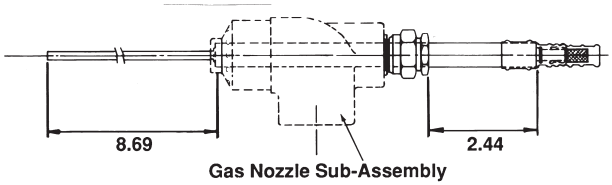
For example, if you anticipate running the system at 600°F, follow that dotted line to the right until it intersects curve, then read downward to a correction factor of 0.5. Therefore, if you read a cold suction of 1" wc, your expected suction "at temperature" would be 1" x 0.5 = 0.5" wc.

Dimensions (in inches)

Burner Assembly



Flame Rod Assembly



ANSI Z83.18-2004

American National Standard For **Recirculating Direct Gas-Fired Industrial Air Heaters**

Fourth Edition - 2004

This standard is a revised
edition of the former
standard for

Recirculating Direct
Gas-Fired Industrial
Air Heaters

Z83.18-2000
Z83.18a-2001
Z21.18b-2003

Approved
December 20, 2004
AMERICAN NATIONAL
STANDARDS INSTITUTE, INC.

History Of The Development Of The Standard For Recirculating Direct Gas-Fired Industrial Air Heaters

(This History is informative and is not part of the standard.)

At its March 1983 meeting, the Z83 Subcommittee on Standards for Gas-Fired Heavy Duty Forced Air Heaters considered the need to increase the discharge air temperature limit in the direct gas-fired make-up air heater standard (Z83.4), in light of the increased use of make-up air heaters as total space heating appliances. The heavy duty heater subcommittee appointed a working group of subcommittee members and interested individuals to gather information on the use of direct gas-fired make-up heaters for total space heating.

The working group's report to the subcommittee confirmed there were several local codes permitting the installation of gas-fired make-up air heaters as total space heating appliances in non-residential buildings. Consequently, the working group was requested to develop standards coverage for make-up air heaters installed as total space heating appliances for inclusion in Z83.4.

Although it was initially intended that the necessary coverage would be included in Z83.4, following review of the working group's suggested coverage of its July 1984 meeting, the subcommittee concluded that because of design and function differences (i.e., recirculation of inside air) a separate standard would better suit the needs of certification agencies and Code officials.

A draft standard for industrial air heaters, developed by the working group at a series of meetings, was adopted by the heavy duty heater subcommittee at its June 1985 meeting and distributed for industry review in December 1985. Following reconsideration of this draft standard in light of comments received at its February 1986 meeting, the heavy duty heater subcommittee recommended the draft standard to the Z83 Committee.

At its October 1986 meeting, the Z83 Committee approved the proposed standard for submittal the American National Standards Institute, Inc.

The first edition of the Standard for Direct Gas-Fired Industrial Air Heaters, was approved by the American National Standards Institute, Inc., in September 1987. The second edition was approved by the American National Standards Institute, Inc., on November 30, 1990. The third edition was approved by the American National Standards Institute, Inc., on June 22, 2000.

This, the fourth edition of the industrial heater standard was approved as American National Standard by the American National Standard Institute, Inc. on December 20, 2004.

Following procedures outlined above, further revisions to this standard were developed in line with industry developments.

Previous editions of the industrial air heater standard, and addenda thereto, approved by the American National Standards Institute, are as follows:

Z83.18-1987	Z83.18a-1989	Z83.18b-1989
Z83.18-1990	Z83.18a-1991	Z83.18b-1992
Z83.18-2000	Z83.18a-2001	Z21.18b-2003

The following identifies the designation and year of the fourth edition of the standard:
ANSI Z21.83-2004

NOTE: This 2004 edition incorporates changes to the 2000 edition of Z83.18 and addenda thereto. Changes other than editorial, are denoted by a vertical line in the margin.

2.9 Combustion

2.9.1 Combustion tests shall be conducted with the heater adjusted to operate at the following conditions. The combustion test results for each test shall be recorded and used in conjunction with 1.23.2-u.

a. Manufacturer's specified maximum rated air throughput, minimum external static pressure and maximum temperature rise.

The air velocity or pressure drop across the burner shall be maintained at the air flow sensing system trip points, including the worst-case tolerance, of 2.7.1 and 2.7.2 (or maximum possible throughput for designs which do not incorporate a high air flow sensing system) for each temperature rise specified in 2.9.2 by adjusting the fan speed or changing the profile plate opening, as applicable.

b. Manufacturer's specified minimum rated air throughput, maintaining the air flow sensing system trip point including the worst-case tolerance of 2.7.1, minimum external static pressure for each temperature rise specified in 2.9.2 by adjusting the fan speed or changing the profile plate opening, as applicable.

c. On heaters furnished with profile plate(s) or bypass damper(s), the manufacturer's specified minimum rated air throughput and minimum external static pressure. The air velocity or pressure drop across the burner shall be maintained at the air flow sensing system trip point including the worst-case tolerance of 2.7.2 for each temperature rise specified in 2.9.2 by adjusting the fan speed or changing the profile plate opening, as applicable.

d. The resulting air throughput starting with the manufacturer's specified maximum rated air throughput and minimum external static pressure for each of the damper positions identified in 2.7.3. The air velocity or pressure drop across the burner shall be maintained at the air flow sensing system point obtained during the conduct of 2.7.3 for each temperature rise specified in 2.9.2 by adjusting the fan speed or changing the profile plate opening, as applicable.

e. On heaters equipped with profile plate damper(s), bypass damper(s), or return air damper(s), the test conditions of 2.9.1-a shall be re-established at the temperature rise point(s) where the CO results were found to be the highest.

The control system(s) that controls the movement of the profile plate damper(s), bypass damper(s) and return air damper(s) shall be adjusted in four approximately equal increments over their full range of operation. The temperature rise shall be maintained for each point.

f. On heaters furnished with separate combustion air fans, the heater shall be adjusted to the test conditions of 2.9.1-a and the air to the combustion air fan reduced to the trip point of the combustion air fan airflow sensing system specified by the manufacturer (see 2.7.4) for each temperature rise specified in 2.9.2.

g. On heaters equipped with a means to reduce air throughput and without a means to limit the maximum temperature rise to that achieved at the maximum air throughput, determine the theoretical maximum temperature rise at the minimum airflow from the following conditions:

1. Maximum air throughput times maximum temperature rise divided by the minimum air throughput.

2. Maximum discharge temperature minus minimum inlet temperature.

Combustion tests shall be conducted with the heater adjusted to the minimum air throughput with the air velocity or pressure drop across the burner maintained at the airflow sensing trip point, including the worst-case tolerance of 2.7.1 and 2.7.2 for the maximum theoretical temperature rise derived from the lesser of "a" and "b" above.

2.9.2 Combustion tests shall be conducted at maximum temperature rise, at 75 percent, 50 percent, 25 percent, and at the manufacturer's minimum temperature rise for the test conditions specified under 2.9.1-a, b, c, d, and f, as applicable.

These tests are intended to be performed at input rates that correspond to the theoretical point of rating for each temperature rise for the conditions specified by using the formula shown in 2.15, Burner and Heater Input Rating Determination.

2.9.3 Samples of the outlet air shall be taken at plane 4 in Figure 2, Test Set-up, at each of the points in Figure 3, Distribution of Traverse Points for Round Duct Derived from ANSI/ASHRAE 51 (ANSI/AMCA 210) or Figure 4, Traverse Points for Rectangular Ducts as applicable.

2.9.4 The heater shall not produce carbon dioxide, carbon monoxide, aldehydes or nitrogen dioxide in excess of the values given below, when operated in an atmosphere having a normal oxygen content:

CARBON DIOXIDE: 4000 ppm Maximum Average Concentration added. No test required for carbon dioxide, as the quantity formed varies only with the type of fuel gas and only in direct proportion to the input of the particular fuel gas being used. With -30°F (-34.5°C) incoming air temperature and 160°F (71°C) discharge air temperature, carbon dioxide concentration will approximate 3900 ppm with natural gas. A heater for use with other than natural, manufactured or mixed gas shall be required to operate at less than 190°F (88°C) temperature rise since the calculated carbon dioxide concentration exceeds the 4000 ppm maximum average concentration (calculated 4550 ppm with propane).

Carbon dioxide concentration shall be calculated from the following:

$$CO_2(ppm) = \frac{(K \times I \times 10^{\wedge}3)}{(CFM \times 60)}$$

$$= 19.63 \times K \times \Delta T\ °F$$

$$(SI: \quad = 35.33 \times K \times \Delta T\ °C)$$

where

I = input rate in Btu per hr.

CFM = total air throughput in cu ft per minute (m^3/s),

K = the amount of CO_2 formed by combustion of 1000 Btu (293 W) of gas based on dry standard conditions [60°F and 30 in. Hg (15.5°C and 101.3 kPa)] and the ultimate CO_2 of the particular test gas. The following are the K factors for the test gases specified in 2.2, Test Gases:

ΔT = temperature rise

Test Gas	K Factor
Gas A (Natural)	1.04
Gas B (Manufactured)	0.893
Gas C (Mixed)	0.982
Gas D (n-Butane)	1.24
Gas E (Propane HD-5)	1.206
Gas F (Propane-Air)	1.206
Gas G (Butane-air)	1.24
Gas H (Propane-Air)	1.206

CARBON MONOXIDE: 5 ppm Maximum Average Concentration added. Carbon Monoxide (CO) determination shall be made with a long-path infrared spectrophotometer which has been properly compensated for moisture (Beckman 315L or equal) capable of being set to a 0 to 50 ppm full-scale CO range with an accuracy of ± 1 percent of scale; and connected to a strip-chart recorder set to read 10 ppm on a span of 1 inch (25.4 mm). The instrument shall be zeroed before test with CO-free air. The instrument shall be calibrated before and after each test with CO Standard Test Gas. Before each reading of heated discharge air, a reading of the outside incoming air is to be taken at the outlet of the heater. The difference in readings, outdoor incoming to discharge air, shall be considered to be the parts per million of carbon monoxide added by the burner.

ALIPHATIC ALDEHYDES: 1.0 ppm Maximum Average Concentration added. Aldehyde determination shall be made with natural gas only, in which case only formaldehyde will be sought. The basic test shall be the organoleptic technique, as most people can sense 0.5 to 1.0 ppm by this method. At least two persons shall independently check the heated discharge air for aldehydic odor.

Final testing, if deemed necessary by either the heater manufacturer or the testing agency, shall consist of collecting and analyzing samples in accordance with the MBTH method outlined in Public Health Service Publication *No. 999-AP-11, "Selected Methods for the Measurement of Air Pollutants."*

NITROGEN DIOXIDE: 0.50 ppm Maximum Average Concentration added. Nitrogen dioxide determination of the heated airstream shall be made using a chemiluminescent analyzer or equivalent.

2.10 Burner Operating Characteristics

2.10.1 Burner flame shall not flash back when turned on and off at any firing rate or air throughput specified in 2.9, Combustion.

9.6.1 Natural And Processed Cheese

9.6.1.1 General[1-3]

The United States is one of the largest producers of cheese in the world. The total number of industry establishments in the United States in 1995 was 432. In 1995, total natural cheese production in the U. S., excluding cottage cheeses, was 6.9 billion pounds, and total processed cheese production was 2.3 billion pounds. Wisconsin is the leading producer of cheese in the United States, accounting for over 30 percent of all cheese production in the country.

Popular types of natural cheeses include unripened (e. g., cottage cheese, cream cheese), soft (e. g., Brie, Camembert), semi-hard (e. g., Brick, Muenster, Roquefort, Stilton), hard (e. g., Colby, Cheddar), blue veined (e. g., Blue, Gorgonzola), cooked hard cheeses (e. g., Swiss, Parmesan), and pasta filata (stretched curd, e. g., Mozzarella, Provolone). Examples of processed cheeses include American cheese and various cheese spreads, which are made by blending two or more varieties of cheese or blending portions of the same type of cheese that are in different stages of ripeness.

9.6.1.2 Process Description[4-9]

The modern manufacture of natural cheese consists of four basic steps: coagulating, draining, salting, and ripening. Processed cheese manufacture incorporates extra steps, including cleaning, blending, and melting. No two cheese varieties are produced by the same method. However, manufacturing different cheeses does not require widely different procedures but rather the same steps with variations during each step, the same steps with a variation in their order, special applications, or different ripening practices. Table 9.6.1-1 presents variations in the cheesemaking process characteristic of particular cheese varieties. This section includes a generic process description; steps specific to a single cheese variety are mentioned but are not discussed in detail.

9.6.1.2.1 Natural Cheese Manufacture -

The following sections describe the steps in the manufacture of natural cheese. Figure 9.6.1-1 presents a general process diagram.

Milk Preparation -

Cow's milk is the most widely used milk in cheese processing. First, the milk is homogenized to ensure a constant fat level. A standardizing centrifuge, which skims off the surplus fat as cream, is often used to obtain the fat levels appropriate for different varieties of cheese. Following homogenization, the milk is ready for pasteurization, which is necessary to destroy harmful micro-organisms and bacteria.

Coagulation -

Coagulation, or clotting of the milk, is the basis of cheese production. Coagulation is brought about by physical and chemical modifications to the constituents of milk and leads to the separation of the solid part of milk (the curd) from the liquid part (the whey). To initiate coagulation, milk is mixed with a starter, which is a culture of harmless, active bacteria. The enzyme rennin is also used in coagulation. Most of the fat and protein from the milk are retained in the curd, but nearly all of the lactose and some of the minerals, protein, and vitamins escape into the whey. Table 9.6.1-1 provides the primary coagulating agents and the coagulating times necessary for different varieties of cheese.

Processed Cheese Foods -

Other processed cheeses that are similar to the above in manufacturing are also commonly produced. For example, to produce pasteurized process cheese food, one or more of the following optional dairy ingredients are added: cream, milk, skim milk, buttermilk, and/or cheese whey. The result is a processed cheese food that is higher in moisture and lower in fat than pasteurized process cheese. After heating, processed cheese intended for spreading undergoes a creaming step, which includes mechanical kneading of the hot cheese and addition of various dairy products and other additives. Other processed cheese products include cold-packed cheese, cold-packed cheese food, and reduced fat cheeses. All processed cheeses may be enhanced with salt, artificial colorings, spices or flavorings, fruits, vegetables, and meats.

Grated and powdered cheeses are produced by removing the moisture from one or more varieties of cheeses and grinding, grating, or shredding the cheese(s). Mold-inhibiting ingredients and anti-caking agents may be added as well. Dehydration takes such forms as tray drying, spray or atomized drying, and freeze drying. Popular types of grated cheese include Parmesan, Romano, Mozzarella, and Cheddar. Cheese powders, such as those made from Cheddar cheese, may be used to flavor pasta, or added to bread dough, potato chips, or dips.

9.6.1.3 Emissions And Controls

Particulate emissions from cheese manufacture occur during cheese or whey drying, and may occur when the cheese is grated or ground before drying. CO_2 emissions from direct-fired dryers are primarily from the combustion of fuel, natural gas. Cheese dryers are used in the manufacture of grated or powdered cheeses. Whey dryers are used in some facilities to dry the whey after it has been separated from the curd following coagulation. VOC emissions may occur in the coagulation and/or ripening stages. Particulate emissions from cheese and whey dryers are controlled by wet scrubbers, cyclones, or fabric filters. Cyclones are also used for product recovery. Emission factors for cheese drying and whey drying in natural and processed cheese manufacture are shown in Table 9.6.1-2.

Table 9.6.1-2. PARTICULATE EMISSION FACTORS FOR NATURAL AND PROCESSED CHEESE MANUFACTURE[a]

Source	Pollutant	Average emission factor[b]		
		lb/ton	Rating	Ref.
Cheese dryer (SCC 3-02-030-20)	Filterable PM	2.5	D	1,2,3
	Condensible inorganic PM	0.29	D	2,3
	Condensible organic PM	0.44	D	1,2,3
Whey dryer (SCC 3-02-030-10)	Filterable PM	1.24	D	4,6,7
	Condensible PM	0.31	D	4,6,7

[a] Emission factor units are lb/ton of dry product. To convert from lb/ton to kg/Mg, multiply by 0.5. SCC = Source Classification Code.

[b] Emission factors for cheese dryers represent average values for controlled emissions based on wet scrubbers or venturi scrubbers. Factors for whey dryers are average values for controlled emissions based on cyclones, wet scrubbers, or fabric filters.

References For Section 9.6.1

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TYPICAL APPLICATIONS

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- Garden Centers
- Warehouse Stores
- Residential Garage
- Greenhouses
- Box Stores
- Gymnasium
- Car Dealerships
- Wood/Metal Shop

Duct Furnaces
- Movie Studio
- Retail Shops
- Break Room
- Hardware Stores
- Showrooms
- Detention Centers

Ventilation Units
- Smoking Rooms
- Call Centers
- Day Care Centers
- Aerobics Room
- Classrooms
- Universities
- Health Spas
- Museums
- Libraries
- Locker/Shower Rooms
- Courtroom
- Hobby Shops
- Bars/Clubs
- Conference Rooms
- Meeting Rooms
- Health Centers

Infrared Heaters
- Arenas
- Shipping/Receiving Areas
- Train Stations
- Airplane Hangars
- Loading Docks
- Assembly Lines
- Automotive/Service Centers

Electric Heaters
- Workshops
- Entry Ways
- Stairwells
- Hallways
- Guard Station
- Rest Rooms
- Temporary Heating

Split Systems
- Retail Stores
- Yoga Studio
- Offices
- Meeting Halls
- Recreational Centers
- Banks
- Lecture Rooms
- Doctors' Offices
- Health/Beauty Spas

High Efficiency Rooftop
- Studios
- Offices
- Food/Beverage
- Retail Spaces
- Restaurants

High Outside Air
- Recreational Centers
- Reception Area
- Pharmacies
- Disco/Dance Halls
- Meeting Halls
- Light Industrial
- Dormitories

DOAS Unit
- Computer Rooms
- Pet Shops
- Multi-Use Assembly Halls
- Extended Care Facilities
- Hotel Corridors

Large Air Handlers
- Warehouses
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  - » Industrial strength with showroom appearance

Reznor Residential Garage / Workshop Heater

Model WS Hydronic Unit Heater

Model LDAP Gas Fired, Air Turnover Heater

SELECTION GUIDE

	Gas Fired Unit Heaters					Specialty Unit Heaters			
	GOOD		BETTER		BEST	Gas	Hydronic	Electric	
Model	**UDAP**	**UDBP**	**UDAS**	**UDBS**	**UEAS**	**LDAP**	**WS**	**EGHB**	**EXUB**
Fuel Efficiency	Up to 83%	Up to 83%	Up to 83%	Up to 83%	Up to 93%	83%	-	-	-
Separated Combustion	-	-	✓	✓	✓	-	-	-	-
Heating Technology	TCORE²®	TCORE²	TCORE²	TCORE²	TCORE³®	TCORE²	Fin Tube	Encased Element	
Heating Range (MBH)[A]	30-400	30-400	30-400	30-400	130-310	400-1,200	18-350	2-60[A]	5-30[A]
CFM Range	450-5,125	450-5,125	500-6,200	500-6,200	2,250-4,275	3,250-16,750	270-4,750	700-2,000	400-3,000

[A] Heating range shown in MBH except for Models EGHB and EXUB. These heating values are shown in kW.

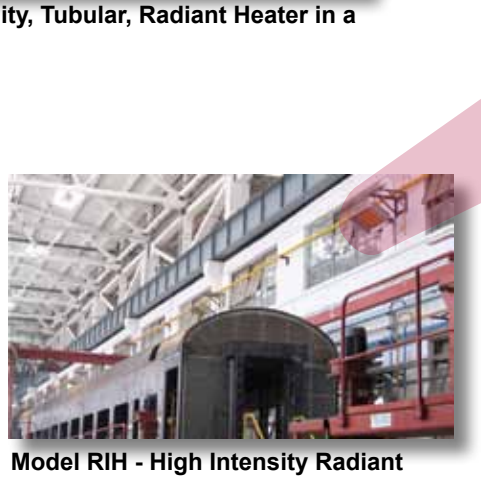
INFRARED HEATERS

Reznor Low Intensity, Tubular, Radiant Heater in a Sports Complex

Infrared rays produce sun-like warmth when absorbed by non-reflective surfaces (like your skin). Reznor high and low intensity infrared equipment gives you instant heat and comfort.

Low intensity heaters cover larger areas and are available with single or two-stage heating. Also available for heating somewhat harsh or humid environments [A].

Model RIH offers high intensity radiant heating.



Model RIH - High Intensity Radiant Heater in a Train Station

SELECTION GUIDE

Model	Description	Heating Range (MBH)	Length Range (Feet)
VPS	Low Intensity, Single Stage Heater	60 - 200	20 - 80
VPT	Low Intensity, Two Stage Heater	45 - 200	20 - 70
VCS [A]	Low Intensity, Single Stage Heater	60 - 200	20 - 80
VCT [A]	Low Intensity, Two Stage Heater	45 - 200	20 - 70
RIH	High Intensity Radiant Heater	30 - 200	-

[A] Models VCS and VCT are constructed of stainless steel and approved for humid environments such as a car wash or greenhouse or outdoor installation.

DUCT HEATERS

Reznor Rooftop Mounted Duct Furnace

Reznor duct furnaces are available in models for indoor or outdoor applications. Outdoor models include weatherized cabinet and control compartment. Each model is completely pre-packaged, factory wired, and fire tested. Units are designed for use with standard air handling systems in air conditioning, heating or makeup air applications.

SELECTION GUIDE

Model	Heating Range (MBH)	Air Volume Range (CFM) [W]
EEDU	75 - 400	615 - 14,745
RP	125 - 400	1,020 - 14,745
HRPD	250 - 800	1,855 - 14,815
SC	100 - 400	820 - 14,815
X	75 - 400	610 - 14,745

[W] High air flow volume can be achieved by removing air baffles from heater.

SPLIT SYSTEMS

Split System consisting of a Model RDH Air Handler and Model MASA Condensing Unit

Our versatile split systems give you the flexibility that you won't find in a packaged system. The multitude of configurations help you design the mechanical system the way you want it.

The product line also features the first North American, 92% efficient, condensing commercial furnace.

Model CAUA Vertical Split System Air Handlers with Cased Cooling Coil

AIR HANDLERS

Model	Description	Heat Capacity Range (MBH) [A]	Cooling Capacity Range (Tons)	CFM Range
SHH	92% Gas Heating Efficient, Indoor Split System	131 - 345	3 - 45	1,500 - 6,600
RHH	92% Gas Heating Efficient, Rooftop Split System	131 -345	3 - 45	1,500 - 6,600
CAUA	Indoor, Vertical Gas Heating Split System	150 - 400	5 - 15	1,600 - 6,600
PDH	Indoor, Horizontal Gas Heating Split System	75 - 400	3 - 45	500 - 7,500
RDH	Rooftop, Horizontal Gas Heating Split System	75 - 400	3 - 45	500 - 7,500
SDH	Separated Combustion, Indoor Gas Heating Split System	75 - 400	3 - 45	500 - 7,500
PEH	Indoor, Electric Heating Split System	10 - 120 kW [A]	3 - 45	500 - 7,500
REH	Rooftop, Electric Heating Split System	10 - 120 kW [A]	3 - 45	500 - 7,500
PXH	Indoor, Cooling Split System with Optional Heating [B]	34 - 908	3 - 45	500 - 7,500
RXH	Rooftop, Cooling Split System with Optional Heating [B]	34 - 908	3 - 45	500 - 7,500

CONDENSING UNIT

Model	Nominal Capacity (Tons)	Circuit Capacity (MBH)	
		Circuit A	Circuit B
MASA	5 - 20	22 - 79	37 - 160

[A] Heating range shown in MBH except for Models PEH and REH. These heating values are shown in kW.

[B] Hydronic heating is optional. Models PXH and RXH are available as cooling-only units.

VENTILATION UNITS

Model ZQYRA

This is the first fully integrated, commercial ventilation unit! The new patent-pending Reznor Z.62e precisely combines the benefits of a heatpump and an energy recovery wheel into one unit. This hybrid unitary product maximizes the entire system to give you hassle free year round performance.

Hybrid Ventilation

The HVAC industry needed a new class of ventilation products for engineers to use. Superior control and energy efficiency define this class of product. The Z.62e technology takes two reliable elements and combines them into one product. The Z.62e is greater than the sum of its parts.

SELECTION GUIDE

Model	Air Flow (SCFM)	HeatPump Max. (MBH)
ZQYRA-8	500 - 1100	35
ZQYRA-12	900 - 1500	43

LARGE CAPACITY AIR HANDLERS

Model DFC - Direct Fired, Makeup Air System for Rooftop Mounting (Also available in vertical configuration)

Large capacity applications can be very specialized. Many manufacturers offer only one type of large air volume unit. Don't fit your project around the HVAC equipment. With Reznor HVAC equipment, you get a choice.

Whether you need a makeup air system or recirculated air, you'll find the equipment you need to meet your specifications. Most models are available with DX cooling, chilled water cooling or evaporative cooling.

Model AEB - Air Turnover System

SELECTION GUIDE

Model	Air Volume Range (CFM)	Heating Capacity Range (MBH)	Type of Heating System
RPBL	3,300 - 14,000	400 - 1,200	Indirect Fired
RPDBL	6,600 - 22,000	800 - 1,600	Indirect Fired
SSCBL	3,300 - 13,500	400 - 1,200	Separated Combustion
SSCDBL	6,600 - 22,000	800 - 1,600	Separated Combustion
RDF	1,000 - 28,000	400 - 3,000	Direct Fired
ADF	2,000 - 15,500	500 - 1,250	Direct Fired
ADFH	2,000 - 15,500	500 - 1,250	Direct Fired
DFC	20,000 - 90,000	4,000 - 12,800	Direct Fired
AEB	3,250 - 150,000	250 - 7,500	Indirect Fired
PCD	1,700 - 110,000	250 - 7,500	Indirect Fired
HPCD	3,100 - 140,000	250 - 7,500	Indirect Fired

PACKAGED AIR CONDITIONING SYSTEMS

Model RDCC

The breadth of the P125 system can cover more applications than any other standard packaged equipment. Optional gas or electric heating is also available.

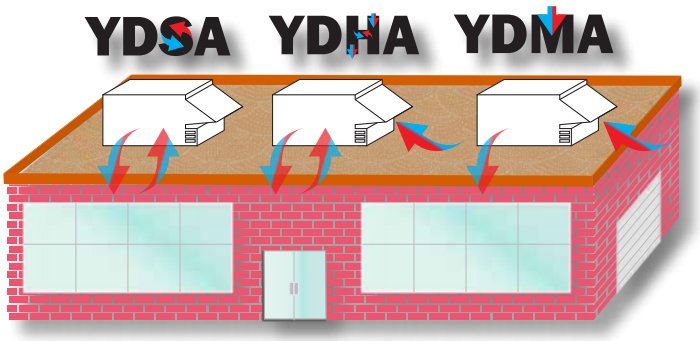


Illustration of how to apply P125 Series

Fresh Air

Using makeup air and ventilation air equipment is the primary method by which buildings insure good environmental conditions for people in the occupied spaces. In fact, dilution ventilation is a great way to reduce the spread of colds for a healthier building environment.

Applications:

- Corridor makeup air
- School ventilation
- Kitchen makeup air
- Theatre ventilation
- Manufacturing makeup air

SELECTION GUIDE

P125 Series

Model	Description	Cooling Capacity Range (Tons)	Heat Capacity Range (MBH) [Q]	Reheat Capacity (Tons)	CFM Range
YDMA	92% Efficient Gas Heating/DX Cooling Makeup Air System [R]	5 - 35	75 - 800		650 - 9,000
YDSA	92% Efficient Gas Heating/DX Cooling Recirculation System [R]	10 - 25	100 - 400		3,000 - 11,550
YDHA	92% Efficient Gas Heating/DX Cooling Hybrid System [R]	10 - 35	75 - 80		750 - 10,550

Modular Air Processing Systems (MAPS®)

Model	Description	Cooling Capacity Range (Tons)	Heat Capacity Range (MBH) [Q]	Reheat Capacity (Tons)	CFM Range
RCC	-	5 - 34	-	-	1,000 - 9,000
RDC	-	7 - 40	-	2 - 6	1,000 - 9,000
RDCC	Natural Gas	5 - 34	100 - 1,000	-	1,000 - 9,000
RDDC	Natural Gas	7 - 40	100 - 1,000	2 - 6	1,000 - 9,000
RECC	Electric Heat	5 - 34	10 - 88 kW	-	1,000 - 9,000
REDC	Electric Heat	7 - 40	10 - 88 kW	2 - 6	1,000 - 9,000

[R] Models YDMA, YDSA and YDHA heating is optional. Available in high efficiency (80%) or super high efficiency (92%) gas heating.

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All the support and information you need is just a manual, download, CD, or phone call away.

PRINTED MANUALS

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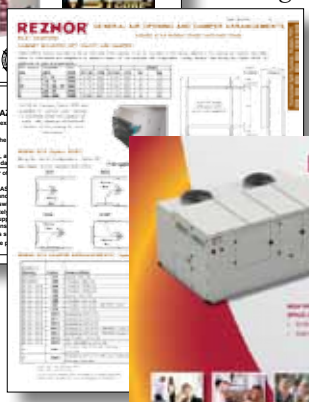

Brochures

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Selection Software

Distributor Locator

Other features of the Reznor Website:

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Deputy Secretary

TECHNICAL MEMORANDUM

DATE: September 9, 2013

TO: All Permitting Staff

FROM: Daren Zigich

THROUGH: Ted Schooley, Permit Program Manager
Ned Jerabek, Major Source Section Manager

SUBJECT: Calculating TSP, PM-10 and PM-2.5 from Cooling Towers

The goal of this memo is to offer a Department approved step-by-step approach for calculating particulate emissions from cooling towers. While the Department encourages using this approach, other approaches, that do not use a droplet settling ratio may be approved on a case-by-case basis.

Due to the variability of methods used by permittees to estimate particulate emissions from cooling towers, a consistent, defensible approach is warranted. For example, some permittees have used a droplet settling ratio from Reference 3 to lower the total potential emissions rate of total particulate matter (PM_{total}). This is unacceptable due to the following:

1. Particulate settling is not appropriate since any verification testing would be completed inside the cooling tower fan stack. All particulate mass that can be measured by an EPA reference method and are emitted to the atmosphere shall be counted as particulate emissions. Particle size distribution can then be used to modify the emission rate of each regulated particulate size.
2. The Department is not aware of information that verifies the droplet settling data is representative for arid climates where evaporation rates are high.
3. The droplet size distribution and % mass data from Reference 1 only consider droplets up to 600 microns. Reference 3 states that settling only exists for droplets greater than 450 microns. Reference 1 lists the % mass of droplets greater than 450 microns to be less than 1 percent of the total mass.

4. Reference 2 test data shows that towers with significant drift droplet diameters greater than 600 microns usually suffer from poor installation of the drift eliminator or from poor water distribution due to issues with the tower packing. Large droplets may indicate that the assumed or guaranteed drift eliminator efficiency is not being met. Providing emissions credit for poor installation, operation or maintenance runs counter to general Department practice.
5. References 1 and 2 make no reference to and assign no credit for the settling theory stated in Reference 3.

For the above reasons, the Reference 3 settling ratio is not an acceptable emissions reduction approach.

Acceptable Calculation Method

Cooling tower particulate emissions are a function of the Drift rate and the concentration of dissolved solids present in the water. The Drift rate is normally listed as a percentage of the circulating water flow rate of the cooling tower.

Step 1 – Establish maximum water circulation rate (Q_{circ}) for the cooling tower. This is usually dependent on the capacity of the circulation pumps and the plant cooling system and should be reported as gallons per minute (gpm). The circulation rate is the sum of the circulation rates for each cell in the tower and thus represents the total flow for the tower.

Step 2 – Establish Drift rate (Q_{drift}) of the cooling tower. This information is dependent on the drift eliminator design and is usually supplied by the tower manufacturer. If manufacturer data is unavailable, the standard drift of 0.02 percent, listed in AP-42, should be used.

Step 3 – Establish maximum Total Dissolved Solids concentration (TDS) in the circulating cooling water. This is dependent on the facility's operations. TDS should be reported as parts per million (ppm) or mg/l.

Step 4 – Calculate total potential hourly particulate emissions (PM_{total}) in pounds per hour (lbs/hr).

$$PM_{total} = TDS(mg/l) \times \frac{1(lbs/mg)}{453{,}600} \times 3.785(l/gal) \times Q_{circ}(gpm) \times \frac{Q_{drift}(\%Q_{circ})}{100} \times 60(min/hr)$$

Example: TDS = 3000 ppm or mg/l, Q_{circ} = 50,000 gpm, Q_{drift} = 0.004%

$PM_{total} = 3000 \times (1/453{,}600) \times 3.785 \times 50{,}000 \times (0.004/100) \times 60$

PM_{total} = 3.0 lbs/hr

Step 5 – Estimate particulate size distribution of the PM_{total} to determine potential emissions of TSP/PM, PM_{10} and $PM_{2.5}$.

The current estimating technique used in References 1 and 2 employs a formula for determining a potential particulate size (i.e. diameter) for a given set of variables. The variables are:

d_d = Drift droplet diameter, microns
C_{TDS} = Concentration of TDS in the circulating water, ppm x 10^{-6}
ρ_w = Density of Drift droplet, g/cm^3
ρ_{salt} = Density of particle, g/cm^3

The equation for determining particle size/diameter (d_p), in microns is:

$$d_p = \frac{d_d}{(\rho_{salt} / \rho_w C_{TDS})^{1/3}}$$

The tables below list particle size related to droplet size for various concentrations (1000 ppm to 12,000 ppm) of TDS in the circulating cooling water. The density of the water droplet (ρ_w) is assumed to be 1.0 g/cm3 (based on density of pure water) and the average density of the TDS salts is assumed to be 2.5 g/cm3. This assumed density is selected based on the average density of common TDS constituents, $CaCO_3$, $CaSO_4$, $CaCl_2$ NaCl, Na_2SO_4, and Na_2CO_3. If actual circulating water constituents are available, that data may be used to estimate the dissolved solids average density.

To determine the droplet size that generates particulate matter of the applicable regulated diameters, TSP/PM (defined as 30 microns or less per NM AQB definition[1]), PM10 and PM2.5, find the column in the table that matches the maximum circulating water TDS concentration and read the values associated with the PM2.5, PM10 and TSP/PM boxes. Boxed values are not exactly equal to the applicable sizes, but are the values greater than and closest to the applicable sizes, given the listed water droplet values from Reference 1.

The far right column of each table provides mass distribution data from Reference 1. The values indicate what percent of the total particulate mass emission, calculated in Step 4, is associated with the applicable particulate size. Read the value that is on the same line (same color) as the applicable particulate size associated with the specified TDS concentration column.

Note: Although the relationship between droplet size and percent mass is not linear, a linear interpolation of the tabulated data is acceptable between two adjacent rows (particle size) to determine an estimate of percent mass for a specific particle size (i.e. PM30, PM10 and PM2.5). Particle sizes for droplets with a non-listed TDS ppm concentration may be calculated using the equation in Step 5.

Example: Continuing from Step 4,

PM_{total} = 3.0 lbs/hr
C_{TDS} = 3000 ppm

From Table:

$PM_{2.5}$:	d_d = 30	%Mass = 0.226%
PM_{10}:	d_d = 110	%Mass = 70.509%
TSP/PM:	d_d = 270	%Mass = 96.288%

The mass emission of each applicable particulate size is:

$PM_{2.5} = PM_{total}(\%Mass/100) = 3.0(0.00226) = 0.007$ lbs/hr
$PM_{10} = 3.0(.70509) = 2.115$ lbs/hr
TSP/PM = 3.0(.96288) = 2.889 lbs/hr

[1]Definition of TSP for purposes of permitting emission sources, 11/2/09, see P:\AQB-Permits-Section\NSR-TV-Common\Permitting-Guidance-Documents – Index & Links document

Size Distribution

1000 ppm (TDS)		2000 ppm		3000 ppm		% Mass
d_d	d_p	d_d	d_p	d_d	d_p	≤
10	0.7387304	10	0.930527	10	1.0650435	0
20	1.4774608	20	1.8610539	20	2.130087 PM2.5	0.196
30	2.2161912	30	2.7915809 PM2.5	30	3.1951306 PM2.5	0.226
40	2.9549216 PM2.5	40	3.7221079	40	4.2601741	0.514
50	3.693652	50	4.6526349	50	5.3252176	1.816
60	4.4323825	60	5.5831618	60	6.3902611	5.702
70	5.1711129	70	6.5136888	70	7.4553046	21.348
90	6.6485737	90	8.3747427	90	9.5853917	49.812
110	8.1260345	110	10.235797 PM10	110	11.715479 PM10	70.509
130	9.6034953	130	12.096851	130	13.845566	82.023
150	11.080956 PM10	150	13.957905	150	15.975653	88.012
180	13.297147	180	16.749485	180	19.170783	91.032
210	15.513339	210	19.541066	210	22.365914	92.468
240	17.72953	240	22.332647	240	25.561045	94.091
270	19.945721	270	25.124228	270	28.756175	94.689
300	22.161912	300	27.915809	300	31.951306 TSP/PM30	96.288
350	25.855564	350	32.568444 TSP/PM30	350	37.276523	97.011
400	29.549216	400	37.221079	400	42.601741	98.34
450	33.242868 TSP/PM30	450	41.873714	450	47.926958	99.071
500	36.93652	500	46.526349	500	53.252176	99.071
600	44.323825	600	55.831618	600	63.902611	100

Size Distribution

4000 ppm (TDS)		5000 ppm		6000 ppm		% Mass
d_d	d_p	d_d	d_p	d_d	d_p	≤
10	1.1721197	10	1.2625337	10	1.3415607	0
20	2.3442393	20	2.5250675 PM2.5	20	2.6831215 PM2.5	0.196
30	3.516359 PM2.5	30	3.7876012	30	4.0246822	0.226
40	4.6884787	40	5.0501349	40	5.366243	0.514
50	5.8605984	50	6.3126686	50	6.7078037	1.816
60	7.032718	60	7.5752024	60	8.0493645	5.702
70	8.2048377	70	8.8377361	70	9.3909252	21.348
90	10.549077 PM10	90	11.362804 PM10	90	12.074047 PM10	49.812
110	12.893316	110	13.887871	110	14.757168	70.509
130	15.237556	130	16.412938	130	17.44029	82.023
150	17.581795	150	18.938006	150	20.123411	88.012
180	21.098154	180	22.725607	180	24.148093	91.032
210	24.614513	210	26.513208	210	28.172776	92.468
240	28.130872	240	30.300809 TSP/PM30	240	32.197458 TSP/PM30	94.091
270	31.647231 TSP/PM30	270	34.088411	270	36.22214	94.689
300	35.16359	300	37.876012	300	40.246822	96.288
350	41.024188	350	44.18868	350	46.954626	97.011
400	46.884787	400	50.501349	400	53.66243	98.34
450	52.745385	450	56.814018	450	60.370234	99.071
500	58.605984	500	63.126686	500	67.078037	99.071
600	70.32718	600	75.752024	600	80.493645	100

Size Distribution

7000 ppm (TDS)		8000 ppm		9000 ppm		% Mass
d_d	d_p	d_d	d_p	d_d	d_p	≤
10	1.4122241	10	1.4764371	10	1.5354962	0
20	2.8244482 PM2.5	20	2.9528742 PM2.5	20	3.0709923 PM2.5	0.196
30	4.2366724	30	4.4293112	30	4.6064885	0.226
40	5.6488965	40	5.9057483	40	6.1419846	0.514
50	7.0611206	50	7.3821854	50	7.6774808	1.816
60	8.4733447	60	8.8586225	60	9.2129769	5.702
70	9.8855688	70	10.33506 PM10	70	10.748473 PM10	21.348
90	12.710017 PM10	90	13.287934	90	13.819465	49.812
110	15.534465	110	16.240808	110	16.890458	70.509
130	18.358914	130	19.193682	130	19.96145	82.023
150	21.183362	150	22.146556	150	23.032442	88.012
180	25.420034	180	26.575867	180	27.638931	91.032
210	29.656707	210	31.005179 TSP/PM30	210	32.245419 TSP/PM30	92.468
240	33.893379 TSP/PM30	240	35.43449	240	36.851908	94.091
270	38.130051	270	39.863801	270	41.458396	94.689
300	42.366724	300	44.293112	300	46.064885	96.288
350	49.427844	350	51.675298	350	53.742365	97.011
400	56.488965	400	59.057483	400	61.419846	98.34
450	63.550085	450	66.439668	450	69.097327	99.071
500	70.611206	500	73.821854	500	76.774808	99.071
600	84.733447	600	88.586225	600	92.129769	100

Size Distribution

10,000 ppm (TDS)		11,000 ppm		12,000 ppm		% Mass
d_d	d_p	d_d	d_p	d_d	d_p	≤
10	1.5903253	10	1.6416091	10	1.6898701	0
20	3.1806507 PM2.5	20	3.2832181 PM2.5	20	3.3797403 PM2.5	0.196
30	4.770976	30	4.9248272	30	5.0696104	0.226
40	6.3613013	40	6.5664363	40	6.7594806	0.514
50	7.9516267	50	8.2080453	50	8.4493507	1.816
60	9.541952	60	9.8496544	60	10.139221 PM10	5.702
70	11.132277 PM10	70	11.491263 PM10	70	11.829091	21.348
90	14.312928	90	14.774482	90	15.208831	49.812
110	17.493579	110	18.0577	110	18.588572	70.509
130	20.674229	130	21.340918	130	21.968312	82.023
150	23.85488	150	24.624136	150	25.348052	88.012
180	28.625856	180	29.548963	180	30.417663 TSP/PM30	91.032
210	33.396832 TSP/PM30	210	34.47379 TSP/PM30	210	35.487273	92.468
240	38.167808	240	39.398618	240	40.556883	94.091
270	42.938784	270	44.323445	270	45.626494	94.689
300	47.70976	300	49.248272	300	50.696104	96.288
350	55.661387	350	57.456317	350	59.145455	97.011
400	63.613013	400	65.664363	400	67.594806	98.34
450	71.56464	450	73.872408	450	76.044156	99.071
500	79.516267	500	82.080453	500	84.493507	99.071
600	95.41952	600	98.496544	600	101.39221	100

References

1. Calculating Realistic PM10 Emissions from Cooling Towers, Abstract No. 216 Session No. AS-1b, J. Reisman and G. Frisbie, Greyston Environmental Consultants, Inc.
2. Cooling Tower Particulate Matter and Drift Rate Emissions Testing Using the Cooling Technology Institute Test Code – CTI ATC-140, August 2003 EPRI Cooling Tower Technology Conference, K. Hennnon, P.E., D. Wheeler, P.E., Power Generation Technology.
3. Effects of Pathogenic and Toxic Materials Transported Via Cooling Device Drift, Vol. 1 Technical Report, EPA-600/7-79-251a, H.D. Freudenthal, J.E. Rubinstein, and A. Uzzo, November 1979.

13.4 Wet Cooling Towers

13.4.1 General[1]

Cooling towers are heat exchangers that are used to dissipate large heat loads to the atmosphere. They are used as an important component in many industrial and commercial processes needing to dissipate heat. Cooling towers may range in size from less than $5.3(10)^6$ kilojoules (kJ) ($5[10]^6$ British thermal units per hour [Btu/hr]) for small air conditioning cooling towers to over $5275(10)^6$ kJ/hr ($5000[10^6]$ Btu/hr) for large power plant cooling towers.

When water is used as the heat transfer medium, wet, or evaporative, cooling towers may be used. Wet cooling towers rely on the latent heat of water evaporation to exchange heat between the process and the air passing through the cooling tower. The cooling water may be an integral part of the process or may provide cooling via heat exchangers.

Although cooling towers can be classified several ways, the primary classification is into dry towers or wet towers, and some hybrid wet-dry combinations exist. Subclassifications can include the draft type and/or the location of the draft relative to the heat transfer medium, the type of heat transfer medium, the relative direction of air movement, and the type of water distribution system.

In wet cooling towers, heat transfer is measured by the decrease in the process temperature and a corresponding increase in both the moisture content and the wet bulb temperature of the air passing through the cooling tower. (There also may be a change in the sensible, or dry bulb, temperature, but its contribution to the heat transfer process is very small and is typically ignored when designing wet cooling towers.) Wet cooling towers typically contain a wetted medium called "fill" to promote evaporation by providing a large surface area and/or by creating many water drops with a large cumulative surface area.

Cooling towers can be categorized by the type of heat transfer; the type of draft and location of the draft, relative to the heat transfer medium; the type of heat transfer medium; the relative direction of air and water contact; and the type of water distribution system. Since wet, or evaporative, cooling towers are the dominant type, and they also generate air pollutants, this section will address only that type of tower. Diagrams of the various tower configurations are shown in Figure 13.4-1 and Figure 13.4-2.

13.4.2 Emissions And Controls[1]

Because wet cooling towers provide direct contact between the cooling water and the air passing through the tower, some of the liquid water may be entrained in the air stream and be carried out of the tower as "drift" droplets. Therefore, the particulate matter constituent of the drift droplets may be classified as an emission.

The magnitude of drift loss is influenced by the number and size of droplets produced within the cooling tower, which in turn are determined by the fill design, the air and water patterns, and other interrelated factors. Tower maintenance and operation levels also can influence the formation of drift droplets. For example, excessive water flow, excessive airflow, and water bypassing the tower drift eliminators can promote and/or increase drift emissions.

Table 13.4-1 (Metric And English Units). PARTICULATE EMISSIONS FACTORS FOR WET COOLING TOWERS[a]

Tower Type[d]	Total Liquid Drift[b]				PM-10[c]		
	Circulating Water Flow[b]	g/daL	lb/10^3 gal	EMISSION FACTOR RATING	g/daL[e]	lb/10^3 gal	EMISSION FACTOR RATING
Induced Draft (SCC 3-85-001-01, 3-85-001-20, 3-85-002-01)	0.020	2.0	1.7	D	0.023	0.019	E
Natural Draft (SCC 3-85-001-02, 3-85-002-02)	0.00088	0.088	0.073	E	ND	ND	—

[a] References 1-17. Numbers are given to 2 significant digits. ND = no data. SCC = Source Classification Code.

[b] References 2,5-7,9-10,12-13,15-16. Total liquid drift is water droplets entrained in the cooling tower exit air stream. Factors are for % of circulating water flow (10^{-2} L drift/L [10^{-2} gal drift/gal] water flow) and g drift/daL (lb drift/10^3 gal) circulating water flow. 0.12 g/daL = 0.1 lb/10^3 gal; 1 daL = 10^1 L.

[c] See discussion in text on how to use the table to obtain PM-10 emission estimates. Values shown above are the arithmetic average of test results from References 2,4,8, and 11-14, and they imply an effective TDS content of approximately 12,000 parts per million (ppm) in the circulating water.

[d] See Figure 13.4-1 and Figure 13.4-2. Additional SCCs for wet cooling towers of unspecified draft type are 3-85-001-10 and 3-85-002-10.

[e] Expressed as g PM-10/daL (lb PM-10/10^3 gal) circulating water flow.

parameter for the cooling tower water (such as conductivity, calcium, chlorides, or phosphate) to that parameter for the make-up water. This estimated cooling tower TDS can be used to calculate the PM-10 emission factor as above. If neither of these methods can be used, the arithmetic average PM-10 factor given in Table 13.4-1 can be used. Table 13.4-1 presents the arithmetic average PM-10 factor calculated from the test data in References 2, 4, 8, and 11 - 14. Note that this average corresponds to an effective cooling tower recirculating water TDS content of approximately 11,500 ppm for induced draft towers. (This can be found by dividing the total liquid drift factor into the PM-10 factor.)

As an alternative approach, if TDS data are unavailable for an induced draft tower, a value may be selected from Table 13.4-2 and then be combined with the total liquid drift factor in Table 13.4-1 to determine an apparent PM-10 factor.

As shown in Table 13.4-2, available data do not suggest that there is any significant difference between TDS levels in counter and cross flow towers. Data for natural draft towers are not available.

Table 13.4-2. SUMMARY STATISTICS FOR TOTAL DISSOLVED SOLIDS (TDS) CONTENT IN CIRCULATING WATER[a]

Type Of Draft	No. Of Cases	Range Of TDS Values (ppm)	Geometric Mean TDS Value (ppm)
Counter Flow	10	3700 - 55,000	18,500
Cross Flow	7	380 - 91,000	24,000
Overall[b]	17	380 - 91,000	20,600

[a] References 2,4,8,11-14.
[b] Data unavailable for natural draft towers.

References For Section 13.4

1. *Development Of Particulate Emission Factors For Wet Cooling Towers*, EPA Contract No. 68-D0-0137, Midwest Research Institute, Kansas City, MO, September 1991.

2. *Cooling Tower Test Report, Drift And PM-10 Tests T89-50, T89-51, And T89-52*, Midwest Research Institute, Kansas City, MO, February 1990.

3. *Cooling Tower Test Report, Typical Drift Test*, Midwest Research Institute, Kansas City, MO, January 1990.

4. *Mass Emission Measurements Performed On Kerr-McGee Chemical Corporation's Westend Facility*, Kerr-McGee Chemical Corporation, Trona, CA, And Environmental Systems Corporation, Knoxville, TN, December 1989.

5. Confidential Cooling Tower Drift Test Report For Member Of The Cooling Tower Institute, Houston, TX, Midwest Research Institute, Kansas City, MO, January 1989.

6. Confidential Cooling Tower Drift Test Report For Member Of The Cooling Tower Institute, Houston, TX, Midwest Research Institute, Kansas City, MO, October 1988.

7. Confidential Cooling Tower Drift Test Report For Member Of The Cooling Tower Institute, Houston, TX, Midwest Research Institute, Kansas City, MO, August 1988.

8. *Report Of Cooling Tower Drift Emission Sampling At Argus And Sulfate #2 Cooling Towers*, Kerr-McGee Chemical Corporation, Trona, CA, and Environmental Systems Corporation, Knoxville, TN, February 1987.

9. Confidential Cooling Tower Drift Test Report For Member Of The Cooling Tower Institute, Houston, TX, Midwest Research Institute, Kansas City, MO, February 1987.

10. Confidential Cooling Tower Drift Test Report For Member Of The Cooling Tower Institute, Houston, TX, Midwest Research Institute, Kansas City, MO, January 1987.

13.2.1 Paved Roads

13.2.1.1 General

Particulate emissions occur whenever vehicles travel over a paved surface such as a road or parking lot. Particulate emissions from paved roads are due to direct emissions from vehicles in the form of exhaust, brake wear and tire wear emissions and resuspension of loose material on the road surface. In general terms, resuspended particulate emissions from paved roads originate from, and result in the depletion of, the loose material present on the surface (i.e., the surface loading). In turn, that surface loading is continuously replenished by other sources. At industrial sites, surface loading is replenished by spillage of material and trackout from unpaved roads and staging areas. Figure 13.2.1-1 illustrates several transfer processes occurring on public streets.

Various field studies have found that public streets and highways, as well as roadways at industrial facilities, can be major sources of the atmospheric particulate matter within an area.[1-9] Of particular interest in many parts of the United States are the increased levels of emissions from public paved roads when the equilibrium between deposition and removal processes is upset. This situation can occur for various reasons, including application of granular materials for snow and ice control, mud/dirt carryout from construction activities in the area, and deposition from wind and/or water erosion of surrounding unstabilized areas. In the absence of continuous addition of fresh material (through localized track out or application of antiskid material), paved road surface loading should reach an equilibrium value in which the amount of material resuspended matches the amount replenished. The equilibrium surface loading value depends upon numerous factors. It is believed that the most important factors are: mean speed of vehicles traveling the road; the average daily traffic (ADT); the number of lanes and ADT per lane; the fraction of heavy vehicles (buses and trucks); and the presence/absence of curbs, storm sewers and parking lanes.[10]

The particulate emission factors presented in a previous version of this section of AP-42, dated October 2002, implicitly included the emissions from vehicles in the form of exhaust, brake wear, and tire wear as well as resuspended road surface material. EPA included these sources in the emission factor equation for paved roads since the field testing data used to develop the equation included both the direct emissions from vehicles and emissions from resuspension of road dust.

This version of the paved road emission factor equation only estimates particulate emissions from resuspended road surface material[28]. The particulate emissions from vehicle exhaust, brake wear, and tire wear are now estimated separately using EPA's MOVES [29] model. This approach eliminates the possibility of double counting emissions. Double counting results when employing the previous version of the emission factor equation in this section and MOVES to estimate particulate emissions from vehicle traffic on paved roads. It also incorporates the decrease in exhaust emissions that has occurred since the paved road emission factor equation was developed. Earlier versions of the paved road emission factor equation includes estimates of emissions from exhaust, brake wear, and tire wear based on emission rates for vehicles in the 1980 calendar year fleet. The amount of PM released from vehicle exhaust has decreased since 1980 due to lower new vehicle emission standards and changes in fuel characteristics.

13.2.1.3 Predictive Emission Factor Equations[10,29]

The quantity of particulate emissions from resuspension of loose material on the road surface due to vehicle travel on a dry paved road may be estimated using the following empirical expression:

$$E = k\,(sL)^{0.91} \times (W)^{1.02} \qquad (1)$$

where: E = particulate emission factor (having units matching the units of k),

k = particle size multiplier for particle size range and units of interest (see below),

sL = road surface silt loading (grams per square meter) (g/m^2), and

W = average weight (tons) of the vehicles traveling the road.

It is important to note that Equation 1 calls for the average weight of all vehicles traveling the road. For example, if 99 percent of traffic on the road are 2 ton cars/trucks while the remaining 1 percent consists of 20 ton trucks, then the mean weight "W" is 2.2 tons. More specifically, Equation 1 is *not* intended to be used to calculate a separate emission factor for each vehicle weight class. Instead, only one emission factor should be calculated to represent the "fleet" average weight of all vehicles traveling the road.

The particle size multiplier (k) above varies with aerodynamic size range as shown in Table 13.2.1-1. To determine particulate emissions for a specific particle size range, use the appropriate value of k shown in Table 13.2.1-1.

To obtain the total emissions factor, the emission factors for the exhaust, brake wear and tire wear obtained from either EPA's MOBILE6.2 [27] or MOVES2010 [29] model should be added to the emissions factor calculated from the empirical equation.

Table 13.2.1-1. PARTICLE SIZE MULTIPLIERS FOR PAVED ROAD EQUATION

Size range[a]	Particle Size Multiplier k[b]		
	g/VKT	g/VMT	lb/VMT
PM-2.5[c]	0.15	0.25	0.00054
PM-10	0.62	1.00	0.0022
PM-15	0.77	1.23	0.0027
PM-30[d]	3.23	5.24	0.011

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

[d] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

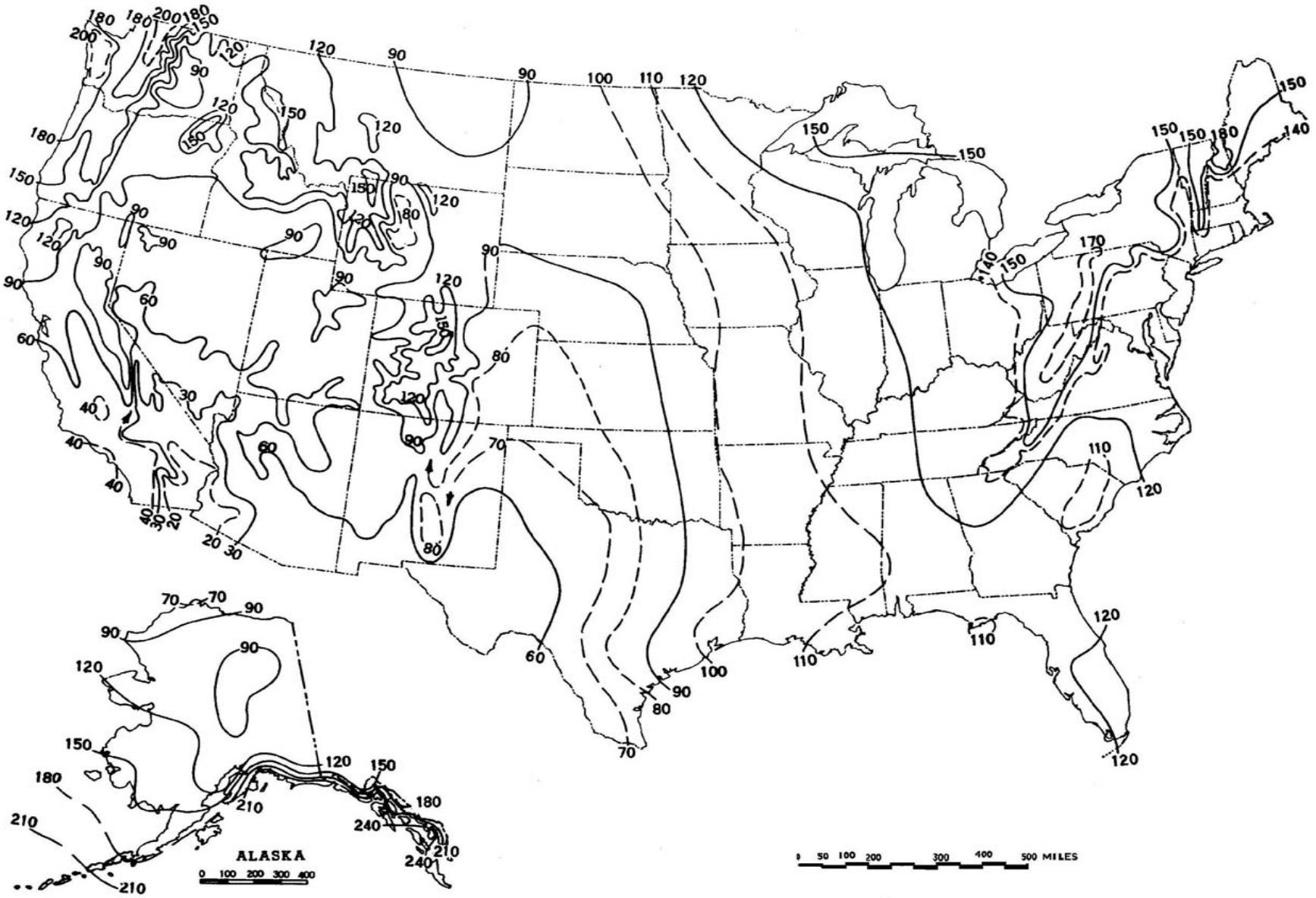

Figure 13.2.1-2. Mean number of days with 0.01 inch or more of precipitation in the United States.

New Mexico Environment Department
Air Quality Bureau
Compliance and Enforcement Section
1301 Siler Road Building B
Santa Fe, NM 87507
Phone (505) 476-4300 Fax (505) 476-4375

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REPORTING SUBMITTAL FORM

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Staff	
Admin	

PLEASE NOTE: ® - Indicates required field

SECTION I - GENERAL COMPANY AND FACILITY INFORMATION

A. ® Company Name: DairiConcepts, LLC			D. ® Facility Name: Portales Plant		
B.1 ® Company Address: 3253 East Chestnut Expressway			E.1 ® Facility Address: 1820 South Industrial Drive		
B.2 ® City: Springfield	B.3 ® State: Mo	B.4 ® Zip: 65802□	E.2 ® City: Portales	E.3 ® State: NM	E.4 ® Zip: 88130
C.1 ® Company Environmental Contact: Cheryl Akers	C.2 ® Title: Mgr. Environmental Com		F.1 ® Facility Contact: Ed Steven	F.2 ® Title: Site Manager	
C.3 ® Phone Number: (417) 829-3762	C.4 ® Fax Number: (417) 829-3763		F.3 ® Phone Number: (575) 359-3902	F.4 ® Fax Number: (575) 359-3903	
C.5 ® Email Address: cakers@dfamilk.com			F.5 ® Email Address: estevan@dairiconcepts.com		
G. Responsible Official: (Title V only): Ed Steven	H. Title: Site Manager		I. Phone Number: (575) 359-3902	J. Fax Number: (575) 359-3903	

K. ® AI Number:	L. Title V Permit Number:	M. Title V Permit Issue Date:	N. NSR Permit Number:	O. NSR Permit Issue Date:
1094	P234-R1	2/18/2011	1263-M3R4	8/24/2011

P. Reporting Period: From: To:	OR	Q. Proposed Test Date: December 19 - 23, 2011	OR	R. Actual Test Date: December 19 - 22, 2011

SECTION II – TYPE OF SUBMITTAL (check one that applies)

A. ☐	Title V Annual Compliance Certification	Permit Condition(s):	Description:	
B. ☐	Title V Semi-annual Monitoring Report	Permit Condition(s):	Description:	
C. ☐	NSPS Requirement (40CFR60)	Regulation:	Section(s):	Description:
D. ☐	MACT Requirement (40CFR63)	Regulation:	Section(s):	Description:
E. ☐	NMAC Requirement (20.2.xx) or NESHAP Requirement (40CFR61)	Regulation:	Section(s):	Description:
F. ☐	Permit or Notice of Intent (NOI) Requirement	Permit No.☐: or NOI No.☐:	Condition(s):	Description:
G. ☐	Requirement of an Enforcement Action	NOV No. ☐: or SFO No. ☐: or CD No. ☐: or Other ☐:	Section(s):	Description:

SECTION III – PERIODIC EMISSIONS TEST NOTIFICATIONS, TEST PROTOCOLS AND TEST REPORTS (if applicable)

T. ☐	A. Test Report ☒ CMT:____	B. Test Protocol ☐	C. Notification ☐ CMT:____	Description: (Emission Units to be Tested)
	D. Initial Compliance Test (EPA Methods) ☐	E. Periodic Test (EPA Methods) ☒	F. RATA Test ☐	G. Opacity Test ☐	H. Portable Analyzer (Periodic Test) ☐	D-1 (Niro) consisting of one stack. D-2 (CE Rogers) consisting of 3 stacks

SECTION IV - CERTIFICATION

After reasonable inquiry, I Ed Steven (name of reporting official) certify that the information in this submittal is true, accurate and complete.

® Signature of Reporting Official	® Title:	® Date	® Responsible Official for Title V?
	Site Manager	02/06/12	☒ Yes ☐ No

Reviewed By: _____ Date Reviewed: _____

New Mexico Environment Department
Air Quality Bureau
1301 Siler Road Building B
Santa Fe, NM 87507
Phone (505) 476-4300 Fax (505) 476-4375

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UNIVERSAL STACK TEST NOTIFICATION, PROTOCOL AND REPORT FORM

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Admin	

Submit to: Stacktest.aqb@state.nm.us

I. DATABASE HEADER INFORMATION (drop down menus in bold)

a. AI#		
1094	Test Notification/Protocol	Periodic Test (EPA Method)

d. Company Name:	e. Facility Name:
DairiConcepts, LLC.	Portales Plant

f. Emission Unit Numbers:	g. Emission Unit Description (boiler, Waukesha 7042, etc)
Dryer-2	Milk Dryer, CE Rogers, 50 mmbtu/hr

h. Reports - Tracking Number from notification response:	i. Proposed Test Date:	j. Actual test date:
CMT	Dec. 20 - 23, 2011	December 21- 22, 2011

k. Reason for test (name permit requirement, NSPS, MACT, consent decree, etc. Indicate here is this notification is a revised test date only)
Condition A-106 of Permit 1263-M3R4

II. GENERAL COMPANY AND FACILITY INFORMATION

a.Company Address:			k.. Facility Address:		
3253 East Chestnut Expressway			1820 South Industrial Drive		
b. City:	c. State:	d. Zip:	l. City:	m. State:	n. Zip:
Springfield	MO	65802	Portales	NM	88130
e. Environmental Contact:	f. Title:		o. Facility Contact:	p. Title:	
Cheryl Akers	Mgr. Environmental Com		Ed Steven	Site Manager	
g. Phone Number:	h. Cell Number:		q. Phone Number:	r. Cell Number:	
(417) 829-3762			(575) 359-3902		
i. Email Address:			s. Email Address:		
cakers@dfamilk.com			esteven@dairiconcepts.com		
j. Title V Permit Number:			t. NSR Permit Number:		
P234-R1			1263-M3R4		

u. Detailed driving directions from nearest New Mexico town:
From Portales: South on West 2nd Street (US-70). Turn right onto 18th Street. Turn left onto South Industrial Drive. Facility on right.

III. TESTING FIRM

a. Company:			g. Contact:	
Environmental Services and Testing			Tim Naquin	
b. Address 1:			h. Title:	
P.O. Box 2525			President, Project Engineer	
c. Address 2:			i. Office Phone:	j. Cell Phone:
			(480) 635-0828	(480) 236-6342
d. City:	e. State:	f. Zip:	k. Email Address:	
Gilbert	Az	85299	tinaquin@cox.net	

IV. EMISSION UNIT

a. Emission Unit Number:	b. Make & Model Number
Dryer-2	**CE Rogers**
c. Serial Number:	d. Permitted Capacity:
TCF-542	**50 mmbtu/hr**

e Exceptions: Explain if test is late, rescheduled, related to an enforcement action:

g. Emission Unit Description and brief process name or description:

Milk processing plant. Dryer-2 is the process being tested. It is equipped with two bag houes to control emissions. It is equipped with three stacks referred to as: North Stack, South Stack and Belt Vent Stack.

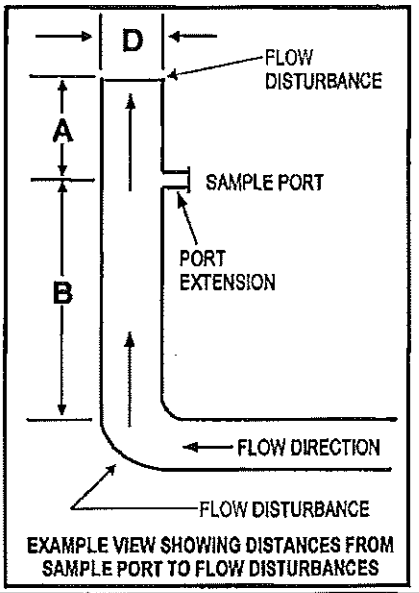
h. Installation Date:	i. Startup Date:	k. Date Reached Max. Capacity:

l. Control Equipment Description as listed in permit (model, ser. # etc. If applicable):

2 bag houses to control emissions.

STACK PARAMETERS

m. Velocity (ft/sec):	**See Tables**
n. Temperature (°C):	**See Tables**
o. Stack Diameter, D (in.):	**See Tables**
p. Distance to Stack Bends or Obstructions:	
Upstream, Distance A (in.):	**See Figures**
Downstream, Distance B (in.):	**See Figures**



EXAMPLE VIEW SHOWING DISTANCES FROM SAMPLE PORT TO FLOW DISTURBANCES

Attach an explanation or drawing to explain any difficult or unusual stack geometry or parameters.

V. POLLUTANTS AND PROPOSED TEST METHODS

Pollutant or Parameter:		Proposed Test Methods (Deviations from approved methods require supporting documentation and prior authorization)	Deviation to Test Method Requested
☐	**Portable Analyzer Methods for NOx, CO, SO_2**		☐
☒	NOx	**EPA Method 7E**	☐
☒	CO	**EPA Method 10**	☐
☐	SO2	**EPA Method 6**	☐
☒	VOCs	**(Specify) EPA Method 25A**	☐
☐	HAPs	**(Specify)**	☐
☒	PM (TSP)	**EPA Method 5**	☒
☐	PM10	**EPA Method 201**	☐
☐	PM2.5	**(Specify)**	☐
☒	Opacity	**EPA Method 9**	☐
☐	Visual E.	**EPA Method 22**	☐
☒	Stack Flow	**EPA Methods 1 - 3**	☐
☒	Moisture	**EPA Method 4**	☐
☐	Other	**(Specify)**	☐
☐	Other	**(Specify)**	☐

List Specific VOC's and HAP's:

VI. PROPOSED TEST RUN AND TEST LOAD INFORMATION

a. Number of Test Runs:	b. Run Duration	c. Required by (regulation or permit number):	d. Specific Condition or Section:
3	60 minutes	NSR 1263-M3R4	B 111 (3)

PLEASE NOTE – Default run duration is 60 minutes, unless otherwise specified by an applicable regulation.

e. Expected Load:	f. Percent of Permitted Capacity:	g. Is this an opacity test?	h. If yes, no. of observation pts.:
	Greater than 90% capacity	Yes ☒ No ☐	24 points (6-minute read)

i. If expected load during test is less than 90% of capacity, explain:

NOTE – Failure to test at 90-100% of permitted load will limit unit operation to 110% of tested load until a new initial compliance test is conducted.

PLANT OR UNIT OPERATING PARAMETERS TO BE MONITORED

j. List and explain the plant operating parameters that will be monitored and applicable permit conditions or regulatory standards.

Dryer-2 (North Stack); Tested December 21, 2011: Production Rate = 16,280 lb/hr
Dryer-2 (South Stack): Tested December 21, 2011: Production Rate = 16,640 lb/hr
Dryer-2 (Belt Vent): Tested December 22, 2011: Production Rate = 13,749 lb/hr

VII. ADDITIONAL DETAILS (where applicable)

RATA and INSTRUMENTAL ANALYZER CALIBRATION PROCEDURES

a. Do any of the methods you are proposing utilize instrumental analyzers (i.e.; EPA Methods 3A, 6C, 7E, 10, 18, 25/25A, 320 etc.)? If yes, briefly describe analyzer calibration procedures and/or calibration standard procedures. Enter the highest pollutant concentration expected and the proposed concentrations of calibration gases.	☒ Yes	☐ No

As described in EPA Methods 3A, 7E and 10.
O2: Calibration Range 25%
NOx: Calkibration Range 25 ppm
CO: Calibration Range: 50 ppm
VOC: Calibration Range 100 ppm

SAMPLING TRAIN LEAK CHECK PROCEDURES

b. Do any of the methods you are proposing utilize the EPA Method 5 sampling train (i.e.; EPA Methods 1-4, 5, 17, 26/26A, 29, etc.)? If yes, briefly describe sampling train and pitot tube leak check procedures:	☒ Yes	☐ No

As described in EPA Method 5

EPA METHOD 19 IN LIEU OF EPA METHODS 1-4

c. Are you proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4? If yes, explain why you believe this proposal is justified:	☐ Yes	☒ No

PLEASE NOTE – EPA Method 19 may be utilized in lieu of EPA Methods 1-4, subject to the approval of the Department. If you are proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4, you MUST include a recent fuel gas heating value analysis as well as a recent fuel flow meter calibration certificate, preferably conducted on the day of the test, but no earlier than three months prior to the test date. If the analyses have been conducted prior to the test date, you MUST append the certificates to the protocol. If conducted on the day of the test, you MUST append the certificates to the final test report.

VIII. ATTACHMENTS (as needed to support proposed test; check all that apply)		
NOTIFICATION/PROTOCOL ATTACHMENTS		
☐	Road Map Indicating Directions from Nearest New Mexico Town to Facility	
☒	Schematic of process being tested showing emission points, sampling sites and stack cross-section	
☐	Copy of proposed test methods (except for those promulgated test methods found in 40 CFR 51, 60, 61 and 63)	
☐	Fuel Heating Value Analysis	
☐	Fuel Flow Meter Calibration Certificate	
☒	Other:	**EST is requesting NMED to allow us to utilize a stainless steel liner in the Method 5 probe.**
☒	Other:	**Use TSP emissions results to report PM-10 and PM-2.5 emissions.**
TEST REPORT ATTACHMENTS		
☒	**Section 2. Tables of Results**	
☐	**Supporting Documents (Specify)**	
Retain Report Section 3 - Test Procedures, Data, Calculations, Appendices – 2 years NSR permits, 5 years TV		

IX. CERTIFICATION		
This document has been prepared under my supervision and is accurate and complete to the best of my knowledge. I understand that acceptance of this protocol does not waive the requirements of any permit or regulation. I understand that any procedural errors or omissions are the sole responsibility of the permit holder.		
Signature:	Print Name and Title: **Ed Steven, Site Manager**	Date: 02/06/12
Responsible Official for Title V? ☒ Yes ☐ No (R.O signature not required for routine periodic testing)		

Table 1. Executive Summary
Dryer-2

TSP, PM-10 and PM-2.5 Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	1.74	
Dryer-2 South Stack	lb/hr	1.56	
Belt Vent Stack	lb/hr	0.16	
Total	**lb/hr**	**3.46**	**18.1**

NOx Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	1.22	
Dryer-2 South Stack	lb/hr	1.02	
Belt Vent Stack	lb/hr	0.014	
Total	**lb/hr**	**2.25**	**8.0**

CO Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	0.89	
Dryer-2 South Stack	lb/hr	0.93	
Belt Vent Stack	lb/hr	0.26	
Total	**lb/hr**	**2.08**	**12.0**

VOC Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	0.0039	
Dryer-2 South Stack	lb/hr	0.0051	
Belt Vent Stack	lb/hr	0.0041	
Total	**lb/hr**	**0.013**	**0.3**

Table 2. Detailed Summary of Results
DairiConcepts
Dryer-2 North Stack

CEMS Results - NOx, CO, VOC and O_2: EPA Methods 3A, 7E, 10 and 25A

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	8:27	9:55	11:18	
End Time	military	9:27	10:55	12:18	
NOx Concentration	ppm	6.47	4.77	5.59	5.61
NOx Mass Flow Rate	**lb/hr**	**1.40**	**1.03**	**1.23**	**1.22**
CO Concentration	ppm	12.17	3.63	4.46	6.76
CO Mass Flow Rate	**lb/hr**	**1.61**	**0.48**	**0.60**	**0.89**
VOC Concentration	ppm	0	0	0.15	0.051
VOC Mass Flow Rate	**lb/hr**	**0**	**0**	**0.012**	**0.0039**
O_2 Level	%	17.93	19.74	19.47	19.05
CO_2 Level	%	0.33	0.40	0.37	0.37
Exhaust Rate	dscfm	30221	30213	30659	30364

TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	Military	8:27	9:55	11:18	
Finish Time	Military	9:34	11:02	12:26	
Duration Time	min	60	60	60	
Stack Temperature	F	188	189	191	
Stack Pressure	in Hg	25.86	25.86	25.86	
Average Pressure Head	in wc	0.34	0.33	0.35	
Velocity	ft/sec	39.14	38.80	39.73	39.22
Flow Rate	acfm	46084	45684	46778	46182
Flow Rate	dscfm	30221	30213	30659	30364
PM Loading	gr/dscf	0.0069	0.0067	0.0065	0.0067
PM Emission Rate	**lb/hr**	**1.78**	**1.72**	**1.70**	**1.74**

Table 3. Detailed Summary of Results
DairiConcepts
Dryer-2 South Stack

CEMS Results - NOx, CO, and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	13:20	14:43	21:33	
End Time	military	14:20	15:43	22:33	
NOx Concentration	ppm	5.40	5.05	3.70	4.72
NOx Mass Flow Rate	**lb/hr**	**1.19**	**1.08**	**0.80**	**1.02**
CO Concentration	ppm	10.37	5.92	4.92	7.07
CO Mass Flow Rate	**lb/hr**	**1.39**	**0.77**	**0.64**	**0.93**
VOC Concentration	ppm	0	0	0.20	0.068
VOC Mass Flow Rate	**lb/hr**	**0**	**0**	**0.015**	**0.0051**
O_2 Level	%	18.95	19.03	19.04	19.01
CO_2 Level	%	0.33	0.40	0.40	0.38
Exhaust Rate	dscfm	30623	29798	30030	30151

TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	Military	13:20	14:43	21:33	
Finish Time	Military	14:27	15:53	22:44	
Duration Time	min	60	60	60	
Stack Temperature	F	191	193	192	
Stack Pressure	in Hg	25.9	25.9	25.9	
Average Pressure Head	in wc	0.34	0.32	0.33	
Velocity	ft/sec	39.15	38.35	38.73	38.7
Flow Rate	acfm	46101	45160	45603	45621
Flow Rate	dscfm	30623	29798	30030	30151
PM Loading	gr/dscf	0.0058	0.0062	0.0061	0.0060
PM Emission Rate	**lb/hr**	**1.52**	**1.58**	**1.58**	**1.56**

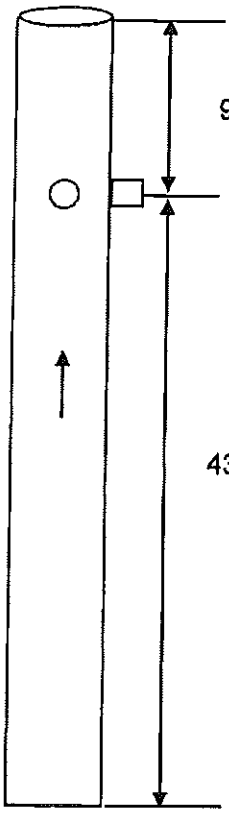
Table 4. Detailed Summary of Results
Dari Concepts
Dryer-2 Belt Vent

CEMS Results - NOx, CO, and O_2: EPA Methods 3A, 7E and 10

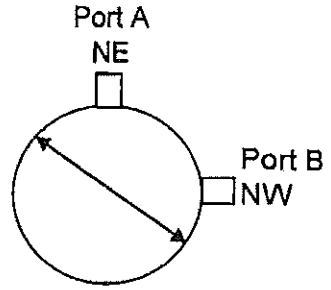
Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	9:41	11:09	12:46	
End Time	military	10:41	12:09	13:46	
NOx Concentration	ppm	0.28	0.080	0.75	0.37
NOx Mass Flow Rate	**lb/hr**	**0.010**	**0.0031**	**0.029**	**0.014**
CO Concentration	ppm	4.34	7.86	21.47	11.22
CO Mass Flow Rate	**lb/hr**	**0.10**	**0.18**	**0.50**	**0.26**
TOC Concentration	ppm	0.26	0.31	0.36	0.31
TOC Mass Flow Rate	**lb/hr**	**0.0034**	**0.0041**	**0.0048**	**0.0041**
O_2 Level	%	20.40	20.42	19.68	20.17
CO_2 Level	%	0.40	0.20	0.20	0.27
Exhaust Rate	dscfm	5304	5364	5351	5340

TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	Military	9:41	11:09	12:45	
Finish Time	Military	10:47	12:15	13:56	
Duration Time	min	60	60	60	
Stack Temperature	F	115	114	114	
Stack Pressure	in Hg	25.86	25.86	25.86	
Average Pressure Head	in wc	0.70	0.72	0.72	
Velocity	ft/sec	52.70	53.47	53.33	53.2
Flow Rate	acfm	6895	6996	6977	6956
Flow Rate	dscfm	5304	5364	5351	5340
PM Loading	gr/dscf	0.0035	0.0035	0.0032	0.0034
PM Emission Rate	**lb/hr**	**0.16**	**0.16**	**0.15**	**0.16**



Side View

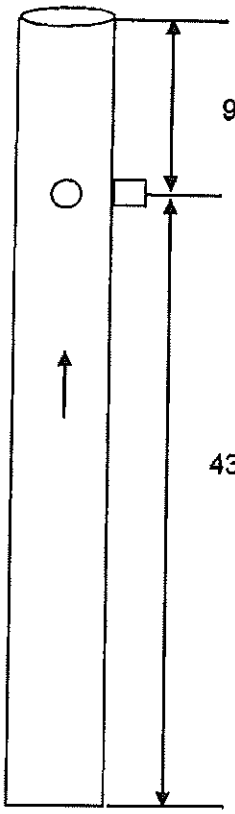


Top View

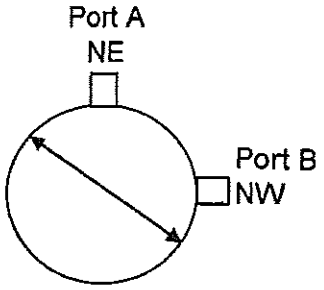
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure-1: Stack Dimensions and Traverse Points
Dryer 2 - North Stack



Side View

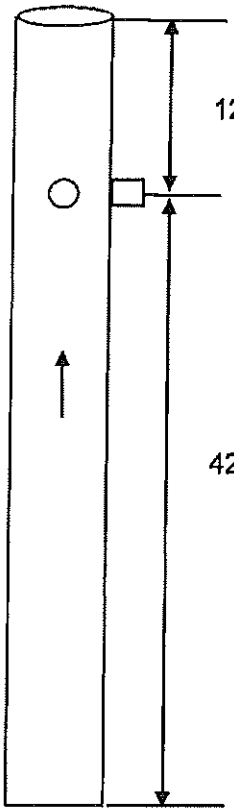


Top View

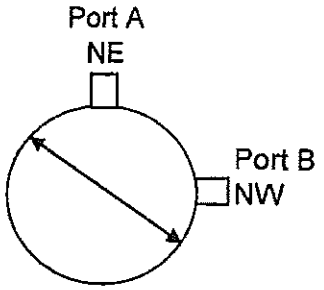
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure-2: Stack Dimensions and Traverse Points
Dryer 2 - South Stack



Side View



Top View

Diameter	20.0	Inches
Port Length	1.0	Inches
Upstream Diameters	6.0	Diameters
Downstream Diameters	21.0	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	0.5	1.5
2	6.7	1.3	2.3
3	11.8	2.4	3.4
4	17.7	3.5	4.5
5	25.0	5.0	6.0
6	35.6	7.1	8.1
7	64.4	12.9	13.9
8	75.0	15.0	16.0
9	82.3	16.5	17.5
10	88.2	17.6	18.6
11	93.3	18.7	19.7
12	97.9	0.5	1.5

Figure-3: Stack Dimensions and Traverse Points
Dryer 2 - Belt Vent Stack

New Mexico Environment Department
Air Quality Bureau
1301 Siler Road Building B
Santa Fe, NM 87507
Phone (505) 476-4300 Fax (505) 476-4375

Version 1/1/2010

NMED USE ONLY	
DTS	
TEMPO	

UNIVERSAL STACK TEST NOTIFICATION, PROTOCOL AND REPORT FORM

NMED USE ONLY	
Staff	
Admin	

Submit to: Stacktest.aqb@state.nm.us

I. DATABASE HEADER INFORMATION (drop down menus in bold)

a. AI#		
1094	**Test Report**	**Periodic Test (EPA Method)**

d. Company Name:	e. Facility Name:
Dairy Farmers of America	**DFA - Portales**

f. Emission Unit Numbers:	g. Emission Unit Description (boiler, Waukesha 7042, etc)
D-2	**CE Rogers Vertical Dryer, 50 mmbtu/hr**

h. Reports - Tracking Number from notification response:	i. Proposed Test Date:	j. Actual test date:
CMT	**Dec 28 - 31, 2012**	**Dec. 28 - 30, 2012**

k. Reason for test (name permit requirement, NSPS, MACT, consent decree, etc. Indicate here is this notification is a revised test date only)
Condition A106-I of Permit P234-R1M1 and Permit 12 63-M3R6

II. GENERAL COMPANY AND FACILITY INFORMATION

a. Company Address:			k.. Facility Address:		
3257 East Chestnut Expressway			**1820 South Industrial Drive**		
b. City:	c. State:	d. Zip:	l. City:	m. State:	n. Zip:
Springfield	**Mo**	**65802□**	**Portales**	**NM**	**88130**
e. Environmental Contact:	f. Title:		o. Facility Contact:	p. Title:	
Steve Moore	**Mgr. Environmental Com**		**Ed Steven**	**Site Manager**	
g. Phone Number:	h. Cell Number:		q. Phone Number:	r. Cell Number:	
(417) 829-3766	**(417) 829-3767**		**(575) 359-3902**	**(575) 359-3902**	
i. Email Address:			s. Email Address:		
cakers@dfamilk.com			**esteven@dfamilk.com**		
j. Title V Permit Number:			t. NSR Permit Number:		
P234-R1M1			**1263-M3R6**		

u. Detailed driving directions from nearest New Mexico town:
From Portales: South on West 2nd Street (US-70). Turn right onto 18th Street. Turn left onto South Industrial Drive. Facility on right.

III. TESTING FIRM

a. Company:			g. Contact:	
Environmental Services and Testing, Inc.			**Tim Naquin**	
b. Address 1:			h. Title:	
P.O. Box 2525			**President, Project Engineer**	
c. Address 2:			i. Office Phone:	j. Cell Phone:
			(480) 635-0828	**(480) 236-6342**
d. City:	e. State:	f. Zip:	k. Email Address:	
Gilbert	**Az**	**85299**	**tinaquin@cox.net**	

IV. EMISSION UNIT

a. Emission Unit Number:	b. Make & Model Number
D-2	CE Rogers
c. Serial Number:	d. Permitted Capacity:
TCF 542	50 mmbtu/hr

e Exceptions: Explain if test is late, rescheduled, related to an enforcement action:

Testing was originally scheduled for December 10, but was rescheduled for December 28 - December 30, 2012 due to a lack of milk. EST informed the Air Quality Bureau on December 3, 2012.

g. Emission Unit Description and brief process name or description:

Milk processing plant. D-2 is the process being tested. It is equipped with two baghouses to control emissions. It is also equipped with three referred to as : North Stack, South Stack and Belt Vent Stack.

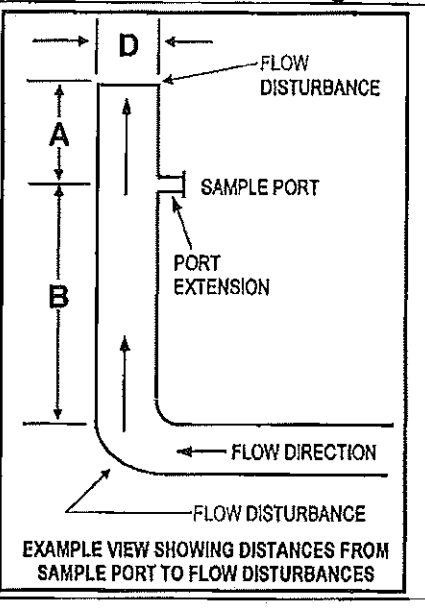
h. Installation Date:	i. Startup Date:	k. Date Reached Max. Capacity:

l. Control Equipment Description as listed in permit (model, ser. # etc. if applicable):

Two baghouses to control emissions

STACK PARAMETERS

m. Velocity (ft/sec):	See Tables
n. Temperature (°C):	See Tables
o. Stack Diameter, D (in.):	See tables
p. Distance to Stack Bends or Obstructions:	
Upstream, Distance A (in.):	See Diagrams
Downstream, Distance B (in.):	See Diagrams



EXAMPLE VIEW SHOWING DISTANCES FROM SAMPLE PORT TO FLOW DISTURBANCES

Attach an explanation or drawing to explain any difficult or unusual stack geometry or parameters.

V. POLLUTANTS AND PROPOSED TEST METHODS

Pollutant or Parameter:		Proposed Test Methods (Deviations from approved methods require supporting documentation and prior authorization)	Deviation to Test Method Requested
☐	**Portable Analyzer Methods for NOx, CO, SO_2**		☐
☒	NOx	EPA Method 7E	☐
☒	CO	EPA Method 10	☐
☐	SO2	EPA Method 6	☐
☐	VOCs	(Specify)	☐
☐	HAPs	(Specify)	☐
☒	PM (TSP)	EPA Method 5	☒
☐	PM10	EPA Method 201	☐
☐	PM2.5	(Specify)	☐
☐	Opacity	EPA Method 9	☐
☐	Visual E.	EPA Method 22	☐
☒	Stack Flow	EPA Methods 1 - 3	☐
☒	Moisture	EPA Method 4	☐
☐	Other	(Specify)	☐
☐	Other	(Specify)	☐

List Specific VOC's and HAP's:

VI. PROPOSED TEST RUN AND TEST LOAD INFORMATION

a. Number of Test Runs:	b. Run Duration	c. Required by (regulation or permit number):	d. Specific Condition or Section:
3	60 minutes	R234-R1M1	B.111

PLEASE NOTE – Default run duration is 60 minutes, unless otherwise specified by an applicable regulation.

e. Expected Load:	f. Percent of Permitted Capacity:	g. Is this an opacity test?	h. If yes, no. of observation pts.:
	Greater than 90% capacity	Yes ☐ No ☒	

i. If expected load during test is less than 90% of capacity, explain:

Dryer-2 (North Stack): Tested December 28, 2012: Production Rate = 12,155 lb/hr
Dryer-2 (South Stack): Tested December 29, 2012: Production Rate = 12,120 lb/hr
Dryer-2 (Belt Vent STack): Tested December 30, 2012: Producftion Rate = 10,702 lb/hr

NOTE – Failure to test at 90-100% of permitted load will limit unit operation to 110% of tested load until a new initial compliance test is conducted.

PLANT OR UNIT OPERATING PARAMETERS TO BE MONITORED

j. List and explain the plant operating parameters that will be monitored and applicable permit conditions or regulatory standards.

Production rate, which must be greater than 90% of permitted capacity. The permitted production rate for D-2 is 21,100 lb/hr.

VII. ADDITIONAL DETAILS (where applicable)

RATA and INSTRUMENTAL ANALYZER CALIBRATION PROCEDURES

a. Do any of the methods you are proposing utilize instrumental analyzers (i.e.; EPA Methods 3A, 6C, 7E, 10, 18, 25/25A, 320 etc.)? If yes, briefly describe analyzer calibration procedures and/or calibration standard procedures. Enter the highest pollutant concentration expected and the proposed concentrations of calibration gases.	☒ Yes	☐ No

As described in EPA Methods 3A, 7E and 10
O2: Expected level: 20%, Calibration Range: 25%
NOx: Excpected concentration < 25 ppm, Calibration Range: 25 ppm
CO: Expected concentration < 25 ppm; Calibration Range: 25 ppm

SAMPLING TRAIN LEAK CHECK PROCEDURES

b. Do any of the methods you are proposing utilize the EPA Method 5 sampling train (i.e.; EPA Methods 1-4, 5, 17, 26/26A, 29, etc.)? If yes, briefly describe sampling train and pitot tube leak check procedures:	☒ Yes	☐ No

As described in EPA Method 5

EPA METHOD 19 IN LIEU OF EPA METHODS 1-4

c. Are you proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4? If yes, explain why you believe this proposal is justified:	☐ Yes	☒ No

PLEASE NOTE – EPA Method 19 may be utilized in lieu of EPA Methods 1-4, subject to the approval of the Department. If you are proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4, you MUST include a recent fuel gas heating value analysis as well as a recent fuel flow meter calibration certificate, preferably conducted on the day of the test, but no earlier than three months prior to the test date. If the analyses have been conducted prior to the test date, you MUST append the certificates to the protocol. If conducted on the day of the test, you MUST append the certificates to the final test report.

VIII. ATTACHMENTS (as needed to support proposed test; check all that apply)		
NOTIFICATION/PROTOCOL ATTACHMENTS		
☐	Road Map Indicating Directions from Nearest New Mexico Town to Facility	
☐	Schematic of process being tested showing emission points, sampling sites and stack cross-section	
☐	Copy of proposed test methods (except for those promulgated test methods found in 40 CFR 51, 60, 61 and 63)	
☐	Fuel Heating Value Analysis	
☐	Fuel Flow Meter Calibration Certificate	
☐	Other:	
☐	Other:	
TEST REPORT ATTACHMENTS		
☒	**Section 2. Tables of Results**	
☒	**Supporting Documents (Specify) Stack Diagrams**	
Retain Report Section 3 - Test Procedures, Data, Calculations, Appendices – 2 years NSR permits, 5 years TV		

IX. CERTIFICATION		
This document has been prepared under my supervision and is accurate and complete to the best of my knowledge. I understand that acceptance of this protocol does not waive the requirements of any permit or regulation. I understand that any procedural errors or omissions are the sole responsibility of the permit holder.		
Signature:	Print Name and Title: **Ed Steven, Site Manager**	Date: 01/14/13
Responsible Official for Title V? ☒ Yes ☐ No (R.O signature not required for routine periodic testing)		

Table 1. Executive Summary
Dryer-2

TSP, PM-10 and PM-2.5 Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	1.40	
Dryer-2 South Stack	lb/hr	1.61	
Belt Vent Stack	lb/hr	0.34	
Total	**lb/hr**	**3.35**	**18.1**

NOx Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	0.29	
Dryer-2 South Stack	lb/hr	0.34	
Belt Vent Stack	lb/hr	0.021	
Total	**lb/hr**	**0.65**	**8.0**

CO Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	0.00	
Dryer-2 South Stack	lb/hr	0.00	
Belt Vent Stack	lb/hr	0.00	
Total	**lb/hr**	**0.00**	**12.0**

Notes: 1. The TSP mass emission rate is used to report PM-10 and PM-2.5 in accordance with Permit P234R1M1 Condition A601-I.

Table 2. Detailed Summary of Results
Dairy Farmers of America
D-2 North Stack

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	17:06	18:45	20:36	
End Time	military	18:06	19:45	21:36	
NOx Concentration	ppm	1.29	1.35	1.32	1.32
NOx Mass Flow Rate	**lb/hr**	**0.28**	**0.30**	**0.29**	**0.29**
CO Concentration	ppm	18.73	17.12	18.00	17.95
CO Mass Flow Rate	**lb/hr**	**2.51**	**2.29**	**2.42**	**2.41**
O_2 Level	%	19.34	19.49	19.34	19.39
CO_2 Level	%	0.33	0.50	0.51	0.44
Exhaust Rate	dscfm	30702	30632	30854	30729

TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	17:06	18:45	20:36	
End Time	military	18:12	19:51	21:41	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	32.18	31.97	31.75	
Stack Temperature	F	175	173	174	174
Stack Pressure	in Hg	25.77	25.77	25.77	25.77
Average Pressure head	in H_2O	0.34	0.35	0.35	0.35
Velocity	ft/sec	39.08	39.31	39.56	39.32
Exhaust Rate	acfm	46022	46287	46582	46297
Exhaust Rate	dscfm	30702	30632	30854	30729
TSP Loading	gr/dscf	0.0053	0.0054	0.0054	0.0053
TSP Emission Rate	**lb/hr**	**1.39**	**1.41**	**1.42**	**1.40**

Notes: The exhaust rate (dscfm) and pollutant concentrations (ppm) were measured simultaneously.

Table 3. Detailed Summary of Results
Dairy Farmers of America
D-2 South Stack

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	8:22	9:48	11:33	
End Time	military	9:22	10:48	12:33	
NOx Concentration	ppm	1.37	1.67	1.61	1.55
NOx Mass Flow Rate	**lb/hr**	**0.30**	**0.36**	**0.35**	**0.34**
CO Concentration	ppm	10.33	10.38	10.84	10.52
CO Mass Flow Rate	**lb/hr**	**1.35**	**1.37**	**1.46**	**1.39**
O_2 Level	%	19.89	19.93	20.22	20.02
CO_2 Level	%	0.77	0.70	0.79	0.75
Exhaust Rate	dscfm	30010	30241	30832	30361

TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	8:22	9:48	11:33	
End Time	military	9:31	10:59	12:43	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	30.46	30.51	32.00	
Stack Temperature	F	175	177	179	177
Stack Pressure	in Hg	26.03	26.03	26.03	26.03
Average Pressure head	in H_2O	0.33	0.34	0.35	0.34
Velocity	ft/sec	37.97	38.23	39.28	38.49
Exhaust Rate	acfm	44707	45016	46251	45325
Exhaust Rate	dscfm	30010	30241	30832	30361
TSP Loading	gr/dscf	0.0065	0.0060	0.0060	0.0062
TSP Emission Rate	**lb/hr**	**1.67**	**1.57**	**1.60**	**1.61**

Notes: The exhaust rate (dscfm) and pollutant concentrations (ppm) were measured simultaneously.

Table 4. Detailed Summary of Results
Dairy Farmers of America
D-2 Belt Vent Stack

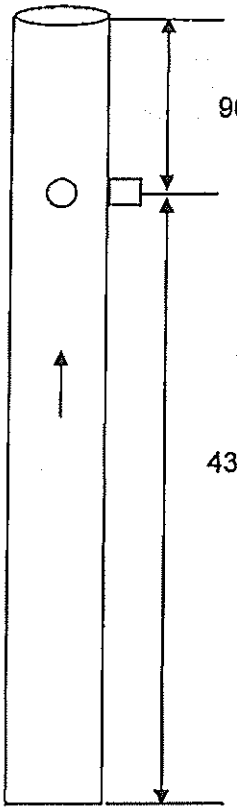
CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	5:21	6:43	8:21	
End Time	military	6:21	7:43	9:21	
NOx Concentration	ppm	0.73	0.38	0.44	0.52
NOx Mass Flow Rate	**lb/hr**	**0.029**	**0.015**	**0.018**	**0.021**
CO Concentration	ppm	4.06	4.03	4.40	4.16
CO Mass Flow Rate	**lb/hr**	**0.097**	**0.099**	**0.11**	**0.10**
O_2 Level	%	19.92	20.08	19.69	19.90
CO_2 Level	%	0.17	0.15	0.25	0.19
Exhaust Rate	dscfm	5504	5664	5750	5639

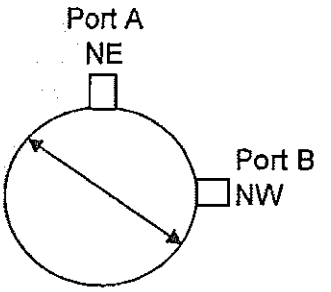
TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	5:21	6:43	8:21	
End Time	military	6:29	7:45	9:24	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	29.35	30.45	30.71	
Stack Temperature	F	113	114	113	113
Stack Pressure	in Hg	25.77	25.77	25.82	25.78
Average Pressure head	in H_2O	0.76	0.80	0.83	0.80
Velocity	ft/sec	54.65	56.38	56.90	55.98
Exhaust Rate	acfm	7151	7376	7444	7324
Exhaust Rate	dscfm	5504	5664	5750	5639
TSP Loading	gr/dscf	0.0074	0.0072	0.0067	0.0071
TSP Emission Rate	**lb/hr**	**0.35**	**0.35**	**0.33**	**0.34**

Notes: The exhaust rate (dscfm) and pollutant concentrations (ppm) were measured simultaneously.



Side View

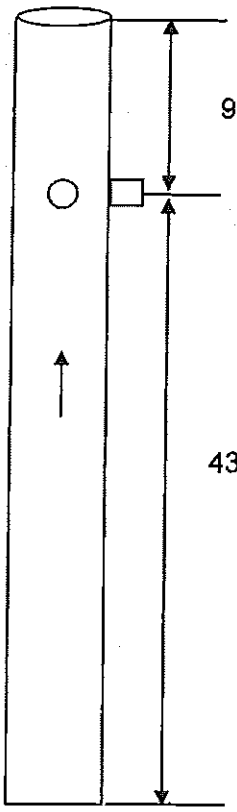


Top View

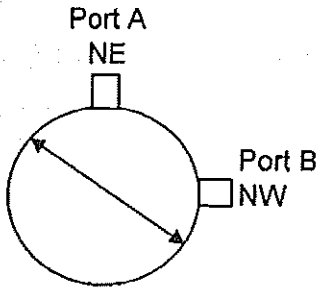
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure-1: Stack Dimensions and Traverse Points
Dryer 2 - North Stack



Side View

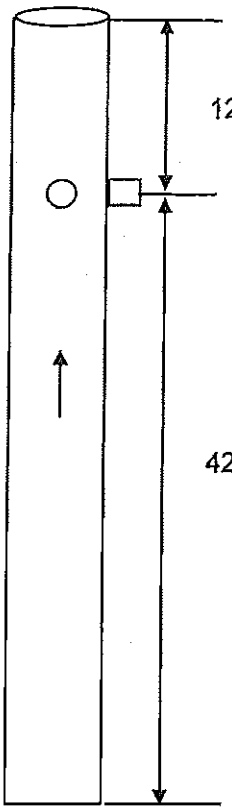


Top View

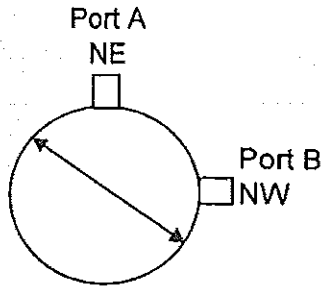
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure-2: Stack Dimensions and Traverse Points
Dryer 2 - South Stack



Side View



Top View

Diameter	20.0	Inches
Port Length	1.0	Inches
Upstream Diameters	6.0	Diameters
Downstream Diameters	21.0	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	0.5	1.5
2	6.7	1.3	2.3
3	11.8	2.4	3.4
4	17.7	3.5	4.5
5	25.0	5.0	6.0
6	35.6	7.1	8.1
7	64.4	12.9	13.9
8	75.0	15.0	16.0
9	82.3	16.5	17.5
10	88.2	17.6	18.6
11	93.3	18.7	19.7
12	97.9	0.5	1.5

Figure-3: Stack Dimensions and Traverse Points
Dryer 2 - Belt Vent Stack

New Mexico Environment Department
Air Quality Bureau
Compliance and Enforcement Section
525 Camino de Los Marquez, Suite 1
Santa Fe, NM 87505
Phone (505) 476-4300 Fax (505) 476-4375

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REPORTING SUBMITTAL FORM

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Staff	
Admin	

PLEASE NOTE: ® - Indicates required field

SECTION I - GENERAL COMPANY AND FACILITY INFORMATION

A. ® Company Name: Dairy Farmers of America			**D. ® Facility Name:** Portales Plant		
B.1 ® Company Address: 800 West Tampa Street			**E.1 ® Facility Address:** 1820 South Industrial Drive		
B.2 ® City: Springfield	**B.3 ®** State: MO	**B.4 ® Zip:** 6 5 8 0 2	**E.2 ® City:** Portales	**E.3 ®** State: NM	**E.4 ® Zip:** 88130
C.1 ® Company Environmental Contact: Steve Moore	**C.2 ® Title:** Mgr. Environmental Com.		**F.1 ® Facility Contact:** Ed Steven	**F.2 ® Title:** Site Manager	
C.3 ® Phone Number: (417) 829-2856	**C.4 ® Fax Number:** (417) 829-2579		**F.3 ® Phone Number:** (575) 359-3902	**F.4 ® Fax Number:** (575) 359-3903	
C.5 ® Email Address: smoore@dfamilk.com			**F.5 ® Email Address:** esteven@dfamilk.com		
G. Responsible Official: (Title V only): Ed Steven	**H. Title:** Site Manager		**I. Phone Number:** (575) 359-3902	**J. Fax Number:** (575) 359-3903	

K. ® AI Number: 1094	**L. Title V Permit Number:** P234-R1M1	**M.** Title V Permit Issue Date: 9/7/2012	**N. NSR Permit Number:** 1263-M3R6	**O. NSR Permit Issue Date:** 9/7/2012

P. Reporting Period: From: 11/1/2012 To: 10/31/2013	**OR**	**Q. Proposed Test Date:**	**OR**	**R. Actual Test Date:** 8/12/13 - 8/16/13

SECTION II – TYPE OF SUBMITTAL (check one that applies)

C. ☐	**NSPS Requirement (40 CFR 60)**	**Regulation:**	**Section(s):**	**Description:**
F.1 ☐	**Permit Requirement – Annual Fuel Meter Calibrations**	**Permit No.:**	**Condition(s):**	**Description:**
F.2 ☐	**Permit Requirement – Quarterly Report**	**Permit No.:**	**Condition(s):**	**Description:**
F.3 ☐	**Permit Requirement – Annual Boiler Test**	**Permit No.:**	**Condition(s):**	**Description:**
F.4 ☐	**Permit Requirement – Quarterly VOC Test**	**Permit No.:**	**Condition(s):**	**Description:**
F.5 ☐	**Permit Requirement – Annual HAP Test**	**Permit No.:**	**Condition(s):**	**Description:**
F.6 ☐	**Permit Requirement – Other**	**Permit No.:** P2340R1M1	**Condition(s):** A601 - I.	**Description:** EPA Methods Test (Units Dryers 1 and 2)
G. ☐	**Requirement of a Settlement Agreement or Compliance Order**	NOV No. ☐ or SFO No. ☐: or CD No. ☐ or Other ☐:	**Section(s):**	**Description:**

SECTION III – PERIODIC EMISSIONS TEST NOTIFICATIONS, TEST PROTOCOLS AND TEST REPORTS (if applicable)

T. ☒	A. Test Report ☒ CMT:_____	B. Test Protocol ☐	C. Notification ☐ CMT:_____				**Description: (Emission Units to be Tested)**
	D. Initial Compliance Test (EPA Methods) ☐	E. Periodic Test (EPA Methods) ☒	F. RATA Test ☐	G. Opacity Test ☐	**H** Portable Analyzer (Periodic Test) ☐		Dryers 1 & 2 emission tests on Aug. 12-16, 2013

SECTION IV - CERTIFICATION

After reasonable inquiry, I Ed Steven **certify that the information in this submittal is true, accurate and complete.**
(name of reporting official)

® Signature of Reporting Official:	**® Title:** Site Manager	**® Date**	**® Responsible Official for Title V?** ☒ **Yes** ☐ **No**

Reviewed By: _____ Date Reviewed: _____

UNIVERSAL STACK TEST NOTIFICATION, PROTOCOL and REPORT FORM

PM, NOx, CO and VOC EMISSIONS MEASUREMENTS FROM:

DRYER #2 – NORTH STACK
DRYER #2 – SOUTH STACK
DRYER #2 – BELT VENT STACK

SUBMITTED TO:

NEW MEXICO ENVIRONMENTAL DEPARTMENT
AIR QUALITY BUREAU
1301 Siler Road, Building B
Santa Fe, New Mexico 87507

SUBMITTED BY:

DAIRY FARMERS of AMERICA
1820 South Industrial Drive
Portales, New Mexico 88130

SUBMITTED ON:

September 11, 2013

PREPARED BY:

ENVIRONMENTAL SERVICES AND TESTING
P.O. Box 2525
Gilbert, Arizona 85299

New Mexico Environment Department
Air Quality Bureau
1301 Siler Road Building B
Santa Fe, NM 87507
Phone (505) 476-4300 Fax (505) 476-4375

Version 1/1/2010

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UNIVERSAL STACK TEST NOTIFICATION, PROTOCOL AND REPORT FORM

NMED USE ONLY	
Staff	
Admin	

Submit to: Stacktest.aqb@state.nm.us

I. DATABASE HEADER INFORMATION (drop down menus in bold)

a. AI#		
1094	**Test Notification/Protocol**	**Periodic Test (Portable Analyzer)**

d. Company Name:	e. Facility Name:
Dairy Farmers of America	**DFA - Portales**

f. Emission Unit Numbers:	g. Emission Unit Description (boiler, Waukesha 7042, etc)
D-2	**CE Rogers Vertical Dryer, 50 mmbtu/hr**

h. Reports - Tracking Number from notification response:	i. Proposed Test Date:	j. Actual test date:
CMT	**August 13 - 16, 2013**	**August 14, 2013**

k. Reason for test (name permit requirement, NSPS, MACT, consent decree, etc. Indicate here is this notification is a revised test date only)
Condition A106-1 of Permit P234-R1M1 and Permit 1263-M3R6

II. GENERAL COMPANY AND FACILITY INFORMATION

a.Company Address:			k.. Facility Address:		
3257 East Chestnut Expressway			**1820 South industrial Drive**		
b. City:	c. State:	d. Zip:	l. City:	m. State:	n. Zip:
Springfield	**Mo**	**65802□**	**Portales**	**NM**	**88130**
e. Environmental Contact:	f. Title:		o. Facility Contact:	p. Title:	
Steve Moore	**Mgr. Environmental Com**		**Tom Henningfield**	**Plant Engineering Mgr.**	
g. Phone Number:	h. Cell Number:		q. Phone Number:	r. Cell Number:	
(417) 829-3766	**(417) 829-3767**		**(575) 359-3977**	**(575) 218-0459**	
i. Email Address:			s. Email Address:		
smoore@dfamilk.com			**thenningfield@dfamilk.com**		
j. Title V Permit Number:			t. NSR Permit Number:		
P234-R1M1			**1263-M3R6**		

u. Detailed driving directions from nearest New Mexico town:
From Portales: South on West 2nd Street (US-70). Turn right onto 18th Street. Turn left onto South Industrial Drive. Facility on right.

III. TESTING FIRM

a. Company:			g. Contact:	
Environmental Services and Testing, inc.			**Tim Naquin**	
b. Address 1:			h. Title:	
P.O. Box 2525			**President, Project Engineer**	
c. Address 2:			i. Office Phone:	j. Cell Phone:
			(480) 635-0828	**(480) 236-6342**
d. City:	e. State:	f. Zip:	k. Email Address:	
Gilbert	**Az**	**85299**	**tlnaquin@cox.net**	

IV. EMISSION UNIT

a. Emission Unit Number:	b. Make & Model Number
D-2	**CE Rogers**
c. Serial Number:	d. Permitted Capacity:
TCF 542	**50 mmbtu/hr**

e Exceptions: Explain if test is late, rescheduled, related to an enforcement action:

g. Emission Unit Description and brief process name or description:

Milk processing plant. D-2 is the process being tested. It is equipped with two baghouses to control emissions. It is also equipped with three stacks that are referred to as: North Stack, South Stack and Belt Vent Stack.

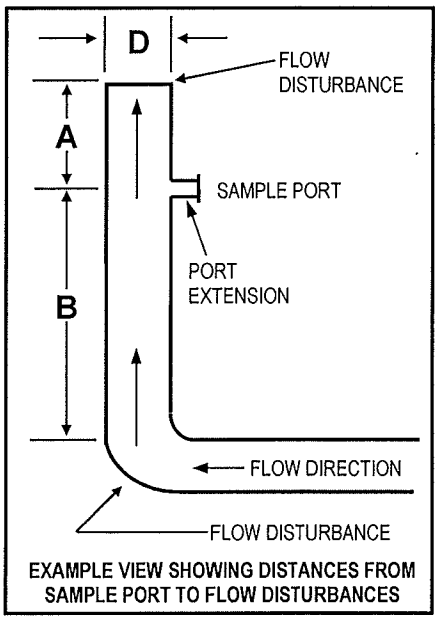
h. Installation Date:	i. Startup Date:	k. Date Reached Max. Capacity:

l. Control Equipment Description as listed in permit (model, ser. # etc. if applicable):

Two baghouses to control emissions.

STACK PARAMETERS

m. Velocity (ft/sec):	**Tables 2-4**
n. Temperature (°C):	**Tables 2-4**
o. Stack Diameter, D (in.):	**Figures 1-3**
p. Distance to Stack Bends or Obstructions:	
Upstream, Distance A (in.):	**Figures 1-3**
Downstream, Distance B (in.):	**Figures 1-3**



EXAMPLE VIEW SHOWING DISTANCES FROM SAMPLE PORT TO FLOW DISTURBANCES

Attach an explanation or drawing to explain any difficult or unusual stack geometry or parameters.

V. POLLUTANTS AND PROPOSED TEST METHODS

Pollutant or Parameter:		Proposed Test Methods (Deviations from approved methods require supporting documentation and prior authorization)	Deviation to Test Method Requested
☐	**Portable Analyzer Methods for NOx, CO, SO_2**		☐
☒	NOx	**EPA Method 7E**	☐
☒	CO	**EPA Method 10**	☐
☐	SO2	**EPA Method 6**	☐
☐	VOCs	**(Specify)**	☐
☐	HAPs	**(Specify)**	☐
☒	PM (TSP)	**EPA Method 5**	☐
☐	PM10	**EPA Method 201**	☐
☐	PM2.5	**(Specify)**	☐
☐	Opacity	**EPA Method 9**	☐
☐	Visual E.	**EPA Method 22**	☐
☒	Stack Flow	**EPA Methods 1 - 3**	☐
☒	Moisture	**EPA Method 4**	☐
☐	Other	**(Specify)**	☐
☐	Other	**(Specify)**	☐

List Specific VOC's and HAP's:

VI. PROPOSED TEST RUN AND TEST LOAD INFORMATION

a. Number of Test Runs:	b. Run Duration	c. Required by (regulation or permit number):	d. Specific Condition or Section:
3	**60 minutes**	**R234-R1M1**	**B.111**

PLEASE NOTE – Default run duration is 60 minutes, unless otherwise specified by an applicable regulation.

e. Expected Load:	f. Percent of Permitted Capacity:	g. Is this an opacity test?	h. If yes, no. of observation pts.:
See attachment	**Greater than 90% capacity**	Yes ☐ No ☒	

i. If expected load during test is less than 90% of capacity, explain:

All loads are greater than 90% of capacity (See attachment)

NOTE – Failure to test at 90-100% of permitted load will limit unit operation to 110% of tested load until a new initial compliance test is conducted.

PLANT OR UNIT OPERATING PARAMETERS TO BE MONITORED

j. List and explain the plant operating parameters that will be monitored and applicable permit conditions or regulatory standards.

Product rate, which must be greater than 90% of the permitted capacity. The permitted production rate for D-2 is 21,100 lb/hr. (See attachment).

VII. ADDITIONAL DETAILS (where applicable)

RATA and INSTRUMENTAL ANALYZER CALIBRATION PROCEDURES

a. Do any of the methods you are proposing utilize instrumental analyzers (i.e.; EPA Methods 3A, 6C, 7E, 10, 18, 25/25A, 320 etc.)? If yes, briefly describe analyzer calibration procedures and/or calibration standard procedures. Enter the highest pollutant concentration expected and the proposed concentrations of calibration gases.	☒ Yes	☐ No

As described in EPA Methods 3A, 7E and 10.
O2: Level: Tables 2-4, Upscale Cal Gas = 21.12%; Low Scale Cal Gas = 9.00%
NOx: Level: Tables 2-4; Upscale Cal Gas = 39.6 ppm Low Scale Cal Gas = 7.76 ppm
CO: Level: Tables 2-4: Upscale Cal Gas = 90.3 ppm; Low Scale Cal Gas = 40.6 ppm

SAMPLING TRAIN LEAK CHECK PROCEDURES

b. Do any of the methods you are proposing utilize the EPA Method 5 sampling train (i.e.; EPA Methods 1-4, 5, 17, 26/26A, 29, etc.)? If yes, briefly describe sampling train and pitot tube leak check procedures:	☒ Yes	☐ No

As described in EPA Method 5.

EPA METHOD 19 IN LIEU OF EPA METHODS 1-4

c. Are you proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4? If yes, explain why you believe this proposal is justified:	☐ Yes	☒ No

PLEASE NOTE – EPA Method 19 may be utilized in lieu of EPA Methods 1-4, subject to the approval of the Department. If you are proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4, you MUST include a recent fuel gas heating value analysis as well as a recent fuel flow meter calibration certificate, preferably conducted on the day of the test, but no earlier than three months prior to the test date. If the analyses have been conducted prior to the test date, you MUST append the certificates to the protocol. If conducted on the day of the test, you MUST append the certificates to the final test report.

VIII. ATTACHMENTS (as needed to support proposed test; check all that apply)		
NOTIFICATION/PROTOCOL ATTACHMENTS		
☐	Road Map Indicating Directions from Nearest New Mexico Town to Facility	
☒	Schematic of process being tested showing emission points, sampling sites and stack cross-section	
☐	Copy of proposed test methods (except for those promulgated test methods found in 40 CFR 51, 60, 61 and 63)	
☐	Fuel Heating Value Analysis	
☐	Fuel Flow Meter Calibration Certificate	
☐	Other:	
☐	Other:	
TEST REPORT ATTACHMENTS		
☒	**Section 2. Tables of Results**	
☒	**Supporting Documents (Specify) Production rates during source test.**	
Retain Report Section 3 - Test Procedures, Data, Calculations, Appendices – 2 years NSR permits, 5 years TV		

IX. CERTIFICATION		
This document has been prepared under my supervision and is accurate and complete to the best of my knowledge. I understand that acceptance of this protocol does not waive the requirements of any permit or regulation. I understand that any procedural errors or omissions are the sole responsibility of the permit holder.		
Signature:	Print Name and Title: **Tom Henningfield, Plant Engineering Manager**	Date:
Responsible Official for Title V? ☒ Yes ☐ No (R.O signature not required for routine periodic testing)		

Table 1. Executive Summary
Dryer-2

TSP, PM-10 and PM-2.5 Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	0.38	
Dryer-2 South Stack	lb/hr	0.63	
Belt Vent Stack	lb/hr	0.11	
Total	**lb/hr**	**1.12**	**18.1**

NOx Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	0.41	
Dryer-2 South Stack	lb/hr	0.56	
Belt Vent Stack	lb/hr	0.025	
Total	**lb/hr**	**1.00**	**8.0**

CO Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	1.98	
Dryer-2 South Stack	lb/hr	2.87	
Belt Vent Stack	lb/hr	0.27	
Total	**lb/hr**	**5.12**	**12.0**

Notes: 1. The TSP mass emission rate is used to report PM-10 and PM-2.5 in accordance with Permit P234R1M1 Condition A601-I.

Table 2. Detailed Summary of Results
Dairy Farmers of America
Dryer-2 North Stack

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	9:33	11:02	12:30	
End Time	military	10:33	12:02	13:30	
NOx Concentration	ppm	1.94	2.00	2.09	2.01
NOx Mass Flow Rate	**lb/hr**	**0.41**	**0.41**	**0.43**	**0.41**
CO Concentration	ppm	16.00	15.66	15.60	15.75
CO Mass Flow Rate	**lb/hr**	**2.05**	**1.95**	**1.93**	**1.98**
O_2 Level	%	19.63	19.77	19.88	19.76
CO_2 Level	%	0.70	0.74	0.67	0.70
Exhaust Rate	dscfm	29344	28584	28421	28783

TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	9:33	11:02	12:38	
End Time	military	10:38	12:10	13:44	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	31.18	30.69	30.08	
Stack Temperature	F	197	205	210	204
Stack Pressure	in Hg	26.02	26.02	26.02	26.02
Average Pressure head	in H_2O	0.34	0.33	0.33	0.34
Velocity	ft/sec	39.87	39.15	39.23	39.42
Exhaust Rate	acfm	46944	46100	46190	46411
Exhaust Rate	dscfm	29344	28584	28421	28783
TSP Loading	gr/dscf	0.0014	0.0015	0.0017	0.0015
TSP Emission Rate	**lb/hr**	**0.35**	**0.38**	**0.41**	**0.38**

Notes: 1. The exhaust rate (dscfm) and pollutant concentrations (ppm) are measured simultaneously.

Table 3. Detailed Summary of Results
Dairy Farmers of America
Dryer-2 South Stack

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	14:37	16:03	17:40	
End Time	military	15:37	17:03	18:40	
NOx Concentration	ppm	1.93	1.92	2.02	1.96
NOx Mass Flow Rate	**lb/hr**	**0.56**	**0.55**	**0.57**	**0.56**
CO Concentration	ppm	17.07	16.42	16.02	16.50
CO Mass Flow Rate	**lb/hr**	**2.99**	**2.86**	**2.77**	**2.87**
O_2 Level	%	20.02	19.83	19.72	19.86
CO_2 Level	%	0.46	0.50	0.41	0.46
Exhaust Rate	dscfm	40153	39860	39610	39875

TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	14:37	16:08	17:40	
End Time	military	15:43	17:13	18:46	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	30.11	30.41	30.42	
Stack Temperature	F	218	233	242	231
Stack Pressure	in Hg	26.01	26.01	26.01	26.01
Average Pressure head	in H_2O	0.64	0.66	0.65	0.65
Velocity	ft/sec	55.07	55.87	56.51	55.81
Exhaust Rate	acfm	64840	65782	66540	65721
Exhaust Rate	dscfm	40153	39860	39610	39875
TSP Loading	gr/dscf	0.0018	0.0019	0.0019	0.0018
TSP Emission Rate	**lb/hr**	**0.63**	**0.64**	**0.63**	**0.63**

Notes: 1. The exhaust rate (dscfm) and pollutant concentrations (ppm) are measured simultaneously.

Table 4. Detailed Summary of Results
Dairy Farmers of America
Belt Vent Stack

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	19:40	21:00	22:42	
End Time	military	20:40	22:00	23:42	
NOx Concentration	ppm	0.58	0.62	0.63	0.61
NOx Mass Flow Rate	**lb/hr**	**0.024**	**0.026**	**0.025**	**0.025**
CO Concentration	ppm	10.65	10.84	10.92	10.80
CO Mass Flow Rate	**lb/hr**	**0.26**	**0.27**	**0.27**	**0.27**
O_2 Level	%	20.94	20.97	21.03	20.98
CO_2 Level	%	0.089	0.074	0.097	0.087
Exhaust Rate	dscfm	5649	5788	5672	5703

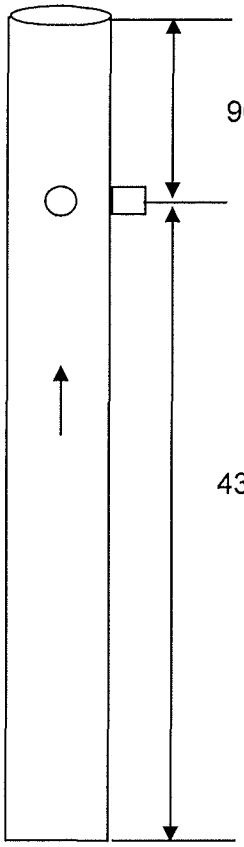
TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	19:40	21:00	22:42	
End Time	military	20:43	22:04	23:46	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	38.76	39.05	38.59	
Stack Temperature	F	152	152	151	151
Stack Pressure	in Hg	26.02	26.02	26.02	26.02
Average Pressure head	in H_2O	0.87	0.90	0.88	0.88
Velocity	ft/sec	60.02	61.35	60.38	60.58
Exhaust Rate	acfm	7853	8026	7899	7926
Exhaust Rate	dscfm	5649	5788	5672	5703
TSP Loading	gr/dscf	0.00018	0.00022	0.00224	0.0022
TSP Emission Rate	**lb/hr**	**0.0087**	**0.011**	**0.11**	**0.11**

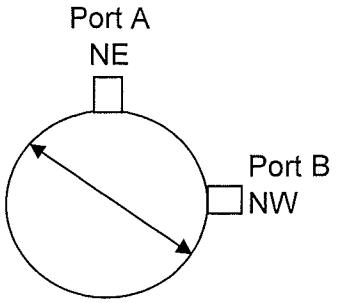
Notes: 1. The exhaust rate (dscfm) and pollutant concentrations (ppm) are measured simultaneously.

2. It should be noted that no milk was fed to the dryer during Runs 1 and 2; only water. As noted in the production data, the quantity of water that was fed to the dryer is equivalent to the quantity that is evaporated from the milk if milk was being fed. This causes the burner to fire at the same rate as it would have fired if milk was being As can be observed in this table, the NOx and CO levels measured during Runs 1 and 2 are equivalent to levels measured during Run-3 when milk was being fed.

3. No milk was being fed to the dryer during Runs 1 and 2, only water. Milk was fed to the dryer during Run-3. Therefore Runs 1 and 2 are not included when determining PM loading and mass emission rate. Only the third run is reported.



Side View

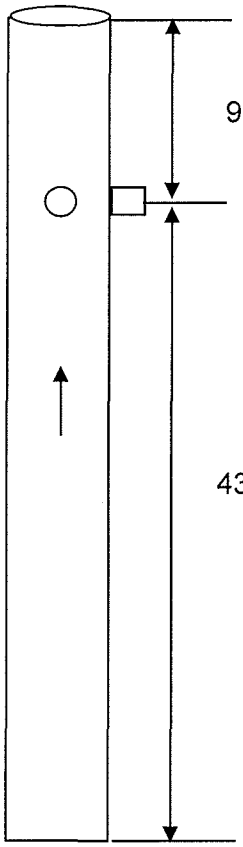


Top View

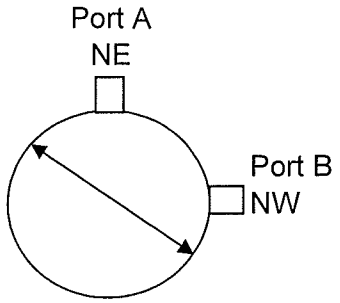
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure 1. Stack Dimensions and Traverse Points
Dryer 2 - North Stack



Side View

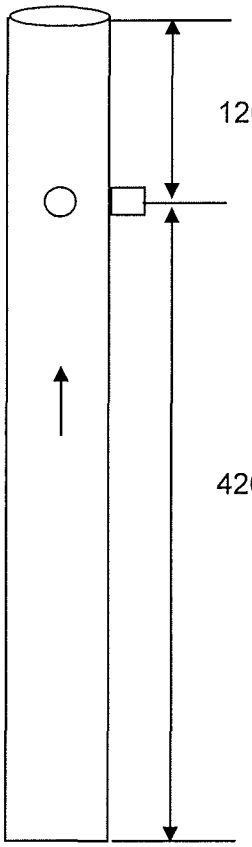


Top View

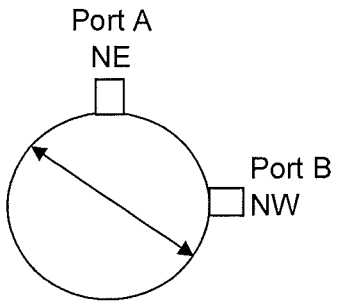
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure 2. Stack Dimensions and Traverse Points
Dryer 2 - South Stack



Side View



Top View

Diameter	20.0	Inches
Port Length	1.0	Inches
Upstream Diameters	6.0	Diameters
Downstream Diameters	21.0	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	0.5	1.5
2	6.7	1.3	2.3
3	11.8	2.4	3.4
4	17.7	3.5	4.5
5	25.0	5.0	6.0
6	35.6	7.1	8.1
7	64.4	12.9	13.9
8	75.0	15.0	16.0
9	82.3	16.5	17.5
10	88.2	17.6	18.6
11	93.3	18.7	19.7
12	97.9	0.5	1.5

Figure 3. Stack Dimensions and Traverse Points
Dryer 2 - Belt Vent Stack

Unit Operating Parameters

Date	Process Tested	Stack I.D.	Process Rate
August 14, 2013	Dryer –2 (CER)	North Stack NOx and CO (Runs 1-3) TSP,PM-10, PM-2.5 (Runs 1-3)	21,580 lb/hr
August 14, 2013	Dryer-2 (CER)	South Stack NOx and CO (Runs 1-3) TSP,PM-10, PM-2.5 (Runs 1-3)	22,250 lb/hr
August 14, 2013	Dryer-2 (CER)	Belt Vent Stack NOx and CO (Runs 1-3) TSP,PM-10, PM-2.5 (Runs 1-3)	24,400 lb/hr

Notes:

1. Production rate data are obtained from Dairy Farmers of America.

2. The permitted production rate for Dryer-2 is 21,100 lb/hr.

3. The North Stack is tested while operating at 102% of the permitted rate.

4. The South Stack is tested while operating at 105% of the permitted rate.

5. The Belt Vent Stack is tested while operating at 116% of the permitted rate during Run-3 only. During Run-1 and Run-2 only water was fed to the CER and no powder was produced. This was done inadvertently. Powder was produced during Run-3 oat rate of 24,400 lb/hr.

SOURCE TEST REPORT

PM, NOx, CO and VOC EMISSIONS MEASUREMENTS FROM:

DRYER #2 – NORTH STACK
DRYER #2 – SOUTH STACK
DRYER #2 – BELT VENT STACK

SUBMITTED TO:

NEW MEXICO ENVIRONMENTAL DEPARTMENT
AIR QUALITY BUREAU
1301 Siler Road, Building B
Santa Fe, New Mexico 87507

SUBMITTED BY:

DAIRY FARMERS of AMERICA
1820 South Industrial Drive
Portales, New Mexico 88130

SUBMITTED ON:

August 28, 2014

PREPARED BY:

ENVIRONMENTAL SERVICES AND TESTING, INC.
P.O. Box 10570
Bakersfield, California 93389

New Mexico Environment Department
Air Quality Bureau
1301 Siler Road Building B
Santa Fe, NM 87507
Phone (505) 476-4300 Fax (505) 476-4375

Version 1/1/2010

NMED USE ONLY	
DTS	
TEMPO	

UNIVERSAL STACK TEST NOTIFICATION, PROTOCOL AND REPORT FORM

NMED USE ONLY	
Staff	
Admin	

Submit to: Stacktest.aqb@state.nm.us

I. DATABASE HEADER INFORMATION (drop down menus in bold)

a. AI#		
1094	**Test Report**	**Periodic Test (EPA Method)**

d. Company Name:	e. Facility Name:
Dairy Farmers of America	**DFA - Portales**
f. Emission Unit Numbers: **D-2**	g. Emission Unit Description (boiler, Waukesha 7042, etc) **CE Rogers Vertical Dryer, 50 mmbtu/hr**
h. Reports - Tracking Number from notification response: **CMT**	i. Proposed Test Date: **July 28-Aug. 1, 2014** / j. Actual test date: **July 31, 2014**

k. Reason for test (name permit requirement, NSPS, MACT, consent decree, etc. Indicate here is this notification is a revised test date only)
Condition A601-1 of Permit P234-R1M1 and Permit 1263-M3R6

II. GENERAL COMPANY AND FACILITY INFORMATION

a.Company Address:			k.. Facility Address:		
800 West Tampa Street			**1820 South Industrial Drive**		
b. City:	c. State:	d. Zip:	l. City:	m. State:	n. Zip:
Springfield	**MO**	**65802-0000**	**Portales**	**NM**	**88130**
e. Environmental Contact:	f. Title:		o. Facility Contact:	p. Title:	
Steve Moore	**Mgr. Environmental Com**		**Jeff Larson**	**Plant Manager**	
g. Phone Number:	h. Cell Number:		q. Phone Number:	r. Cell Number:	
(417) 829-2856	**(417) 829-3767**		**(575) 359-3902**	**(219) 841-1233**	
i. Email Address:			s. Email Address:		
smoore@dfamilk.com			**jelarson@dfamilk.com**		
j. Title V Permit Number:			t. NSR Permit Number:		
P234-R1M1			**1263-M3R6**		

u. Detailed driving directions from nearest New Mexico town:
From Portales: South on West 2nd Street (US-70). Turn right onto 18th Street. Turn left onto South Industrial Drive. Facility on right.

III. TESTING FIRM

a. Company:			g. Contact:	
Environmental Services and Testing, Inc.			**James Taplin**	
b. Address 1:			h. Title:	
P.O. Box 10570			**President, Project Manager**	
c. Address 2:			i. Office Phone: **(661) 496-9895**	j. Cell Phone: **(661)496-9895**
d. City:	e. State:	f. Zip:	k. Email Address:	
Bakersfield	**CA**	**93389**	**james@estair-usa.com**	

IV. EMISSION UNIT

a. Emission Unit Number:	b. Make & Model Number
D-2	**CE Rogers**
c. Serial Number:	d. Permitted Capacity: **50 mmbtu/hr**

e Exceptions: Explain if test is late, rescheduled, related to an enforcement action:

g. Emission Unit Description and brief process name or description:

Milk processing plant. D-2 is the process tested. It is equipped two baghouses to control emissions. It is also equipped with three stacks that are referred to as: North Stack, South Stack and Belt Vent Stack.

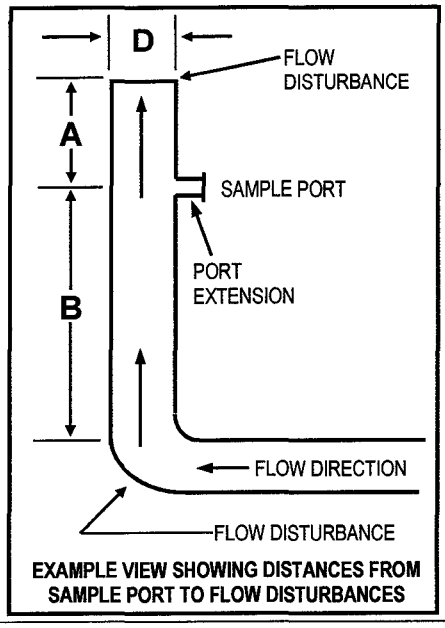
h. Installation Date:	i. Startup Date:	k. Date Reached Max. Capacity:

l. Control Equipment Description as listed in permit (model, ser. # etc. if applicable):

Two baghouses to control emissions

STACK PARAMETERS

m. Velocity (ft/sec):	**Tables 2-4**
n. Temperature (°C):	**Tables 2-4**
o. Stack Diameter, D (in.):	**Figures 1-3**
p. Distance to Stack Bends or Obstructions:	
Upstream, Distance A (in.):	**Figures 1-3**
Downstream, Distance B (in.):	**Figures 1-3**



EXAMPLE VIEW SHOWING DISTANCES FROM SAMPLE PORT TO FLOW DISTURBANCES

Attach an explanation or drawing to explain any difficult or unusual stack geometry or parameters.

V. POLLUTANTS AND PROPOSED TEST METHODS

Pollutant or Parameter:		Proposed Test Methods (Deviations from approved methods require supporting documentation and prior authorization)	Deviation to Test Method Requested
☐	**Portable Analyzer Methods for NOx, CO, SO_2**		☐
☒	NOx	EPA Method 7E	☐
☒	CO	EPA Method 10	☐
☐	SO2	EPA Method 6	☐
☐	VOCs	(Specify)	☐
☐	HAPs	(Specify)	☐
☒	PM (TSP)	EPA Method 5	☐
☐	PM10	EPA Method 201	☐
☐	PM2.5	(Specify)	☐
☐	Opacity	EPA Method 9	☐
☐	Visual E.	EPA Method 22	☐
☒	Stack Flow	EPA Methods 1 - 3	☐
☒	Moisture	EPA Method 4	☐
☐	Other	(Specify)	☐
☐	Other	(Specify)	☐

List Specific VOC's and HAP's:

VI. PROPOSED TEST RUN AND TEST LOAD INFORMATION

a. Number of Test Runs:	b. Run Duration	c. Required by (regulation or permit number):	d. Specific Condition or Section:
3	**60 minutes**	**P234-R1M1**	**B.111**

PLEASE NOTE – Default run duration is 60 minutes, unless otherwise specified by an applicable regulation.

e. Expected Load:	f. Percent of Permitted Capacity:	g. Is this an opacity test?	h. If yes, no. of observation pts.:
See attachment	**Greater than 90% capacity**	Yes ☐ No ☒	

i. If expected load during test is less than 90% of capacity, explain:

All loads are greater than 90% of capacity (See attachment)

NOTE – Failure to test at 90-100% of permitted load will limit unit operation to 110% of tested load until a new initial compliance test is conducted.

PLANT OR UNIT OPERATING PARAMETERS TO BE MONITORED

j. List and explain the plant operating parameters that will be monitored and applicable permit conditions or regulatory standards.

Production rate, which must be greater than 90% of the permitted capacity. The permitted production rate for D-2 is 21,100 lb/hr. (See attachment).

VII. ADDITIONAL DETAILS (where applicable)

RATA and INSTRUMENTAL ANALYZER CALIBRATION PROCEDURES

a. Do any of the methods you are proposing utilize instrumental analyzers (i.e.; EPA Methods 3A, 6C, 7E, 10, 18, 25/25A, 320 etc.)? If yes, briefly describe analyzer calibration procedures and/or calibration standard procedures. Enter the highest pollutant concentration expected and the proposed concentrations of calibration gases. ☒ Yes ☐ No

As described in EPA Methods 3A, 7E and 10
O2: Level: Tables 2-4, Upscale Cal Gas = 20.00%, Low Scale Cal Gas = 9.92%
NOx: Level: Tables 2-4, Upscale Cal Gas = 90.3 ppm, Low Scale Cal Gas = 38.9 ppm
CO: Level: Tables 2-4, Upscale Cal Gas = 90.1 ppm, Low Scale Cal Gas = 41.2 ppm

SAMPLING TRAIN LEAK CHECK PROCEDURES

b. Do any of the methods you are proposing utilize the EPA Method 5 sampling train (i.e.; EPA Methods 1-4, 5, 17, 26/26A, 29, etc.)? If yes, briefly describe sampling train and pitot tube leak check procedures: ☒ Yes ☐ No

As described in EPA Method 5

EPA METHOD 19 IN LIEU OF EPA METHODS 1-4

c. Are you proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4? If yes, explain why you believe this proposal is justified: ☐ Yes ☒ No

PLEASE NOTE – EPA Method 19 may be utilized in lieu of EPA Methods 1-4, subject to the approval of the Department. If you are proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4, you MUST include a recent fuel gas heating value analysis as well as a recent fuel flow meter calibration certificate, preferably conducted on the day of the test, but no earlier than three months prior to the test date. If the analyses have been conducted prior to the test date, you MUST append the certificates to the protocol. If conducted on the day of the test, you MUST append the certificates to the final test report.

VIII. ATTACHMENTS (as needed to support proposed test; check all that apply)		
NOTIFICATION/PROTOCOL ATTACHMENTS		
☐	Road Map Indicating Directions from Nearest New Mexico Town to Facility	
☒	Schematic of process being tested showing emission points, sampling sites and stack cross-section	
☐	Copy of proposed test methods (except for those promulgated test methods found in 40 CFR 51, 60, 61 and 63)	
☐	Fuel Heating Value Analysis	
☐	Fuel Flow Meter Calibration Certificate	
☐	Other:	
☐	Other:	
TEST REPORT ATTACHMENTS		
☒	**Section 2. Tables of Results**	
☒	**Supporting Documents (Specify) Production rates during source test.**	
Retain Report Section 3 - Test Procedures, Data, Calculations, Appendices – 2 years NSR permits, 5 years TV		

IX. CERTIFICATION		
This document has been prepared under my supervision and is accurate and complete to the best of my knowledge. I understand that acceptance of this protocol does not waive the requirements of any permit or regulation. I understand that any procedural errors or omissions are the sole responsibility of the permit holder.		
Signature:	Print Name and Title: **James Taplin, EST Project Manager**	Date: **08/29/2014**
Responsible Official for Title V? ☐ Yes	☒ No (R.O signature not required for routine periodic testing)	

Table 1. Executive Summary
Dryer-2

TSP, PM-10 and PM-2.5 Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	0.38	
Dryer-2 South Stack	lb/hr	0.30	
Belt Vent Stack	lb/hr	0.02	
Total	**lb/hr**	**0.70**	**18.1**

NOx Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	0.29	
Dryer-2 South Stack	lb/hr	0.87	
Belt Vent Stack	lb/hr	0.00	
Total	**lb/hr**	**1.16**	**8.0**

CO Emissions

Pollutant	Units	Average	Permit Limit
Dryer-2 North Stack	lb/hr	2.13	
Dryer-2 South Stack	lb/hr	3.10	
Belt Vent Stack	lb/hr	0.06	
Total	**lb/hr**	**5.29**	**12.0**

Notes: 1. The TSP mass emission rate is used to report PM-10 and PM-2.5 in accordance with Permit P234R1M1 Condition A601-I.

Table 2. Detailed Summary of Results
Dairy Farmers of America
Dryer-2 (North Stack)

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	12:15	13:35	15:05	
End Time	military	13:15	14:35	16:05	
NOx Concentration	ppm	1.28	1.41	1.11	1.26
NOx Mass Flow Rate	**lb/hr**	**0.30**	**0.32**	**0.25**	**0.29**
CO Concentration	ppm	15.65	15.80	14.40	15.28
CO Mass Flow Rate	**lb/hr**	**2.20**	**2.20**	**2.00**	**2.13**
O_2 Level	%	19.59	19.84	19.92	19.78
CO_2 Level	%	0.76	0.66	0.59	0.67
Exhaust Rate	dscfm	32196	31877	31868	31980

TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	12:15	13:35	15:05	
End Time	military	13:16	14:36	16:06	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	33.92	34.21	34.64	
Stack Temperature	°F	203	202	203	203
Stack Pressure	in Hg	26.08	26.08	26.08	26.08
Average Pressure Head	in H_2O	0.40	0.40	0.39	0.40
Velocity	ft/sec	43.25	42.28	42.19	42.57
Exhaust Rate	acfm	50924	49780	49678	50127
Exhaust Rate	dscfm	32196	31877	31868	31980
TSP Loading	gr/dscf	0.0014	0.0012	0.0016	0.0014
TSP Emission Rate	**lb/hr**	**0.38**	**0.33**	**0.43**	**0.38**

Notes: 1. The exhaust rate (dscfm) and pollutant concentrations (ppm) are measured

Table 3. Detailed Summary of Results
Dairy Farmers of America
Dryer-2 (South Stack)

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	8:05	9:27	10:55	
End Time	military	9:05	10:27	11:55	
NOx Concentration	ppm	8.41	0.34	0.08	2.94
NOx Mass Flow Rate	**lb/hr**	**2.50**	**0.10**	**0.02**	**0.87**
CO Concentration	ppm	15.30	18.37	19.49	17.72
CO Mass Flow Rate	**lb/hr**	**2.77**	**3.17**	**3.35**	**3.10**
O_2 Level	%	19.98	19.98	19.84	19.93
CO_2 Level	%	0.49	0.54	0.48	0.50
Exhaust Rate	dscfm	41459	39599	39453	40170

TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	8:05	9:27	10:55	
End Time	military	9:06	10:28	11:56	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	32.22	32.34	31.77	
Stack Temperature	°F	198	205	212	205
Stack Pressure	in Hg	26.08	26.08	26.08	26.08
Average Pressure Head	in H_2O	0.65	0.63	0.61	0.63
Velocity	ft/sec	54.71	53.53	53.67	53.97
Exhaust Rate	acfm	64423	53035	63193	60217
Exhaust Rate	dscfm	41459	39599	39453	40170
TSP Loading	gr/dscf	0.0011	0.0006	0.0008	0.0008
TSP Emission Rate	**lb/hr**	**0.39**	**0.22**	**0.29**	**0.30**

Notes: 1. The exhaust rate (dscfm) and pollutant concentrations (ppm) are measured simultaneously.

Table 4. Detailed Summary of Results
Dairy Farmers of America
Dryer-2 (Belt Vent Stack)

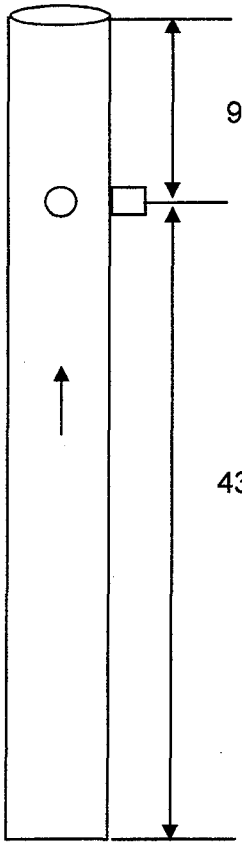
CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	16:25	18:00	19:45	
End Time	military	17:25	19:00	20:45	
NOx Concentration	ppm	0.12	0.00	0.00	0.04
NOx Mass Flow Rate	**lb/hr**	**0.00**	**0.00**	**0.00**	**0.00**
CO Concentration	ppm	2.26	2.24	2.19	2.23
CO Mass Flow Rate	**lb/hr**	**0.06**	**0.06**	**0.06**	**0.06**
O_2 Level	%	20.32	20.35	20.42	20.36
CO_2 Level	%	0.05	0.06	0.04	0.05
Exhaust Rate	dscfm	5779	5959	5848	5862

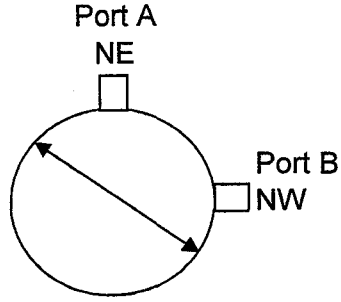
TSP Emissions - EPA Method 5

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	16:25	18:00	19:45	
End Time	military	17:26	19:01	20:46	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	31.03	31.89	31.18	
Stack Temperature	°F	154	155	155	155
Stack Pressure	in Hg	26.08	26.08	26.08	26.08
Average Pressure Head	in H_2O	0.93	0.97	0.95	0.95
Velocity	ft/sec	62.24	64.20	63.22	63.22
Exhaust Rate	acfm	8143	8399	8271	8271
Exhaust Rate	dscfm	5779	5959	5848	5862
TSP Loading	gr/dscf	0.0003	0.0004	0.0004	0.0004
TSP Emission Rate	**lb/hr**	**0.01**	**0.02**	**0.02**	**0.02**

Notes: 1. The exhaust rate (dscfm) and pollutant concentrations (ppm) are measured simultaneously.



Side View

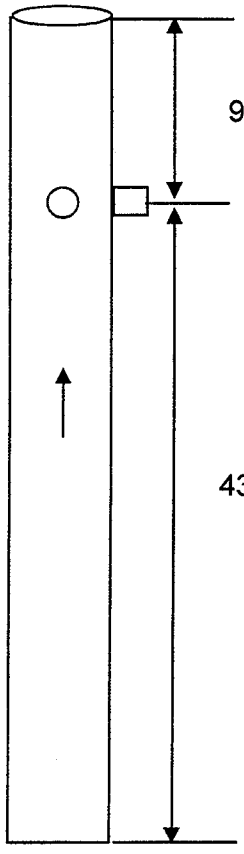


Top View

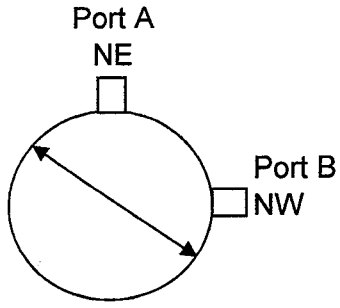
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure 1. Stack Dimensions and Traverse Points
Dryer 2 - North Stack



Side View

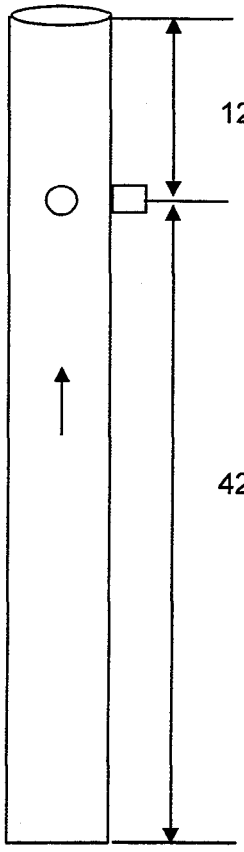


Top View

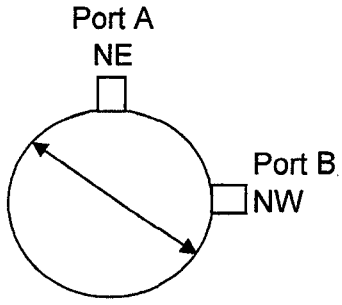
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure 2. Stack Dimensions and Traverse Points
Dryer 2 - South Stack



Side View



Top View

Diameter	20.0	Inches
Port Length	1.0	Inches
Upstream Diameters	6.0	Diameters
Downstream Diameters	21.0	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	0.5	1.5
2	6.7	1.3	2.3
3	11.8	2.4	3.4
4	17.7	3.5	4.5
5	25.0	5.0	6.0
6	35.6	7.1	8.1
7	64.4	12.9	13.9
8	75.0	15.0	16.0
9	82.3	16.5	17.5
10	88.2	17.6	18.6
11	93.3	18.7	19.7
12	97.9	0.5	1.5

Figure 3. Stack Dimensions and Traverse Points
Dryer 2 - Belt Vent Stack

B: Unit Operating Parameters

Date	Process Tested	Stack I.D.	Process Rate
July 31, 2014	Dryer – 2 (CER)	North Stack NOx and CO (Runs 1-3) TSP,PM-10, PM-2.5 (Runs 1-3)	23,258.68 lb/hr
		South Stack NOx and CO (Runs 1-3) TSP,PM-10, PM-2.5 (Runs 1-3)	
		Belt Vent Stack NOx and CO (Runs 1-3) TSP,PM-10, PM-2.5 (Runs 1-3)	

Notes:

1. Production rate data was obtained from Dairy Farmers of America.

2. The permitted production rate for Dryer-2 is 21,100 lb/hr.

3. Dryer – 2 (CER) was tested while operating at **110%** of the permitted rate. As per Permit P234R1M1 Condition B111 (4), the production rate must be no less than **90%** of the permitted rate during a source test.

SOURCE TEST REPORT

PM, NOx, CO and VOC EMISSIONS MEASUREMENTS FROM:

DRYER #2 – NORTH STACK
DRYER #2 – SOUTH STACK
DRYER #2 – BELT VENT STACK

SUBMITTED TO:

NEW MEXICO ENVIRONMENTAL DEPARTMENT
AIR QUALITY BUREAU
1301 Siler Road, Building B
Santa Fe, New Mexico 87507

SUBMITTED BY:

DAIRY FARMERS of AMERICA
1820 South Industrial Drive
Portales, New Mexico 88130

SUBMITTED ON:

August 28, 2015

PREPARED BY:

ENVIRONMENTAL SERVICES AND TESTING, INC.
P.O. Box 10570
Bakersfield, California 93389

New Mexico Environment Department
Air Quality Bureau
1301 Siler Road Building B
Santa Fe, NM87507
Phone (505) 476-4300 Fax (505) 476-4375

Version 1/1/2010

NMED USE ONLY	
DTS	
TEMPO	

UNIVERSAL STACK TEST NOTIFICATION, PROTOCOL AND REPORT FORM

NMED USE ONLY	
Staff	
Admin	

Submit to: Stacktest.aqb@state.nm.us

I. DATABASEHEADERINFORMATION(drop down menus in bold)

a. AI#		
1094	**Test Report**	**Periodic Test (EPA Method)**

d. Company Name:	e. Facility Name:
Dairy Farmers of America	**DFA - Portales**

f. Emission Unit Numbers:	g. Emission Unit Description (boiler, Waukesha 7042, etc)
D-2	**CE Rogers Vertical Dryer, 50 mmbtu/hr**

h. Reports - Tracking Number from notification response:	i. Proposed Test Date:	j. Actual test date:
CMT	**July 27-31, 2015**	**July 30, 2015**

k. Reason for test (name permit requirement, NSPS, MACT, consent decree, etc. Indicate here is this notification is a revised test date only)
Condition A601.G(Periodic Emissions Tests) of Permit 1263-M4

II. GENERALCOMPANY AND FACILITY INFORMATION

a.Company Address:			k.. Facility Address:		
800 West Tampa Street			**1820 South Industrial Drive**		
b. City:	c. State:	d. Zip:	l. City:	m. State:	n. Zip:
Springfield	**MO**	**65802-0000**	**Portales**	**NM**	**88130**
e. Environmental Contact:	f. Title:		o. Facility Contact:	p. Title:	
Whitney Christian	**Sr. Mgr. Env. Compliance**		**Joey Martin**	**Plant Manager**	
g. Phone Number:	h. Cell Number:		q. Phone Number:	r. Cell Number:	
(417) 829-2852	**(417) 414-8503**		**(575) 359-3904**	**(575) 218-5315**	
i. Email Address:			s. Email Address:		
whgalloway@dfamilk.com			**joeymartin@dfamilk.com**		
j. Title V Permit Number:			t. NSR Permit Number:		
P234-R1M1			**1263-M4**		

u. Detailed driving directions from nearest New Mexico town:
From Portales: South on West 2nd Street (US-70). Turn right onto 18th Street. Turn left onto South Industrial Drive. Facility on right.

III. TESTING FIRM

a. Company:			g. Contact:	
Environmental Services and Testing, Inc.			**James Taplin**	
b. Address 1:			h. Title:	
P.O. Box 10570			**President, Project Manager**	
c. Address 2:			i. Office Phone:	j. Cell Phone:
			(661) 496-9895	**(661)496-9895**
d. City:	e. State:	f. Zip:	k. Email Address:	
Bakersfield	**CA**	**93389**	**james@estair-usa.com**	

IV. EMISSION UNIT

a. Emission Unit Number:	b. Make & Model Number
D-2	**CE Rogers**
c. Serial Number:	d. Permitted Capacity: **50 mmbtu/hr**

e Exceptions: Explain if test is late, rescheduled, related to an enforcement action:

g. Emission Unit Description and brief process name or description:

Milk processing plant. D-2 is the process tested. It is equipped two baghouses to control emissions. It is also equipped with three stacks that are referred to as: North Stack, South Stack and Belt Vent Stack.

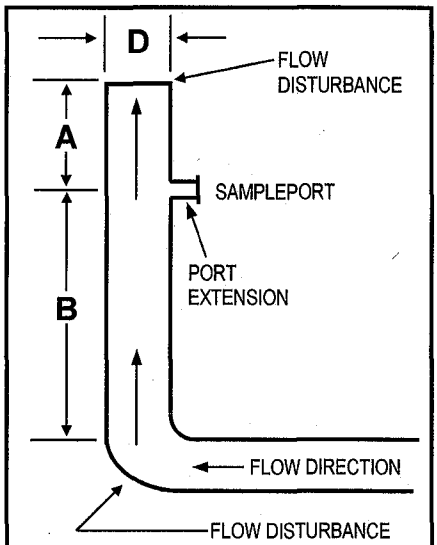
h. Installation Date:	i. Startup Date:	k. Date Reached Max. Capacity:

l. Control Equipment Description as listed in permit (model, ser. # etc. if applicable):

Two baghouses to control emissions

STACK PARAMETERS

m. Velocity (ft/sec):	**See Tables**
n. Temperature (°C):	**See Tables**
o. Stack Diameter, D (in.):	**Figures 1-3**
p. Distance to Stack Bends or Obstructions:	
Upstream, Distance A (in.):	**Figures 1-3**
Downstream, Distance B (in.):	**Figures 1-3**



EXAMPLE VIEW SHOWING DISTANCES FROM SAMPLEPORT TO FLOW DISTURBANCES

Attach an explanation or drawing to explain any difficult or unusual stack geometry or parameters.

V. POLLUTANTS AND PROPOSED TEST METHODS

Pollutant or Parameter:		Proposed Test Methods (Deviations from approved methods require supporting documentation and prior authorization)	Deviation to Test Method Requested
☐	**Portable Analyzer Methods for NOx, CO, SO_2**		☐
☒	NOx	**EPA Method 7E**	☐
☒	CO	**EPA Method 10**	☐
☐	SO2	**EPA Method 6**	☐
☐	VOCs	**(Specify)**	☐
☐	HAPs	**(Specify)**	☐
☒	PM (TSP)	**EPA Method 5**	☒
☐	PM10	**EPA Method 201**	☐
☐	PM2.5	**(Specify)**	☐
☐	Opacity	**EPA Method 9**	☐
☐	Visual E.	**EPA Method 22**	☐
☒	Stack Flow	**EPA Methods 1 - 3**	☐
☒	Moisture	**EPA Method 4**	☐
☒	Other	**(Specify) EPA Method 202**	☐
☐	Other	**(Specify)**	☐

List Specific VOC's and HAP's:

VI. PROPOSED TEST RUN AND TEST LOAD INFORMATION

a. Number of Test Runs:	b. Run Duration	c. Required by (regulation or permit number):	d. Specific Condition or Section:
3	**60 minutes**	**1263-M4**	**B111.C**

PLEASE NOTE – Default run duration is 60 minutes, unless otherwise specified by an applicable regulation.

e. Expected Load:	f. Percent of Permitted Capacity:	g. Is this an opacity test?	h. If yes, no. of observation pts.:
19,434 lbs/hr	**81%**	Yes ☐ No ☒	

i. If expected load during test is less than 90% of capacity, explain:

Monitoring was conducted at the maximum achievable load under prevailing operating conditions as related to milk volume and product.

NOTE – Failure to test at 90-100% of permitted load will limit unit operation to 110% of tested load until a new initial compliance test is conducted.

PLANT OR UNIT OPERATING PARAMETERS TO BE MONITORED

j. List and explain the plant operating parameters that will be monitored and applicable permit conditions or regulatory standards.

Production rate of Powder (lb/hr). The permitted production rate for D-2 is 24,000 lb/hr. The production rate was targeted at 90% capacity. As noted in B108.E of NSR Permit 1263-M4, if 90% capacity cannot be achieved, monitoring will be conducted at the maximum achievable load under prevailing operating conditions.

VII. ADDITIONAL DETAILS (where applicable)

RATA and INSTRUMENTAL ANALYZER CALIBRATION PROCEDURES

a. Do any of the methods you are proposing utilize instrumental analyzers (i.e.; EPA Methods 3A, 6C, 7E, 10, 18, 25/25A, 320 etc.)? If yes, briefly describe analyzer calibration procedures and/or calibration standard procedures. Enter the highest pollutant concentration expected and the proposed concentrations of calibration gases.	☒Yes	☐No

As described in EPA Methods 3A, 7E and 10
O2: Level: Tables 2-4, Upscale Cal Gas = 20.00%, Low Scale Cal Gas = 8.97%
NOx: Level: Tables 2-4, Upscale Cal Gas = 78.5 ppm, Low Scale Cal Gas = 40.0 ppm
CO: Level: Tables 2-4, Upscale Cal Gas = 80.5 ppm, Low Scale Cal Gas = 40.2 ppm

SAMPLING TRAIN LEAK CHECK PROCEDURES

b. Do any of the methods you are proposing utilize the EPA Method 5 sampling train (i.e.; EPA Methods 1-4, 5, 17, 26/26A, 29, etc.)? If yes, briefly describe sampling train and pitot tube leak check procedures:	☒Yes	☐No

After the sampling train has been assembled, turn on and set the filter and probe heating systems to the desired operating temperatures. Allow time for the temperatures to stabilize. If a Viton A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 380 mm (15 in.) Hg vacuum. NOTE: A lower vacuum may be used, provided that it is not exceeded during the test.s described in EPA Method 5

EPA METHOD 19 IN LIEU OF EPA METHODS 1-4

c. Are you proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4? If yes, explain why you believe this proposal is justified:	☐Yes	☒No

PLEASE NOTE – EPA Method 19 may be utilized in lieu of EPA Methods 1-4, subject to the approval of the Department. If you are proposing to utilize EPA Method 19 in lieu of EPA Methods 1-4, you MUST include a recent fuel gas heating value analysis as well as a recent fuel flow meter calibration certificate, preferably conducted on the day of the test, but no earlier than three months prior to the test date. If the analyses have been conducted prior to the test date, you MUST append the certificates to the protocol. If conducted on the day of the test, you MUST append the certificates to the final test report.

VIII. ATTACHMENTS (as needed to support proposed test; check all that apply)		
NOTIFICATION/PROTOCOL ATTACHMENTS		
☐	Road Map Indicating Directions from Nearest New MexicoTown to Facility	
☐	Schematic of process being tested showing emission points, sampling sites and stack cross-section	
☐	Copy of proposed test methods (except for those promulgated test methods found in 40 CFR 51, 60, 61 and 63)	
☐	Fuel Heating Value Analysis	
☐	Fuel Flow Meter Calibration Certificate	
☐	Other:	
☐	Other:	
TEST REPORT ATTACHMENTS		
☒	**Section 2. Tables of Results**	
☒	**Supporting Documents (Specify) Schmatics**	
Retain Report Section 3 - Test Procedures, Data, Calculations, Appendices – 2 years NSR permits, 5 years TV		

IX. CERTIFICATION		
This document has been prepared under my supervision and is accurate and complete to the best of my knowledge. I understand that acceptance of this protocol does not waive the requirements of any permit or regulation. I understand that any procedural errors or omissions are the sole responsibility of the permit holder.		
Signature:	Print Name and Title: **Jason Anthony - Environmental Scientist**	Date: **08/28/2015**
Responsible Official for Title V? ☐ Yes	☒ No (R.O signature not required for routine periodic testing)	

List of Tables

List of Figures

Table 1. Executive Summary
Dryer-2

Particulate Matter: PM (CPM + TSP)

Pollutant	Units	Average	Permit Limit
North Stack	lb/hr	1.94	
South Stack	lb/hr	3.10	
Belt Vent Stack	lb/hr	0.02	
Total	**lb/hr**	**5.06**	**18.1**

PM includes both filterable (TSP) and condensable (CPM) particulate matter.

NOx Emissions

Pollutant	Units	Average	Permit Limit
North Stack	lb/hr	0.17	
South Stack	lb/hr	0.17	
Belt Vent Stack	lb/hr	0.01	
Total	**lb/hr**	**0.35**	**8.0**

CO Emissions

Pollutant	Units	Average	Permit Limit
North Stack	lb/hr	1.66	
South Stack	lb/hr	2.17	
Belt Vent Stack	lb/hr	0.06	
Total	**lb/hr**	**3.89**	**12.0**

Notes: 1. The TSP mass emission rate is used to report PM-10 and PM-2.5 in accordance with NSR Permit 1263-M4 Condition A601.G. The TSP emission rates are found in Tables 3, 5, 7.

Table 2. Detailed Summary of Results
Dairy Farmers of America
Dryer-2 (North Stack)

Parameter	Units	Run-1	Run-2	Run-3	Average
Production Rate	**lbs/hr**	**18322**	**19091**	**19346**	**18920**

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	16:15	17:55	19:30	
End Time	military	17:14	18:54	20:29	
NOx Concentration	ppm	1.01	0.81	0.55	0.79
NOx Mass Flow Rate	**lb/hr**	**0.21**	**0.17**	**0.11**	**0.17**
CO Concentration	ppm	12.4	12.2	14.8	13.1
CO Mass Flow Rate	**lb/hr**	**1.58**	**1.56**	**1.85**	**1.66**
O_2 Level	%	19.12	20.10	19.74	19.65
CO_2 Level	%	0.57	0.57	0.57	0.57
Exhaust Rate	dscfm	29203	29296	28661	29053

Particulate Determination - EPA Methods 3, 4 , 5 and 202

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	16:15	17:55	19:30	
End Time	military	17:20	19:00	20:35	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	31.96	32.28	32.36	
Stack Temperature	°F	191	197	197	195
Stack Moisture	%	11.5	11.1	11.5	11.4
Stack Pressure	in Hg	25.92	25.92	25.92	25.92
Average Pressure head	in H_2O	0.35	0.35	0.34	0.35
Velocity	ft/sec	39.89	40.21	39.50	39.87
Exhaust Rate	acfm	46976	47349	46508	46944
Exhaust Rate	dscfm	29203	29296	28661	29053
PM Loading	gr/dscf	0.0071	0.0079	0.0084	0.0078
PM Emission Rate	**lb/hr**	**1.78**	**1.97**	**2.07**	**1.94**

Notes:
1. The exhaust rate (dscfm) and pollutant concentrations (ppm) are measured simultaneously.
2. PM includes both filterable and condensable particulate matter.
3. A breakdown of particulate emissions is included in Table 3.

Table 3. Summary of Results
DFA - Dryer 2 North Stack
Particulate Emissions

Parameter	Units	Run-1	Run-2	Run-3	Average
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	31.96	32.28	32.36	
O_2 Level	%	19.12	20.10	19.74	19.65
CO_2 Level	%	0.57	0.57	0.57	0.57
Moisture Level	%	11.54	11.10	11.50	11.38
Exhaust Rate	dscfm	29203	29296	28661	29053
PM Loading	gr/dscf	0.0071	0.0079	0.0084	0.0078
PM Mass Emission Rate	lb/hr	1.78	1.97	2.07	1.94
TSP Loading	gr/dscf	0.0016	0.0022	0.0027	0.0022
TSP Mass Emission Rate	lb/hr	0.39	0.56	0.66	0.54
CPM Loading	gr/dscf	0.0055	0.0056	0.0057	0.0056
CPM Mass Emission Rate	lb/hr	1.39	1.41	1.41	1.40

Notes:

1. **PM: Particulate Matter:** Includes both filterable and condensable particulate matter.

2. **TSP: Total Suspended Particulate:** Includes filterable particulate matter only. This is matter that is captured on the filter and in train components located upstream of the filter.

3. **CPM: Condensable Particulate Matter:** This is matter that passes through the filter and condenses in the wet impingement train. CPM includes both organic and water soluble particulate matter.

Table 4. Detailed Summary of Results
Dairy Farmers of America
Dryer-2 (South Stack)

Parameter	Units	Run-1	Run-2	Run-3	Average
Production Rate	**lbs/hr**	**20128**	**20087**	**19654**	**19956**

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	10:20	12:15	14:05	
End Time	military	11:19	13:14	15:04	
NOx Concentration	ppm	0.73	0.60	0.48	0.60
NOx Mass Flow Rate	**lb/hr**	**0.21**	**0.17**	**0.13**	**0.17**
CO Concentration	ppm	11.8	11.7	14.0	12.5
CO Mass Flow Rate	**lb/hr**	**2.08**	**2.05**	**2.38**	**2.17**
O_2 Level	%	19.89	19.66	19.37	19.64
CO_2 Level	%	0.57	0.57	0.54	0.56
Exhaust Rate	dscfm	40436	40208	39006	39883

Particulate Determination - EPA Methods 3, 4 , 5 and 202

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	10:20	12:15	14:05	
End Time	military	11:25	13:20	15:10	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	30.84	30.90	30.19	
Stack Temperature	°F	219	218	221	219
Stack Moisture	%	8.5	8.7	8.7	8.6
Stack Pressure	in Hg	25.76	25.76	25.76	25.76
Average Pressure head	in H_2O	0.35	0.35	0.34	0.35
Velocity	ft/sec	55.99	55.74	54.38	55.37
Exhaust Rate	acfm	65929	65633	64032	65198
Exhaust Rate	dscfm	40436	40208	39006	39883
PM Loading	gr/dscf	0.0089	0.0093	0.0090	0.0091
PM Emission Rate	**lb/hr**	**3.08**	**3.19**	**3.02**	**3.10**

Notes:
1. The exhaust rate (dscfm) and pollutant concentrations (ppm) are measured simultaneously.
2. PM includes both filterable and condensable particulate matter.
3. A breakdown of particulate emissions is included in Table 5.

Table 5. Summary of Results
DFA - Dryer 2 South Stack
Particulate Emissions

Parameter	Units	Run-1	Run-2	Run-3	Average
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	30.84	30.90	30.19	
O_2 Level	%	19.15	20.15	19.74	19.68
CO_2 Level	%	0.55	0.55	0.55	0.55
Moisture Level	%	8.47	8.67	8.70	8.62
Exhaust Rate	dscfm	40436	40208	39006	39883
PM Loading	gr/dscf	0.0089	0.0093	0.0090	0.0091
PM Mass Emission Rate	lb/hr	3.08	3.19	3.02	3.10
TSP Loading	gr/dscf	0.0054	0.0064	0.0053	0.0057
TSP Mass Emission Rate	lb/hr	1.88	2.19	1.77	1.95
CPM Loading	gr/dscf	0.0035	0.0029	0.0038	0.0034
CPM Mass Emission Rate	lb/hr	1.20	1.00	1.26	1.15

Notes:

1. **PM: Particulate Matter:** Includes both filterable and condensable particulate matter.

2. **TSP: Total Suspended Particulate:** Includes filterable particulate matter only. This is matter that is captured on the filter and in train components located upstream of the filter.

3. **CPM: Condensable Particulate Matter:** This is matter that passes through the filter and condenses in the wet impingement train. CPM includes both organic and water soluble particulate matter.

Table 6. Detailed Summary of Results
Dairy Farmers of America
Dryer-2 (Belt Vent Stack)

Parameter	Units	Run-1	Run-2	Run-3	Average
Production Rate	**lbs/hr**	**19825**	**19451**	**18322**	**19199**

CEMS Results - NOx, CO and O_2: EPA Methods 3A, 7E and 10

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	13:00	14:55	17:00	
End Time	military	14:00	15:55	18:00	
NOx Concentration	ppm	0.16	0.19	0.19	0.18
NOx Mass Flow Rate	**lb/hr**	**0.01**	**0.01**	**0.01**	**0.01**
CO Concentration	ppm	2.44	2.11	2.61	2.39
CO Mass Flow Rate	**lb/hr**	**0.06**	**0.06**	**0.07**	**0.06**
O_2 Level	%	20.01	19.99	19.41	19.80
CO_2 Level	%	0.11	0.15	0.21	0.16
Exhaust Rate	dscfm	5944	5924	5915	5928

Particulate Determination - EPA Methods 3, 4 , 5 and 202

Parameter	Units	Run-1	Run-2	Run-3	Average
Start Time	military	13:00	14:55	17:00	
End Time	military	14:05	16:00	18:05	
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	31.33	31.19	31.44	
Stack Temperature	°F	149	148	152	150
Stack Moisture	%	6.1	6.6	6.2	6.3
Stack Pressure	in Hg	25.92	25.92	25.92	25.92
Average Pressure head	in H_2O	0.95	0.99	0.10	0.68
Velocity	ft/sec	64.40	64.42	64.47	64.43
Exhaust Rate	acfm	8426	8428	8435	8430
Exhaust Rate	dscfm	5944	5924	5915	5927
PM Loading	gr/dscf	0.0005	0.0003	0.0005	0.0004
PM Emission Rate	**lb/hr**	**0.02**	**0.02**	**0.02**	**0.02**

Notes:
1. The exhaust rate (dscfm) and pollutant concentrations (ppm) are measured simultaneously.
2. PM includes both filterable and condensable particulate matter.
3. A breakdown of particulate emissions is included in Table 7.

Table 7. Summary of Results
DFA - Dryer 2 Belt Vent Stack
Particulate Emissions

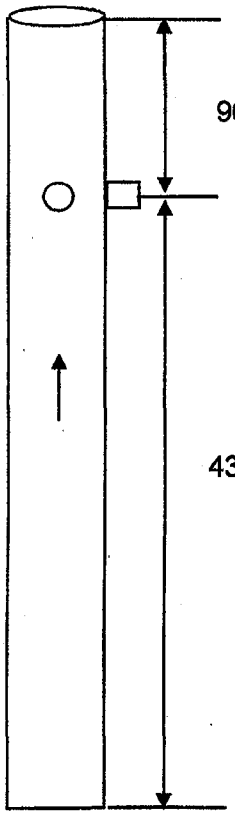
Parameter	Units	Run-1	Run-2	Run-3	Average
Test Duration	min	60.0	60.0	60.0	
Dry Standard Sample Volume	dscf	31.33	31.19	31.44	
O_2 Level	%	20.10	19.99	19.41	19.83
CO_2 Level	%	0.11	0.15	0.21	0.16
Moisture Level	%	6.1	6.6	6.2	6.3
Exhaust Rate	dscfm	5944	5924	5915	5927
PM Loading	gr/dscf	0.0005	0.0004	0.0004	0.0005
PM Mass Emission Rate	lb/hr	0.025	0.016	0.024	0.02
TSP Loading	gr/dscf	0.0003	0.0002	0.0003	0.0003
TSP Mass Emission Rate	lb/hr	0.016	0.008	0.017	0.01
CPM Loading	gr/dscf	0.0002	0.0002	0.0001	0.0002
CPM Mass Emission Rate	lb/hr	0.009	0.008	0.007	0.01

Notes:

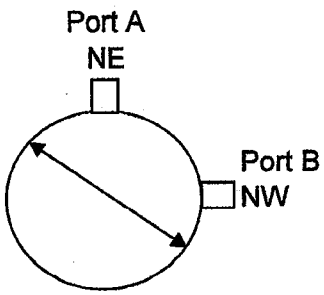
1. **PM: Particulate Matter:** Includes both filterable and condensable particulate matter.

2. **TSP: Total Suspended Particulate:** Includes filterable particulate matter only. This is matter that is captured on the filter and in train components located upstream of the filter.

3. **CPM: Condensable Particulate Matter:** This is matter that passes through the filter and condenses in the wet impingement train. CPM includes both organic and water soluble particulate matter.



Side View

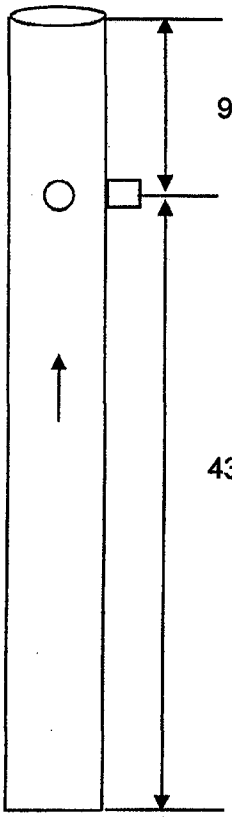


Top View

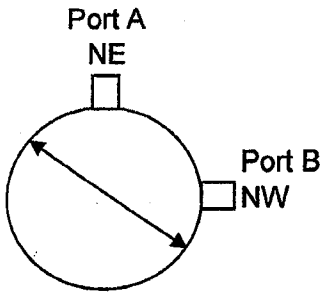
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure 1. Stack Dimensions and Traverse Points
Dryer 2 - North Stack



Side View

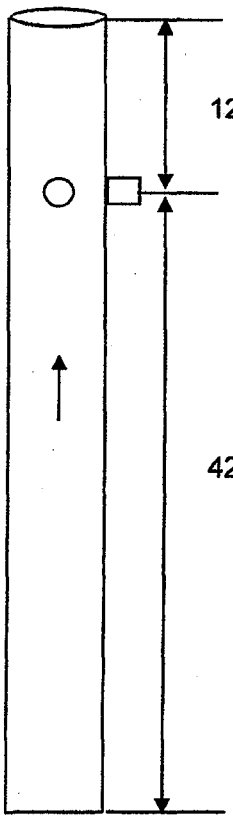


Top View

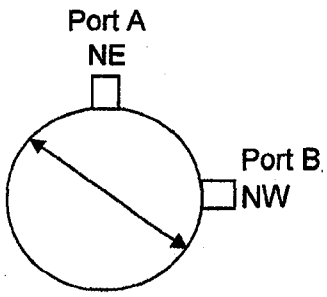
Diameter	60.0	Inches
Port Length	1.0	Inches
Upstream Diameters	1.6	Diameters
Downstream Diameters	7.2	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	1.3	2.3
2	6.7	4.0	5.0
3	11.8	7.1	8.1
4	17.7	10.6	11.6
5	25.0	15.0	16.0
6	35.6	21.4	22.4
7	64.4	38.6	39.6
8	75.0	45.0	46.0
9	82.3	49.4	50.4
10	88.2	52.9	53.9
11	93.3	56.0	57.0
12	97.9	58.7	59.7

Figure 2. Stack Dimensions and Traverse Points
Dryer 2 - South Stack



Side View



Top View

Diameter	20.0	Inches
Port Length	1.0	Inches
Upstream Diameters	6.0	Diameters
Downstream Diameters	21.0	Diameters

Point	% Diameter %	Distance From Wall inches	Distance From Port inches
1	2.1	0.5	1.5
2	6.7	1.3	2.3
3	11.8	2.4	3.4
4	17.7	3.5	4.5
5	25.0	5.0	6.0
6	35.6	7.1	8.1
7	64.4	12.9	13.9
8	75.0	15.0	16.0
9	82.3	16.5	17.5
10	88.2	17.6	18.6
11	93.3	18.7	19.7
12	97.9	0.5	1.5

Figure 3. Stack Dimensions and Traverse Points
Dryer 2 - Belt Vent Stack

SAFETY DATA SHEET

AC-55-5

Section 1. Chemical product and company identification

Product name	:	AC-55-5
Recommended use and restrictions	:	Heavy duty cleaner Use only for the purpose on the product label.
Product dilution information	:	Up to 3 oz/gal or 23.4 mL/L in water
Supplier's information	:	Ecolab Inc. Food & Beverage Division 370 N. Wabasha Street St. Paul, MN 55102 1-800-392-3392
Code	:	922321
Date of issue	:	**11 Mar 2013** EMERGENCY HEALTH INFORMATION: 1-800-328-0026 Outside United States and Canada CALL 1-651-222-5352 (in USA)

Section 2. Hazards identification

		Product AS SOLD	**Product AT USE DILUTION**
GHS Classification	:	CORROSIVE TO METALS - Category 1 SKIN CORROSION/IRRITATION - Category 1 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1 AQUATIC TOXICITY (ACUTE) - Category 3	SKIN CORROSION/IRRITATION - Category 1 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
GHS label elements			
Signal word	:	Danger	Danger
Symbol	:		
Hazard statements	:	May be corrosive to metals. Causes severe skin burns and eye damage. Harmful to aquatic life.	Causes severe skin burns and eye damage.
Precautionary statements			
Prevention	:	Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep only in original container. Avoid release to the environment. Wash hands thoroughly after handling. Do not mix with bleach or other chlorinated products - will cause chlorine gas.	Wear protective gloves. Wear eye or face protection. Wear protective clothing. Wash hands thoroughly after handling.
Response	:	Absorb spillage to prevent material damage. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash

Section 2. Hazards identification

		contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.	contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.
Storage	:	Store in corrosive resistant container with a resistant inner liner.	No other specific measures identified.
Disposal	:	See section 13 for waste disposal information.	See section 13 for waste disposal information.
Other hazards	:	None known.	None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Product AS SOLD

Hazardous ingredients	Concentration Range (%)	CAS number
nitric acid	38	7697-37-2
PHOSPHORIC ACID	2	7664-38-2

Product AT USE DILUTION

Within the present knowledge of the supplier, this product does not contain any hazardous ingredients in quantities requiring reporting, in accordance with local regulations.

Section 4. First aid measures

		Product AS SOLD	Product AT USE DILUTION
Eye contact	:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.
Skin contact	:	Take off immediately all contaminated clothing. Rinse skin with water or shower. Get medical attention immediately. Wash clothing before reuse. Clean shoes thoroughly before reuse.	Take off immediately all contaminated clothing. Rinse skin with water or shower. Get medical attention immediately. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Inhalation	:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention immediately.	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention immediately.
Ingestion	:	Get medical attention immediately. Rinse mouth. Do not induce vomiting.	Get medical attention immediately. Rinse mouth. Do not induce vomiting.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

See toxicological information (section 11)

Section 5. Fire-fighting measures

Product AS SOLD

Suitable fire extinguishing media : Use water spray, fog or foam.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
nitrogen oxides
phosphorus oxides

Specific fire-fighting methods : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

	Product AS SOLD	Product AT USE DILUTION
Personal precautions	: Initiate company's spill response procedures immediately. Keep people out of area. Put on appropriate personal protective equipment (see section 8). Do not touch or walk through spilled material.	Initiate company's spill response procedures immediately. Keep people out of area. Put on appropriate personal protective equipment (see section 8). Do not touch or walk through spilled material.
Environmental precautions	: Avoid contact of spilled material and runoff with soil and surface waterways.	Avoid contact of spilled material and runoff with soil and surface waterways.
Methods for cleaning up	: Follow company's spill procedures. Keep people away from spill. Put on appropriate personal protective equipment (see section 8). Absorb/ neutralize liquid material. Use a tool to scoop up solid or absorbed material and put into appropriate labeled container. Use a tool to scoop up solid or absorbed material and place into appropriate labeled waste container. Use a water rinse for final clean-up.	Follow company's spill procedures. Keep people away from spill. Put on appropriate personal protective equipment (see section 8). Absorb/neutralize liquid material. Use a tool to scoop up solid or absorbed material and put into appropriate labeled container. Use a tool to scoop up solid or absorbed material and place into appropriate labeled waste container. Use a water rinse for final clean-up.

Section 7. Handling and storage

	Product AS SOLD	Product AT USE DILUTION
Handling	: Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling. Do not mix with bleach or other chlorinated products - will cause chlorine gas.	Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling.
Storage	: Keep out of reach of children. Keep container tightly closed. Store between the following temperatures: -30 and 45°C	Keep out of reach of children. Keep container tightly closed.

Section 8. Exposure controls/personal protection

Control parameters

Ingredient name	Exposure limits
nitric acid	**ACGIH TLV (United States, 3/2012).** STEL: 10 mg/m³ 15 minutes. STEL: 4 ppm 15 minutes. TWA: 5.2 mg/m³ 8 hours. TWA: 2 ppm 8 hours. **OSHA PEL (United States, 6/2010).** TWA: 5 mg/m³ 8 hours. TWA: 2 ppm 8 hours. **NIOSH REL (United States, 6/2009).** TWA: 2 ppm 10 hours. TWA: 5 mg/m³ 10 hours. STEL: 4 ppm 15 minutes. STEL: 10 mg/m³ 15 minutes.
PHOSPHORIC ACID	**ACGIH TLV (United States, 3/2012).** STEL: 3 mg/m³ 15 minutes. TWA: 1 mg/m³ 8 hours. **OSHA PEL (United States, 6/2010).** TWA: 1 mg/m³ 8 hours. **NIOSH REL (United States, 6/2009).** TWA: 1 mg/m³ 10 hours. STEL: 3 mg/m³ 15 minutes.

	Product AS SOLD	Product AT USE DILUTION
Appropriate engineering controls	: Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.	Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.
Personal protection		
Eye protection	: Use chemical splash goggles. For continued or severe exposure wear a face shield over the goggles.	Use chemical splash goggles. For continued or severe exposure wear a face shield over the goggles.
Hand protection	: Use chemical-resistant, impervious gloves.	Use chemical-resistant, impervious gloves.
Skin protection	: Use synthetic apron, other protective equipment as necessary to prevent skin contact.	Use synthetic apron, other protective equipment as necessary to prevent skin contact.
Respiratory protection	: A respirator is not needed under normal and intended conditions of product use.	A respirator is not needed under normal and intended conditions of product use.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Section 9. Physical and chemical properties

	Product AS SOLD	Product AT USE DILUTION
Physical state	: Liquid.	Liquid.
Color	: Colorless	Colorless
Odor	: Pungent	Odorless
pH	: 0.9 to 1.1 (100%)	1 to 1.8
Flash point	: > 100°C Product does not support combustion.	> 100°C
Explosion limits	: Not available.	
Flammability (solid, gas)	: Not available.	
Melting point	: Not available.	
Boiling point	: >100°C (>212°F)	
Evaporation rate (butyl acetate = 1)	: Not available.	
Vapor pressure	: Not available.	
Vapor density	: Not available.	
Relative density	: 1.244 to 1.254 (Water = 1)	
Solubility	: Easily soluble in the following materials: cold water and hot water.	
Partition coefficient: n-octanol/water	: Not available.	
Auto-ignition temperature	: Not available.	
Decomposition temperature	: Not available.	
Odor threshold	: Not available.	
Viscosity	: Not available.	

Section 10. Stability and reactivity

Product AS SOLD

Stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	: No specific data.
Materials to avoid	: Extremely reactive or incompatible with the following materials: alkalis. Reactive or incompatible with the following materials: organic materials, metals and moisture. Do not mix with bleach or other chlorinated products - will cause chlorine gas.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Route of exposure : Skin contact, Eye contact, Inhalation, Ingestion

Section 11. Toxicological information

	Product AS SOLD	Product AT USE DILUTION
Symptoms		
Eye contact	: Adverse symptoms may include the following: pain watering redness	Adverse symptoms may include the following: pain watering redness
Skin contact	: Adverse symptoms may include the following: pain or irritation redness blistering may occur	Adverse symptoms may include the following: pain or irritation redness blistering may occur
Inhalation	: Adverse symptoms may include the following: coughing Respiratory tract irritation	Adverse symptoms may include the following: coughing Respiratory tract irritation
Ingestion	: Adverse symptoms may include the following: stomach pains	Adverse symptoms may include the following: stomach pains
Acute toxicity		
Eye contact	: Causes serious eye damage.	Causes serious eye damage.
Skin contact	: Causes severe burns.	Causes severe burns.
Inhalation	: May cause respiratory irritation.	May cause respiratory irritation.
Ingestion	: May cause burns to mouth, throat and stomach.	May cause burns to mouth, throat and stomach.

Toxicity data

Product/ingredient name	Result	Species	Dose
phosphoric acid	LC50 Inhalation Dusts and mists	Rat	0.962 mg/l
	LD50 Dermal	Rat	>2000 mg/kg
	LD50 Oral	Rat	>2000 mg/kg

Chronic toxicity

Carcinogenicity	: No known significant effects or critical hazards.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: No known significant effects or critical hazards.
Developmental effects	: No known significant effects or critical hazards.
Fertility effects	: No known significant effects or critical hazards.

Section 12. Ecological information

Product AS SOLD

Ecotoxicity : This material is harmful to aquatic life.

Aquatic and terrestrial toxicity

Product/ingredient name	Result	Species	Exposure
nitric acid	Acute LC50 72 mg/l	Fish	96 hours
phosphoric acid	Acute LC50 75.1 mg/l	Fish	96 hours

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Section 13. Disposal considerations

Product AS SOLD

Disposal methods : Avoid disposal. Attempt to use product completely in accordance with intended use. Disposal should be in accordance with applicable regional, national and local laws and regulations.

RCRA classification : Unused product is D002 (Corrosive)

Product AT USE DILUTION

Avoid disposal. Attempt to use product completely in accordance with intended use. Disposal should be in accordance with applicable regional, national and local laws and regulations.

Section 14. Transport information

Certain shipping modes or package sizes may have exceptions from the transport regulations. The classification provided may not reflect those exceptions and may not apply to all shipping modes or package sizes.

DOT

DOT Classification	UN2031
DOT Proper shipping name	NITRIC ACID
Class	8
Packing group	II

IMO/IMDG

IMO/IMDG Classification	UN2031
IMO/IMDG Proper shipping name	NITRIC ACID solution
Class	8
Packing group	II

For transport in bulk, see shipping documents for specific transportation information.

Product AT USE DILUTION

Not intended for transport.

Section 15. Regulatory information

Product AS SOLD

U.S. Federal regulations

TSCA 8(b) inventory : All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: nitric acid

SARA 302/304 emergency planning and notification: nitric acid

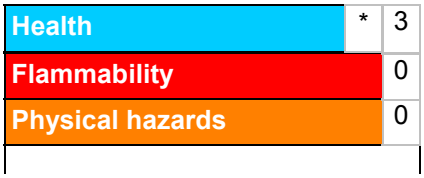
SARA 313	Product name	CAS number	Concentration
Form R - Reporting requirements :	nitric acid	7697-37-2	38.09

California Prop. 65 : No listed substance

Section 16. Other information

Product AS SOLD

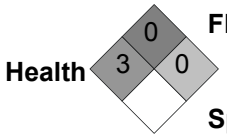
Hazardous Material Information System (U.S.A.) :



Product AT USE DILUTION

Section 16. Other information

National Fire Protection Association (U.S.A.) :



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3
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Health
Flammability
Instability/Reactivity
Special

Date of issue : **11 Mar 2013**

Prepared by : Regulatory Affairs
1-800-352-5326

Notice to reader

The above information is believed to be correct with respect to the formula used to manufacture the product in the country of origin. As data, standards, and regulations change, and conditions of use and handling are beyond our control, NO WARRANTY, EXPRESS OR IMPLIED, IS MADE AS TO THE COMPLETENESS OR CONTINUING ACCURACY OF THIS INFORMATION.

SAFETY DATA SHEET

AC-103

Section 1. Chemical product and company identification

Product name	:	AC-103
Recommended use and restrictions	:	Heavy duty cleaner Use only for the purpose on the product label.
Product dilution information	:	Up to 3.2oz/gal or 25mL/L in water
Supplier's information	:	Ecolab Inc. Food & Beverage Division 370 N. Wabasha Street St. Paul, MN 55102 1-800-392-3392
Code	:	943803
Date of issue	:	**21 May 2013** EMERGENCY HEALTH INFORMATION: 1-800-328-0026 Outside United States and Canada CALL 1-651-222-5352 (in USA)

Section 2. Hazards identification

		Product AS SOLD	**Product AT USE DILUTION**
GHS Classification	:	CORROSIVE TO METALS - Category 1 SKIN CORROSION/IRRITATION - Category 1 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1	SKIN CORROSION/IRRITATION - Category 1 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
GHS label elements			
Signal word	:	Danger	Danger
Symbol	:		
Hazard statements	:	May be corrosive to metals. Causes severe skin burns and eye damage.	Causes severe skin burns and eye damage.
Precautionary statements			
Prevention	:	Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep only in original container. Wash hands thoroughly after handling.	Wear protective gloves. Wear eye or face protection. Wear protective clothing. Wash hands thoroughly after handling.
Response	:	Absorb spillage to prevent material damage. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact

Section 2. Hazards identification

		lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.	lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.
Storage	:	Store in corrosive resistant container with a resistant inner liner.	No other specific measures identified.
Disposal	:	See section 13 for waste disposal information.	See section 13 for waste disposal information.
Other hazards	:	None known.	None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Product AS SOLD

Hazardous ingredients	Concentration Range (%)	CAS number
SODIUM HYDROXIDE	49	1310-73-2

Product AT USE DILUTION

Hazardous ingredients	Concentration Range (%)	CAS number
SODIUM HYDROXIDE	1	1310-73-2

Section 4. First aid measures

		Product AS SOLD	Product AT USE DILUTION
Eye contact	:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.
Skin contact	:	Take off immediately all contaminated clothing. Rinse skin with water or shower. Get medical attention immediately. Wash clothing before reuse. Clean shoes thoroughly before reuse.	Take off immediately all contaminated clothing. Rinse skin with water or shower. Get medical attention immediately. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Inhalation	:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention immediately.	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention immediately.
Ingestion	:	Get medical attention immediately. Rinse mouth. Do not induce vomiting.	Get medical attention immediately. Rinse mouth. Do not induce vomiting.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.	
Notes to physician	:	Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.	

See toxicological information (section 11)

Section 5. Fire-fighting measures

Product AS SOLD

Suitable fire extinguishing media	:	Use water spray, fog or foam.
Specific hazards arising from the chemical	:	In a fire or if heated, a pressure increase will occur and the container may burst.
Hazardous thermal decomposition products	:	Decomposition products may include the following materials: metal oxide/oxides

Section 5. Fire-fighting measures

Specific fire-fighting methods : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

	Product AS SOLD	Product AT USE DILUTION
Personal precautions	: Initiate company's spill response procedures immediately. Keep people out of area. Put on appropriate personal protective equipment (see section 8). Do not touch or walk through spilled material.	Initiate company's spill response procedures immediately. Keep people out of area. Put on appropriate personal protective equipment (see section 8). Do not touch or walk through spilled material.
Environmental precautions	: Avoid contact of spilled material and runoff with soil and surface waterways.	Avoid contact of spilled material and runoff with soil and surface waterways.
Methods for cleaning up	: Follow company's spill procedures. Keep people away from spill. Put on appropriate personal protective equipment (see section 8). Absorb/ neutralize liquid material. Use a tool to scoop up solid or absorbed material and put into appropriate labeled container. Use a tool to scoop up solid or absorbed material and place into appropriate labeled waste container. Use a water rinse for final clean-up.	Follow company's spill procedures. Keep people away from spill. Put on appropriate personal protective equipment (see section 8). Absorb/neutralize liquid material. Use a tool to scoop up solid or absorbed material and put into appropriate labeled container. Use a tool to scoop up solid or absorbed material and place into appropriate labeled waste container. Use a water rinse for final clean-up.

Section 7. Handling and storage

	Product AS SOLD	Product AT USE DILUTION
Handling	: Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling.	Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling.
Storage	: Keep out of reach of children. Keep container tightly closed. Store between the following temperatures: 10 and 50°C	Keep out of reach of children. Keep container tightly closed.

Section 8. Exposure controls/personal protection

Control parameters

Ingredient name	Exposure limits
SODIUM HYDROXIDE	**ACGIH TLV (United States, 3/2012).** C: 2 mg/m³ **OSHA PEL (United States, 6/2010).** TWA: 2 mg/m³ 8 hours. **NIOSH REL (United States, 6/2009).** CEIL: 2 mg/m³

Section 8. Exposure controls/personal protection

	Product AS SOLD	Product AT USE DILUTION
Appropriate engineering controls	: Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.	Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.
Personal protection		
Eye protection	: Use chemical splash goggles. For continued or severe exposure wear a face shield over the goggles.	Use chemical splash goggles. For continued or severe exposure wear a face shield over the goggles.
Hand protection	: Use chemical-resistant, impervious gloves.	Use chemical-resistant, impervious gloves.
Skin protection	: Use synthetic apron, other protective equipment as necessary to prevent skin contact.	Use synthetic apron, other protective equipment as necessary to prevent skin contact.
Respiratory protection	: A respirator is not needed under normal and intended conditions of product use.	A respirator is not needed under normal and intended conditions of product use.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Section 9. Physical and chemical properties

	Product AS SOLD	Product AT USE DILUTION
Physical state	: Liquid.	Liquid.
Color	: Hazy liquid	Colorless
Odor	: Faint odor	Odorless
pH	: 13.5 to 14 (100%)	12.5 to 13.5
Flash point	: > 100°C	> 100°C
Explosion limits	: Not available.	
Flammability (solid, gas)	: Not available.	
Melting point	: Not available.	
Boiling point	: Not available.	
Evaporation rate (butyl acetate = 1)	: Not available.	
Vapor pressure	: Not available.	
Vapor density	: Not available.	
Relative density	: 1.5 to 1.53 (Water = 1)	
Solubility	: Not available.	
Partition coefficient: n-octanol/water	: Not available.	
Auto-ignition temperature	: Not available.	
Decomposition temperature	: Not available.	
Odor threshold	: Not available.	
Viscosity	: Not available.	

Section 10. Stability and reactivity

Product AS SOLD

Stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Materials to avoid : Extremely reactive or incompatible with the following materials: acids.
Slightly reactive or incompatible with the following materials: metals and moisture.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Route of exposure : Skin contact, Eye contact, Inhalation, Ingestion

	Product AS SOLD	Product AT USE DILUTION
Symptoms		
Eye contact	: Adverse symptoms may include the following: pain watering redness	Adverse symptoms may include the following: pain watering redness
Skin contact	: Adverse symptoms may include the following: pain or irritation redness blistering may occur	Adverse symptoms may include the following: pain or irritation redness blistering may occur
Inhalation	: Adverse symptoms may include the following: coughing Respiratory tract irritation	Adverse symptoms may include the following: coughing Respiratory tract irritation
Ingestion	: Adverse symptoms may include the following: stomach pains	Adverse symptoms may include the following: stomach pains
Acute toxicity		
Eye contact	: Causes serious eye damage.	Causes serious eye damage.
Skin contact	: Causes severe burns.	Causes severe burns.
Inhalation	: May cause respiratory irritation.	May cause respiratory irritation.
Ingestion	: May cause burns to mouth, throat and stomach.	May cause burns to mouth, throat and stomach.

Toxicity data

Product/ingredient name
Not applicable.

Chronic toxicity

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 12. Ecological information

Product AS SOLD

Ecotoxicity : This material is harmful to aquatic life.

Aquatic and terrestrial toxicity

Product/ingredient name	Result	Species	Exposure
sodium hydroxide	Acute EC50 40 mg/l	Daphnia	48 hours

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Product AS SOLD

Disposal methods : Avoid disposal. Attempt to use product completely in accordance with intended use. Disposal should be in accordance with applicable regional, national and local laws and regulations.

RCRA classification : Unused product is D002 (Corrosive)

Product AT USE DILUTION

Avoid disposal. Attempt to use product completely in accordance with intended use. Disposal should be in accordance with applicable regional, national and local laws and regulations.

Section 14. Transport information

Certain shipping modes or package sizes may have exceptions from the transport regulations. The classification provided may not reflect those exceptions and may not apply to all shipping modes or package sizes.

DOT

DOT Classification	UN1824
DOT Proper shipping name	Sodium hydroxide solution
Class	8
Packing group	II

IMO/IMDG

IMO/IMDG Classification	UN1824
IMO/IMDG Proper shipping name	SODIUM HYDROXIDE SOLUTION
Class	8
Packing group	II

For transport in bulk, see shipping documents for specific transportation information.

Product AT USE DILUTION

Not intended for transport.

Section 15. Regulatory information

Product AS SOLD

U.S. Federal regulations

TSCA 8(b) inventory : All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No listed substance

SARA 302/304 emergency planning and notification: No listed substance

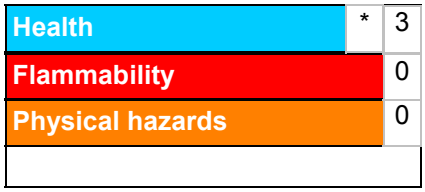
SARA 313	Product name	CAS number	Concentration
Form R - Reporting requirements :	No listed substance		

California Prop. 65 : No listed substance

Section 16. Other information

Product AS SOLD

Hazardous Material Information System (U.S.A.) :



National Fire Protection Association (U.S.A.) :

Product AT USE DILUTION

Date of issue : **21 May 2013**

Prepared by : Regulatory Affairs
1-800-352-5326

Notice to reader

The above information is believed to be correct with respect to the formula used to manufacture the product in the country of origin. As data, standards, and regulations change, and conditions of use and handling are beyond our control, NO WARRANTY, EXPRESS OR IMPLIED, IS MADE AS TO THE COMPLETENESS OR CONTINUING ACCURACY OF THIS INFORMATION.

SAFETY DATA SHEET

PRINCIPAL

Section 1. Chemical product and company identification

Product name	:	PRINCIPAL
Recommended use and restrictions	:	Cleaning product Use only for the purpose on the product label.
Product dilution information	:	Up to 3 oz/4 gal or 5.8 mL/L in water
Supplier's information	:	Ecolab Inc. Food & Beverage Division 370 N. Wabasha Street St. Paul, MN 55102 1-800-392-3392
Code	:	948463
Date of issue	:	**13 Mar 2013** EMERGENCY HEALTH INFORMATION: 1-800-328-0026 Outside United States and Canada CALL 1-651-222-5352 (in USA)

Section 2. Hazards identification

		Product AS SOLD	**Product AT USE DILUTION**
GHS Classification	:	CORROSIVE TO METALS - Category 1 SKIN CORROSION/IRRITATION - Category 1 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1 AQUATIC TOXICITY (ACUTE) - Category 2	CORROSIVE TO METALS - Category 1 SKIN CORROSION/IRRITATION - Category 1 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
GHS label elements			
Signal word	:	Danger	Danger
Symbol	:		
Hazard statements	:	May be corrosive to metals. Causes severe skin burns and eye damage. Toxic to aquatic life.	May be corrosive to metals. Causes severe skin burns and eye damage.
Precautionary statements			
Prevention	:	Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep only in original container. Avoid release to the environment. Wash hands thoroughly after handling. Mixing this product with acid or ammonia releases chlorine gas.	Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep only in original container. Wash hands thoroughly after handling.
Response	:	Absorb spillage to prevent material damage. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash	Absorb spillage to prevent material damage. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse

Section 2. Hazards identification

		contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.	skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.
Storage	:	Store in corrosive resistant container with a resistant inner liner.	Store in corrosive resistant container with a resistant inner liner.
Disposal	:	See section 13 for waste disposal information.	See section 13 for waste disposal information.
Other hazards	:	None known.	None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Product AS SOLD

Hazardous ingredients	Concentration Range (%)	CAS number
SODIUM HYDROXIDE	15	1310-73-2
sodium hypochlorite	3	7681-52-9

Product AT USE DILUTION

Hazardous ingredients	Concentration Range (%)	CAS number
sodium hypochlorite	<0.5	7681-52-9

Section 4. First aid measures

		Product AS SOLD	Product AT USE DILUTION
Eye contact	:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.
Skin contact	:	Take off immediately all contaminated clothing. Rinse skin with water or shower. Get medical attention immediately. Wash clothing before reuse. Clean shoes thoroughly before reuse.	Take off immediately all contaminated clothing. Rinse skin with water or shower. Get medical attention immediately. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Inhalation	:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention immediately.	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention immediately.
Ingestion	:	Get medical attention immediately. Rinse mouth. Do not induce vomiting.	Get medical attention immediately. Rinse mouth. Do not induce vomiting.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

See toxicological information (section 11)

Section 5. Fire-fighting measures

Product AS SOLD

Suitable fire extinguishing media : Use water spray, fog or foam.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst. This material is toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
metal oxide/oxides

Specific fire-fighting methods : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

	Product AS SOLD	Product AT USE DILUTION
Personal precautions	Initiate company's spill response procedures immediately. Keep people out of area. Put on appropriate personal protective equipment (see section 8). Do not touch or walk through spilled material.	Initiate company's spill response procedures immediately. Keep people out of area. Put on appropriate personal protective equipment (see section 8). Do not touch or walk through spilled material.
Environmental precautions	Avoid contact of spilled material and runoff with soil and surface waterways.	Avoid contact of spilled material and runoff with soil and surface waterways.
Methods for cleaning up	Follow company's spill procedures. Keep people away from spill. Put on appropriate personal protective equipment (see section 8). Absorb/ neutralize liquid material. Use a tool to scoop up solid or absorbed material and put into appropriate labeled container. Use a tool to scoop up solid or absorbed material and place into appropriate labeled waste container. Use a water rinse for final clean-up.	Follow company's spill procedures. Keep people away from spill. Put on appropriate personal protective equipment (see section 8). Absorb/neutralize liquid material. Use a tool to scoop up solid or absorbed material and put into appropriate labeled container. Use a tool to scoop up solid or absorbed material and place into appropriate labeled waste container. Use a water rinse for final clean-up.

Section 7. Handling and storage

	Product AS SOLD	Product AT USE DILUTION
Handling	Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling. Mixing this product with acid or ammonia releases chlorine gas.	Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling.
Storage	Keep out of reach of children. Keep container tightly closed. Do not store above the following temperature: 40°C	Keep out of reach of children. Keep container tightly closed.

Section 8. Exposure controls/personal protection

Control parameters

Ingredient name	Exposure limits
SODIUM HYDROXIDE	**ACGIH TLV (United States, 3/2012).** C: 2 mg/m³ **OSHA PEL (United States, 6/2010).** TWA: 2 mg/m³ 8 hours. **NIOSH REL (United States, 6/2009).** CEIL: 2 mg/m³
sodium hypochlorite	**AIHA WEEL (United States, 10/2011).** STEL: 2 mg/m³ 15 minutes.
chlorine	**ACGIH TLV (United States, 3/2012).** STEL: 2.9 mg/m³ 15 minutes. STEL: 1 ppm 15 minutes. TWA: 1.5 mg/m³ 8 hours. TWA: 0.5 ppm 8 hours. **OSHA PEL (United States, 6/2010).** CEIL: 3 mg/m³ CEIL: 1 ppm **NIOSH REL (United States, 6/2009).** CEIL: 0.5 ppm 15 minutes. CEIL: 1.45 mg/m³ 15 minutes.

	Product AS SOLD	Product AT USE DILUTION
Appropriate engineering controls	: Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.	Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.
Personal protection		
Eye protection	: Use chemical splash goggles. For continued or severe exposure wear a face shield over the goggles.	Use chemical splash goggles. For continued or severe exposure wear a face shield over the goggles.
Hand protection	: Use chemical-resistant, impervious gloves.	Use chemical-resistant, impervious gloves.
Skin protection	: Use synthetic apron, other protective equipment as necessary to prevent skin contact.	Use synthetic apron, other protective equipment as necessary to prevent skin contact.
Respiratory protection	: A respirator is not needed under normal and intended conditions of product use.	A respirator is not needed under normal and intended conditions of product use.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Section 9. Physical and chemical properties

	Product AS SOLD	Product AT USE DILUTION
Physical state	: Liquid.	Liquid.
Color	: Yellow [Light]	Pale color [Light]
Odor	: chlorine	Faint odor
pH	: 12.5 to 13.5 (100%)	11.7 to 12.7
Flash point	: > 100°C	> 100°C
Explosion limits	: Not available.	
Flammability (solid, gas)	: Not available.	
Melting point	: Not available.	
Boiling point	: Not available.	
Evaporation rate (butyl acetate = 1)	: Not available.	
Vapor pressure	: Not available.	
Vapor density	: Not available.	
Relative density	: 1.237 to 1.25 (Water = 1)	
Solubility	: Not available.	
Partition coefficient: n-octanol/water	: Not available.	
Auto-ignition temperature	: Not available.	
Decomposition temperature	: Not available.	
Odor threshold	: Not available.	
Viscosity	: Not available.	

Section 10. Stability and reactivity

Product AS SOLD

Stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	: No specific data.
Materials to avoid	: Extremely reactive or incompatible with the following materials: acids. Reactive or incompatible with the following materials: moisture. Slightly reactive or incompatible with the following materials: metals. Mixing this product with acid or ammonia releases chlorine gas.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Route of exposure : Skin contact, Eye contact, Inhalation, Ingestion

Section 11. Toxicological information

	Product AS SOLD	Product AT USE DILUTION
Symptoms		
Eye contact	: Adverse symptoms may include the following: pain watering redness	Adverse symptoms may include the following: pain watering redness
Skin contact	: Adverse symptoms may include the following: pain or irritation redness blistering may occur	Adverse symptoms may include the following: pain or irritation redness blistering may occur
Inhalation	: Adverse symptoms may include the following: coughing Respiratory tract irritation	Adverse symptoms may include the following: coughing Respiratory tract irritation
Ingestion	: Adverse symptoms may include the following: stomach pains	Adverse symptoms may include the following: stomach pains
Acute toxicity		
Eye contact	: Causes serious eye damage.	Causes serious eye damage.
Skin contact	: Causes severe burns.	Causes severe burns.
Inhalation	: May cause respiratory irritation.	May cause respiratory irritation.
Ingestion	: May cause burns to mouth, throat and stomach.	May cause burns to mouth, throat and stomach.

Toxicity data

Product/ingredient name	Result	Species	Dose
sodium hypochlorite	LD50 Dermal	Rabbit	>10000 mg/kg
	LD50 Oral	Rat	5230 mg/kg

Chronic toxicity

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 12. Ecological information

Product AS SOLD

Ecotoxicity : This material is toxic to aquatic life.

Aquatic and terrestrial toxicity

Product/ingredient name	Result	Species	Exposure
sodium hydroxide	Acute EC50 40 mg/l	Daphnia	48 hours
sodium hypochlorite	Acute EC50 0.071 mg/l	Daphnia	48 hours

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

	Product AS SOLD	Product AT USE DILUTION
Disposal methods	: Avoid disposal. Attempt to use product completely in accordance with intended use. Disposal should be in accordance with applicable regional, national and local laws and regulations.	Avoid disposal. Attempt to use product completely in accordance with intended use. Disposal should be in accordance with applicable regional, national and local laws and regulations.
RCRA classification	: Unused product is D002 (Corrosive)	

Section 14. Transport information

Certain shipping modes or package sizes may have exceptions from the transport regulations. The classification provided may not reflect those exceptions and may not apply to all shipping modes or package sizes.

DOT

DOT Classification	UN1824
DOT Proper shipping name	Sodium hydroxide solution
Class	8
Packing group	II

IMO/IMDG

IMO/IMDG Classification	UN1824
IMO/IMDG Proper shipping name	SODIUM HYDROXIDE SOLUTION
Class	8
Packing group	II

For transport in bulk, see shipping documents for specific transportation information.

Product AT USE DILUTION
Not intended for transport.

Section 15. Regulatory information

Product AS SOLD

U.S. Federal regulations

TSCA 8(b) inventory : All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No listed substance

SARA 302/304 emergency planning and notification: No listed substance

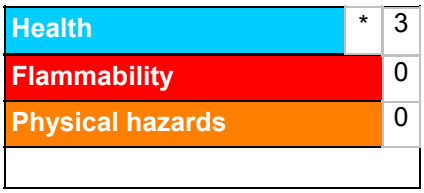
SARA 313	**Product name**	**CAS number**	**Concentration**
Form R - Reporting requirements :	No listed substance		

California Prop. 65 : No listed substance

Section 16. Other information

Product AS SOLD

Hazardous Material Information System (U.S.A.) :



National Fire Protection Association (U.S.A.) :

Product AT USE DILUTION

Section 16. Other information

Date of issue : **13 Mar 2013**

Prepared by : Regulatory Affairs
1-800-352-5326

Notice to reader

The above information is believed to be correct with respect to the formula used to manufacture the product in the country of origin. As data, standards, and regulations change, and conditions of use and handling are beyond our control, NO WARRANTY, EXPRESS OR IMPLIED, IS MADE AS TO THE COMPLETENESS OR CONTINUING ACCURACY OF THIS INFORMATION.

SAFETY DATA SHEET

ULTRASIL 110

Section 1. Chemical product and company identification

Product name	:	ULTRASIL 110
Recommended use and restrictions	:	Cleaning product Use only for the purpose on the product label.
Product dilution information	:	Up to 1.28 oz/gal or 10 mL/L in water
Supplier's information	:	Ecolab Inc. Food & Beverage Division 370 N. Wabasha Street St. Paul, MN 55102 1-800-392-3392
Code	:	916601
Date of issue	:	**21 Aug 2013** EMERGENCY HEALTH INFORMATION: 1-800-328-0026 Outside United States and Canada CALL 1-651-222-5352 (in USA)

Section 2. Hazards identification

		Product AS SOLD	**Product AT USE DILUTION**
GHS Classification	:	SKIN CORROSION/IRRITATION - Category 1 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1	Not classified.
GHS label elements			
Signal word	:	Danger	No signal word.
Symbol	:		
Hazard statements	:	Causes severe skin burns and eye damage.	No known significant effects or critical hazards.
Precautionary statements			
Prevention	:	Wear protective gloves. Wear eye or face protection. Wear protective clothing. Wash hands thoroughly after handling.	Wash thoroughly after handling.
Response	:	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.	Get medical attention if symptoms appear.

Section 2. Hazards identification

Storage	:	No other specific measures identified.	No other specific measures identified.
Disposal	:	See section 13 for waste disposal information.	See section 13 for waste disposal information.
Other hazards	:	None known.	None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Product AS SOLD

Hazardous ingredients	Concentration Range (%)	CAS number
SODIUM HYDROXIDE	7	1310-73-2
TETRASODIUM EDTA	5 - 20	64-02-8
benzenesulfonic acid, (1-methylethyl)-, sodium salt	1 - 5	28348-53-0
benzenesulfonic acid, linear alkyl, sodium salt	1 - 5	68411-30-3

Product AT USE DILUTION

Within the present knowledge of the supplier, this product does not contain any hazardous ingredients in quantities requiring reporting, in accordance with local regulations.

Section 4. First aid measures

		Product AS SOLD	Product AT USE DILUTION
Eye contact	:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.	No known effect after eye contact. Rinse with water for a few minutes.
Skin contact	:	Take off immediately all contaminated clothing. Rinse skin with water or shower. Get medical attention immediately. Wash clothing before reuse. Clean shoes thoroughly before reuse.	No known effect after skin contact. Rinse with water for a few minutes.
Inhalation	:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention immediately.	No special measures required. Treat symptomatically.
Ingestion	:	Get medical attention immediately. Rinse mouth. Do not induce vomiting.	Get medical attention if symptoms occur.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

See toxicological information (section 11)

Section 5. Fire-fighting measures

Product AS SOLD

Suitable fire extinguishing media : Use water spray, fog or foam.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products :

Section 5. Fire-fighting measures

Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides
sulfur oxides
metal oxide/oxides

Specific fire-fighting methods : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

	Product AS SOLD	Product AT USE DILUTION
Personal precautions	: Initiate company's spill response procedures immediately. Keep people out of area. Put on appropriate personal protective equipment (see section 8). Do not touch or walk through spilled material.	Use personal protective equipment as required.
Environmental precautions	: Avoid contact of spilled material and runoff with soil and surface waterways.	Avoid contact of large amounts of spilled material and runoff with soil and surface waterways.
Methods for cleaning up	: Follow company's spill procedures. Keep people away from spill. Put on appropriate personal protective equipment (see section 8). Absorb/ neutralize liquid material. Use a tool to scoop up solid or absorbed material and put into appropriate labeled container. Use a tool to scoop up solid or absorbed material and place into appropriate labeled waste container. Use a water rinse for final clean-up.	Use a water rinse for final clean-up.

Section 7. Handling and storage

	Product AS SOLD	Product AT USE DILUTION
Handling	: Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling.	Wash thoroughly after handling.
Storage	: Keep out of reach of children. Keep container tightly closed. Store between the following temperatures: 0 and 40°C	Keep out of reach of children.

Section 8. Exposure controls/personal protection

Control parameters

Ingredient name	Exposure limits
SODIUM HYDROXIDE	**ACGIH TLV (United States, 3/2012).** C: 2 mg/m³ **OSHA PEL (United States, 6/2010).** TWA: 2 mg/m³ 8 hours. **NIOSH REL (United States, 6/2009).** CEIL: 2 mg/m³

Section 8. Exposure controls/personal protection

	Product AS SOLD	Product AT USE DILUTION
Appropriate engineering controls	: Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.	Good general ventilation should be sufficient to control worker exposure to airborne contaminants.
Personal protection		
Eye protection	: Use chemical splash goggles. For continued or severe exposure wear a face shield over the goggles.	No protective equipment is needed under normal use conditions.
Hand protection	: Use chemical-resistant, impervious gloves.	No protective equipment is needed under normal use conditions.
Skin protection	: Use synthetic apron, other protective equipment as necessary to prevent skin contact.	No protective equipment is needed under normal use conditions.
Respiratory protection	: A respirator is not needed under normal and intended conditions of product use.	A respirator is not needed under normal and intended conditions of product use.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Section 9. Physical and chemical properties

	Product AS SOLD	Product AT USE DILUTION
Physical state	: Liquid.	Liquid.
Color	: Brown [Light]	Yellow [Light]
Odor	: Faint odor	Faint odor
pH	: 12 to 13 (100%)	9 to 12.5
Flash point	: > 100°C Product does not support combustion.	> 100°C
Explosion limits	: Not available.	
Flammability (solid, gas)	: Not available.	
Melting point	: Not available.	
Boiling point	: >100°C (>212°F)	
Evaporation rate (butyl acetate = 1)	: Not available.	
Vapor pressure	: Not available.	
Vapor density	: Not available.	
Relative density	: 1.152 to 1.182 (Water = 1)	
Solubility	: Easily soluble in the following materials: cold water and hot water.	
Partition coefficient: n-octanol/water	: Not available.	
Auto-ignition temperature	: Not available.	
Decomposition temperature	: Not available.	

Section 9. Physical and chemical properties

Odor threshold : Not available.

Viscosity : Not available.

Section 10. Stability and reactivity

Product AS SOLD

Stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Materials to avoid : Highly reactive or incompatible with the following materials: acids.
Slightly reactive or incompatible with the following materials: metals and moisture.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Route of exposure : Skin contact, Eye contact, Inhalation, Ingestion

	Product AS SOLD	**Product AT USE DILUTION**
Symptoms		
Eye contact	: Adverse symptoms may include the following: pain watering redness	No specific data.
Skin contact	: Adverse symptoms may include the following: pain or irritation redness blistering may occur	No specific data.
Inhalation	: Adverse symptoms may include the following: coughing Respiratory tract irritation	No specific data.
Ingestion	: Adverse symptoms may include the following: stomach pains	No specific data.
Acute toxicity		
Eye contact	: Causes serious eye damage.	No known significant effects or critical hazards.
Skin contact	: Causes severe burns.	No known significant effects or critical hazards.
Inhalation	: May cause respiratory irritation.	No known significant effects or critical hazards.
Ingestion	: May cause burns to mouth, throat and stomach.	No known significant effects or critical hazards.

Toxicity data

Product/ingredient name			
acetic acid, (ethylenedinitrilo)tetra-, tetrasodium salt	LD50 Oral	Rat	1700 mg/kg
benzenesulfonic acid, (1-methylethyl)-, sodium salt	LC50 Inhalation Dusts and mists	Rat	>770 mg/l
	LD50 Dermal	Rabbit	>2000 mg/kg
	LD50 Oral	Rat	>7000 mg/kg
benzenesulfonic acid, linear alkyl, sodium salt	LD50 Dermal	Rat	>2000 mg/kg
	LD50 Oral	Rat	1080 mg/kg

Chronic toxicity

Section 11. Toxicological information

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 12. Ecological information

Product AS SOLD

Ecotoxicity : This material is harmful to aquatic life.

Aquatic and terrestrial toxicity

Product/ingredient name	Result	Species	Exposure
acetic acid, (ethylenedinitrilo)tetra-, tetrasodium salt	Acute LC50 121 mg/l	Fish	96 hours
sodium hydroxide	Acute EC50 40 mg/l	Daphnia	48 hours
benzenesulfonic acid, (1-methylethyl)-, sodium salt	Acute LC50 >450 mg/l	Fish	96 hours
benzenesulfonic acid, linear alkyl, sodium salt	Acute LC50 1.04 mg/l	Fish	96 hours

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Product AS SOLD

Disposal methods : Avoid disposal. Attempt to use product completely in accordance with intended use. Disposal should be in accordance with applicable regional, national and local laws and regulations.

RCRA classification : Unused product is D002 (Corrosive)

Product AT USE DILUTION

Diluted product can be flushed to sanitary sewer. Discard empty container in trash.

Section 14. Transport information

Certain shipping modes or package sizes may have exceptions from the transport regulations. The classification provided may not reflect those exceptions and may not apply to all shipping modes or package sizes.

DOT

DOT Classification	UN1824
DOT Proper shipping name	Sodium hydroxide solution
Class	8
Packing group	II

IMO/IMDG

IMO/IMDG Classification	UN1824
IMO/IMDG Proper shipping name	SODIUM HYDROXIDE SOLUTION
Class	8
Packing group	II

For transport in bulk, see shipping documents for specific transportation information.

Product AT USE DILUTION

Not intended for transport.

Section 15. Regulatory information

Product AS SOLD

U.S. Federal regulations

TSCA 8(b) inventory : All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No listed substance

SARA 302/304 emergency planning and notification: No listed substance

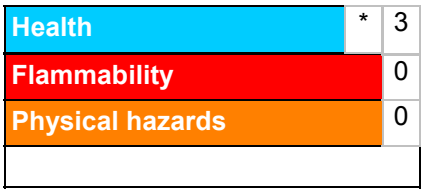
SARA 313	Product name	CAS number	Concentration
Form R - Reporting requirements	: No listed substance		

California Prop. 65 : No listed substance

Section 16. Other information

Product AS SOLD

Hazardous Material Information System (U.S.A.) :



National Fire Protection Association (U.S.A.) :

Product AT USE DILUTION

Date of issue : **21 Aug 2013**

Prepared by : Regulatory Affairs
1-800-352-5326

Notice to reader

The above information is believed to be correct with respect to the formula used to manufacture the product in the country of origin. As data, standards, and regulations change, and conditions of use and handling are beyond our control, NO WARRANTY, EXPRESS OR IMPLIED, IS MADE AS TO THE COMPLETENESS OR CONTINUING ACCURACY OF THIS INFORMATION.

SAFETY DATA SHEET

XY-12

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	XY-12
Other means of identification	:	Not applicable
Recommended use	:	Sanitizer
Restrictions on use	:	Reserved for industrial and professional use.
Product dilution information	:	0.00024 % - 0.84 % UP TO 14 OZ/13 GAL OF WATER
Company	:	Ecolab Inc. 370 N. Wabasha Street St. Paul, Minnesota USA 55102 1-800-352-5326
Emergency telephone	:	1-800-328-0026 (US/Canada), 1-651-222-5352 (outside US)
Issuing date	:	10/23/2014

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Product AS SOLD

Oxidizing liquids	:	Category 2
Skin corrosion	:	Category 1A
Serious eye damage	:	Category 1

Product AT USE DILUTION
Not a hazardous substance or mixture.

GHS Label element

Product AS SOLD

Hazard pictograms :

Signal Word : Danger

Hazard Statements : May intensify fire; oxidizer.
Causes severe skin burns and eye damage.

Precautionary Statements : **Prevention:**
Keep away from heat. Keep/Store away from clothing/ combustible materials. Take any precaution to avoid mixing with combustibles. Wash skin thoroughly after handling. Wear protective gloves/ protective clothing/ eye protection/ face protection. Mixing this product with acid or ammonia releases chlorine gas.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove

contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician. Wash contaminated clothing before reuse. In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
Storage:
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Product AT USE DILUTION
Precautionary Statements : **Prevention:**
Wash hands thoroughly after handling.
Response:
Get medical advice/ attention if you feel unwell.
Storage:
Store in accordance with local regulations.

Other hazards : None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Product AS SOLD
Pure substance/mixture : Mixture

Chemical Name	**CAS-No.**	**Concentration (%)**
sodium hypochlorite	7681-52-9	8.4

Product AT USE DILUTION

Chemical Name	**CAS-No.**	**Concentration (%)**
sodium hypochlorite	7681-52-9	0.071

No hazardous ingredients

SECTION 4. FIRST AID MEASURES

Product AS SOLD

In case of eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes. Use a mild soap if available. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

If swallowed : Rinse mouth with water. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

If inhaled : Remove to fresh air. Treat symptomatically. Get medical attention if symptoms occur.

Protection of first-aiders : If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Notes to physician : Treat symptomatically.

Product AT USE DILUTION
In case of eye contact : Rinse with plenty of water.

In case of skin contact	:	Rinse with plenty of water.
If swallowed	:	Rinse mouth. Get medical attention if symptoms occur.
If inhaled	:	Get medical attention if symptoms occur.

See toxicological information (Section 11)

SECTION 5. FIRE-FIGHTING MEASURES

Product AS SOLD

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	:	None known.
Specific hazards during fire fighting	:	Oxidizer. Contact with other material may cause fire.
Hazardous combustion products	:	Decomposition products may include the following materials: Carbon oxides Nitrogen oxides (NOx) Sulfur oxides Oxides of phosphorus
Special protective equipment for fire-fighters	:	Use personal protective equipment.
Specific extinguishing methods	:	Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. In the event of fire and/or explosion do not breathe fumes.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Product AS SOLD

Personal precautions, protective equipment and emergency procedures	:	Ensure adequate ventilation. Keep people away from and upwind of spill/leak. Avoid inhalation, ingestion and contact with skin and eyes. When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Ensure clean-up is conducted by trained personnel only. Refer to protective measures listed in sections 7 and 8.
Environmental precautions	:	Do not allow contact with soil, surface or ground water.
Methods and materials for containment and cleaning up	:	Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Flush away traces with water. For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway.

Product AT USE DILUTION

Personal precautions, protective equipment and emergency procedures	:	Refer to protective measures listed in sections 7 and 8.
Environmental precautions	:	No special environmental precautions required.

Methods and materials for containment and cleaning up	:	Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Flush away traces with water. For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway.

SECTION 7. HANDLING AND STORAGE

Product AS SOLD

Advice on safe handling	:	Do not ingest. Do not get in eyes, on skin, or on clothing. Do not breathe dust/ fume/ gas/ mist/ vapors/ spray. Use only with adequate ventilation. Wash hands thoroughly after handling. Mixing this product with acid or ammonia releases chlorine gas.
Conditions for safe storage	:	Keep in a cool, well-ventilated place. Do not store near acids. Keep away from reducing agents. Keep away from combustible material. Keep out of reach of children. Keep container tightly closed. Store in suitable labeled containers.

Product AT USE DILUTION

Advice on safe handling	:	Wash hands after handling. For personal protection see section 8.
Conditions for safe storage	:	Keep out of reach of children. Store in suitable labeled containers.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Product AS SOLD
Ingredients with workplace control parameters

Ingredients	CAS-No.	Form of exposure	Permissible concentration	Basis
sodium hypochlorite	7681-52-9	STEL	2 mg/m3	WEEL
chlorine	7782-50-5	TWA	0.5 ppm	ACGIH
		STEL	1 ppm	ACGIH
		Ceiling	0.5 ppm 1.45 mg/m3	NIOSH REL
		C	1 ppm 3 mg/m3	OSHA Z1
sodium hypochlorite	7681-52-9	STEL	2 mg/m3	WEEL
chlorine	7782-50-5	TWA	0.5 ppm	ACGIH
		STEL	1 ppm	ACGIH
		Ceiling	0.5 ppm 1.45 mg/m3	NIOSH REL
		C	1 ppm 3 mg/m3	OSHA Z1
sodium hypochlorite	7681-52-9	STEL	2 mg/m3	WEEL

Engineering measures	:	Effective exhaust ventilation system. Maintain air concentrations below occupational exposure standards.

Personal protective equipment

Eye protection	:	Safety goggles Face-shield

Hand protection	:	Wear the following personal protective equipment: Standard glove type. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Skin protection	:	Personal protective equipment comprising: suitable protective gloves, safety goggles and protective clothing
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety practice. Remove and wash contaminated clothing before re-use. Wash face, hands and any exposed skin thoroughly after handling. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.

Product AT USE DILUTION

Engineering measures	:	Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Personal protective equipment

Eye protection	:	No special protective equipment required.
Hand protection	:	No special protective equipment required.
Skin protection	:	No special protective equipment required.
Respiratory protection	:	No personal respiratory protective equipment normally required.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

		Product AS SOLD	Product AT USE DILUTION
Appearance	:	liquid	liquid
Color	:	light yellow	colorless
Odor	:	Chlorine	slight chlorine
pH	:	12.5, 100 %	6.0 - 9.5
Flash point	:	No data available	
Odor Threshold	:	No data available	
Melting point/freezing point	:	No data available	
Initial boiling point and boiling range	:	No data available	
Evaporation rate	:	No data available	
Flammability (solid, gas)	:	No data available	
Upper explosion limit	:	No data available	
Lower explosion limit	:	No data available	
Vapor pressure	:	No data available	
Relative vapor density	:	No data available	
Relative density	:	1.154	
Water solubility	:	No data available	

Solubility in other solvents	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Autoignition temperature	:	No data available
Thermal decomposition	:	No data available
Viscosity, kinematic	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Molecular weight	:	No data available
VOC	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Product AS SOLD

Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	Mixing this product with acid or ammonia releases chlorine gas.
Conditions to avoid	:	None known.
Incompatible materials	:	None known.
Hazardous decomposition products	:	Decomposition products may include the following materials: Carbon oxides Nitrogen oxides (NOx) Sulfur oxides Oxides of phosphorus

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	:	Inhalation, Eye contact, Skin contact

Potential Health Effects

Product AS SOLD

Eyes	:	Causes serious eye damage.
Skin	:	Causes severe skin burns.
Ingestion	:	Causes digestive tract burns.
Inhalation	:	May cause nose, throat, and lung irritation.
Chronic Exposure	:	Health injuries are not known or expected under normal use.

Product AT USE DILUTION

Eyes	:	Health injuries are not known or expected under normal use.
Skin	:	Health injuries are not known or expected under normal use.
Ingestion	:	Health injuries are not known or expected under normal use.
Inhalation	:	Health injuries are not known or expected under normal use.

Chronic Exposure	:	Health injuries are not known or expected under normal use.

Experience with human exposure

Product AS SOLD

Eye contact	:	Redness, Pain, Corrosion
Skin contact	:	Redness, Pain, Corrosion
Ingestion	:	Corrosion, Abdominal pain
Inhalation	:	Respiratory irritation, Cough

Product AT USE DILUTION

Eye contact	:	No symptoms known or expected.
Skin contact	:	No symptoms known or expected.
Ingestion	:	No symptoms known or expected.
Inhalation	:	No symptoms known or expected.

Toxicity

Product AS SOLD

Acute oral toxicity	:	No data available
Acute inhalation toxicity	:	No data available
Acute dermal toxicity	:	No data available
Skin corrosion/irritation	:	No data available
Serious eye damage/eye irritation	:	No data available
Respiratory or skin sensitization	:	No data available
Carcinogenicity	:	No data available
Reproductive effects	:	No data available
Germ cell mutagenicity	:	No data available
Teratogenicity	:	No data available
STOT-single exposure	:	No data available
STOT-repeated exposure	:	No data available
Aspiration toxicity	:	No data available

Ingredients

Acute oral toxicity	:	sodium hypochlorite LD50 Rat: 5,230 mg/kg

Ingredients

Acute inhalation toxicity	:	sodium hypochlorite 1 h LC50 Rat: > 10,500 mg/l

Ingredients

Acute dermal toxicity	:	sodium hypochlorite LD50 Rabbit: > 10,000 mg/kg

SECTION 12. ECOLOGICAL INFORMATION

Product AS SOLD
Ecotoxicity

Environmental Effects	:	Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.

Product

Toxicity to fish	:	96 h LC50 Oncorhynchus mykiss (rainbow trout) : 2.1 mg/l
		96 h LC50 Inland Silverside : 7.6 mg/l
Toxicity to daphnia and other aquatic invertebrates	:	48 h LC50 Daphnia dubia (Water flea) : 0.57 mg/l
		48 h LC50 Americamysis bahia : 18.1 mg/l
Toxicity to algae	:	No data available

Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.
Not Assigned

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Product AS SOLD

Disposal methods	:	The product should not be allowed to enter drains, water courses or the soil. Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.
Disposal considerations	:	Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.
RCRA - Resource Conservation and Recovery Authorization Act Hazardous waste	:	D002 (Corrosive)

Product AT USE DILUTION

Disposal methods	:	The product should not be allowed to enter drains, water courses or the soil. Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.

Disposal considerations	:	Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

Product AS SOLD

The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.

Land transport (DOT)

UN number	:	1791
Description of the goods	:	Hypochlorite solutions
Class	:	8
Packing group	:	III
Environmentally hazardous	:	no

Sea transport (IMDG/IMO)

UN number	:	1791
Description of the goods	:	HYPOCHLORITE SOLUTION
Class	:	8
Packing group	:	III
Marine pollutant	:	yes

Product AT USE DILUTION
Not intended for transport.

SECTION 15. REGULATORY INFORMATION

Product AS SOLD

EPA Registration number : 1677-52

EPCRA - Emergency Planning and Community Right-to-Know

CERCLA Reportable Quantity
This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity
This material does not contain any components with a section 304 EHS RQ.

SARA 311/312 Hazards	:	Fire Hazard Acute Health Hazard
SARA 302	:	No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.
SARA 313	:	This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

California Prop 65
This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

The ingredients of this product are reported in the following inventories:

1907/2006 (EU) :
not determined

Switzerland. New notified substances and declared preparations :
On the inventory, or in compliance with the inventory

United States TSCA Inventory :
On TSCA Inventory

Canadian Domestic Substances List (DSL) :
All components of this product are on the Canadian DSL.

Australia Inventory of Chemical Substances (AICS) :
On the inventory, or in compliance with the inventory

New Zealand. Inventory of Chemical Substances :
On the inventory, or in compliance with the inventory

Japan. ENCS - Existing and New Chemical Substances Inventory :
On the inventory, or in compliance with the inventory

Japan. ISHL - Inventory of Chemical Substances (METI) :
On the inventory, or in compliance with the inventory

Korea. Korean Existing Chemicals Inventory (KECI) :
On the inventory, or in compliance with the inventory

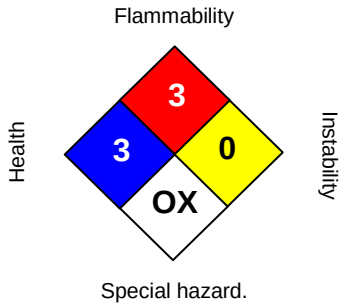
Philippines Inventory of Chemicals and Chemical Substances (PICCS) :
On the inventory, or in compliance with the inventory

China. Inventory of Existing Chemical Substances in China (IECSC) :
On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

Product AS SOLD

NFPA:



HMIS III:

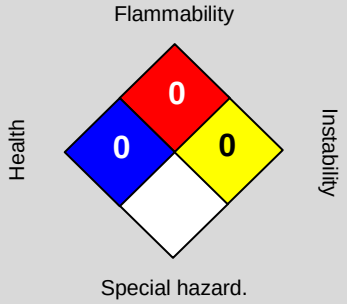
HEALTH	3
FLAMMABILITY	3
PHYSICAL HAZARD	2

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Product AT USE DILUTION

XY-12

NFPA:



HMIS III:

HEALTH	0
FLAMMABILITY	0
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Issuing date	:	10/23/2014
Version	:	1.3
Prepared by	:	Regulatory Affairs

REVISED INFORMATION: Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

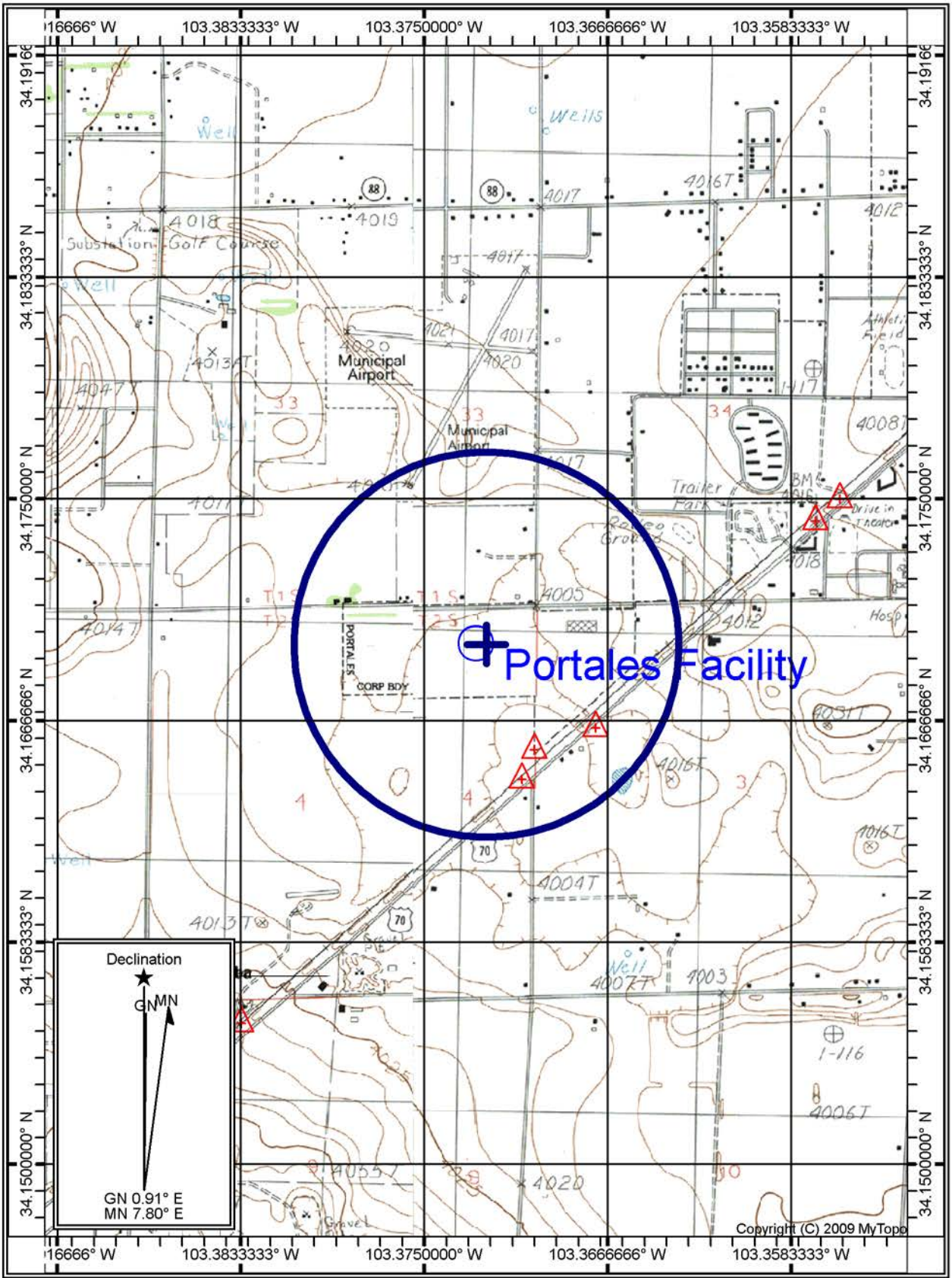
Section 8

Map(s)

A map such as a 7.5 minute topographic quadrangle showing the exact location of the source. The map shall also include the following:

The UTM or Longitudinal coordinate system on both axes	An indicator showing which direction is north
A minimum radius around the plant of 0.8km (0.5 miles)	Access and haul roads
Topographic features of the area	Facility property boundaries
The name of the map	The area which will be restricted to public access
A graphical scale	

A topographical map is attached on the following page.



Map Name: PORTALES
Print Date: 06/30/20
Scale: 1 inch = 2,000 ft.
Map Center: 034.1696677° N 103.3726778° W

Horizontal Datum: WGS84

Section 10

Written Description of the Routine Operations of the Facility

---

A written description of the routine operations of the facility. Include a description of how each piece of equipment will be operated, how controls will be used, and the fate of both the products and waste generated. For modifications and/or revisions, explain how the changes will affect the existing process. In a separate paragraph describe the major process bottlenecks that limit production. The purpose of this description is to provide sufficient information about plant operations for the permit writer to determine appropriate emission sources.

The facility receives raw milk delivered to the facility by truck. The milk is temporarily stored in silos (large vertical tanks) located near the loading bay. The milk is dehydrated at the facility to produce milk powder. Four boilers located at the facility provide heat for facility operations. The dehydration system also includes a direct-fired spray dryer as the last dehydration step for the process line; the dryer includes a control system to recover the dried milk. Dryer 2 "CER" is connected to a baghouse system. Dried milk that would otherwise be lost is also recovered via a baghouse system attached to the packaging system. Water and solids removed from the milk are treated at the effluent plant, and then used to irrigate land located near the facility.

The plant is regulated by the U. S. Department of Agriculture (USFDA) Food and Drug Administration (FDA), which mandates a high level of cleanliness and rigorous inspections. This includes regular inspections of material storage, handling and sanitation procedures. All chemicals and other materials used directly for production operations are food grade.

Water treated in the effluent plant is discharged onto irrigated land and is covered under the facility's discharge plan, administered to Portales Dairy Products, LLC, formerly referred to as Dairy Farmers of America, by the New Mexico Environment Department's Ground Water Quality Bureau.

Section 11
Source Determination

Source submitting under 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC

Sources applying for a construction permit, PSD permit, or operating permit shall evaluate surrounding and/or associated sources (including those sources directly connected to this source for business reasons) and complete this section. Responses to the following questions shall be consistent with the Air Quality Bureau's permitting guidance, Single Source Determination Guidance, which may be found on the Applications Page in the Permitting Section of the Air Quality Bureau website.

Typically, buildings, structures, installations, or facilities that have the same SIC code, that are under common ownership or control, and that are contiguous or adjacent constitute a single stationary source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes. Submission of your analysis of these factors in support of the responses below is optional, unless requested by NMED.

A. Identify the emission sources evaluated in this section (list and describe)**: Refer to Table 2-A**

B. Apply the 3 criteria for determining a single source:

SIC Code: Surrounding or associated sources belong to the same 2-digit industrial grouping (2-digit SIC code) as this facility, OR surrounding or associated sources that belong to different 2-digit SIC codes are support facilities for this source.

☑ **Yes** ☐ **No**

Common Ownership or Control: Surrounding or associated sources are under common ownership or control as this source.

☑ **Yes** ☐ **No**

Contiguous or Adjacent: Surrounding or associated sources are contiguous or adjacent with this source.

☑ **Yes** ☐ **No**

C. Make a determination:

☑ The source, as described in this application, constitutes the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes. If in "A" above you evaluated only the source that is the subject of this application, all "**YES**" boxes should be checked. If in "A" above you evaluated other sources as well, you must check **AT LEAST ONE** of the boxes "**NO**" to conclude that the source, as described in the application, is the entire source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes.

☐ The source, as described in this application, **does not** constitute the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes (A permit may be issued for a portion of a source). The entire source consists of the following facilities or emissions sources (list and describe):

Section 12

Section 12.A
PSD Applicability Determination for All Sources

(Submitting under 20.2.72, 20.2.74 NMAC)

A PSD applicability determination for all sources. For sources applying for a significant permit revision, apply the applicable requirements of 20.2.74.AG and 20.2.74.200 NMAC and to determine whether this facility is a major or minor PSD source, and whether this modification is a major or a minor PSD modification. It may be helpful to refer to the procedures for Determining the Net Emissions Change at a Source as specified by Table A-5 (Page A.45) of the EPA New Source Review Workshop Manual to determine if the revision is subject to PSD review.

A. This facility is:

- ☐ **a minor PSD source before and after this modification (if so, delete C and D below).**
- ☐ **a major PSD source before this modification. This modification will make this a PSD minor source.**
- ☐ **an existing PSD Major Source that has never had a major modification requiring a BACT analysis.**
- ☐ **an existing PSD Major Source that has had a major modification requiring a BACT analysis**
- ☐ **a new PSD Major Source after this modification.**

B. **This facility [is or is not] one of the listed 20.2.74.501 Table I – PSD Source Categories. The "project" emissions** for this modification are **[significant or not significant]. [Discuss why.] The "project" emissions listed below [do or do not] only result from changes described in this permit application, thus no emissions from other [revisions or modifications, past or future] to this facility. Also, specifically discuss whether this project results in "de-bottlenecking", or other associated emissions resulting in higher emissions. The project emissions (before netting) for this project are as follows [see Table 2 in 20.2.74.502 NMAC for a complete list of significance levels]:**

a. **NOx: XX.X TPY**
b. **CO: XX.X TPY**
c. **VOC: XX.X TPY**
d. **SOx: XX.X TPY**
e. **PM: XX.X TPY**
f. **PM10: XX.X TPY**
g. **PM2.5: XX.X TPY**
h. **Fluorides: XX.X TPY**
i. **Lead: XX.X TPY**
j. **Sulfur compounds (listed in Table 2): XX.X TPY**
k. **GHG: XX.X TPY**

C. If this is an existing PSD major source, or any facility with emissions greater than 250 TPY (or 100 TPY for 20.2.74.501 Table 1 – PSD Source Categories), determine whether any permit modifications are related, or could be considered a single project with this action, and provide an explanation for your determination whether a PSD modification is triggered.

N/A – This application is being submitted under 20.2.70 NMAC.

Section 13

Determination of State & Federal Air Quality Regulations

This section lists each state and federal air quality regulation that may apply to your facility and/or equipment that are stationary sources of regulated air pollutants.

Not all state and federal air quality regulations are included in this list. Go to the Code of Federal Regulations (CFR) or to the Air Quality Bureau's regulation page to see the full set of air quality regulations.

Required Information for Specific Equipment:
For regulations that apply to specific source types, in the 'Justification' column **provide any information needed to determine if the regulation does or does not apply**. **For example**, to determine if emissions standards at 40 CFR 60, Subpart IIII apply to your three identical stationary engines, we need to know the construction date as defined in that regulation; the manufacturer date; the date of reconstruction or modification, if any; if they are or are not fire pump engines; if they are or are not emergency engines as defined in that regulation; their site ratings; and the cylinder displacement.

Required Information for Regulations that Apply to the Entire Facility:
See instructions in the 'Justification' column for the information that is needed to determine if an 'Entire Facility' type of regulation applies (e.g. 20.2.70 or 20.2.73 NMAC).

Regulatory Citations for Regulations That Do Not, but Could Apply:
If there is a state or federal air quality regulation that does not apply, but you have a piece of equipment in a source category for which a regulation has been promulgated, you must **provide the low level regulatory citation showing why your piece of equipment is not subject to or exempt from the regulation. For example** if you have a stationary internal combustion engine that is not subject to 40 CFR 63, Subpart ZZZZ because it is an existing 2 stroke lean burn stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions, your citation would be 40 CFR 63.6590(b)(3)(i). **We don't want a discussion of every non-applicable regulation, but if it is possible a regulation could apply, explain why it does not. For example,** if your facility is a power plant, you do not need to include a citation to show that 40 CFR 60, Subpart OOO does not apply to your non-existent rock crusher.

Regulatory Citations for Emission Standards:
For each unit that is subject to an emission standard in a source specific regulation, such as 40 CFR 60, Subpart OOO or 40 CFR 63, Subpart HH, include the low level regulatory citation of that emission standard. Emission standards can be numerical emission limits, work practice standards, or other requirements such as maintenance. **Here are examples:** a glycol dehydrator is subject to the general standards at 63.764C(1)(i) through (iii); an engine is subject to 63.6601, Tables 2a and 2b; a crusher is subject to 60.672(b), Table 3 and all transfer points are subject to 60.672(e)(1)

Federally Enforceable Conditions:
All federal regulations are federally enforceable. All Air Quality Bureau State regulations are federally enforceable except for the following: affirmative defense portions at 20.2.7.6.B, 20.2.7.110(B)(15), 20.2.7.11 through 20.2.7.113, 20.2.7.115, and 20.2.7.116; 20.2.37; 20.2.42; 20.2.43; 20.2.62; 20.2.63; 20.2.86; 20.2.89; and 20.2.90 NMAC. Federally enforceable means that EPA can enforce the regulation as well as the Air Quality Bureau and federally enforceable regulations can count toward determining a facility's potential to emit (PTE) for the Title V, PSD, and nonattainment permit regulations.

INCLUDE ANY OTHER INFORMATION NEEDED TO COMPLETE AN APPLICABILITY DETERMINATION OR THAT IS RELEVENT TO YOUR FACILITY'S NOTICE OF INTENT OR PERMIT.

EPA Applicability Determination Index for 40 CFR 60, 61, 63, etc: http://cfpub.epa.gov/adi/

Table for Applicable State REGULATIONS:

STATE REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)
20.2.1 NMAC	General Provisions	Yes	Facility	General Provisions apply to Notice of Intent, Construction, and Title V permit applications.
20.2.3 NMAC	Ambient Air Quality Standards NMAAQS	Yes	Facility	20.2.3 NMAC is a SIP approved regulation that limits the maximum allowable concentration of Total Suspended Particulates, Sulfur Compounds, Carbon Monoxide and Nitrogen Dioxide. The facility meets maximum allowable concentrations of TSP, SO_2, H_2S, NO_x, and CO under this regulation.
20.2.7 NMAC	Excess Emissions	Yes	Facility	This regulation establishes requirements for the facility if operations at the facility result in any excess emissions. The owner or operator will operate the source at the facility having an excess emission, to the extent practicable, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions. The facility will also notify the NMED of any excess emission per 20.2.7.110 NMAC.
20.2.23 NMAC	Fugitive Dust Control	No	N/A	This facility is not authorized under 20.2.73. Therefore, this regulation does not apply.
20.2.33 NMAC	Gas Burning Equipment - Nitrogen Dioxide	No	N/A	This facility does not have gas burning equipment (external combustion emission sources, such as gas fired boilers and heaters) having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. The facility is not subject to this regulation and does not have emission sources that meet the applicability requirements under 20.2.33.108 NMAC.
20.2.34 NMAC	Oil Burning Equipment: NO_2	No	N/A	This facility does not have oil burning equipment (external combustion emission sources, such as oil-fired boilers and heaters) having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. The facility is not subject to this regulation and does not have emission sources that meet the applicability requirements under 20.2.34.108 NMAC.
20.2.35 NMAC	Natural Gas Processing Plant – Sulfur	No	N/A	This regulation establishes sulfur emission standards for natural gas processing plants. This facility is not subject to the requirements of this regulation as it does not process sour gas.
20.2.37 and 20.2.36 NMAC	Petroleum Processing Facilities and Petroleum Refineries	N/A	N/A	**These regulations were repealed by the Environmental Improvement Board. If you had equipment subject to 20.2.37 NMAC before the repeal, your combustion emission sources are now subject to 20.2.61 NMAC.**
20.2.38 NMAC	Hydrocarbon Storage Facility	No	N/A	This facility does not meet the definition of hydrocarbon storage facility.
20.2.39 NMAC	Sulfur Recovery Plant - Sulfur	No	N/A	This facility does not meet the definition of sulfur recovery plant facility.
20.2.61.109 NMAC	Smoke & Visible Emissions	Yes	B1-B4, D2, AHU-1, and AHU-2, MAU-1001, MAU-1002	This regulation establishes controls on smoke and visible emissions from combustion sources and therefore the combustion units are subject to 20.2.61.109 NMAC.
20.2.70 NMAC	Operating Permits	Yes	Facility	This regulation establishes requirements for obtaining an operating permit. The facility is subject to this regulation because the source is a Title V major source and is operating under permit P234-R2M1.
20.2.71 NMAC	Operating Permit Fees	Yes	Facility	This regulation establishes a schedule of operating permit emission fees. The facility is subject to 20.2.70 NMAC and in turn subject to 20.2.71 NMAC.
20.2.72 NMAC	Construction Permits	Yes	Facility	This regulation establishes the requirements for obtaining a construction permit. The facility is a stationary source that has potential emission rates greater than 10 pounds per hour or 25 tons per year of any regulated air contaminant for which there is a National or New Mexico Air Quality Standard. Therefore, this facility is subject to

STATE REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)
20.2.73 NMAC	NOI & Emissions Inventory Requirements	Yes	Facility	The facility is a Title V major source and must meet the requirements of 20.2.73.300 NMAC for emissions inventory reporting.
20.2.74 NMAC	Permits – Prevention of Significant Deterioration (PSD)	No	N/A	This regulation establishes requirements for obtaining a prevention of significant deterioration permit. This facility is not a PSD major source.
20.2.75 NMAC	Construction Permit Fees	Yes	Facility	This facility is subject to 20.2.72 NMAC and is in turn subject to 20.2.75 NMAC.
20.2.77 NMAC	New Source Performance	Yes	B1-B4	This is a stationary source which is subject to the requirements of 40 CFR Part 60, as amended through January 15, 2017.. Specifically, these boiler units are covered under NSPS 40 CFR60.40a, Subpart Dc, therefore this regulation is applicable to them.
20.2.78 NMAC	Emission Standards for HAPS	No	N/A	This facility does not emit hazardous air pollutants which are subject to the requirements of 40 CFR Part 61, as amended through December 31, 2010.
20.2.79 NMAC	Permits – Nonattainment Areas	No	N/A	This regulation establishes the requirements for obtaining a nonattainment area permit. The facility will not be located in a non-attainment area and therefore is not subject to this regulation.
20.2.80 NMAC	Stack Heights	No	N/A	This regulation establishes requirements for the evaluation of stack heights and other dispersion techniques. This regulation does not apply as all stacks at the facility follow good engineering practice.
20.2.82 NMAC	MACT Standards for source categories of HAPS	No	N/A	This regulation applies to all sources emitting hazardous air pollutants, which are subject to the requirements of 40 CFR Part 63, as amended through January 15, 2017. Due to the fact that these emissions sources are not regulated under any applicable MACT, this regulation does not apply to these emission sources.

Table for Applicable FEDERAL REGULATIONS:

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
40 CFR 50	NAAQS	Yes	Facility	This regulation defines national ambient air quality standards. The facility meets all applicable national ambient air quality standards for NOx, CO, SO_2, H_2S, PM_{10}, and $PM_{2.5}$ under this regulation.
NSPS 40 CFR 60, Subpart A	General Provisions	No	B1-B4	This regulation defines general provisions for relevant standards that have been set under this part. Units B1-B4 are subject to NSPS Subpart Dc therefore this regulation applies.
NSPS 40 CFR60.40a, Subpart Da	Subpart Da, Performance Standards for **Electric Utility Steam Generating Units**	No	N/A	This regulation establishes standards of performance for electric utility steam generating units. This regulation does not apply because the facility does not operate any electric utility steam generating units.
NSPS 40 CFR60.40b Subpart Db	**Electric Utility Steam Generating Units**	Yes	N/A	This regulation establishes standards of performance for industrial-commercial-institutional steam generating units. This regulation does not apply because the facility does not operate any industrial-commercial-institutional steam generating units.
40 CFR 60.40c, Subpart Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units	Yes	B1-B4	This regulation applies to each steam generating unit for which construction, modification, or reconstruction is commenced after June 9, 1989 and that has a maximum design heat input capacity of 29 megawatts (MW) (100 MMBtu/h) or less, but greater than or equal to 2.8 MW (10 MMBtu/h). Since Units B1and B2 have a capacity of 25.2 MMBtu/hr and units B3 and B4 are rated at 40 MMBtu/hr, they are all subject to this regulation.
NSPS 40 CFR 60, Subpart Ka	Standards of Performance for **Storage Vessels for Petroleum Liquids** for which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and **Prior** to July 23, 1984	No	N/A	This regulation establishes performance standards for storage vessels for petroleum liquids for which construction, reconstruction, or modification commenced after May 18, 1978, and prior to July 23, 1984. The capacities of the tanks at the facility are less than 40,000 gallons and are not subject to this regulation. [40 CFR Part 60.110a(a)]

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NSPS 40 CFR 60, Subpart Kb	Standards of Performance for **Volatile Organic Liquid Storage Vessels** (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced **After** July 23, 1984	No	N/A	This regulation establishes performance standards for volatile organic liquid storage vessels (including petroleum liquid storage vessels) for which construction, reconstruction, or modification commenced after July 23, 1984. The capacities of the tanks at the facility are less than 75 m^3 and are not subject to this regulation. [40 CFR Part 60.60110b(a)]
NSPS 40 CFR 60.330 Subpart GG	**Stationary Gas Turbines**	No	N/A	This regulation establishes standards of performance for stationary gas turbines. The facility does not operate stationary gas turbines and is therefore not subject to this regulation.
NSPS 40 CFR 60, Subpart KKK	Leaks of VOC from **Onshore Gas Plants**	No	N/A	This regulation establishes standards of performance for equipment leaks of VOC from onshore natural gas processing plants for which construction, reconstruction, or modification commenced after January 20, 1984, and on or before august 23, 2011. The facility is not a natural gas processing plant as defined in this regulation [40 CFR Part 60.631]. This regulation does not apply because this facility does not meet the definition of a natural gas processing plant as stated in the regulation.
NSPS 40 CFR Part 60 Subpart LLL	Standards of Performance for **Onshore Natural Gas Processing**: SO_2 Emissions	No	N/A	This regulation establishes standards of performance for SO2 emissions from onshore natural gas processing for which construction, reconstruction, or modification commenced after January 20, 1984 and on or before August 23, 2011. The facility does not have a sweetening unit or considered a natural gas processing plant and does not meet the applicability requirements of this regulation under 40 CFR Part 60.640 (a). The facility is not subject to this regulation.
NSPS 40 CFR Part 60 Subpart OOOO	Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which construction, modification or reconstruction commenced after August 23, 2011 and before September 18, 2015	No	N/A	This regulation does not pertain to this facility as it does not produce crude oil or natural gas.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NSPS 40 CFR Part 60 Subpart OOOOa	Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015	No	N/A	This regulation does not pertain to this facility as it does not produce crude oil or natural gas.
NSPS 40 CFR 60 Subpart IIII	Standards of performance for Stationary Compression Ignition Internal Combustion Engines	No	N/A	This regulation does not apply as this facility does not contain any units that are considered a compression ignition internal combustion engine.
NSPS 40 CFR Part 60 Subpart JJJJ	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines	No	N/A	This regulation establishes standards of performance for stationary spark ignition combustion engines. The facility does not operate any units at the facility that would be subject to this regulation.
NSPS 40 CFR 60 Subpart TTTT	Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units	No	N/A	This section does not apply as the site does not have generators capable of selling greater than 25 MW of electricity.
NSPS 40 CFR 60 Subpart UUUU	Emissions Guidelines for Greenhouse Gas Emissions and Compliance Times for Electric Utility Generating Units	No	N/A	This regulation does not apply as it is only for power plants.
NSPS 40 CFR 60, Subparts WWW, XXX, Cc, and Cf	Standards of performance for Municipal Solid Waste (MSW) Landfills	No	N/A	This regulation does not apply because this facility is not a landfill.
NESHAP 40 CFR 61 Subpart A	General Provisions	No	N/A	There are no NESHAP-affected source types at this facility
NESHAP 40 CFR 61 Subpart E	National Emission Standards for **Mercury**	No	N/A	The provisions of this subpart are applicable to those stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge. Since this facility does not process mercury, this regulation does not apply.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NESHAP 40 CFR 61 Subpart V	National Emission Standards for **Equipment Leaks** (Fugitive Emission Sources)	No	N/A	This regulation establishes national emission standards for equipment leaks (fugitive emission sources). The facility does not have equipment that operates in volatile hazardous air pollutant (VHAP) service [40 CFR Part 61.240]. The regulated activities subject to this regulation do not take place at this facility. The facility is not subject to this regulation.
MACT 40 CFR 63, Subpart A	General Provisions	No	N/A	This regulation does not apply because no subpart of part 63 applies to this facility.
MACT 40 CFR 63.760 Subpart HH	**Oil and Natural Gas Production Facilities**	No	N/A	This regulation establishes national emission standards for hazardous air pollutants from oil and natural gas production facilities. The facility is not subject to this regulation and does not have any emission units that are subject to this regulation [40 CFR Part 63.760].
MACT 40 CFR 63 Subpart HHH	National Emission Standards for Hazardous Air Pollutants From Natural Gas Transmission and Storage Facilities	No	N/A	This regulation establishes national emission standards for hazardous air pollutants from natural gas transmission and storage facilities. This regulation does not apply because this facility is not a natural gas transmission or storage facility as defined in this regulation [40 CFR Part 63.1270(a)].
MACT 40 CFR 63 Subpart DDDDD	National Emission Standards for Hazardous Air Pollutants for Major Industrial, Commercial, and Institutional Boilers & Process Heaters	No	N/A	This regulation establishes national emission standards for hazardous air pollutants from Major Industrial, Commercial, and Institutional Boilers & Process Heaters. This regulation does not apply because this facility is not a major source of HAP emissions.
MACT 40 CFR 63 Subpart UUUUU	National Emission Standards for Hazardous Air Pollutants Coal & Oil Fire Electric Utility Steam Generating Unit	No	N/A	This regulation does not apply because this facility does not have Coal & Oil Fire Electric Utility Steam Generating Units.
MACT 40 CFR 63 Subpart ZZZZ	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (**RICE MACT**)	No	N/A	Facilities are subject to this subpart if they own or operate a stationary RICE, except if the stationary RICE is being tested at a stationary RICE test cell/stand. This regulation does not apply to this facility since it does not operates stationary RICE unit.
40 CFR 64	**Compliance Assurance Monitoring**	No	N/A	This regulation defines compliance assurance monitoring. There are not any units at the facility that have the potential pre-controlled device emissions of an applicable regulated pollutant required for a source to be classified as a major source [40 CFR 64.2(a)(3)]. The facility is not subject to this regulation.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
40 CFR 68	**Chemical Accident Prevention**	Yes	Facility	An owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process, as determined under §68.115. This facility has in place a RMP that was submitted to EPA.
Title IV – Acid Rain 40 CFR 72	**Acid Rain**	No	N/A	This part establishes the acid rain program. This facility is not an acid rain source. This regulation does not apply.
Title IV – Acid Rain 40 CFR 73	**Sulfur Dioxide** Allowance Emissions	No	N/A	This regulation establishes sulfur dioxide allowance emissions for certain types of facilities. This facility is not an acid rain source. This regulation does not apply.
Title IV-Acid Rain 40 CFR 75	**Continuous Emissions Monitoring**	No	N/A	This regulation does not apply as this facility does not generate election power for sale.
Title IV – Acid Rain 40 CFR 76	**Acid Rain** Nitrogen Oxides **Emission Reduction Program**	No	N/A	This regulation establishes an acid rain nitrogen oxides emission reduction program. This regulation applies to each coal-fired utility unit that is subject to an acid rain emissions limitation or reduction requirement for SO_2. This part does not apply because the facility does not operate any coal-fired units [40 CFR Part 76.1].
Title VI – 40 CFR 82	Protection of **Stratospheric Ozone**	Yes	Facility	Portales Dairy Products owns appliances containing CFCs and is therefore subject to this requirement. Portales Dairy Products uses only certified technicians for the maintenance, service, repair and disposal of appliances and maintains the appropriate records for this requirement. Note: Disposal definition in 82.152: Disposal means the process leading to and including: (1) The discharge, deposit, dumping or placing of any discarded appliance into or on any land or water; (2) The disassembly of any appliance for discharge, deposit, dumping or placing of its discarded component parts into or on any land or water; or (3) The disassembly of any appliance for reuse of its component parts. "Major maintenance, service, or repair means" any maintenance, service, or repair that involves the removal of any or all of the following appliance components: compressor, condenser, evaporator, or auxiliary heat exchange coil; or any maintenance, service, or repair that involves uncovering an opening of more than four (4) square inches of "flow area" for more than 15 minutes.

Section 14

Operational Plan to Mitigate Emissions

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

☑ **Title V Sources** (20.2.70 NMAC)**:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Emissions During Startups, Shutdowns, and Emergencies** defining the measures to be taken to mitigate source emissions during startups, shutdowns, and emergencies as required by 20.2.70.300.D.5(f) and (g) NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☐ **NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Source Emissions During Malfunction, Startup, or Shutdown** defining the measures to be taken to mitigate source emissions during malfunction, startup, or shutdown as required by 20.2.72.203.A.5 NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☑ **Title V** (20.2.70 NMAC)**, NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has established and implemented a Plan to Minimize Emissions During Routine or Predictable Startup, Shutdown, and Scheduled Maintenance through work practice standards and good air pollution control practices as required by 20.2.7.14.A and B NMAC. This plan shall be kept on site or at the nearest field office to be made available to the Department upon request. This plan should not be submitted with this application.

Emissions during startups, shutdowns, maintenance and emergencies (ESDs) will be minimized through the use of industry standards and/or manufacturer's recommended operating practices. Portales Dairy Products, LLC (PDP), formerly referred to Dairy Farmers of America (DFA), engineers and trained technicians are responsible for the timely and effective execution of these actions. In addition, equipment at the facility is equipped with safety devices that will aid in minimizing excess emissions during non-routine operating conditions. The following summarizes the facility's operational plans for minimizing excess emissions.

Maintenance

The key to minimizing excess emissions during non-routine operating conditions is minimizing the occurrence of such conditions. To this end, PDP has taken a pro-active approach to facility and equipment maintenance and environmental awareness. Operations personnel are aware of the importance of proper and efficient operation of equipment, and of the potential liabilities associated with improper operation. Moreover, PDP recognizes the economic incentives to maintain and operate equipment efficiently. Malfunctioning equipment wastes resources and costs money.

Equipment at the facility is maintained in accordance with manufacturers' recommendations, industry best operating practices, and PDP's practices designed to minimize downtime and non-routine operations. Procedures exist for maintenance of each major piece of equipment; personnel are trained in proper procedures; and PDP's internal review processes ensure that procedures are followed. As a result, non-routine operational events and consequent excess emissions are minimized.

Startup and Shutdown

Excess emissions from startup and shutdown events are brief, as the duration of the actual startup or shutdown event is relatively short. However, PDP takes steps to minimize the number of such events, and to minimize their duration.

For example, equipment shutdowns for maintenance are performed in accordance with procedures designed to minimize the duration of shutdown events. Such procedures include the following.

- Operational loads may be shifted to other units.
- Maintenance may be scheduled for periods of low load.
- Multiple maintenance activities may be scheduled to occur simultaneously.
- Emergency Conditions

Despite PDP's best planning and maintenance efforts, incidents may happen, often as the result of external causes. PDP monitors the operating condition of equipment and their procedures specify that abnormal operations be investigated and rectified. Thus, prolonged abnormal operations will not occur; the malfunctioning equipment will be repaired or adjusted, or shutdown for repair.

Compliance

In the event of a malfunction or other event that may potentially increase emissions, PDP complies with the requirements of 20.2.7 NMAC, and with permit conditions including taking appropriate steps to minimize emissions. In addition, they maintain records of startup, shutdown, and malfunction events and submit reports when required.

Section 15

Alternative Operating Scenarios

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

Alternative Operating Scenarios: Provide all information required by the department to define alternative operating scenarios. This includes process, material and product changes; facility emissions information; air pollution control equipment requirements; any applicable requirements; monitoring, recordkeeping, and reporting requirements; and compliance certification requirements. Please ensure applicable Tables in this application are clearly marked to show alternative operating scenario.

Construction Scenarios: When a permit is modified authorizing new construction to an existing facility, NMED includes a condition to clearly address which permit condition(s) (from the previous permit and the new permit) govern during the interval between the date of issuance of the modification permit and the completion of construction of the modification(s). There are many possible variables that need to be addressed such as: Is simultaneous operation of the old and new units permitted and, if so for example, for how long and under what restraints? In general, these types of requirements will be addressed in Section A100 of the permit, but additional requirements may be added elsewhere. Look in A100 of our NSR and/or TV permit template for sample language dealing with these requirements. Find these permit templates at: https://www.env.nm.gov/aqb/permit/aqb_pol.html. Compliance with standards must be maintained during construction, which should not usually be a problem unless simultaneous operation of old and new equipment is requested.

In this section, under the bolded title "Construction Scenarios", specify any information necessary to write these conditions, such as: conservative-realistic estimated time for completion of construction of the various units, whether simultaneous operation of old and new units is being requested (and, if so, modeled), whether the old units will be removed or decommissioned, any PSD ramifications, any temporary limits requested during phased construction, whether any increase in emissions is being requested as SSM emissions or will instead be handled as a separate Construction Scenario (with corresponding emission limits and conditions, etc.

The term "alternative operating scenario" is not defined by regulation. Portales Dairy Products, LLC, formerly referred to as Dairy Farmers of America, understands this term to apply to a source which may routinely operate with alternative fuels or processes in such a manner as to potentially affect emissions; and not to apply to startup, shutdown, and changes in operational parameters in response to load or capacity changes. Based on this understanding, this facility has no alternative operating scenarios.

Section 17

Compliance Test History

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

To show compliance with existing NSR permits conditions, you must submit a compliance test history. The table below provides an example.

Compliance Test History Table

Unit No.	Test Description	Test Date
B3, B4	Tested in accordance with EPA test methods for NOx and CO as required by NSR permit 1263.	6/21/2004
D2	Tested in accordance with EPA test methods for TSP, NOx and CO as required by NSR permit 1263.	6/23-24/2004 11/3-4/2004 12/2005 12/2006 12/2007 12/2008 12/2011 12/2012 9/2013 7/31/2014 7/30/2015 5/22-23/2016 5/30-6/1/2017 5/8-9/2018 6/4-5/2019 6/2-3/2020
D2	Tested in accordance with EPA test methods for PM_{10} as required by NSR permit 1263-M5-R1.	4/10-11/2017

Section 19

Requirements for Title V Program

Do not print this section unless this is a Title V application.

Who Must Use this Attachment:

* Any major source as defined in 20.2.70 NMAC.
* Any source, including an area source, subject to a standard or other requirement promulgated under Section 111 - Standards of Performance for New Stationary Sources, or Section 112 Hazardous Air Pollutants, of the 1990 federal Clean Air Act ("federal Act"). Non-major sources subject to Sections 111 or 112 of the federal Act are exempt from the obligation to obtain an 20.2.70 NMAC operating permit until such time that the EPA Administrator completes rulemakings that require such sources to obtain operating permits. In addition, sources that would be required to obtain an operating permit solely because they are subject to regulations or requirements under Section 112(r) of the federal Act are exempt from the requirement to obtain an Operating Permit.
* Any Acid Rain source as defined under title IV of the federal Act. The Acid Rain program has additional forms. See http://www.env.nm.gov/aqb/index.html. Sources that are subject to both the Title V and Acid Rain regulations are encouraged to submit both applications simultaneously.
* Any source in a source category designated by the EPA Administrator ("Administrator"), in whole or in part, by regulation, after notice and comment.

This facility is a major source as defined in 20.2.70 NMAC.

19.1 - 40 CFR 64, Compliance Assurance Monitoring (CAM) (20.2.70.300.D.10.e NMAC)

Any source subject to 40CFR, Part 64 (Compliance Assurance Monitoring) must submit all the information required by section 64.7 with the operating permit application. The applicant must prepare a separate section of the application package for this purpose; if the information is already listed elsewhere in the application package, make reference to that location. Facilities not subject to Part 64 are invited to submit periodic monitoring protocols with the application to help the AQB to comply with 20.2.70 NMAC. Sources subject to 40 CFR Part 64, must submit a statement indicating your source's compliance status with any enhanced monitoring and compliance certification requirements of the federal Act.

This facility is not subject to 40CFR Part 64 due to the fact that none of the units are subject to an emission limitation or standard for the applicable regulated air pollutant other than an emission limitation by the Administrator after Nov 15, 1990.

19.2 - Compliance Status (20.2.70.300.D.10.a & 10.b NMAC)

Describe the facility's compliance status with each applicable requirement at the time this permit application is submitted. This statement should include descriptions of or references to all methods used for determining compliance. This statement should include descriptions of monitoring, recordkeeping and reporting requirements and test methods used to determine compliance with all applicable requirements. Refer to Section 2, Tables 2-N and 2-O of the Application Form as necessary. (20.2.70.300.D.11 NMAC) For facilities with existing Title V permits, refer to most recent Compliance Certification for existing requirements. Address new requirements such as CAM, here, including steps being taken to achieve compliance.

Operator certified compliance with applicable requirements, pursuant to condition 6.0 of Permit and 20.2.70.302.E.3 NMAC. Operator states that, based on information and belief formed after reasonable inquiry, the statements and information in this document are true, accurate and complete as regards compliance with applicable requirements.

19.3 - Continued Compliance (20.2.70.300.D.10.c NMAC)

Provide a statement that your facility will continue to be in compliance with requirements for which it is in compliance at the time of permit application. This statement must also include a commitment to comply with other applicable requirements as they come into effect during the permit term. This compliance must occur in a timely manner or be consistent with such schedule expressly required by the applicable requirement.

Operator states that the facility will continue to be in compliance with requirements for which it is in compliance at the time of the permit application, as described in Section 19.2. Operator further states that facility is committed to be in compliance with other applicable requirements as they become effective during the permit term, and that such compliance will occur in a timely manner consistent with such schedule as expressly required by the applicable requirement.

19.4 - Schedule for Submission of Compliance (20.2.70.300.D.10.d NMAC)

You must provide a proposed schedule for submission to the department of compliance certifications during the permit term. This certification must be submitted annually unless the applicable requirement or the department specifies a more frequent period. A sample form for these certifications will be attached to the permit.

In accordance with Permit Condition A109.B., DFA submits their Annual Compliance Certification on or before November 30 of each year.

19.5 - Stratospheric Ozone and Climate Protection

In addition to completing the four (4) questions below, you must submit a statement indicating your source's compliance status with requirements of Title VI, Section 608 (National Recycling and Emissions Reduction Program) and Section 609 (Servicing of Motor Vehicle Air Conditioners).

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1. Does your facility have any air conditioners or refrigeration equipment that uses CFCs, HCFCs or other ozone-depleting substances? ☑ **Yes** ☐ **No**

2. Does any air conditioner(s) or any piece(s) of refrigeration equipment contain a refrigeration charge greater than 50 lbs? ☐ **Yes** ☑ **No**
   (If the answer is yes, describe the type of equipment and how many units are at the facility.)

3. Do your facility personnel maintain, service, repair, or dispose of any motor vehicle air conditioners (MVACs) or appliances ("appliance" and "MVAC" as defined at 82. 152)? ☐ **Yes** ☑ **No**

4. Cite and describe which Title VI requirements are applicable to your facility (i.e. 40 CFR Part 82, Subpart A through G.)

To save paper and to standardize the application format, delete this sentence, and begin your submittal for this item here. The facility, like all owner of CFC-.containing appliances, has a general duty to comply with the requirements of Section 608. Otherwise, there are no applicable Title VI requirements.

19.6 - Compliance Plan and Schedule

Applications for sources, which are not in compliance with all applicable requirements at the time the permit application is submitted to the department, must include a proposed compliance plan as part of the permit application package. This plan shall include the information requested below:

A. Description of Compliance Status: (20.2.70.300.D.11.a NMAC)
A narrative description of your facility's compliance status with respect to all applicable requirements (as defined in 20.2.70 NMAC) at the time this permit application is submitted to the department.

B. Compliance plan: (20.2.70.300.D.11.B NMAC)
A narrative description of the means by which your facility will achieve compliance with applicable requirements with which it is not in compliance at the time you submit your permit application package.

C. Compliance schedule: (20.2.70.300D.11.c NMAC)
A schedule of remedial measures that you plan to take, including an enforceable sequence of actions with milestones, which will lead to compliance with all applicable requirements for your source. This schedule of compliance must be at least as stringent as that contained in any consent decree or administrative order to which your source is subject. The obligations of any consent decree or administrative order are not in any way diminished by the schedule of compliance.

D. Schedule of Certified Progress Reports: (20.2.70.300.D.11.d NMAC)
A proposed schedule for submission to the department of certified progress reports must also be included in the compliance schedule. The proposed schedule must call for these reports to be submitted at least every six (6) months.

E. Acid Rain Sources: (20.2.70.300.D.11.e NMAC)
If your source is an acid rain source as defined by EPA, the following applies to you. For the portion of your acid rain source subject to the acid rain provisions of title IV of the federal Act, the compliance plan must also include any additional requirements under the acid rain provisions of title IV of the federal Act. Some requirements of title IV regarding the schedule and methods the source will use to achieve compliance with the acid rain emissions limitations may supersede the requirements of title V and 20.2.70 NMAC. You will need to consult with the Air Quality Bureau permitting staff concerning how to properly meet this requirement.

NOTE: The Acid Rain program has additional forms. See http://www.env.nm.gov/aqb/index.html. Sources that are subject to both the Title V and Acid Rain regulations are **encouraged** to submit both applications **simultaneously**.

Operator states that, based on information and belief formed after reasonable inquiry, the statements and information in this document are true, accurate, and complete as regards compliance with applicable requirements; and that facility is in compliance with all applicable requirements.

19.7 - 112(r) Risk Management Plan (RMP)

Any major sources subject to section 112(r) of the Clean Air Act must list all substances that cause the source to be subject to section 112(r) in the application. The permittee must state when the RMP was submitted to and approved by EPA.

This facility has in place a RMP that was submitted to the EPA on August 30th, 2019. EPA facility identifier:1000 0018 9173.

19.8 - Distance to Other States, Bernalillo, Indian Tribes and Pueblos

Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B NMAC)?

(If the answer is yes, state which apply and provide the distances.)

Texas at approximately 30.23 km.

19.9 - Responsible Official

Provide the Responsible Official as defined in 20.2.70.7.AD NMAC: Joey Martin, Plant Manager

Section 20

Other Relevant Information

Other relevant information. Use this attachment to clarify any part in the application that you think needs explaining. Reference the section, table, column, and/or field. Include any additional text, tables, calculations or clarifying information.

Additionally, the applicant may propose specific permit language for AQB consideration. In the case of a revision to an existing permit, the applicant should provide the old language and the new language in track changes format to highlight the proposed changes. If proposing language for a new facility or language for a new unit, submit the proposed operating condition(s), along with the associated monitoring, recordkeeping, and reporting conditions. In either case, please limit the proposed language to the affected portion of the permit.

No other relevant information is being submitted with this application

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Section 22: Certification

Company Name: Portales Dairy Products, LLC

I, Joey Martin, hereby certify that the information and data submitted in this application are true and as accurate as possible, to the best of my knowledge and professional expertise and experience.

Signed this 28th day of September 2020, upon my oath or affirmation, before a notary of the State of New Mexico.

*Signature

9/28/2020
Date

Joey Martin
Printed Name

Plant Manager
Title

Scribed and sworn before me on this 28 day of September, 2020.

My authorization as a notary of the State of New Mexico expires on the 28th day of July, 2022.

Susan Kay Vannatta
Notary's Signature

09-28-2020
Date

Susan Kay Vannatta
Notary's Printed Name

OFFICIAL SEAL
Susan Kay Vannatta
NOTARY PUBLIC-STATE OF NEW MEXICO
My commission expires: 7-28-2022

*For Title V applications, the signature must be of the Responsible Official as defined in 20.2.70.7.AE NMAC.