



# Pneumatic Controllers and Pumps

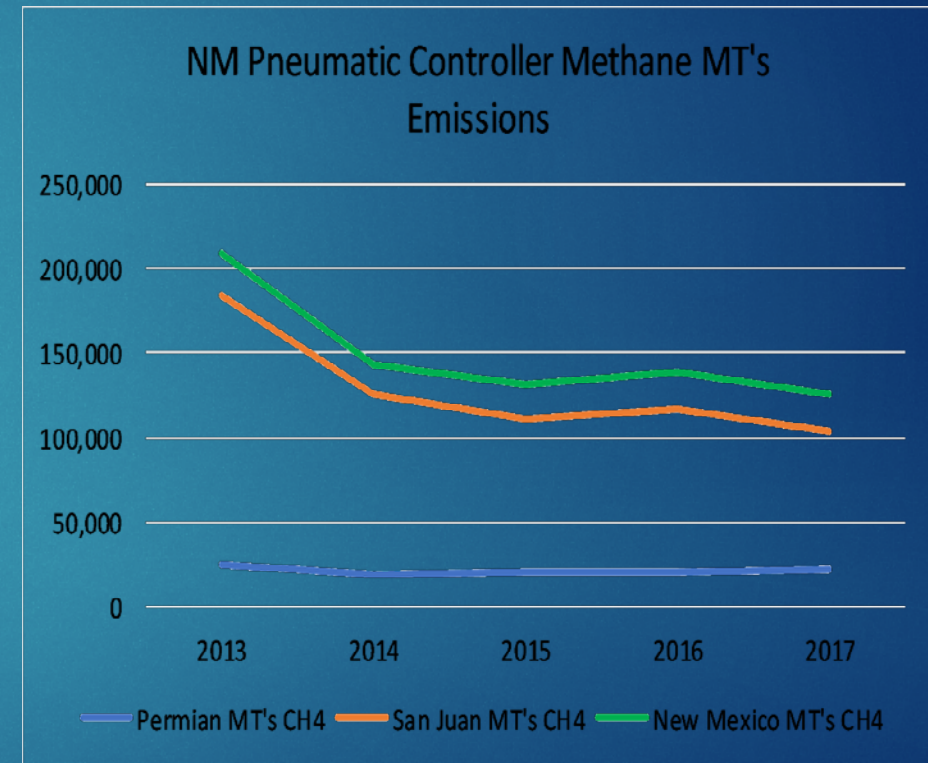
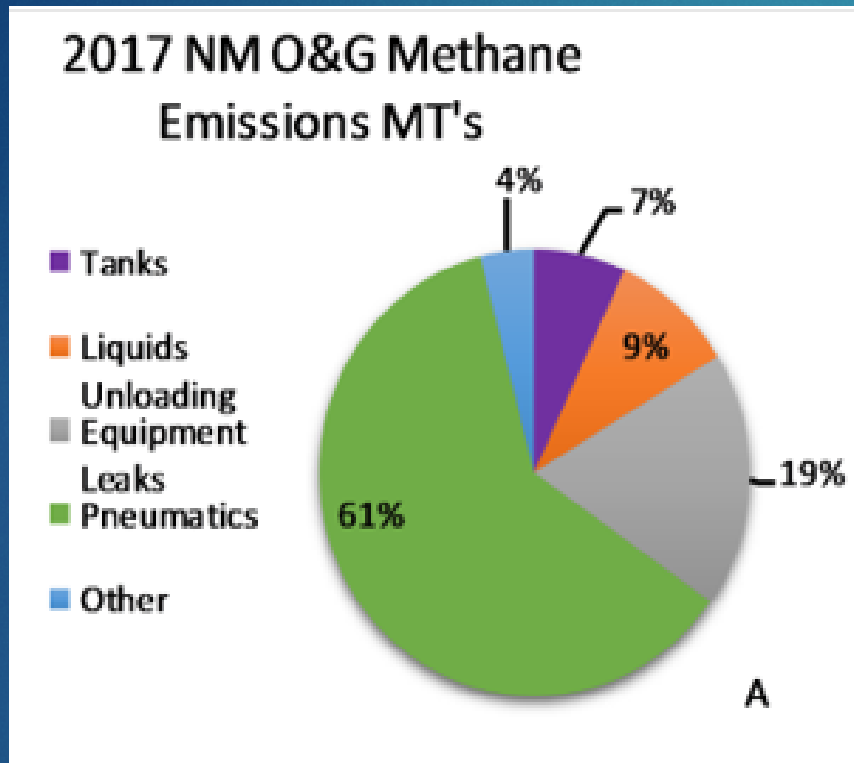
9/27/2019 PRESENTATION TO METHANE ADVISORY PANEL

ADAM PACSI, CHEVRON

# Need for Pneumatic Devices

- ▶ There is a need to perform process control functions (open and close valves, etc.) on upstream oil and gas sites.
- ▶ Facilities in all sectors tend to automated control functions for safety and efficiency of operations.
- ▶ Many oil and gas sites are remote, and natural gas is an available working fluid with enough motive force to enable these control functions to happen reliably.

# Pneumatic Emissions in New Mexico



# Types of Pneumatic Devices

## ▶ Pneumatic Controllers

- ▶ Process control devices found throughout the oil and gas value chain as part of the instrumentation to control the position of valves, and may be actuated using natural gas.
- ▶ Types of service include safety shut-down, position, fluid level, pressure, temperature and flow rate.

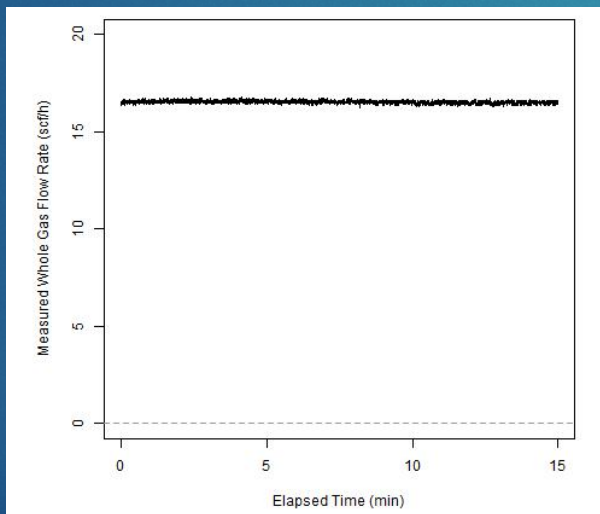
## ▶ Pneumatic Pumps

- ▶ Chemical injection pumps inject small volumes of chemicals into wellheads and gathering lines.
- ▶ Diaphragm pumps are positive displacement pumps moving larger volumes of liquids.

# Classifications of Pneumatic Controllers

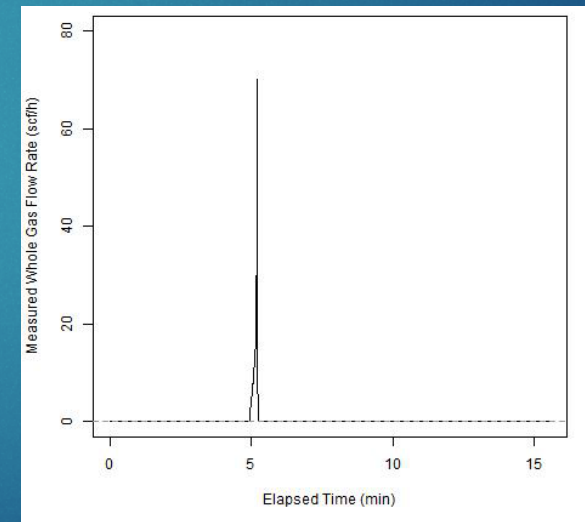
## Continuous High Bleed and Continuous Low Bleed

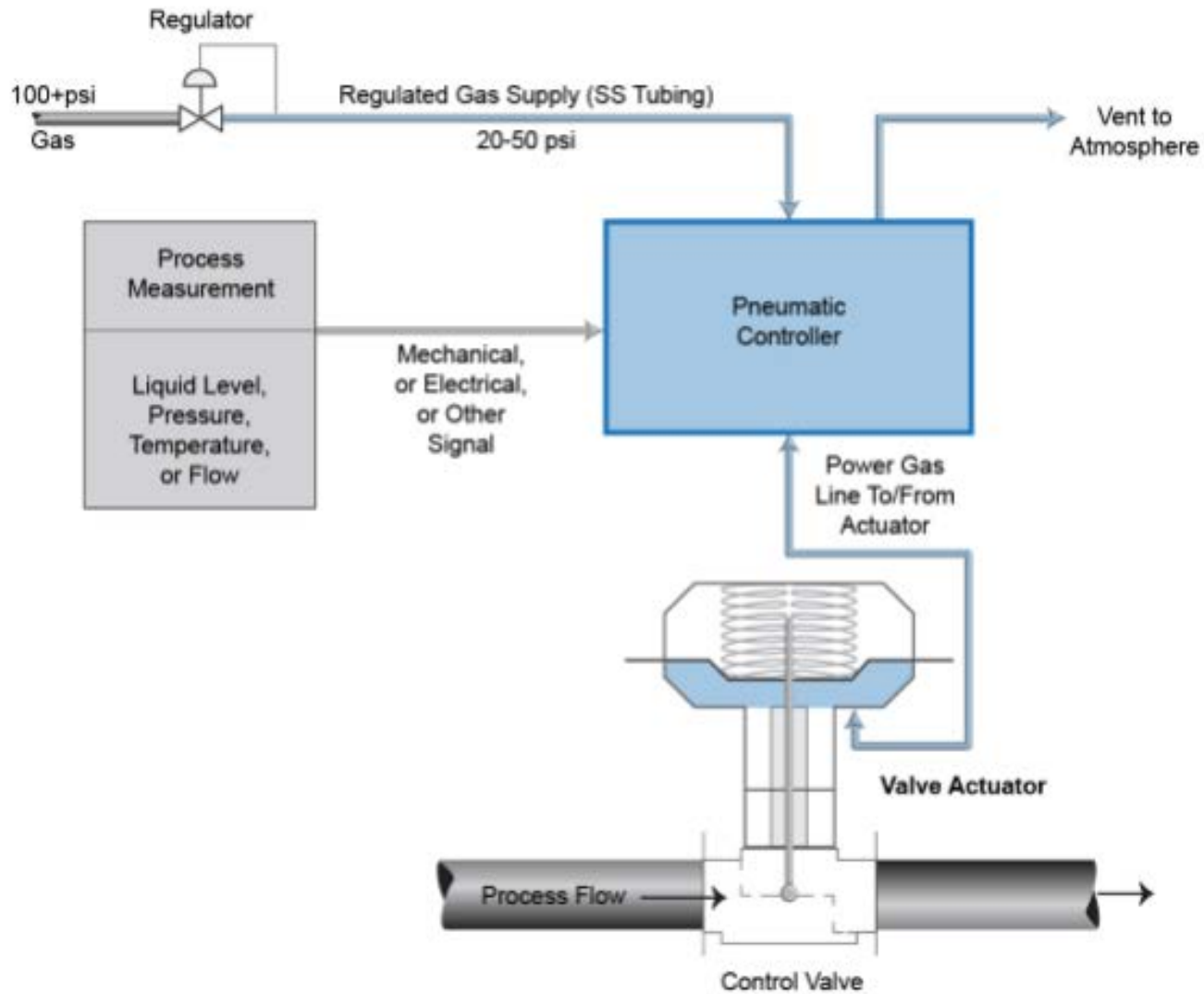
- ▶ Vent natural gas at a continuous rate that is above (high bleed) or below (low bleed) 6 scf/hr



## Intermittent Vent

- ▶ Vent natural gas when the end device needs to move position (actuate)





# Typical Pneumatic Controller Flow Diagram

# Example configuration in the field

Liquid Level Sensor  
(process measurement,  
inside unit)



Pneumatic  
Controller

Valve and Valve  
Actuator

Image from UT-Austin

<http://dept.ceer.utexas.edu/meth:ane2/study/>

# Pneumatic Controllers Vary in Appearance and Function



Liquid level controller,  
[www.norrisealwellmark.com](http://www.norrisealwellmark.com)



High pressure shutoff  
valve  
[www.emerson.com](http://www.emerson.com)



Valve controller  
[www.norrisealwellmark.com](http://www.norrisealwellmark.com)



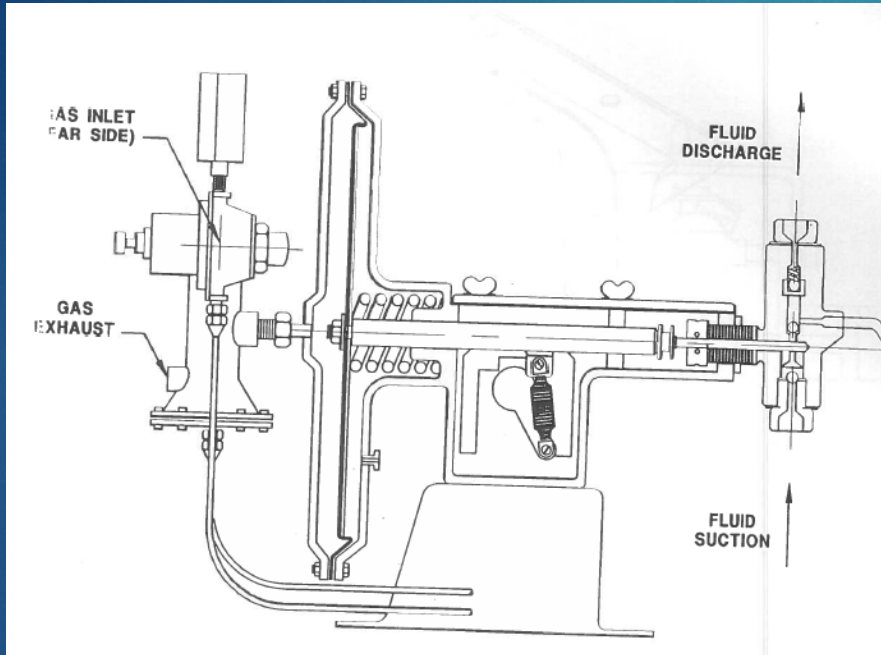
Pressure Regulator  
[www.kimray.com](http://www.kimray.com)



Temperature controller,  
[www.kimray.com](http://www.kimray.com)



# Pneumatic Pumps



- ▶ Use pressurized gas to pump a liquid by changing the volume fluid area by exerting more or less pressure on the fluid section
- ▶ Diagram to the left is a diaphragm pump, which is used for larger liquid volumes
- ▶ Examples:
  - ▶ Glycol circulation
  - ▶ Corrosion inhibitors

# Regulated Under Federal Air Rules: 40 CFR 60, Subpart OOOO/OOOOa

- ▶ 40 CFR Part 60, Subpart OOOO requires no new continuous high bleed pneumatics be installed after August 2011
- ▶ 40 CFR Part 60, Subpart OOOOa
  - ▶ Wellsite pneumatic pumps must control natural gas emissions by 95% if a control device or process is on site and it is feasible to tie in the pump emissions.
  - ▶ Chemical injection pumps (piston pumps) do not have control requirements due to their “inherently low emission rates” (preamble printed page 35849)

# Methane Emission Estimation for EPA Reporting

Operator supplies count of each type of device at the basin-level

Percent methane in gas

$$E_{s,i} = \sum_{t=1}^3 Count_t * EF_t * GHG_i * T_t$$

Required EPA Emissions Factors per Device

Onshore petroleum and natural gas production and Onshore petroleum and natural gas gathering and boosting	Emission factor (scf/hour/component)
Low Continuous Bleed Pneumatic Device Vents <sup>2</sup>	1.39
High Continuous Bleed Pneumatic Device Vents <sup>2</sup>	37.3
Intermittent Bleed Pneumatic Device Vents <sup>2</sup>	13.5
Pneumatic Pumps <sup>3</sup>	13.3

Hours operated per year, default is 8760.

# Selection of Recent Field Studies



Study Name	# Pneumatic Controllers in Study	Application	Duration of Measurement	Average Whole gas Emission Rate (scf/hr)
<u>EDF/UTexas 2014</u>	377	Well pads natural gas production, several U.S. basins	15 minutes	<ul style="list-style-type: none"><li>• 5.5 – all sites</li><li>• 5.8 - Midcontinent (region with Permian)</li><li>• 0.8 - Rockies (region with San Juan)</li></ul>
<u>EPA – Thoma Utah Study 2016</u>	80	Uintah Basin well pads (Utah), oil and gas production	1 hour or more	0.36

# Emission Reduction Strategies

- ▶ Retrofit or replace continuous high bleed pneumatic controllers
- ▶ Run pneumatic controllers on compressed air on oil well sites with multiple controllers and with access to reliable electricity.
- ▶ In limited situations, mechanical valves can be used without a pneumatic controller to control liquid level. Mechanical valve without a pneumatic controller may not be sufficient for some liquid level process such as when there is a larger process flow or pressure. Retrofit is not feasible.
- ▶ Route gas from pneumatic pumps to a control device or process if a low pressure control device or process is available on site and in close proximity.

Questions?