EcoVapor's comments regarding MAP report on Separators/Heaters/Storage Vessels and Permitting Incentives

We at EcoVapor have been working with operators and regulators in several states over the last ten years including Oklahoma, Texas, North Dakota, Colorado, and, more recently, New Mexico. We applaud the NMED and ERMED for putting together an effective technical body in the MAP team and the MAP members as well for their thorough and timely report. It is an impressive body of work that other states can use as a guide.

Our comments support the idea that incorporating a permitting process with clear, predictable incentives can benefit New Mexico's air quality. This revised permitting process would be part of a comprehensive regulatory plan. Specifically, in Path Forward Option 8.14, the MAP team recommended consideration of a control credit process similar to the one currently used by the TCEQ (see Figure 1 below).

	OPTIONS	DESCRIPTION AND LINK TO INFORMATION IF AVAILABLE. PLEASE LIST THE BENEFIT THAT COULD BE ACHIEVED THROUGH THIS OPTION AND ANY DRAWBACKS OR CHALLENGES TO IMPLEMENTATION	EFFECTIVENESS OF COST NOW (choose one)	REPORTING, MONITORING AND RECORDING OPTIONS, INCLUDING REMOTE DATA COLLECTION	IS THIS OPTION HELPFUL IN THE SAN JUAN BASIN, PERMIAN BASIN OR BOTH
8.14	Consideration of a control credit similar to TCEQ program	See page 12 of Enhanced Vapor Recovery presentation. The addition of additional control equipment can result in an increased percent emission reduction credit.			
	COMMENT		SUGGESTION TO MAKE THIS OPTION MORE WORKABLE:		

Figure 1 MAP Path Forward Option 8.14

Ms. Sandra Ely spoke at an industry meeting last fall. During part of her talk she implored the operators in attendance to do everything they could to reduce emissions as soon as possible to prevent areas of the State from being classified as nonattainment for ozone, adding that such an event would be bad for the industry due to increased permitting times, complexity, and cost. One of the operators inquired what incentives are or could be in place for operators who install emission control systems prior to them being required and/or achieving lower-than-required emission levels.

As stated above, our company is working in other states as well as New Mexico and is knowledgeable of air permitting processes and procedures in those states. We have a large presence in both Texas and Colorado and have seen how Enhanced Vapor Recovery (EVR) positively impacts air permitting in both states. The Texas Commission on Environmental Quality (TCEQ) has regulations designed to reduce emissions without excessive regulatory complexity. EVR fits very well with them and provides clear, additional benefits for operators who reduce emissions beyond the minimums required.

The TCEQ Control Credit table (below) shown to the MAP team last fall as part of the Enhanced Vapor Recovery presentation is one means of incentivizing operators to reduce emissions both as soon and as much as possible. We applaud the MAP for recognizing the value of this process and the positive impacts it can have for operators, New Mexico’s regulators, and most importantly New Mexico’s air quality.

TCEQ Control Credit Applicability Table - ZerO2 Impacts

Control Credit %:	What / Why:	Provided By:	Criteria 1:	Criteria 2:
95%	Installation of a Vapor Recovery System	mVRU	Designed to capture vapor	Designed to sense pressure and capture during peak periods
1%	mVRU compressor design and controls	mVRU	The mVRU compressor is capable of handling both wet and dry gas.	The mVRU compressor is capable of changing speeds to respond to changing conditions.
1%	Additional sensing equipment	mVRU (or ancillary equipment)	Enables greater control	Enables greater efficiency
1%	Appropriately designed bypass system	mVRU (or ancillary equipment)	Operates automatically	Redirects streams as needed
1%	Oxygen ingress control **	Ancillary equipment		
1%	Continuous monitoring and recordkeeping	mVRU (or ancillary equipment)		

100% (all rows)

Basic VRU (95% and first 1% rows)

Enhanced System (remaining 1% rows)

Source: TCEQ

Figure 2 TCEQ Control Credit Table with EcoVapor Annotations

The incentives available to operators should the NMED adopt this process or something similar are:

1) Permit predictability - If an operator installs a VRU and other equipment as shown on the table, they are able to employ the associated Potential To Emit (PTE) pre-approved percentage reductions. In that process the operator knows the resulting expected PTE prior to submitting their air permit and what type of permit will be required.

2) Tangible cost/benefit ratios - By knowing the gross PTE, the percentage reduction impacts of the VRU(s) and each piece of additional equipment, the operator also then can determine the cost/benefit ratio(s) for each piece of vapor control equipment and the overall system.

3) Ability to stay below Title V PTE levels - This has several sub-benefits:
    a) Not having to get a Title V permit thereby reducing permit cost and complexity;

b) Reduced permitting time frame and accelerating the start of production. This is likely the largest financial gain to an operator from using this process. For example, a standard cash flow discount rate used in the oil and gas industry is 10%, so money earned a year from now is worth 90% of what its value is today. Accelerating the start of production of a 1,000 BOPD site by six months can increase the net present value of that project by over $500,000.

c) Additional wells per site. By adding more vapor control equipment and earning more Control Credit percentages, the resulting lower net PTE can allow the operator to bring additional wells to the production site and still stay below Title V levels. More wells per site results in land use, personnel and infrastructure efficiencies.

These benefits and credits are generated by multiple vapor capture technologies and service providers.

While New Mexico is more than capable of designing its own permitting process, there are advantages to considering what Texas has put in place. Those advantages include accelerated implementation and processes common to both sides of the state border. New Mexico may also adopt the framework and adjust the control credits and criteria to best fit its needs and goals.

These incentives will likely compliment the pending new regulations from both the NMED and the NMOCD. Reduction of emissions and waste by installing highly effective vapor recovery systems aligns with the goals of the MAP.

Our recommendations to complete the Table in Option 8.14 are as follows:

1) *Effectiveness of Cost Now* – **High.** There is a clear correlation between the types of equipment installed and the reduction in PTE, so operators will find this tool valuable in their permitting immediately. The NMED would also be able to apply these same percentages to the gross PTE values submitted by operators.
2) *Reporting, Monitoring and Recording Options, Including Remote Data Collection* – **Included**. The TCEQ table provides a clear incentive to an operator who installs EVR equipment with that capability. While the PTE reduction credit for this is shown as only 1%, large production sites will need as much PTE credit possible to stay below Title V levels. Often these individual capabilities are imbedded in EVR equipment as part of a larger technology package. Alternatively, the NMED has the option to adjust the credits as they see fit if this process is adopted.
3) *Is this Option Helpful in the San Juan Basin, Permian Basin, or Both* – **Both**. While the Primary Benefit would be to Permian Basin operators due to the high level of activity there now, it would be helpful to operators across the State.

EcoVapor’s comments regarding MAP report on Separators/Heaters/Storage Vessels

Executive Summary

We at EcoVapor have been working with operators and regulators in several states over the last ten years including Oklahoma, Texas, North Dakota, Colorado, and, more recently, New Mexico. We applaud the NMED and ERMED for putting together an effective technical body in the MAP team and the MAP members as well for their thorough and timely report. It is an impressive body of work that other states can use as a guide.

The information compiled by the MAP team for each topic was understandably put together in a logical and sequential manner. EcoVapor’s Peter Mueller presented information on Enhanced Vapor Recovery (EVR) towards the end of the MAP process on Separators/Heaters/Storage Vessels (SHSV), so discussion of enhanced vapor recovery is not included until the Path Forward section. Our comments will show how EVR can apply throughout this section with tangible and cost-effective impacts of reducing waste and emissions.

Combining oxygen removal technology with vapor recovery units allows operators to recover and sell close to 100% of tank flash gas with a corresponding decrease in VOC and NOx emissions that otherwise would have been generated had that gas been flared instead. Recovery and sale of this ultra-rich gas stream, containing often 20 GPM of NGLs or more, results in emissions reductions with a profit per ton of methane instead of a cost. Said another way, Enhanced Vapor Recovery is the rare true win/win for both operators and the environment.

Comments

Flow Diagram

Below, in Figure 1, we present a modified version of the General Process Description for Production Facilities to help illustrate how an EVR system functions. The modifications are as follows:

1) The ULPS/VRT is removed, and the oil flows directly to the oil tanks.
2) Flowlines off the oil tanks, water tanks, heater treater and FWKO have been joined together and re-colored to indicate that the gas stream likely contains oxygen.
3) These combined streams are routed to a VRU that is also connected to a backup flare or combustor system to be used during maintenance or unplanned downtime.
4) The VRU is connected to a gas conditioning unit (EcoVapor’s ZerO2) that removes the free oxygen down to levels acceptable to gas gatherers, gas processors and mainline transporters, alike.
5) A legend has been added to the ANNOTATIONS section to show and differentiate gas with oxygen (orange) and oxygen-free gas (red).

This system is being employed now in the Permian Basin, both in Texas and in New Mexico, by international oil companies such as Shell and by independents or all sizes. Furthermore, it is being used in other basins and States including Texas' Eagle Ford, Colorado's DJ Basin, Oklahoma's STACK and SCOOP, and North Dakota's Bakken. In Colorado, where the EPA recently reclassified the Denver Metro Area and Front Range to Serious Non-Attainment for Ozone, multiple operators are using this process to reduce VOC emissions at sites having a gross PTE of over 1500 TPY down to less than 30 TPY without generating NOx in the process. This reduction has allowed DJ operators, so equipped, to develop their sites without need for a Title V permit.

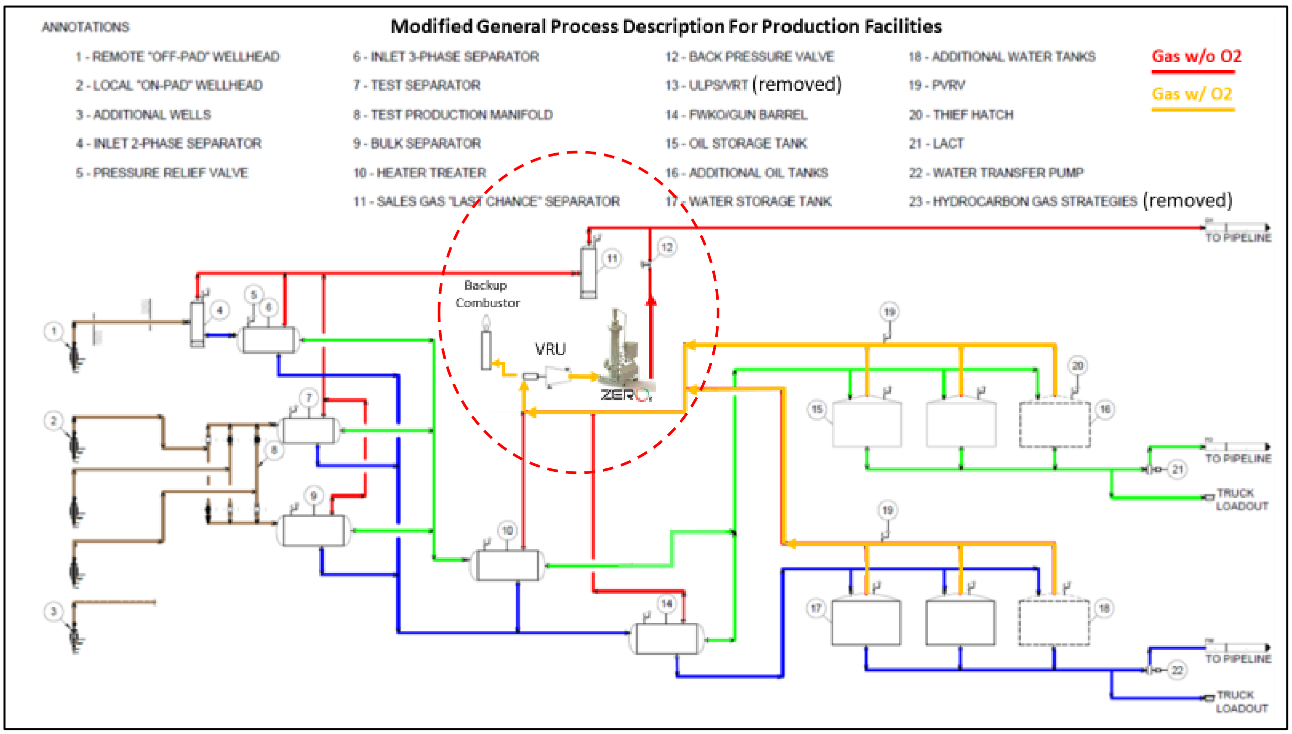


Figure 1 - Modified Production Facility Process Diagram

The key difference in Figure 1 is the removal of the ULPS/VRT and the addition of the oxygen-removal unit. This change greatly increases the ability of a production facility to capture all the tank flash gas instead of just a portion of it. Both modeling and empirical data have shown that vapor recovery towers (VRTs) often capture between 60% to 75% of the entrained gas, leaving the rest to evolve from the oil once it enters the oil storage tanks. That gas pressures up the tanks, potentially resulting in leaks and venting, or, in the best case, pushing the gas to combustors or flares.

Furthermore, VRTs can be problematic to operate, especially on multi-well sites. Production surges can cause overflows, shutting down or even damaging the VRU. Cold weather can cause the overhead and dump lines to freeze off, rendering the VRT useless until it can be thawed out. It is our observation that a significant number of VRTs are simply bypassed by field personnel when problems are encountered in order to keep production flowing.

VRUs were originally designed to pull gas off oil storage tanks, but corrosion of steel pipelines due to the entrained oxygen caused pipeline operators to test for oxygen and reject gas streams with levels higher than 10 ppm, sometimes even less. By removing the oxygen, operators can, again, install VRUs directly on tanks.

Engineering Considerations

As noted in the MAP SHSV Engineering Considerations table on page 5, the *Challenges* for *Recovery* under *Complexity / Tanks* are *Incorrect [Gas] Composition* because of *Oxygen* or *Blanket Gas* and *(Tanks) Set Point Limitations* and *Retrofit Complications*. We agree. We also know that these *Challenges* have been solved.

Removing oxygen from natural gas is happening 24/7 at hundreds of production sites today. Doing so makes the need for blanket gas moot. The concept of blanket gas merits a brief discussion here. Blanket gas is used to create positive pressure inside an oil and/or water tank in an effort to prevent air and oxygen ingress. Tanks often have operating pressures of 8 oz/in2 or 0.5 psi whereas oxygen has a partial pressure of approximately 3 psia at sea level. A tank with positive gas pressure will not stop oxygen ingress, but the injection of natural gas as a gas blanket can "flush" out oxygenated gas and push it to flares or combustors. The consequences of this are wasted gas, increased flaring emissions, and higher tanks pressures, which, in turn, cause more leaks and venting. Using a VRU to "pull" gas off storage vessels reduces tank pressures and pushes the gas, instead, to a sales line.

Pressure Vessels

On pages 8 and 9, the MAP SHSV report includes the following table and text (italicized). The highlighted portions require additional discussion and information in light of oxygen-removal technology.

For simplicity, pressure vessels used at production facilities are organized into one of three categories

1) Normal Pressure Vessels
2) Heater Treaters
3) VRT's

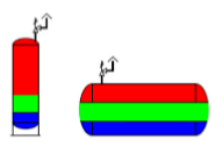
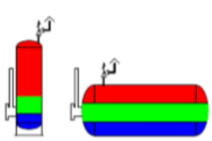
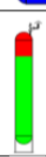
Category		Pressure	Temperature	Separation Principle(s)	Comment
Normal Pressure Vessels		15-1440 PSIG	Variable	Mechanical Flash Vaporization	Inlet separators, 2Phase, 3Phase, Sales Separators, FWKO, etc.
Heater Treaters		< First Stage	80-140 °F	Mechanical Flash Vaporization Heat Transfer	Uses fuel gas for combustion
VRT's		0-5 PSIG	Variable	Mechanical Flash Vaporization	Gravity feeds to tanks; no dump valve

Figure 2 - Pressure Vessels. Color code: Red- natural gas, Green- oil / condensate, Blue - water

It is critical to note that the purpose of the VRT is to be used in conjunction with a VRU (where the gas can be sold) to minimize flash vaporization in the tanks. While using a VRU to pull vapors directly from the tanks is theoretically feasible, the potential risk of introducing oxygen into a hydrocarbon rich vapor space adds complexity to the design. If there is inadequate gas produced by flash vaporization in the tanks, the compressor will pull the pressure of the tank below zero (vacuum). The result would be the activation of a PVRD which would allow air to be drawn into the head space of a tank and commingled with the flash gas sent to sales. Introducing oxygen into a hydrocarbon rich vapor space also creates the possibility of an explosive atmosphere. Failure of the PVRD to draw in adequate air to relieve the vacuum may result in tank collapse/failure. In addition, introduction of air/oxygen into the gas stream may result in rejection of the gas due to composition specification. The result could be flaring of additional gas at the site due to the quality issues. Blanket gas systems can be installed to mitigate the vacuum/introduction of air issue. However, there is disagreement on the use of blanket gas as a viable solution to this challenge. For sites with low production of flash gas and/or limited access to appropriate electrical power other methods may produce more emissions than the alternative. Regardless, the use of a VRT can reduce phase separation VOCs in the tanks by 90+%.

Everything highlighted in yellow is mostly true. Much of it is also out of date. Oxygen enters and is mixed with the rich hydrocarbon vapors in oil storage tanks every time a pumper opens a hatch, as well as when a tank is unloaded to a truck. Use of an oxygen removal system negates these concerns. The oxygen removal system itself is simpler in design, installation and operation than a VRT and significantly more effective. Its remarkable reliability, with uptime of over 99.8% fleet-wide, actually enhances the operation of any 3rd party VRU and the vapor recovery system overall. While there are claims that VRTs can capture as much as 90% of flash gas, the best we have witnessed in actual field operating conditions is in the low 80% range. In fact, in a tightly controlled test, run exclusively by one of the largest operators in the United States, their field operating data showed that VRTs were only recovering 62% of the flash gas, whereas their design and modeling indicated it would recover well over 90%. The same site was then equipped with an oxygen removal system, bypassing the VRT, and all flash gas was recovered and sold.

Control System Failures

The MAP SHSV Report included the following information on Control System Failures.

Tank control system failures can also lead to methane emissions. Common causes of system failure include the following:

- Design Flaws
  - VRUs undersized
  - Separators undersized / dumping very frequently
  - Separator dump valve leakage
  - Liquid pooling
- Mechanical Failures
  - Thief hatch mechanical failure (gasket failure, weak or defective sealing mechanisms, etc.)
  - Pilot flame fuel supply and igniter failures
  - Incomplete combustion
- Operational Failures / Errors
  - Thief hatches open
  - Other issues – intentional bypass, flares unlit
- Leaks in the system

The addition of a tank connected VRU along with an oxygen removal system mitigates the effects of most of the tank control system failures listed above and can alert the operator in real time if/when a failure occurs. The oxygen removal system can detect and record levels of incoming oxygen in the recovered gas stream and can be set up to alert the operator's staff in real time when it detects unusually high oxygen levels and/or low tank pressures that are indicative of open or leaking thief hatches and other leaks in the system or if the equipment is undersized relative to current production (extended high tank pressures).

Truck Loading

Controlling emissions during truck loading is another benefit of using an enhanced vapor recovery system. Tank truck vapors contain high levels of oxygen as well as hydrocarbons. Without oxygen removal systems, truck vapors are either simply vented to the atmosphere or are directed to back to the tanks and then to a flare or combustor, releasing VOCs and/or NOx in the process.

Alternatively, an EVR system allows this gas to be routed back to the tanks and then to where the oxygen is removed. The remaining stream is captured and sold, minimizing emissions of both VOCs and NOx (see Figure 3 below).

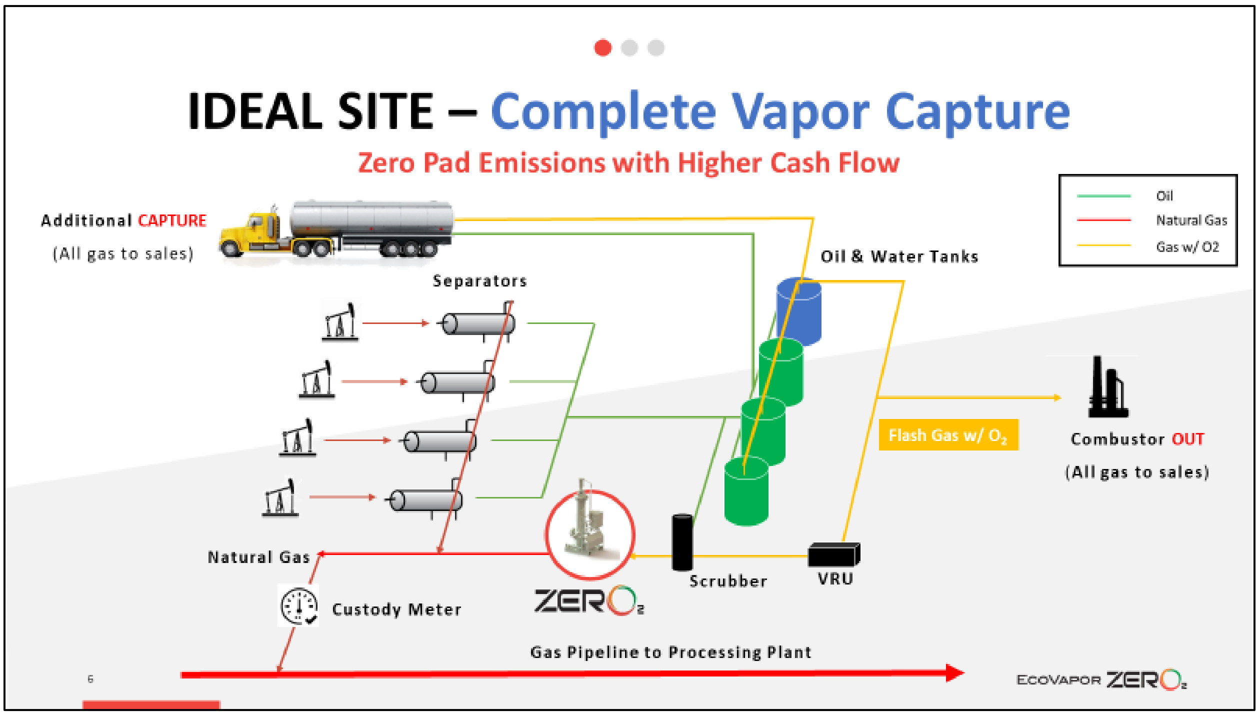


Figure 3 - Tank Truck Emissions Capture

Economic Description of the Process or Equipment

Economics differ greatly depending on each site, its production rates, decline rates, gas/oil ratios and other variables. However, rather than leave the reader without tangible data, we offer the following economic analysis of flash gas recovery during the first year of production at a site making 2,500 BOPD, initially. This analysis compares the economics of using a VRU and a VRT with the economics of using the same VRU without the VRT and, instead, using an oxygen removal system.

The VRU/VRT system is assumed to recover 62% of the entrained natural gas (based on empirical data) and the VRU equipped with an oxygen removal system is assumed to recover 95% of the total flash gas at the tanks along with 1% additional oil recovery. Both the 95% and 1% values are conservative based on actual data showing 99.8% and 1% to 3%, respectively.

Gas prices are conservatively assumed to be $1.50 per MMBTU and oil prices at $48.00 per barrel.

Using the VRU/oxygen control system resulted in a net incremental value of over $500,000 per year for one site compared to the VRU/VRT system. The value drivers are the additional gas recovery and the additional 1% of oil recovered and sold (see Figure 4 below).

While repeat installations with established customer are tangible proxies for the value this system delivers, there is a lower volume limit where incremental economics turn negative. Our economic models indicate that a throughput of 30 MCFD represents breakeven at today's prices of $2.00 per MMBTU for gas and $50.00 per barrel of oil. Recently, our largest customer in the DJ Basin independently determined that their economic limit was 35 MCFD of tank flash gas, which we consider to be confirmation of our analysis.

Estimated Economics: VRT + VRU versus VRU + ZerO2					
Results for One Year Leasing E300					
API Gravity		50	degree	If API is between 40 and 49 use 40 (i.e., use 20, 30, 40, or 50)	
Pressure Drop to Tank		50	psig	Operating pressure of last separator/treater before VRT or tanks	
Volume OF Flash Gas PER Barrel of Oil		134	SCF/Bbl	Scf of flash per bbl oil PLUS 50% margin = potential total flash	
Oil Production b/d		2,500	BBL/Day	Customer input	
Flash Vapor Volume		335	mscfd	Flash per bbl times oil production	
VRT Efficiency		62%		80% is very good, can range between 50 and 80	
Flash Vapor Recoverd at VRT		208	mscfd	Flash volume times VRT efficiency	
Tank Flash Vapor Volume		127	mscfd	Remaining volume flashed in tank after VRT (i.e., 1 - VRT Efficiency)	
Tank Gas Btu/scf		2600	Btu/scf	These can be changed but often don't have real data - these	
VRT Gas Btu/scf		2400	Btu/scf	are safe assumptions	
Natural Gas Price	Check this:	$ 1.50	per MMBtu - assume 1,070 Btu/scf heat value		
Net Oil Price	Check this:	$48.00	per bbl		
Increase in Recovered Oil		1%	Conservative per Laurance Reid Gas Conf paper and independent study; range 3-9% increase)		
Recovery system uptime (VRU limited)		95%	VRU Uptime		
Lease Term (months)		22	Assumption for calculating lease rate from purchase price		
	unit price	**VRT + VRU**		**VRU + ZerO2**	
VRT Lease	$62,000	$ 2,818	*60" x 30'*		
VRT maintenance/mo	$250	$ 250			
VRT installation	$4,500	$ 4,500			
VRU Lease	$86,350	$ 3,925	*FX12*	$ 3,925	
VRU maintenance/mo	$600	$ 600		$ 600	
VRU installation	$5,000	$ 5,000		$ 5,000	
Ecovapor E300 Lease	$170,000			$ 7,850	*Two E300*
Ecovapor maint/mo	$0			$ -	
Ecovapor Delivery & Install/unit	$4,000			$ 4,000	
Recovered Gas MSCFD		197		318	
Value - Btu Adjusted		$ 3.36		$ 3.64	
Monthly Revenue		$ 19,916		$ 34,799	
		12 Months		**12 Months**	
Capex		$ -		$ -	
Lease Cost		$ 80,918		$ 141,300	
Opex & Maintenance		$ 10,200		$ 7,200	
Total Install Costs		$ 9,500		$ 9,000	
Year 1 Gas Revenue		$ 238,991		$ 417,592	
Year 1 Oil Revenue				$ 432,000	
Year 1 Cost		$ 100,618		$ 157,500	
Year 1 Cash Flow		$ 138,373		$ 692,092	
CHANGE IN CASH FLOW		-		$ 553,719	
Additional Cash per day				$ 1,517	
RETURN OVER COST		$ 1.38		$ 4.39	dollars gained for dollars spent
PAYOUT ON ECOVAPOR UNIT				0.2	months to recover investment

Figure 4 - Economic Analysis

Reduced Emissions

It is obvious to the reader that if more gas is captured and sold into the pipeline, instead of being flared at the production site, site emissions will be reduced.

Figure 5 below shows the emissions and emission reductions in Tons Per Year (TPY) of VOC+NOx, GHGs, and CO2e for 300 MCFD of tank flash gas whether it is all recovered (assuming 95% system uptime) or partially recovered using a VRU/VRT system, or simply flared on site.

For example, while a site equipped with a VRU and oxygen removal system would emit 14.6 TPY of VOC+NOx, the same site would emit 96.5 TPY more using a VRU/VRT or 277.9 TPY more if simply flared. The impacts of not recovering this gas is more impactful when measured using GHG and CO2e criteria.

CAPTURE ALL GAS USING ECOVAPOR			
		EcoVapor vs VRT	EcoVapor vs Flaring
If **ALL** Gas is Recovered**			
lb/day	ton/yr	ton/yr	ton/yr
VOC + NOx	**14.6**	**(96.5)**	**(277.9)**
GHGs	943	**(6,223)**	**(17,916)**
CO2e	1,132	**(7,471)**	**(21,509)**

*Figure 5 - Emission Reductions. **Note: Values reflect 95% VRU runtime and 95% effective combustors.*

Technology Alternatives:

List of technology alternatives with link to information or contact information for the company/developers.

Name/Description of Technology	Link (and contact info for company if available)	Availability	Feasibility	Cost Range (choose one)
Secondary Vapor Capture				

Unfortunately, enhanced vapor recovery was not included in the Technology Alternatives section of the MAP report. For completeness, we offer the following information to fill in the above table should the MAP team decide to include it.

Enhanced Vapor Recovery	www.ecovaporrs.com 1-844-NoFlare	In use	Primarily on oil production sites	Low Medium High

Cost of Methane Reductions

Tank flash gas contains high proportions of ethane, propane and other long-chain hydrocarbons or VOCs, making it uniquely energy rich and valuable. At the same time, its proportion of methane is lower than conventional natural gas.

Regardless, using the economics in Figure 4, the cost to recover the methane in our tank flash gas example is -$24,158 per ton. Said another way, **recovery generates a net profit of $24,158 per ton of methane recovered**. This compares favorably to other technologies such as flares that generate no revenue and instead cost between $1500 and $2700 per ton of methane.

3. Implementation

Implementation Feasibility:

What is the feasibility of implementation (availability of required technology or contractors, potential permitting requirements, potential for innovation)?

EcoVapor's ZerO2 oxygen control system is readily available with procurement times of less than one month for most sizes. Installation usually occurs in less than one day and requires a standard roustabout crew (no crane or guy wires required) and an oilfield electrician as the current system design uses 480V 3 phase power. A gas-powered unit that requires no outside electrical power will be available in 2020. Because there are no emissions from the unit, there are no additional permitting considerations. While these systems are easiest to install on new sites, retrofitting existing sites is very common and may require one additional roustabout day.

As previously mentioned, these systems have an average uptime of 99.8% across the fleet. This is continuously monitored using built in systems that can be integrated with the operator's automation system. Maintenance includes monthly calibration of oxygen sensors and periodic changeout of catalyst that occurs between 12 and 24 months of operation.

4. Challenges and Opportunities To Achieve Methane Reduction in New Mexico

While the focus in New Mexico is to reduce methane emissions, tank flash gas contains mostly VOCs that contribute to ozone. By capturing this gas stream, conditioning it for sale, and putting into a gas sales line, enhanced vapor recovery helps limit and reduce ozone as well as methane emissions. The biggest challenge to doing so is not having a gas pipeline connected to the site at startup.

5. SEPARATORS – PATH FORWARD

8.2 Controls – VCUs and VRUs – Comment: Enhanced Vapor Recovery (EVR) via oxygen removal should be included in this section as it is a key part of making VRUs and vapor recovery systems more effective. The cost effectiveness of doing so is detailed above and so should be considered as "HIGH." Continuous monitoring, communication and remote data collection are already integrated in these systems. These units would primarily benefit the Permian Basin, as well as the Mancos oil play in the southern areas of the San Juan Basin.

8.3 Separators / VRTs - Comment: Enhanced Vapor Recovery (EVR) via oxygen removal should be included in this section as it is more effective in capturing entrained gas, more reliable, and simpler to install. The cost effectiveness of doing so is detailed above and so should be considered as "HIGH." Continuous monitoring, communication and remote data collection are already integrated in these systems. These units would primarily benefit the Permian Basin as well as the Mancos oil play in the southern areas of the San Juan Basin.

8.5 Control storage tanks with emissions above specified threshold by 98% - Comment: EVR is allowing Colorado operators to meet the stringent emission reduction targets just specified by the EPA. A site with 1500 TPY PTE was permitted at 29 net TPY (98.1% capture) by use of EVR and making a profit in the process. The cost effectiveness of doing so is detailed above and, therefore, should be considered as "HIGH." Continuous monitoring, communication and remote data collection are already integrated in these systems. These units would primarily benefit the Permian Basin as well as the Mancos oil play in the southern areas of the San Juan Basin.

8.6 Require operators to route tank emissions to VRU unless technically infeasible – Comment: Prior to oxygen removal technology, pipeline oxygen limits made direct recovery of tank emissions difficult, if not impossible. Now that oxygen removal technology is common in most major oil producing areas, direct recovery from tanks is no longer impracticable. Lack of electrical power is a concern that is regularly overcome with the use of gensets until line power can be established. Most sites that use this equipment start off on generator power. Furthermore, in 2020, a non-electric version will be available allowing recovery at all sites. The cost effectiveness of doing so is detailed above and, therefore, should be considered as "HIGH." Continuous monitoring, communication and remote data collection are already integrated in these systems. These units would primarily benefit the Permian Basin, as well as the Mancos oil play in the southern areas of the San Juan Basin.

8.7 Require Operators to Use Automated Tank Gauges to Reduce Emissions from Thief Hatches – Comment: There is an existing Comment that reads in part, "Require operators to install vapor balance return lines." These two concepts, reducing emissions from thief hatches and installing vapor balance return lines (from tank trucks), are enabled by EVR, and, more specifically, by oxygen removal from gas streams. While automated tank gauges reduce the need to gauge the tank manually via the thief hatch, using a VRU to pull gas from the tank lowers tank pressures, reducing the probability of leaking and venting, and reducing the volumes emitted from the tank if, and when, the thief hatches are opened. Furthermore, installing vapor balance lines results in sending oxygen-rich gas from tank trucks back to the oil storage tanks where, absent EVR, the gas can only be flared, resulting in more VOC and NOx emissions. The alternative is to use a VRU and oxygen removal system to condition the gas for sale. The cost effectiveness of doing so is detailed above and, therefore, should be considered as "HIGH." Continuous monitoring, communication and remote data collection are already integrated in these systems. These units would primarily benefit the Permian Basin, as well as the Mancos oil play in the southern areas of the San Juan Basin.

8.8 Require operators control emissions during unloading of tanks into trucks – Comment: See above comments for 8.7.

8.9 Convert Water Tank Blanket from Natural Gas to Produced CO2 Gas – Comment: Why? Unless there is a CO2 separation system on site, where would that gas come from? As an alternative, route water tank vent line to the oil tank vent line and capture both streams using EVR.

8.10 Recover Gas During Condensate Loading – Comment: See above comments for 8.7.

8.11 Install Pressurized Storage of Condensate – Comment: Oil produced from shale tends to have higher gravities, and, therefore, often can be in the condensate range. To install pressurized tanks is both expensive and unnecessary. Instead of working to contain the gas pressure, use a VRU to remove the gas and keep tank pressures low. Combine that with an oxygen removal system.

8.13 Consider installation of remote monitoring… - Comment: Most VRUs and EcoVapor's ZerO2 system are already equipped with sensors, data collection, and telemetry that instantly alerts the vendors and operator's staff of problems if / when they happen.

8.15 Install Enhanced Vapor Recovery in Addition to a VRU System – Comment: This technology was originally explained in the presentation to the MAP team and later supplemented. In addition to being profitable, these systems include Remote Monitoring, Onboard Data Collection, Remote Data Collection and Storage, and real-time alert systems. There systems are most effective in oil producing areas including the Permian Basin and the southern part of the San Juan Basin.

Summary

The use of Enhanced Vapor Recovery allows operators to recover and sell essentially 100% of oil and water tank flash gas with a corresponding reduction in emissions of methane, CO_2, VOCs, and NOx at production sites. This resource is conserved and sold instead of being burned without beneficial use, defined as waste by New Mexico’s Oil Conservation Division. It also allows truck tank loading vapors to be captured, conditioned, and sold instead of being vented or flared.

The technology that makes this possible is oxygen removal. Oxygen entrained in natural gas can be removed in an effective, safe, and economical process acceptable to both producers and pipeline operators. Oxygen removal technology is being used in virtually all the major producing areas of the United States. Super majors including Shell as well as large public domestic independents and private-equity backed companies are now using this technology.

It is readily available and can be installed on both new and existing sites, often in less than one day.

February 11, 2020

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Re: Comments Regarding MAP Draft Report on Separators / Heaters / Storage Vessels and Permitting

Dear Directors Ely and Sandoval,

Attached please find EcoVapor's comments regarding furthering flash gas capture and emission reductions. We are also submitting separate comments regarding permitting as was discussed in Path Forward Option 8.14. Please confirm receipt of this email.

Regards,

Peter M. Mueller

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