

Fully Understand VRU And VRT Operability From An Engineering And Emissions Control Perspective

HY-BON/EDI

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What does a Vapor Recovery Units do?



Takes waste gas emissions and convert them into revenue, while keeping you safe and in compliance.

Wasting resources and, most importantly, revenue!



Actual Measurement

➔ 530 tons per year of VOC Emissions

➔ $55 \text{ MSCFD} \times \frac{\$4}{\text{MSCF}} \times 2000 \text{ BTU} = \frac{\$132,000 \text{ Revenue}}{\text{Year}}$

➔ Project Cost: \$100,000 (VRU, VRT, VCU and Install Estimate)

➔ Payout: 9 Months!

Why the current focus on tank battery emissions?

- ➔ Technology advancements to see and analyze these gas streams
- ➔ Realization that industry and nationwide inventories are understated
- ➔ Dramatically higher volumes of VOC's & other contaminants
- ➔ Focus on reduction of greenhouse gases (CO₂ & CH₄)
- ➔ All resulting in heightened regulations & enforcement

EPA Amends Definition of Storage Vessel Affected Facility

A single storage vessel located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment and has the potential for VOC emissions equal to or greater than 6 tpy MUST reduce the emissions by 95% taking into account requirements under a legally and practically enforceable limit in an operating permit or by other mechanism.

6 tons per year sounds like a lot, but...

- ➔ Threshold based on potential to emit VOC's – 6 tons per year or more

- ➔ Daily equivalents could be as low as:
 - 33 pounds emission
 - About 1 MCF Emission
 - 1 Barrel of Condensate Produced
 - 20 Barrels of Oil Produced
 - 2000 Barrels of Water with 1% Oil Carryover Processed

“Best In Class” Solutions for Effective Capture & Control, VRU And VRT Operability



Requires a Total Solutions Approach

Emission Surveys to Accurately Determine:

- Flow Rate
- Gas Composition
- Pressures

Emission Control Devices Such As:

- Vapor Recovery Towers
- “Real” Vapor Recovery Units
- Enclosed Combustors
- Maintenance & Tracking program

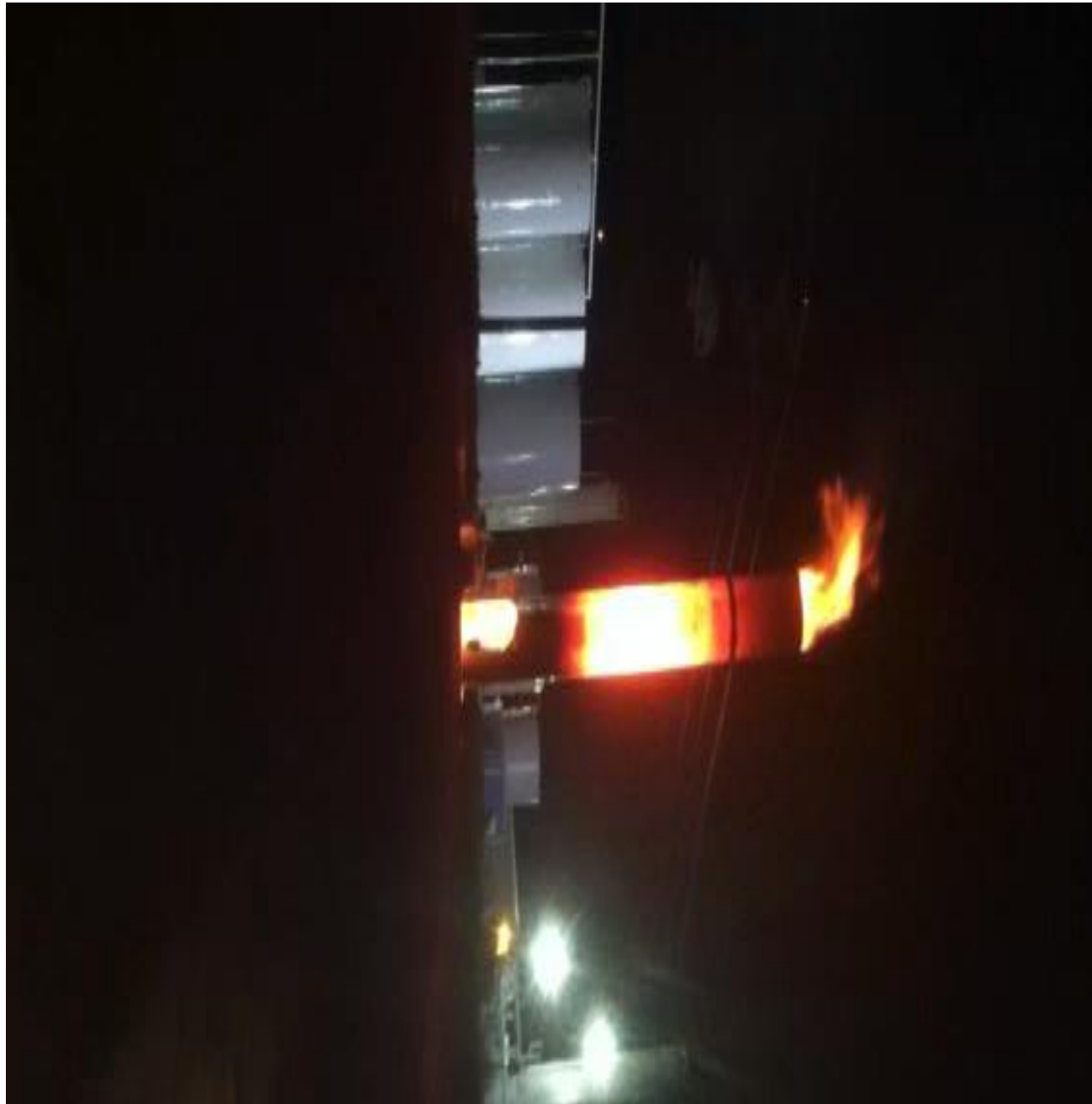
YOU DON'T KNOW WHAT YOU
DON'T KNOW

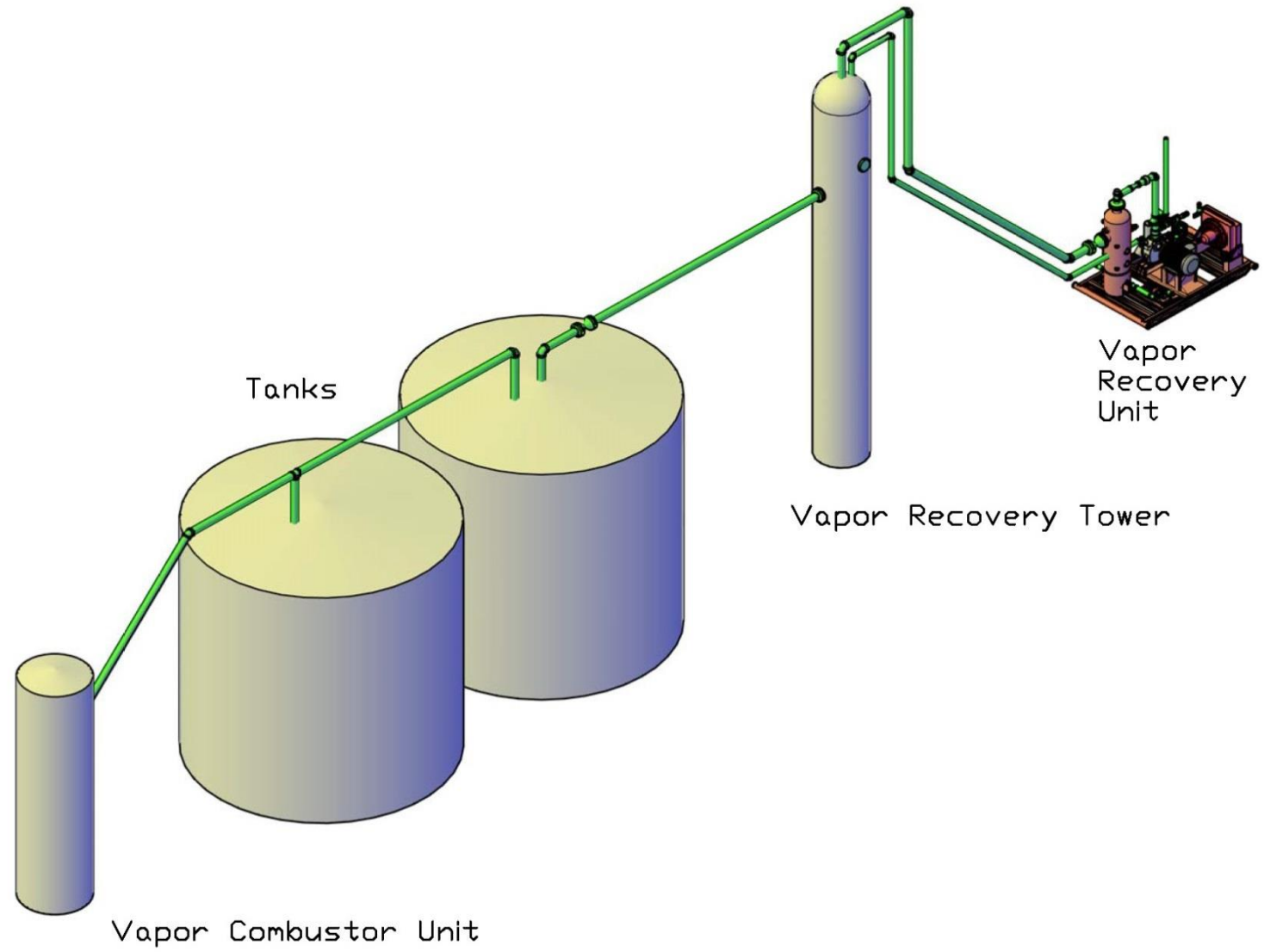


WHAT GETS SEEN, GETS
MEASURED

WHAT GETS MEASURED, GETS
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WHAT GETS CONTROLLED, CAN
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Vapor Recovery Tower (VRT)

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What is a VRT?

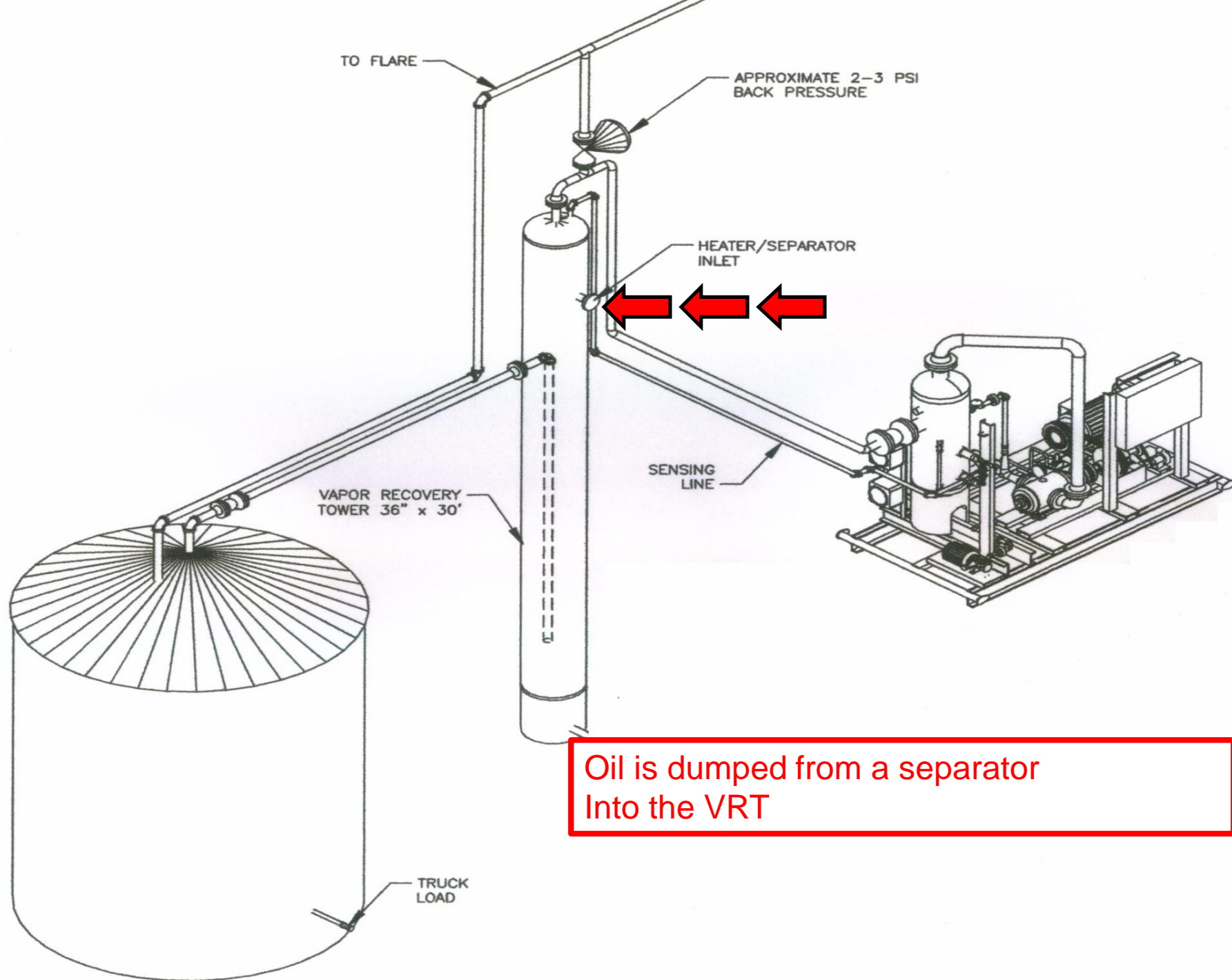
- A vapor recovery tower is a tall pressure vessel which is installed between the production separator(s) and the liquid storage tanks
- “Best in Class” VRT’s are engineered for proper retention time (20 minutes) to allow gas to separate from the liquid, and have no potential for liquid traps in gas vapor piping to VRU.
 - Although VRT’s are normally rated for pressures between 50 and 175 psig, they typically gravity feed to the liquid storage tanks at very low pressure (~1 psig)
 - In most installations, the flash gas from the liquids in the VRT flow to a vapor recovery unit for compression

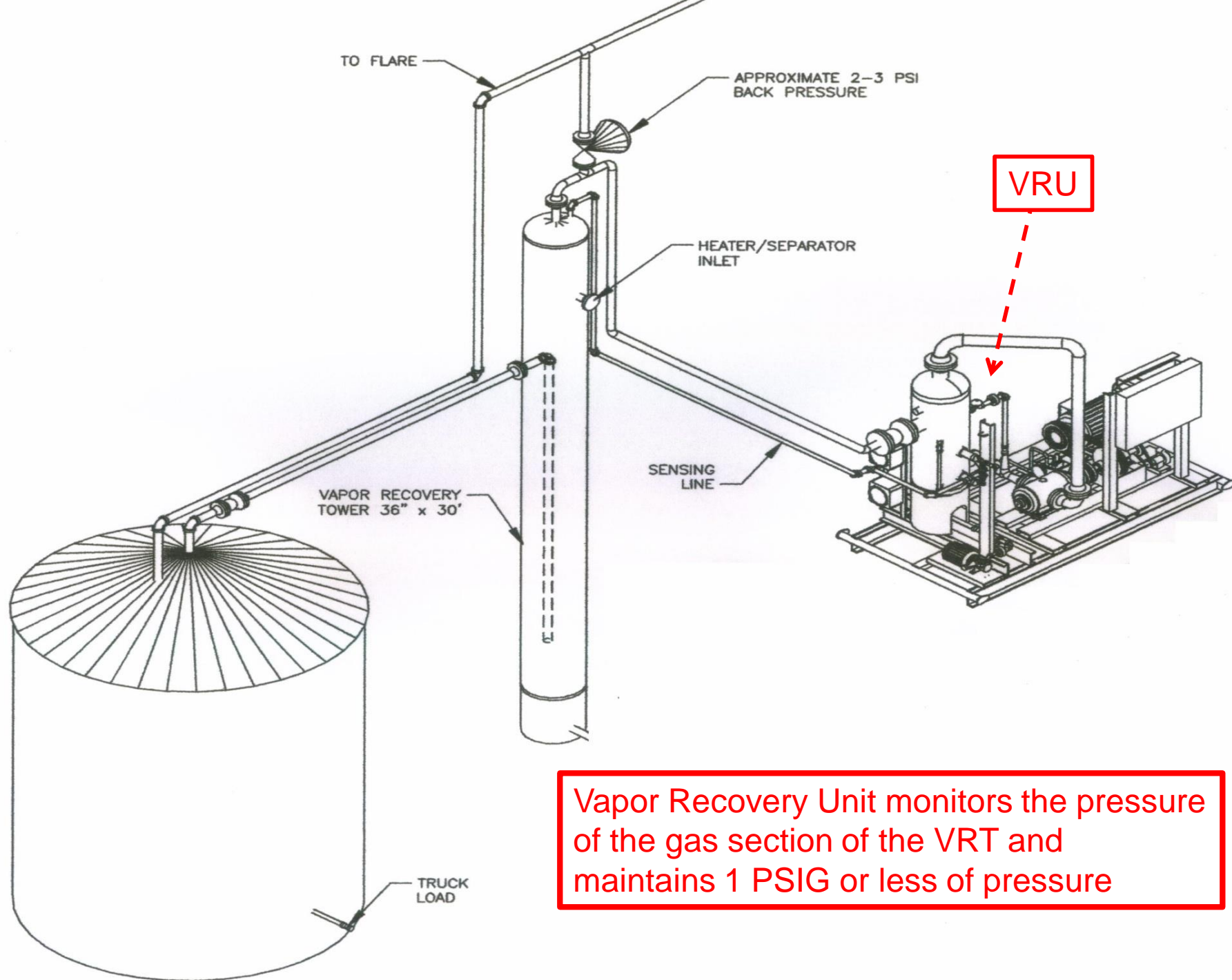


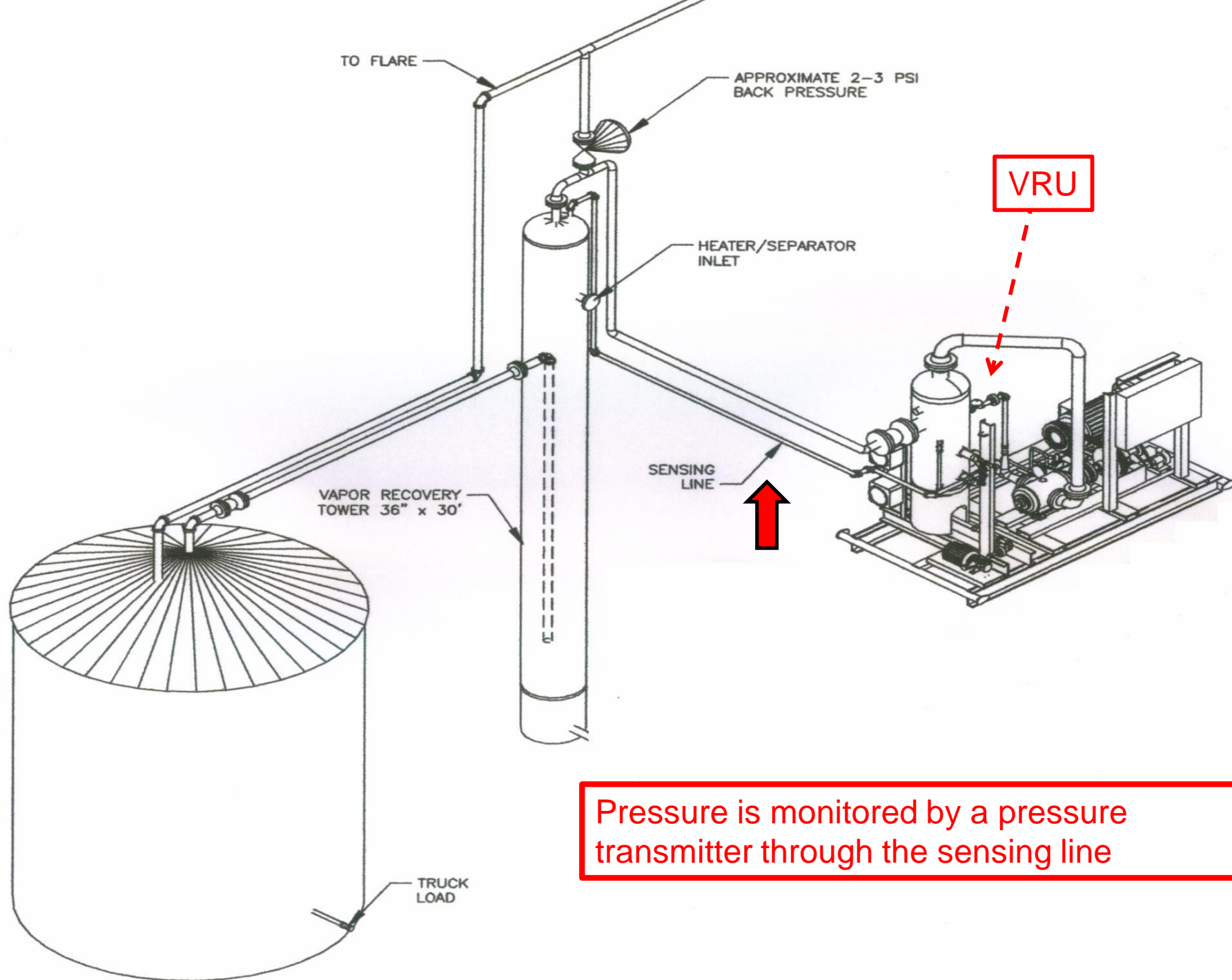
Vapor Recovery Tower (VRT)

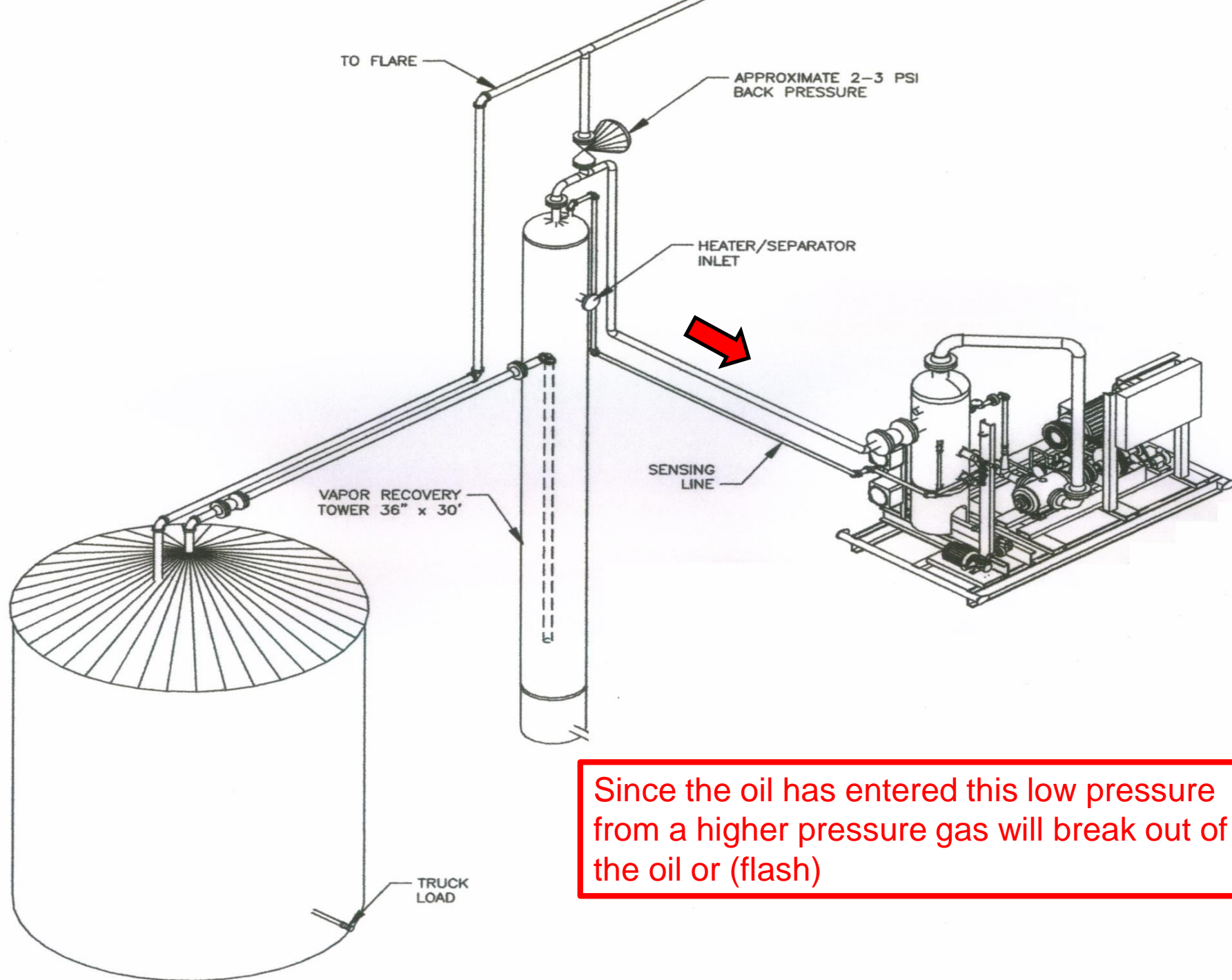
Benefits

- Captures flash vapors without contaminating the captured gas with Oxygen.
- Opportunity to maximize Safe vapor capture, while reducing flash in storage tanks. 90/10
- Vapor Recovery Tower could potentially remove storage tanks from Quad O regulatory reporting /Permits.

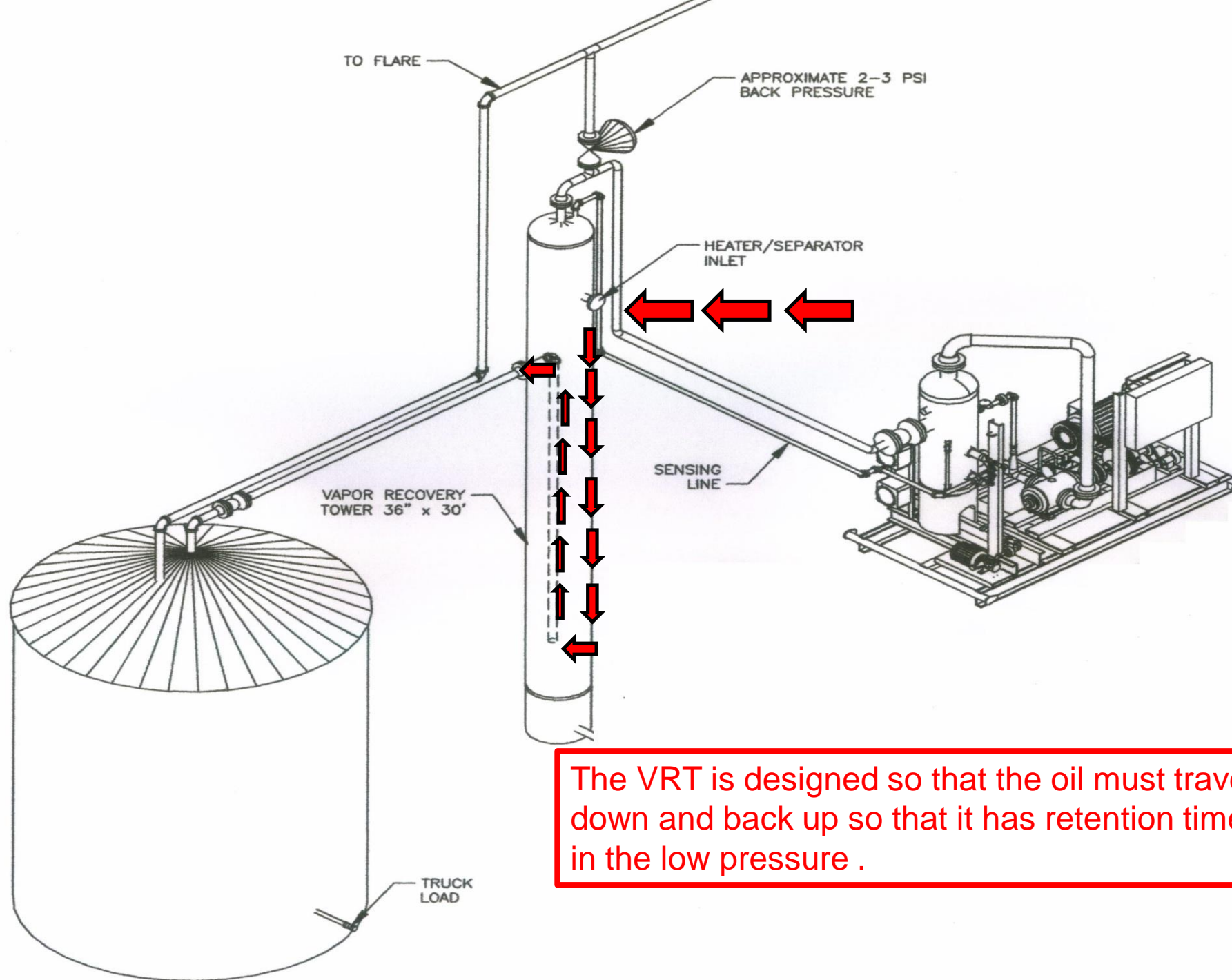




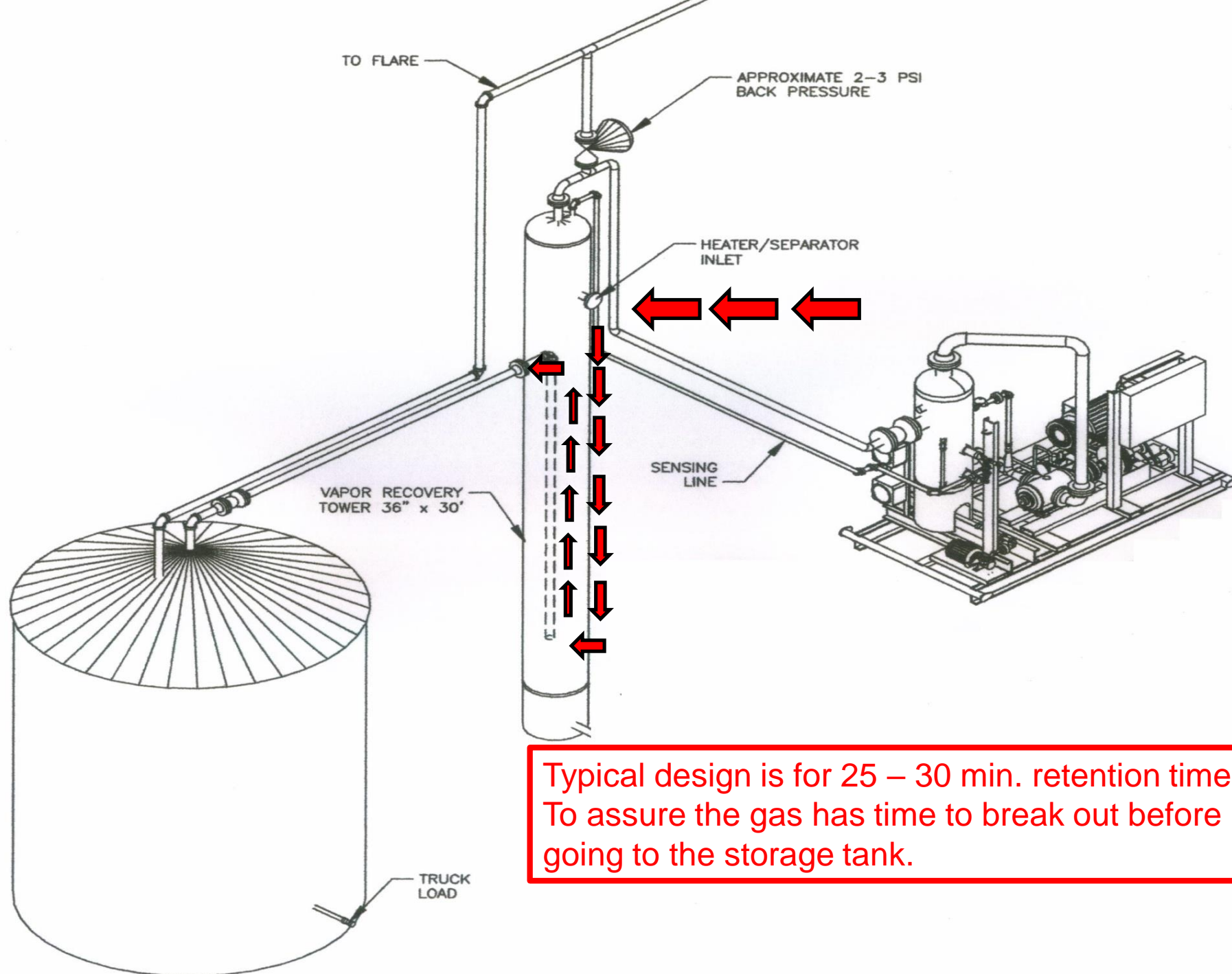




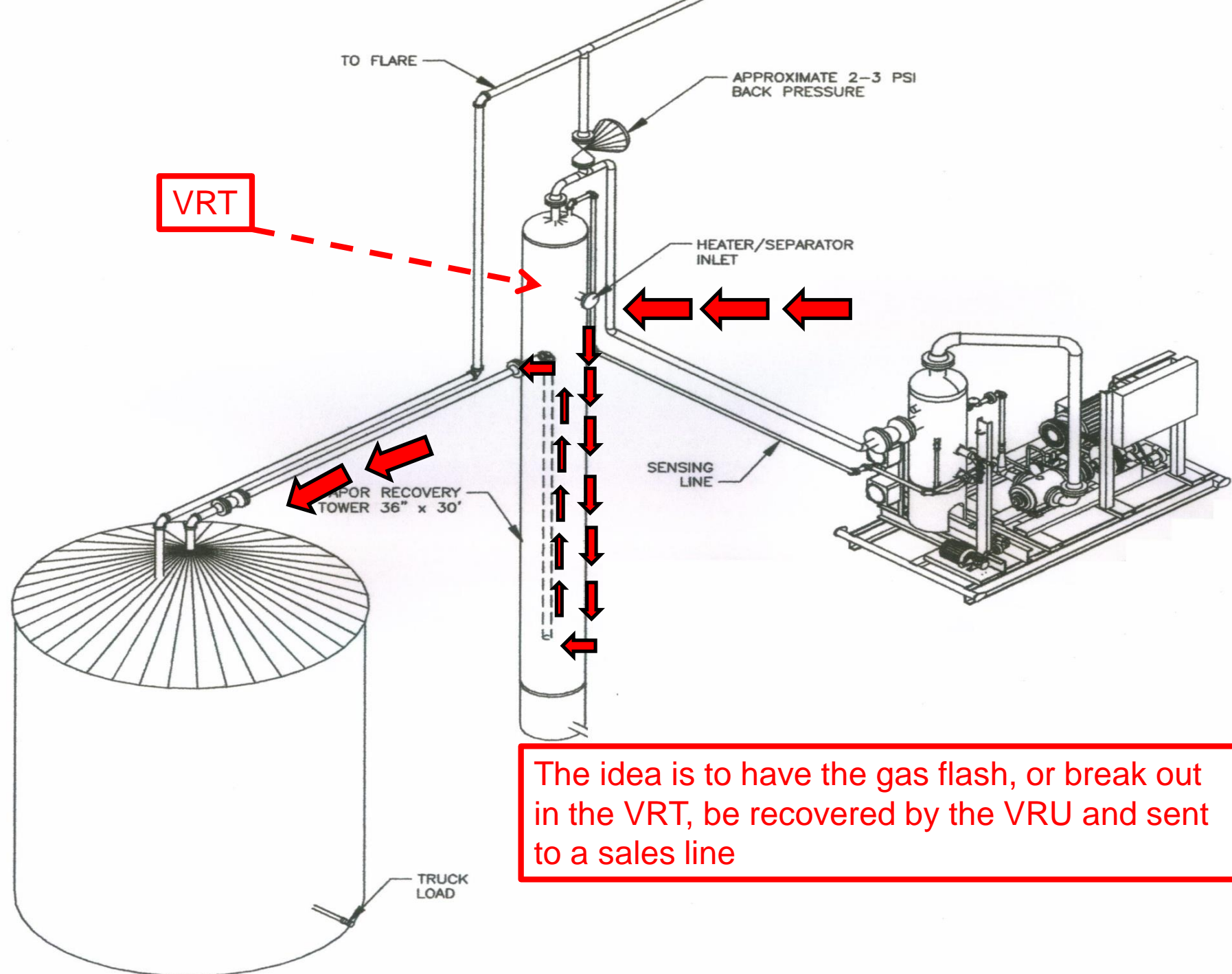
Since the oil has entered this low pressure from a higher pressure gas will break out of the oil or (flash)



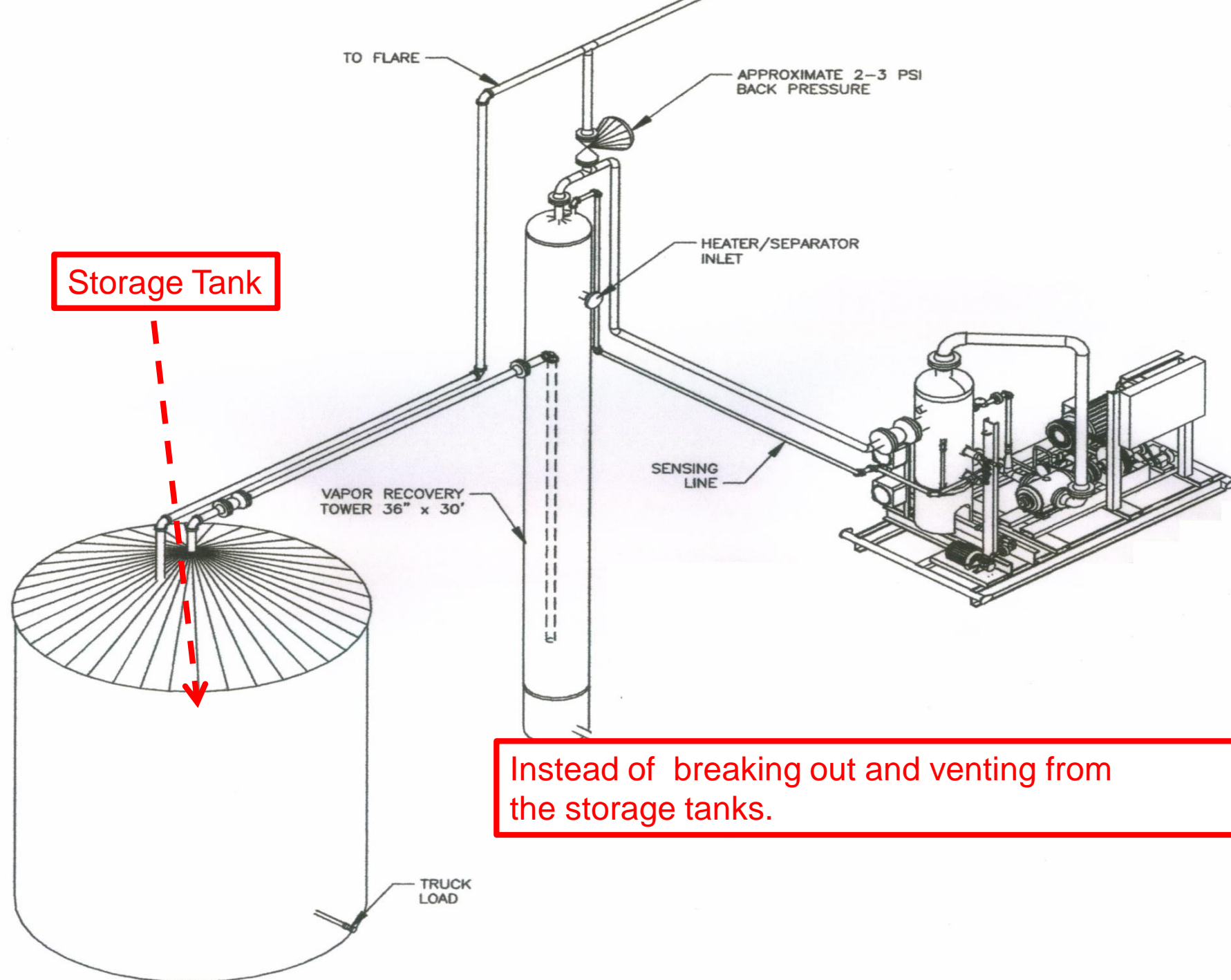
The VRT is designed so that the oil must travel down and back up so that it has retention time in the low pressure .



Typical design is for 25 – 30 min. retention time. To assure the gas has time to break out before going to the storage tank.



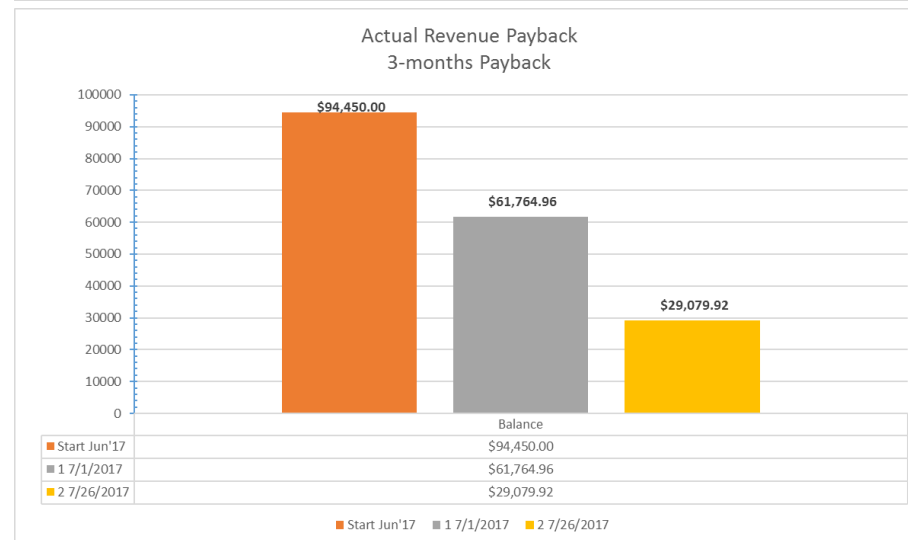
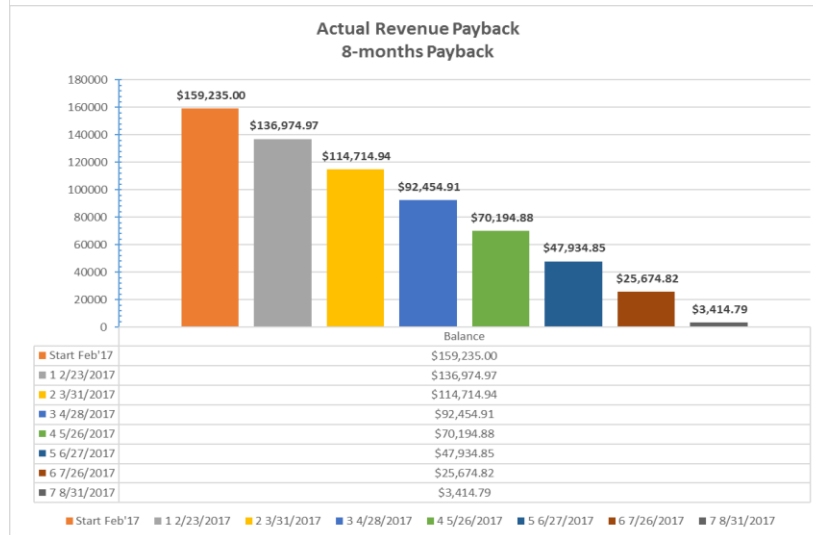
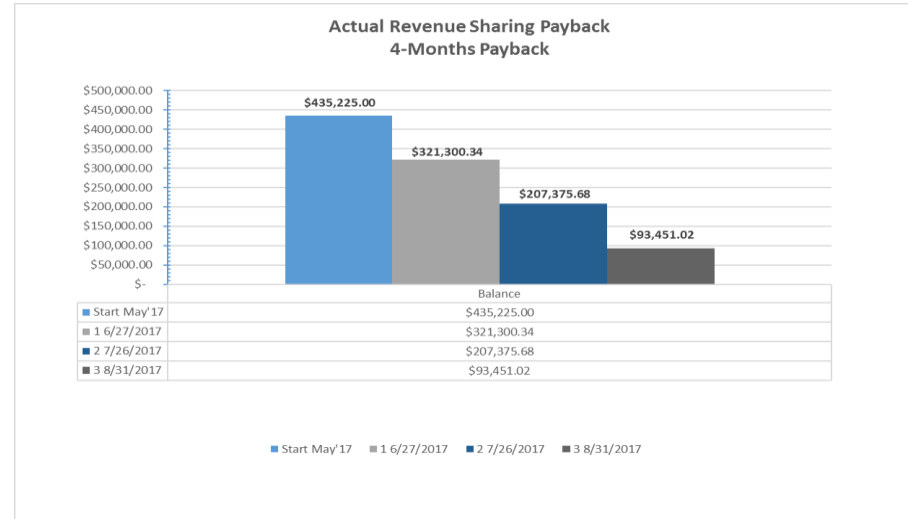
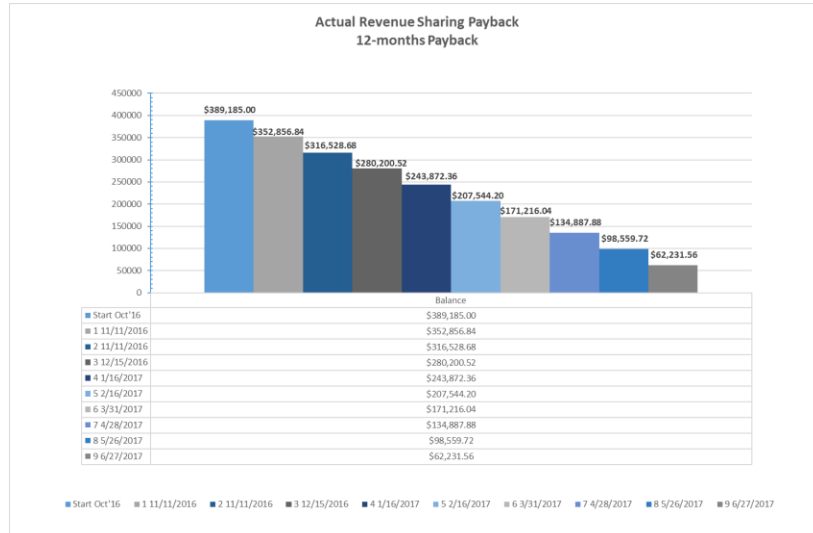
The idea is to have the gas flash, or break out in the VRT, be recovered by the VRU and sent to a sales line



Vent Gas Revenue Share – A Permian Basin Success Story

A TOTAL SOLUTIONS APPROACH

Actual Revenue Sharing Payback



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Not Always the answer!



KEYS TO SUCCESS

“TOTAL SOLUTIONS APPROACH”

**Using Standardized VRU/VRT Designs
Engineered to cost effectively capture the
gas analysis from your field or basin with
maximum run times**

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