

Roska DBO Inc. Pressurized Storage Tanks

In order to help people understand, I'm documenting what lead us to Pressurized Storage Tanks rather than 400 BBL tanks or Vapour-Tights for sour sites and light oils:

From the AER Directive 60 we have the following:

8.2 Limitations of Venting Gas Containing H₂S or Other Odorous Compounds

1) Gas containing more than 10 mol/kmol H₂S must not be vented to the atmosphere (excluding crude bitumen batteries). This includes gas off stock tanks, PSVs, and equipment blowdown systems.

a) Sour pressure-relief valves must be tied into flare systems if the gas contains more than 10 mol/kmol H₂S or result in off-lease H₂S odours.

I will highlight the different scenarios and how each one can be dealt with by the different units.

Gas Blow-by:

Gas blow-by is where the dump valve fails and gas is sent to the tanks. This can also be accomplished by leaving the drain valve on the separator open for too long. The end result, this gas must be adequately vented at the tank to ensure that the tank pressure is not exceeded.

For 400 BBL tanks, we cannot exceed 16 ounces (6.9 kPa). This is either handled by the gooseneck or by a combination of the gooseneck and the thief hatch(es) or PVRV('s)?. To meet the AER directive, the gooseneck would need to be tied into flare. With 400 BBL tanks, we change the dump valve trim size to 1/2" to minimize the blow-by gas case and we require an 8" goose neck and a 16" flare system to handle this flow without over pressuring the tank. With a 3/4" dump valve size, the gooseneck would need to be upsized to 16" and the flare system would need to be 20" to avoid overpressuring the tanks.

For a Vapour-Tight we cannot exceed 14.7 psig. This is typically handled by a vent line plus a PVPA. For the gas blow-by case from a 1/2" trim dump valve, a 6" tank nozzle with an 8" flare system would be required. Similarly, for the gas blow-by case from a 3/4" trim dump valve, an 8" tank nozzle with a 10" flare system would be required to ensure we don't overpressure the Vapor-Tight. The issue with Vapour-Tights currently on the market, is they only come with a 3" nozzle and a 3" PVPA . Therefore, a Vapour-Tight cannot handle a gas blow-by case.

In the case of our Pressurized Storage Tank design (100 psig), we use 3/4" trim on the dump valves allowing us to move higher liquid volumes especially at lower pressures. The PSV on the Pressurized Storage can handle the gas blow-by case with the 3/4" trim and safely move all the gas to the flare with no release using a 6" flare system. The Pressurized Storage comes with the proper nozzle and PSV to handle the gas blow-by case.

Fire Case:

400 BBL tanks are not designed to handle a fire case. Typically it is expected the thief hatches will open and release gas directly to atmosphere until the pressure becomes too great and the tanks split open at the lid in a semi-controlled failure. At this point, the liquid may spill into the secondary containment fueling the fire.

Vapour-tights are also not designed for a fire case. Again, the 3" nozzle and 3" PVPA is too small to successfully release the gas from a fire case. Although vapour-tights are not rated as pressure vessels, they are designed to hold 50 psig. This means in a fire case, the pressure inside will reach 50 psig or higher (reasonable to expect ultimate failure in neighbourhood of 4x design pressure) before rupture. Again, on rupture, the liquid is spilt into secondary containment which fuels the fire. Also, because the rupture will happen above 50 psig, there is a chance for shrapnel from the vessel and explosion or BLEVE (in a catastrophic failure).

Our Pressurized Storage design takes into account the fire case, as is required for a registered pressure vessel. The PSV on the vessel is designed for fire case. It is the fire case that drives the flare system up to 8" for the Pressurize Storage.

Secondary Containment and Spacing:

AER Directive 55 deals with the storage of well fluids.

Aboveground and underground pressurized vessels that are part of an active production process (e.g., flare knockouts and amine surge/drain tanks) and pipeline drip vessels are not within the scope of these requirements provided that they have been designed for a working pressure of 103.4 kilopascals (kPa) (15 pounds per square inch [psi]) and are registered with the Alberta Boilers Safety Association (ABSA). All aboveground and underground nonpressurized storage vessels not registered ABSA are subject to these requirements.

400 BBL tanks require secondary containment. Also, Vapour-Tights since they are not registered with ABSA should also have secondary containment. That said, the Tornado positive pressure systems do not need to meet the secondary containment requirements outlined in Directive 55. Our Pressurized Storage tanks are registered with ABSA so Directive 55 does not apply to them.

Directive 55 also deals with spacing of equipment on site. With the 400 BBL tanks, they must be placed 50 meters away from the wellhead as well as 25 meters from a treater or heater. Tornado positive pressure systems are not explicitly exempt from the spacing rules as they were from secondary containment.

Our Pressurized Storage tanks are exempt from Directive 55. Therefore, it is possible to have them beside the separator and within 25 meters from the wellhead. This helps minimize pipe

runs and heat tracing requirements and minimize plot plan footprint/maximize available space on lease.

Comparison:

It should be noted that one of our Pressurized Storage tanks has the equivalent volume of 2 – 400 BBL tanks.

Since the vapour-tights are not designed for fire case, they are not included in this comparison. Also, typically clients have asked for the comparison with 400 BBL tanks.

See below the sizing comparison for flare systems between using the pressurized storage versus the 400 BBL Tanks. Note, with pressurized storage the flare system is sized such that even under fire the gas is routed to the flare and there is no release of sour gas to the atmosphere. As you can see, the only way to keep the flare system for 400 BBL tanks reasonable (16”) is to account only for the gas blow-by case and in the case of fire, the sour gas would be vented. If the intent is to not vent sour gas then the flare system gets quite large depending on layout. Remember all 400 BBL tanks need to be in secondary containment meaning a fire case for one means a fire case for all. I did look at the option where we separate the tanks into 2 secondary containment areas.

	Pressurized Storage	Pressurized Storage	400 BBL Tanks	400 BBL Tanks	400 BBL Tanks	400 BBL Tanks
Well Count	1	2	1	1	2	2
Condi Tanks	1	2	2	2	4	4
Water Tanks	1	1	1	1	2	2
SC / Berms	None	None	1	1	2	1
Flare Line Size	8"	8"	16"	24"	24"	36"
FKOD Size	5'x10'	5'x10'	5'x10'	9'x18'	9'x18'	13'x18'
Flare Stack Diameter	8"	8"	16"	24"	24"	36"
Gas Blow-by (1 tank)	Flare	Flare	Flare	Flare	Flare	Flare
Fire - Gas Release	Flare	Flare	ATM	Flare	Flare	Flare