

Triton® White Paper

Using Triton Vacuums for Pipeline Pigging and Flushing

Triton Vacuum Systems are used in pipeline work such as Decommissioning and Abandonment of Offshore Oil & Gas Platforms. Triton equipment is ideally suited for pulling a pig and flushing the line. This whitepaper briefly describes this application, and outlines the safety, environmental, and cost benefits of using Triton vacuums.



There are a lot of benefits to using vacuum (versus pressure) to empty and flush a pipeline. If there is a leak and the pipeline is under pressure, the contents of the pipe are pushed out. Under vacuum, the outside environment (air or water) is pulled into the pipeline instead. Additionally, vacuum is inherently safer than pressure. And in the case of subsea piping, where the line has to be flushed before plugging and abandonment, any pinhole leak simply helps flush the line with seawater.

(Incidentally, if a previously legally abandoned pipeline begins leaking, the line can be hot-tapped and suction pulled by a Triton vacuum on a support barge. Triton equipment is ideally suited for barge work due to its small size and footprint....1/10th the weight of a vacuum truck.)

The process basically is this: we'll use a Triton vacuum to pull a pig and evacuate the line of its contents, pulling the line contents into one of a series of vacuum boxes. We'll switch between boxes via a manifold system as necessary to avoid a batch-wise operation and lost time. We'll then flush the line with seawater using the same vacuum and same vacuum boxes as before. We'll then use a centrifugal pump integrated with the Triton unit to pump off the contents of the vacuum boxes to larger frac tanks nearby. Once a clean Static Sheen Test is obtained to confirm no free oil remains, the pipeline can remain flooded with seawater, isolated, and abandoned.

In this whitepaper, we'll use as our example our mid-sized Triton 1500 vacuum system, equipped with a 4" centrifugal pump that will be used to pump off the vacuum boxes to the frac tanks. This unit is called our "Pipeline Pigging Package" and is approximately 7.5' x 19'...just small enough to fit into a 20' Seatainer. We'll assume we're evacuating a fairly large line – 24" diameter and 1500 feet long.

So a typical first step might be to use the Triton 1500 vacuum system to empty the contents of the pipeline into suitable vacuum-tight containers such as vacuum boxes. A typical vacuum box contains 25 cubic yards, or about 5,000 gallons (119 bbls), and has a footprint of 25' x 8'. You

may not be able to transport it over the road if it is filled that heavy, but if you're just using it as an interim storage container, you can fill it more – let's assume to 80% of the available volume, or 4,000 gallons (95 bbls).

Emptying the contents of the pipeline may involve using appropriate pigs that are pulled by the vacuum, and perhaps assisted by water pressure on the back side of the pig. You may want to have a mechanism to catch the pig before it goes into the vacuum box.

Once the pipeline contents are evacuated, the line itself is flushed. For subsea work, a vacuum hose can be dropped from one end of the line into the sea, and the water pulled through and collected into the vacuum boxes. After an appropriate amount of flushing, a Static Sheen Test can be conducted. If a clean test, seawater can be left in the line and the line plugged off. (A solid column of water can be lifted ~24 feet with the Triton system. Higher lifts can be achieved by introducing air into the product stream. Flow rates will be slower.)

Back to our example: the 24" diameter, 1500-foot line can hold 35,000 gallons (833 bbls), but we suggested a single vacuum box can useably contain maybe 4,000 gallons, or 95 bbls. That means you'd have to fill the box nearly 9 times to flush the line once....17 times to flush it twice. So instead of using 17 boxes, you'll want to stage a few boxes and then empty those boxes to another container, which might be frac tank. A frac tank typically holds 500 bbls, or 21,000 gallons, but it is not capable of withstanding vacuum. Frac tanks can come on skids with a footprint 41' x 11'. In our example, then, if we flushed the line twice, we'd need 4 frac tanks to contain the approximately 1,666 bbls of seawater, plus any contents that originally existed in the line. The logistics of siting this much tankage on a workboat needs to be considered. A drawing is attached that shows one conceivable layout.

As oil or water is being evacuated from the line, there will be a need to switch on the fly between vacuum boxes, using a manifold system, so that as one fills, another can be placed in service without interrupting the vacuum. As the second box is filled, the first is emptied so that it can again be placed into collection service. How long it takes to fill a box depends on a number of factors, including vacuum level, height of any lift, friction and line length, etc.

Let's assume that we can move 350 gallons per minute through a 4" line...it will thus take about 100 minutes to empty the 35,000 gallons in the line. That means that a 4000 gallon vacuum box would be filled about every 9 minutes. Once a box is filled and the valve closed, and a second box put into service, the centrifugal pump will be used to pump the first box to the frac tank. (The pump should be sized to take roughly the same amount of time to discharge as it took to fill,

and in this example we're assuming a 4" pump). So we'd want to have an extra vac box available to have a little extra time to maneuver before the box we're emptying will need to be placed back in fill service.

In short, then, you'd need a Triton Vacuum System "Pipeline Pigging Package", equipped with a centrifugal pump; some number of vacuum boxes for temporary storage of the pipeline contents and flush water; and some number of frac tanks for larger storage. The centrifugal pump is used for discharging the contents of the vacuum boxes to the frac tanks. You'd also need suitable valving and gauging. Please contact Triton for more information.

02/14/13

Scale Drawing of Possible Equipment Layout on Clear Deck Space of Workboat – 138' x 43.5'

