

Oily Water / Produced Water Treatment

Deoiling Hydrocyclones



Product Application

Deoiler Hydrocyclones were developed for the offshore oil industry in the 1980s and rapidly became established as standard equipment used for recovery of oil from Produced Water streams in both onshore and offshore applications.

Process Description

The horizontal deoiling hydrocyclone vessel with liners is designed to reduce the oil content of the incoming produced water prior to entering an optional degasser vessel. The horizontal arrangement allows easy access to the liners for inspection, installation and replacement.

Liquid/liquid cyclones - On entering the cyclone tangentially, the fluid begins to spin. This creates a radial force that directs the heavier phase towards the edges of the cyclone and then out of the cyclone underflow owing to differential pressure. The less dense phase is concentrated in the centre of the cyclone before passing out of the cyclone overflow, again due to differential pressure.

Hydrocyclones are effectively centrifugal separators that rely on the differential density between the oil droplet and the water to allow separation. **The efficiency of the separation is governed by five main factors:**

1. Droplet/Particle Size

According to Stokes' Law this is the biggest factor that affects gravity based separation. A hydrocyclone is ultimately a proportional separator. Any single type of hydrocyclone will separate a given percentage of oil droplets of a certain size for a given set of process parameters. This is the profile of the hydrocyclone. It is thus essential at all times to minimise any possible causes for droplet shear.

2. Differential Density

Two different products will only separate due to gravity (or other forces) if there is a difference in density. The greater this difference the easier it is to separate them.

3. Viscosity of the Bulk Fluid

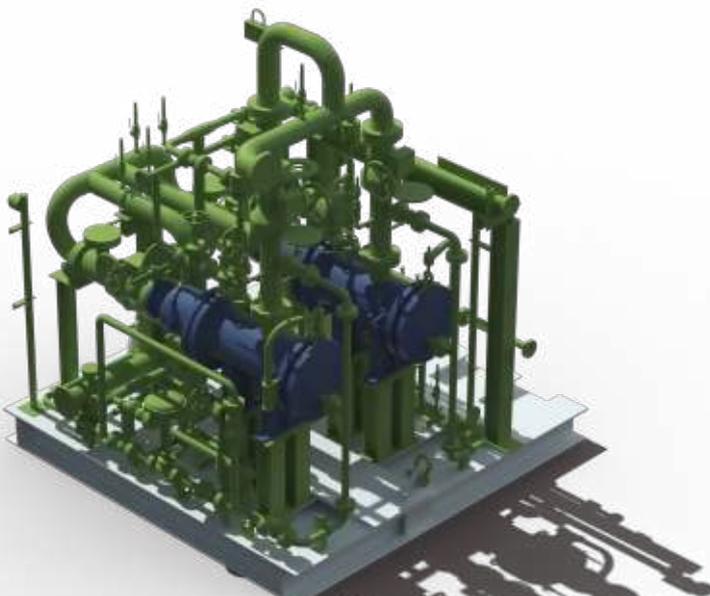
A lower viscosity will result in easier separation.

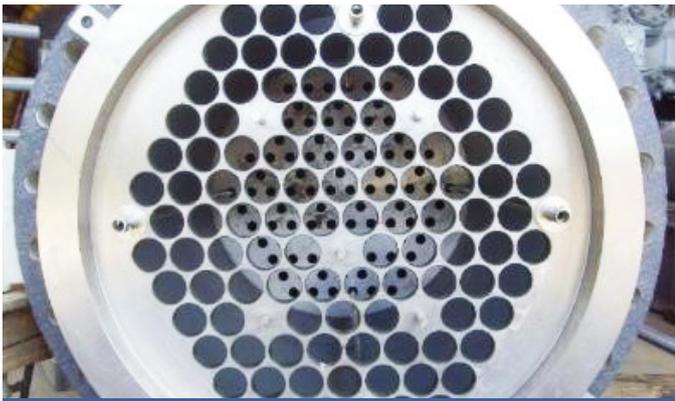
4. Gravity (or Centrifugal Force)

The hydrocyclone liner has a tangential inlet which creates a swirl within its core. This high velocity swirl action imparts massive centrifugal forces to separate the oil from the water, sending the two fluids to their respective discharge ports. By utilising centrifugal pressure as the means of separation, the hydrocyclone achieves performance with a lower residence time than traditional gravity separators.

5. Distance

The reject from the hydrocyclone comes out in a counter current flow as a reverse spinning vortex. For an oil droplet to be removed it must make its way from the bulk fluid into the central core. The less distance the droplet has to travel to get to this central core the higher the efficiency.





Deoiler Hydrocyclone Mounting Plates



Fully-skidded Hydrocyclone System

Additional Services:

- Peerless can cater for future downturn of production and include blanks inside the vessel to allow for a future change in process conditions. This allow the user to simply remove the blanking plate and replace with a hydrocyclone when new process conditions dictate.
- Peerless is able to supply complete skid mounted Hydrocyclone skid package complete with design and supply of all Instrumentation and Controls.
- Due to the corrosive nature of some of the fluids, the Hydrocyclone can be manufactured from exotic materials such as Super Duplex and Inconel.
- Peerless is able to engineer the complete skid package including providing 3D model designs, Stress/STAAD structural analysis and Heat and Mass Balance.

Product Benefits

Deoiler Hydrocyclones offer the following benefits:

- Compact design, replacing substantially larger equipment
- No moving parts and minimal maintenance
- deal for use where space is minimal
- Outlet oil content reduced to 25-40ppm in one pass
- Available in a range of alloys from Stainless steel to Super Duplex SS, Inconel or Hastelloy
- Hydrocyclone liners can be plugged or un-plugged to adjust vessel flow capacity to suit field conditions over time

Field Trials:

- Small scale trials are simple
- Can provide accurate picture of treatability of fluid
- Single liner trials fully scalable
- Suitcase size liner trials

Oil Removal Efficiency of Peerless Deoiling Hydrocyclone vs. Standard Gravitational Separators

