PRODUCED WATER TREATMENT SEPARATION SPECIALISTS

PEMTEC

PROCESS DESIGN & SPECIALIST INTERNALS
TO THE OIL AND GAS INDUSTRY

pemtec.org

SMART DESIGNS

for removing oil and suspended solids from Produced Water

PROCESS DESIGN

Our knowledge of the Produced Water Treatment sector, combined with our in-house specialised technology allow us to offer reliable robust process design. Working with your inlet parameters and your outlet requirements, we will develop working with your feed parameters and your outlet requirements, we will develop a process scheme to achieve your targets.process scheme to achieve your targets.

Our team can provide:

- P&ID
- PFD and H&MB
- Datasheets
- Hydraulic calculations

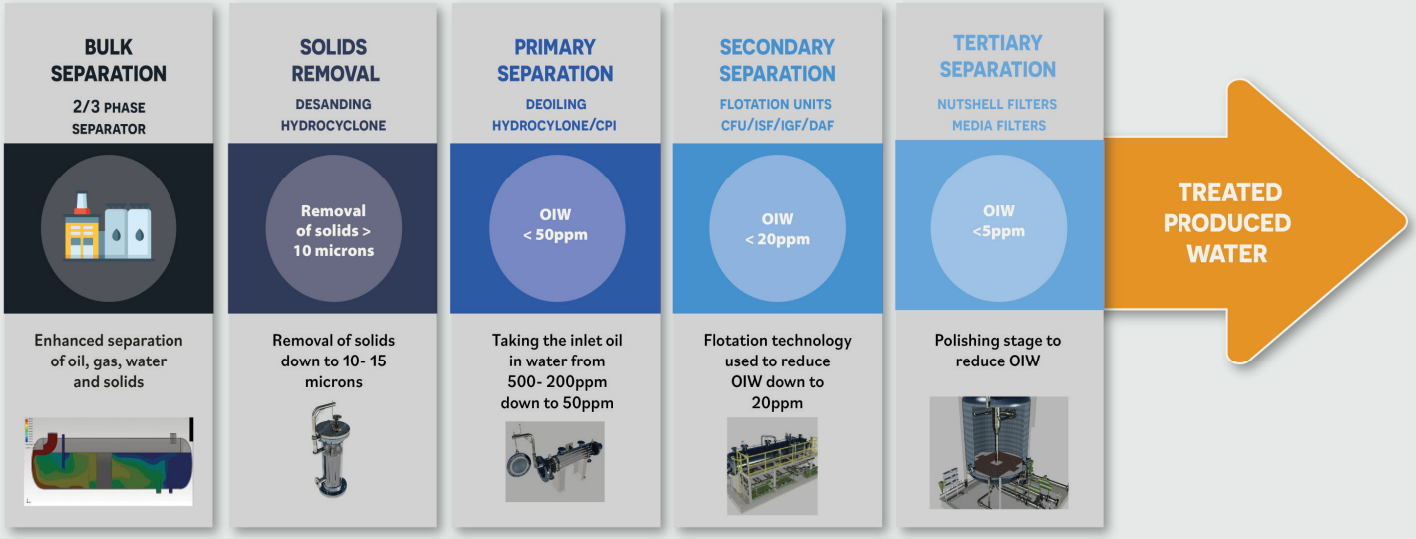
Pemtec Ltd will assist your engineering team from concept to delivery as required. Our designs can be provided with a full process guarantee.

SPECIALIST INTERNALS

Over the last 15 years, we have perfected our internals design for separation equipment and have the following array of technologies at our disposal:

- Wellhead Desanders, Desanding hydrocy clones and sand washing
- 2/3 Phase Separators with inlet devices, plate pack and sand removal
- Produced Water treatment:
  1) Primary Treatment for the removal of bulk oil and solids with deoiling hydrocyclones or CPI
  2) Secondary Treatment for mid-size oil and fine solids with various flotation units (ISF/IGF/CFU/DAF)
  3)Tertiary Treatment with Nutshell Filter
- H2S removal

PRODUCED WATER TREATMENT



SEPARATOR INTERNALS

2/3 PHASE SEPARATORS

Multi-Phase separators are used downstream of the wellhead separator for treatment of the Crude oil and separation of the gas fraction, produced water and solids prior to further processing.

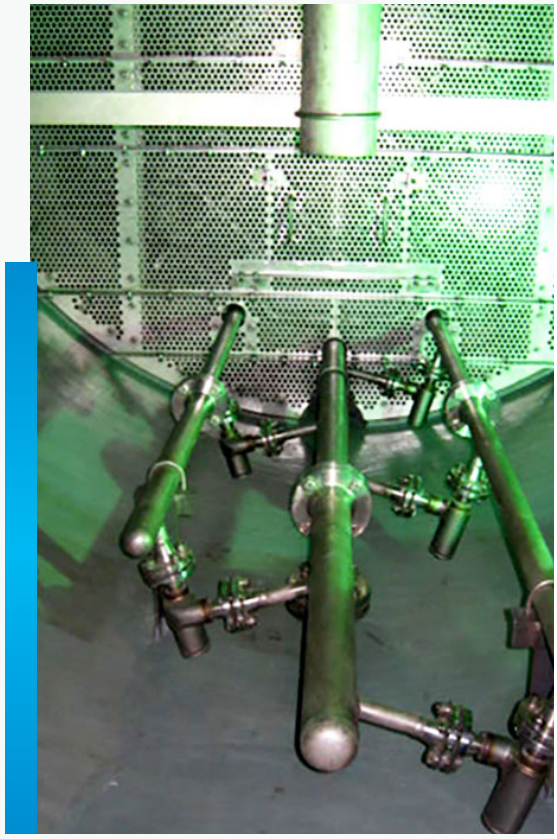
By using Pemtec internals; inlet devices, coalescing baffles, plate packs, demisters, a suitable solution can be defined to meet the various separation requirements. Detailed analysis and computational fluid dynamics (CFD) are used to ensure client requirements are met.

SAND FLUIDISATION INTERNALS

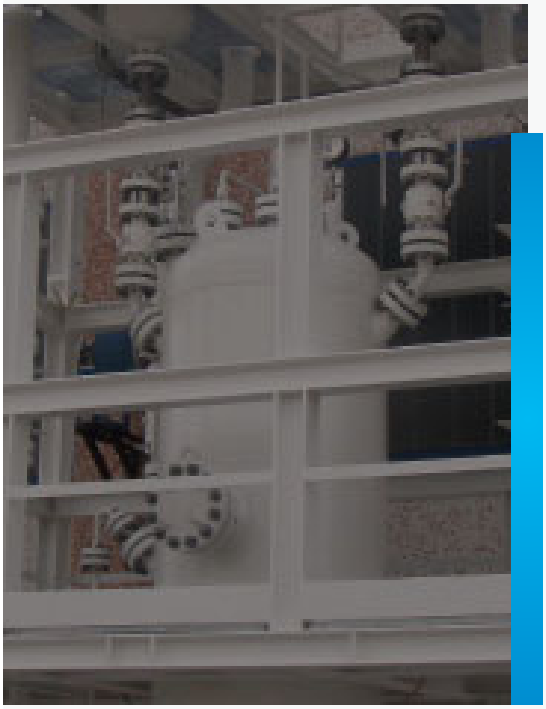
As a more efficient alternative to Sand Jetting, the Pemtec Sand Fluidisation internals allows for on-line solids fluidization and removal with very little turbulence and it does not affect the operation of the separator. This device has no moving parts; it uses a motive fluid to fluidize solids in a controlled manner within a defined region of a vessel.

Providing good floor coverage each unit generates a high solids slurry for easy sand removal with optimal water usage.

The Sand Fluidisation internals are equally effective installed in new vessels or retrofitted into existing facilities.



SAND REMOVAL



WELLHEAD DESANDING

The Wellhead Desanding Hydrocyclone was developed to provide a compact solution for the solids removal upstream of the production choke and is typically designed for ranges from 5,000 to 15,000 psi.

These wellhead desanding Hydrocyclones remove solids from gas or oil stream upstream of the main production units and allow higher sand free production rates.

DESANDING HYDROCYCLONES

Based on increased centrifugal force, the Pemtec desanding hydrocyclone removes suspended solids from Produced Water, ensuring that downstream equipment is protected from erosion and blockages.

These hydrocyclones are designed to handle harsh conditions and are constructed of wear resistant alumina ceramic and nitride bonded silicon carbide.

Due to the high specific gravity difference between water and solids, lower G-forces need to be generated to achieve high separation efficiency and typically a maximum of 2 bar is required to meet client requirements. Removal of particles greater than 10-15 microns can typically be achieved.

PRODUCED WATER TREATMENT

PRIMARY SEPARATION

DEOILING HYDROCYCLONE

The Pemtec deoiling hydrocyclone has been designed with optimum geometry to generate gravity force in excess of 1000G and will allow the separation of free oil from water without shearing of the oil droplets.

The water phase, with a higher specific gravity, will be subjected to higher centrifugal forces, moving it to the outer wall of the cyclone whilst the lighter oil phase is displaced towards the inner core of the cyclone.

By maintaining a balanced differential pressure between the overflow and underflow, the oil core is forced out.

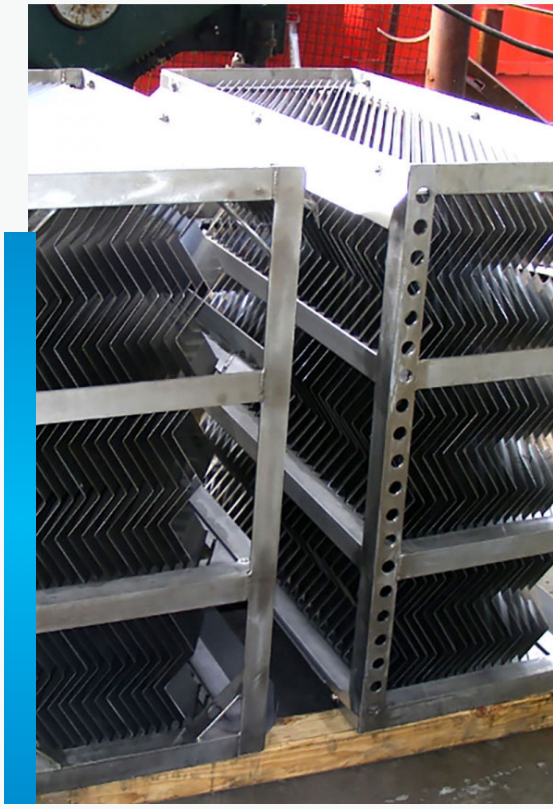
CPI SEPARATOR

The Pemtec CPI (Corrugated Plate Interceptor) is a high efficiency gravity separator used for removing free oil and suspended solids from contaminated water streams.

CPI Separators have been widely used as a primary treatment step for produced water, rain water run-off and plant washdown treatments.

Our CPI internals operates as a two-step process with a primary coalescer to increase the collision between the suspended oil droplets followed by the tilted corrugated plates which guide the oil droplets to the top of the vessel and suspended solids to the bottom.

Oil is temporarily discharged at the top of the vessel and the solids are stored at the bottom of the vessel and periodically discharged. The clean water flows over the water weir and through the outlet nozzle.



SECONDARY SEPARATION

INDUCED GAS FLOTATION IGF / ISF

The Pemtec IGF unit is extremely efficient and reliable at removing free oil droplets and fine suspended solids from produced water streams.

The IGF unit consists of a cylindrical pressure vessel partitioned into six compartments for flotation, degassing and skimming. The IGF vessel is designed to accommodate four flotation chambers, each with its own eductor which recycle the gas from the vessel head space into the flotation chamber.

In each chamber, the oil-water stream is subjected to a contact of fine bubbles of gas to which the oil droplets can attach and form a low density agglomerate that floats to the surface of the water. Oil is then skimmed from the water surface and removed.

COMPACT FLOTATION UNIT (CFU)

The need for lower oil in water concentrations and smaller footprints in the offshore environment has led to the development of the Compact Flotation Unit.

The CFU unit consists of a vertical vessel that contains an internal cylindrical section as well as other internals.

Produced water enters the vessel tangentially at the inner cylinder. Gas bubbles are introduced at the bottom of the inner cylinder by use of a single eductor. The water and gas bubbles flow up the inner cylinder and over into the annulus section. The gas and oil disengage from the water and clean water flows down the annulus and exits through the water outlet nozzle.

The oil forms a pad at the water surface and is periodically skimmed from the water by raising the water level above the oil weir.

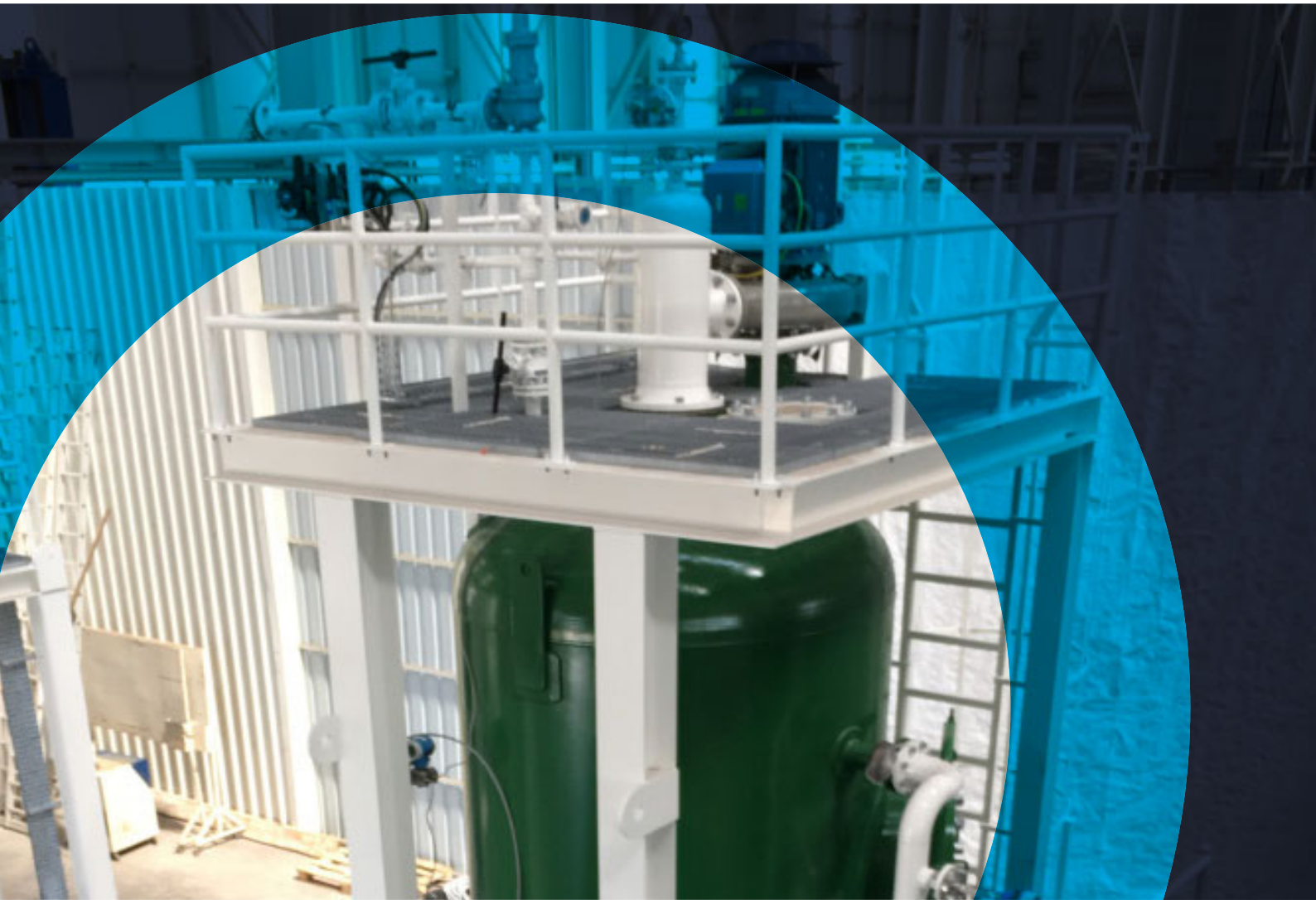
TERTIARY SEPARATION

NUTSHELL FILTERS (NSF)

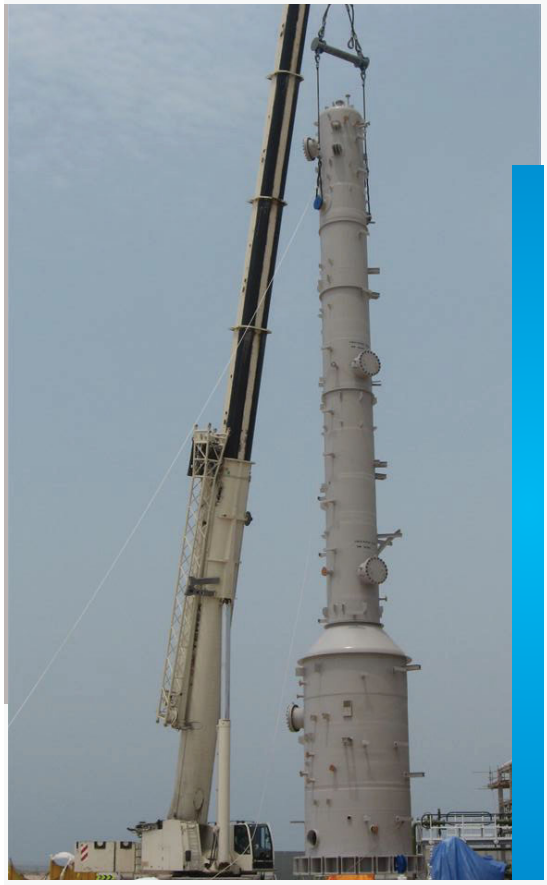
The Pemtec nutshell filter is a down-flow, deep bed medial filter. Our team will select the most appropriate media for your application by using a single source or blend of nutshell as each type possesses many unique qualities making them an optimum media for the final treatment of produced Water.

NSF will capture the free oil droplets and suspended solids, and is capable of removing 95-98% of oil droplets greater than 5 microns and offer comparable solids separation.

Other type of filters can be offered for removal of special components such as BTEX.



H2S REMOVAL



H2S REMOVAL

The stripping process follows a typical pattern where the liquid feed stream enters the top of the column via a feed distribution manifold while the stripping gas is introduced at the bottom of the tower and rises through the column.

Inside the column, a bespoke set of internals, force the liquid to flow back and forth horizontally while the vapour bubbles up through the holes in the trays.
This increases the contact area between the liquid and vapour phases and optimize the mass transfer. H2S transfers from the liquid phase into the gas phase, with an H2S “free” stream exiting at the bottom of the column.

Many parameters have to be taken in consideration when designing an H2S stripper, including pH, salt composition, stripping gas, etc leading to each solution being a custom made design.

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