

## D.06

## CPI Units

### Introduction

Water from oil & gas production facilities and process/plant water often requires a number of options and stages to effectively treat to remove free oil and solids.

The water streams typically contain low levels of oil and solids, although these flows can be intermittent and contain large variations due to slugging or blow-down operations. These events can result in large slugs of oil and solids that are difficult to capture and remove with commonly used water treatment equipment that is designed for more stable operating conditions.

In many applications, these slugging or intermittent flows favour the use of Corrugated Plate Interceptor (CPI) Units. In these applications, a CPI Unit can be very effective as the primary oil/solids removal device.

### Design Basis

CPI Units are designed for either degassed or live process fluids and this affects the mechanical design basis significantly.

Where CPI Units are designed to contain live process liquids, this requires the use of pressure vessels to avoid uncontrolled emissions of hydrocarbon gases or liquids.

CPI units utilise Plate Packs as the primary method of allowing settling of oil & solids within controlled parameters. The use of Plate Packs is integral to the separation process as they rely on the Stokes Law principle of settling oil and solids.

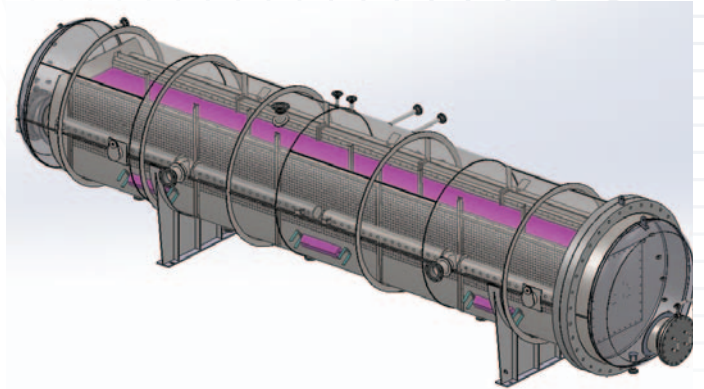
Where pressurised vessels are utilised, removable Plate Packs are installed through the vessel man-ways. The spacing, angle and design of the plates controls the settling, coalescence and separation of free oil and solids, and is an important element determining how successful CPI Units are.

The design of the CPI Unit depends on a number of factors including:

Operating conditions (pressure & temperature)

- Produced water properties
- Surge / slug capacity required
- Inlet oil & solids levels
- Outlet specifications

From this basic information SUEZ ensures that the CPI Unit is suitably designed to meet the required outlet specifications.



Pressurised CPI CAD Model (top) & CPI vessel internals (bottom)

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## CPI Units



### Process Description

SUEZ CPI Units are designed to remove free oil and solids (TSS) from water as a primary stage of water treatment.

These units typically include a number of elements:

- Inlet chamber to collect oil/solids slugs
- Inlet solids settling chamber
- Plate packs, removable through man-ways
- PSV's and gas vent lines
- Solids/sludge removal outlets
- Recovered oil collection & automated removal
- Fully automated and unmanned operation.

The Plate Packs are designed with specific spacing between the plates and with the plates set at designated angles to allow solids to settle and fall to the bottom while simultaneously allowing oil droplets to rise and coalesce on the underside of the plates as they rise to the water surface.

### Operating Principles

Water with entrained oil and solids enters the CPI Unit and flows through an inlet distributor to reduce fluid velocity, as it flows into the inlet chamber.

This allows large oil droplets to rise and be collected in the oil collection zone prior to fluid entering the Plate Packs. The coarse solids settle and are collected in the solids sump section of the inlet chamber.

The water containing the residual oil and solids passes horizontally into the Plate Packs where the flow profile forces laminar flow along a set path through the packs, which are set at an angle to allow simultaneous rise of oil and settling of solids.

This flow path provides a low velocity path for the water through the packs that allows:

- Oil droplets rise to the underside of the plates
- Oil droplets coalesce on the plate surface and travel upwards, further coalescing
- Solids settle to the top of the plates and slide to the bottom.

### Benefits & Features

Advantages offered by SUEZ's range of CPI Units include:

- Low operating & maintenance cost units
- Proven robust and reliable design
- Pressurised vessel design
- Automated controls for unmanned operation
- Suitable for hazardous area environments
- Can be supplied as stand-alone or as part of an integrated system design
- Well-designed CPI units reduce the oil & solids loading from the downstream water treatment train, and smooth out flow slugging

### Product Range & Materials

Plate Packs for CPI Units typically use either Stainless Steel materials (for high temperatures service) or polypropylene materials for lower cost and weight options.

Pressure vessel materials of construction are selected based on the process fluid and operating environment. Materials such as carbon steel (typically internally coated), stainless steel or duplex stainless steel are commonly used materials of construction. Non-metallic materials such as GRP and fibreglass are also available.

### Applications

CPI Units are suited to the following applications:

- Where water is collected from multiple, low pressure sources,
- Handles oil/solids slugs & intermittent flows,
- Common in onshore centralised Water Treatment plants,
- Retention time typically +10 minutes,
- Settles larger oil droplets and coarse solids,
- Mostly supplied with a Pressurised Vessel, to contain and control all gas and liquid emissions
- Primary treatment stage of a Water Treatment train where multiple stages of treatment are required to ensure reliable and effective water treatment.