SWEMA FACT SHEET

# Oil / Water Separators

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## Overview

Oil Water Separators (OWS) are generally used for spill control or in situations where significant quantities of oil might be encountered, for example refineries or petrochemical plants. They operate by flotation, relying on the buoyancy of oil in water to cause the oil to rise into an area where it can remain trapped. The principle is the same as in Hydrodynamic Separators (HDS) and many HDS will act to capture some oil. Of course, most OWS will also capture sediment.

The general equation that describes settling/flotation is Stokes' Law. It dictates that the rising/falling velocity of a particle increase as the particle density increases and as the particle size increases. Since the density difference between oil and water is typically less than that between oil and sediment, oil can be more difficult to capture. OWS are distinguished by the fact that they tend to be sized for longer retention than HDS.

Another key difference is the fact that oil particles do not have a fixed size and they do not maintain their size when captured so particle size is very difficult to measure. This means it is very difficult to predict oil capture behaviour so OWS sizing tends to rely on large safety factors. OWS also try to avoid turbulent flow since it has two disadvantages, it counter acts the buoyancy force and it creates smaller droplets that rise more slowly.

## Types of Oil / Water Separators

There are three general types of OWS: gravimetric, parallel plate (also called coalescing plate) and American Petroleum Institute (API).

Gravimetric devices rely solely on gravity for separation. The only way for a manufacturer to improve performance in these devices is by providing more rise time. Providing more rise time costs money, since a larger separator is needed to provide more time at a given flow rate, so gravimetric units will try to minimize turbulence and maximize the flow path length in order to maximize effectiveness. Thus gravimetric units may use orifices, baffles or other devices to control flow. The advantages of gravimetric devices are lower cost and easier maintenance.

Parallel plate OWS use plates, often inclined, that attract oil particles to their surface. As they rise up the surface the droplets will collide and coalesce. Larger droplets rise faster so coalescing improves performance. The number, spacing, angle and material of construction of the plates all impact performance to some degree, resulting in a very a large number of possible configurations. In general parallel plate OWS can be smaller than an equivalent gravimetric device. The disadvantage of parallel plates is increased maintenance. The plates will require periodic cleaning to maintain effectiveness. Also, since the gaps between plates can be blocked by litter or debris, rendering the plates ineffective, some sort of upstream screening may be required.

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An API separator is a specific type of OWS designed according to standards published by the American Petroleum Institute. They are typically gravimetric devices that are distinguished by having a mechanism for skimming oil at the top and one for moving sediment into a sump at the bottom. API separators are installed in nearly all refineries worldwide. Newer ones may contain parallel plates to enhance separation. All OWS will require periodic removal of accumulated oil and sediment. API separators move the material out of the main chamber so they can be cleaned without shutting down. The trade-off is that they have moving parts that require maintenance.

## Regulations

Use of OWS in the United States is generally governed by the Environmental Protection Agency's (EPA) Spill Prevention, Control and Countermeasures (SPCC) guidelines. OWS that are used solely for the treatment of wastewater are exempt from the SPCC rule. Use of an OWS for stormwater treatment is not addressed directly, it will depends on the specific application.

There is no widely accepted protocol for verifying the performance of OWS. A protocol does exist for testing small units, < 100 gallon volume, but these units are used in sanitary sewers, they are too small for storm sewers. The protocol does not scale up for larger units, it is not practical. Since there is no universal sizing tool, OWS sizing is generally done based on manufacturers suggestions or local guidelines.

## Oil Water Separator Maintenance

Oil Water Separators are above or below ground vaults that are constructed of either steel or concrete and use the power of gravity to separate oil and water. Often oil water separators are installed downstream of garage floor drains and are designed to treat a specific flow rate and to provide a targeted level of oil removal. Typically parallel inclined plates are present in the vaults to provide a surface for the oil droplets to adhere to and coalesce into larger droplets that then float to the liquid surface in the vault. Because oil is lighter than water any accumulated oil is ponded on the water surface and may be skimmed, drained or pumped off the surface as the first step in an oil water separator maintenance event.

## Maintenance of Above Ground Oil Water Separators

- Before beginning maintenance work place safety barriers and warning signs around work area.
- Close inlet valve piping and notify all site personnel that the drains served by the oil water separator are non-functioning and should not be used.

- Using a dipstick or attached site-glass determine level of accumulated oil to ensure adequate capacity to receive pumped or drained material.
- Place oil absorbent pads beneath and surrounding the oil decant valve of the Oil Water separator. Connect drain hose or position waste oil drum beneath oil decant valve.
- Drain accumulated oil into waste container.
- After the waste oil has been removed drain or pump the remaining liquid into a waste removal truck.
- If possible remove inclined coalescing plates and position them over a watertight bin for individual cleaning.
- Clean inclined coalescing plates using a pressure washing spray. Decant accumulated liquid to a waste removal truck as necessary.
- Note and record the level of accumulated solids in the oil water separators.
- Using high pressure spray of water liquidize and simultaneously pump out accumulated solids.
- Replace coalescing plates as per manufacturer's directions.
- Clean all maintenance equipment with rags and oil dispersing cleaners as necessary.
- Restore all covers removed for maintenance.

## Maintenance of Buried Oil Water Separators

- Before beginning maintenance work place safety barriers and warning signs around work area.
- Close inlet valve piping and notify all site personnel that the drains served by the oil water separator are non-functioning and should not be used.
- Determine if confined space entry (CSE) is required. If CSE is required position all necessary recovery equipment and air exchange equipment as per OSHA requirements. Only trained personnel with the required attendants should be allowed to enter the separator.
- Using a dipstick determine level of accumulated oil to ensure adequate capacity to receive pumped or drained material.
- Place oil absorbent pads beneath and surrounding connections of piping to be used in pumping out oil water separator and beneath and surrounding all containers that may be used to receive waste oil.
- Pump accumulated oil into waste container.
- After the waste oil has been removed pump the remaining liquid into a waste removal truck.
- If possible remove inclined coalescing plates and position them over a watertight bin for individual cleaning.
- Clean inclined coalescing plates using a pressure washing spray. Decant

or pump accumulated liquid to a waste removal truck as necessary.

- Note and record the level of accumulated solids in the oil water separators.
- Using high pressure spray of water liquidize and simultaneously pump out accumulated solids.
- Prior to replacing coalescing plates note and record the level of accumulated solids in the oil water separators.
- Replace coalescing plates as per manufacturer's directions.
- Clean all maintenance equipment with rags and oil dispersing cleaners as necessary.
- Restore all covers removed for maintenance.