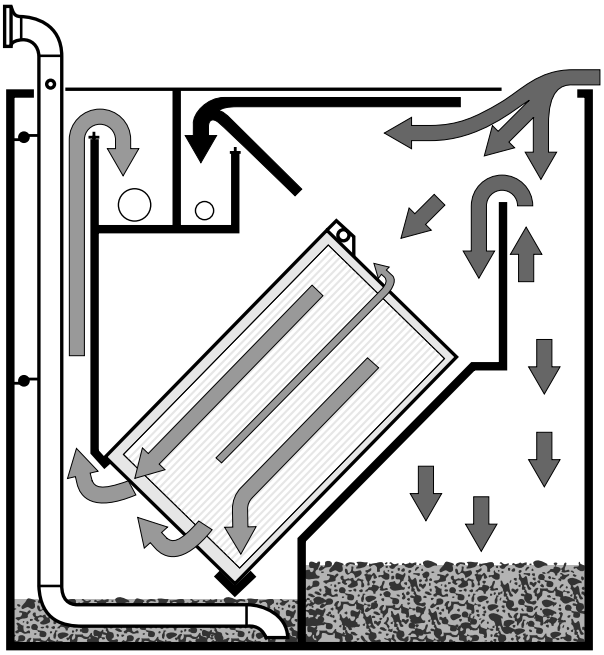
PRECISIONEERING LTD



PERFORMANCE PROVEN

OIL LIQUID SEPARATOR

Removes oil and solids from waste water, corrosive liquid waste and other effluents,... all by gravity

303 NANTUCKET BOULEVARD, SCARBOROUGH, ON, CANADA M1P 2P2

CALL TOLL FREE: 1-800-465-1800 • FAX: 416-751-9382

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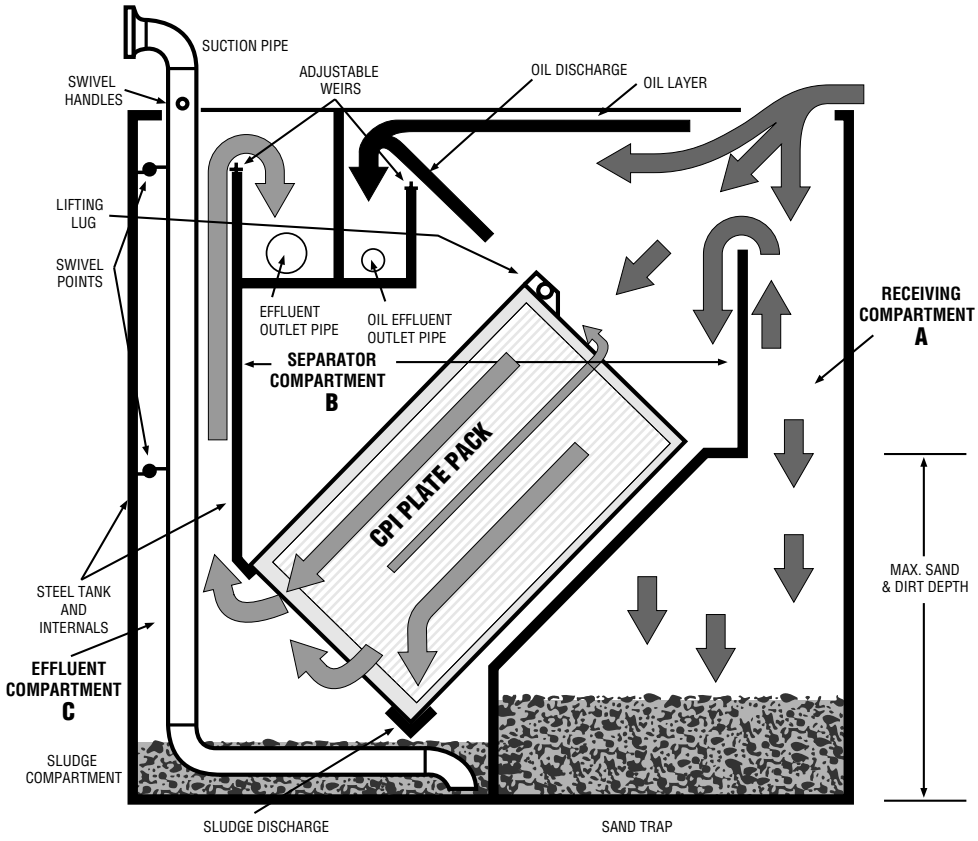
Oil Liquid Separator (OLS)

The general design of the OLS is shown at the right. When the waste water enters the Oil Liquid Separator – the OLS – via the receiving compartment "A", its velocity is slowed down to less than one foot per second. This permits the gross solids to settle out in the sand storage area as well as permitting large oil globules to spring to the surface. The influent then enters the separator compartment "B".

The waste water flows through the Corrugated Plate Interceptor – the CPI – plate pack in which the finer oil globules and sludge are separated from the waste water. The de-oiled waste water flows into the effluent compartment "C" and over the outlet weir.

The separator compartment is provided with an oil skim pipe or weir. Height is adjusted to balance the hydraulic loads so that only oil can be skimmed off the surface and not water. An oil layer is maintained in the interceptor, and the oil is automatically discharged into the skimmer by means of the difference in the specific gravity of oil and water.



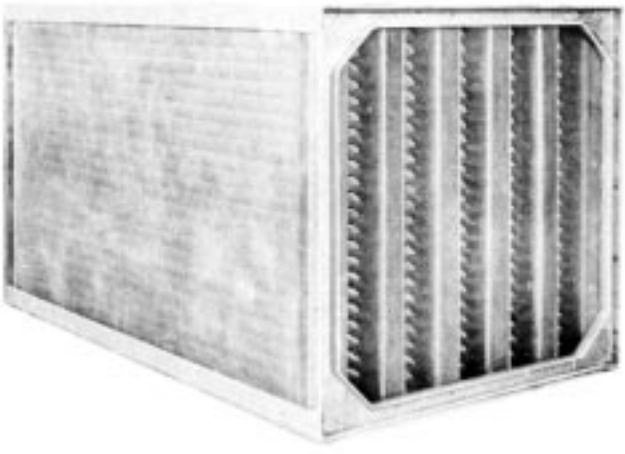
Corrugated Plate Interceptor (CPI)

The heart of the Oil Liquid Separator is the Corrugated Plate Interceptor – the CPI – plate pack. The standard plate pack consists of 47 corrugated plates stacked in parallel at 3/4" intervals. The overall dimensions of this plate pack is 38" high and 42" wide and 69" long. This pack has a horizontally projected area of approximately 550 square feet.

These corrugated plates are enclosed in a molded fiberglass housing. Both the housing and the corrugated plates are made from glass fiber reinforced polyester resin to prevent corrosion. The pack is installed in the tank so that the plates are at an angle of 45° to the horizontal, in the flow direction of the waste water.

Before water containing oil globules enters the pack, its velocity has previously been slowed in the inlet channel where the gross solids and oil were removed. The flow across the face of the CPI plate pack is further slowed and evenly distributed.

As the waste stream passes through the pack, its flow rate is maintained so that laminar flow conditions are assured. Thus, under ideal conditions, the oil rises by gravity to the underside of the next plate above. Then by gravity it migrates to the peak of the corrugation and then travels toward the inlet of the plate pack counter current to the water flow. Sludge settles to the top of the next lower plate and collects in the valley of the corrugations, sliding down by gravity toward the outlet at the bottom of the unit in the direction of the waste water flow.



The peaks of the corrugations at the inlet are connected by vertical gutters or risers which guide the collected oil out of the flow area of the waste water. The same vertical gutter system is provided on the valleys of the plate pack outlet for the disposal of the sludge. Use of these gutters prevents the reentrainment of oil or sludge into the other plates where it would have to be separated again.

It is inaccurate to talk about the capacity of a CPI plate pack in terms of a fixed value. The CPI plate pack is a gravity-type separator, its efficiency is determined by the rising or settling velocity of the smallest particles that will be intercepted.

Capacity

The rising or settling of particles is affected by the rising height, the flow velocity of the liquid and the flow conditions. The corrugated plates in the plate pack reduce the rising height and establish laminar flow conditions.

The flow velocity depends on the through-put. The standard plate distance is 3/4". Thus at the frequently quoted capacity of 130 gpm, this establishes a flow velocity of 1.8 ft./min. which insures intercepting all particles with a rising velocity of 0.42 in./min. (2.1 ft./hour). The size of these particles depends on the difference in specific gravity between the water and the oil and the temperature. Thus when the temperature of the water is 68° F. and the difference in specific gravity between the oil and the water is 0.1, then all oil particles 55 microns and larger will be fully recovered.

It follows that the ppm content of the effluent depends upon the number of particles in the feed having a rising velocity less than 0.42 in./min. entering with the influent.

Thus to increase the separating efficiency of the CPI plate pack, to intercept particles with a rising velocity of less than 0.42 in./min. can only be achieved by reducing the flow velocity - that is, reducing the through-put per pack.

The size droplets that must be removed from the oily water depends on the origin of the waste water and the final concentration desired. Normally tank farm run-off will be less than 20 ppm if all oil globules larger than 90 microns are removed. On the other hand, refinery waste streams will generally be less than 20 ppm when all oil droplets larger than 60 microns are intercepted.

The chart below will give the relationship between capacity, particle size, temperature and differential specific gravity for our standard CPI plate pack.

The CPI plate pack is also being used for the separation of substances heavier than water such as filter earth and precipitates. In this case, the water flow is in an upward direction through the plate pack. Consequently the flow through the separator basin must be reversed.

Example:

How many CPI packs will be required to reduce a refinery stream of 1700 gpm containing 0.4% oil to less than 30 ppm at a temperature of 68° F.

Specific gravity H20 = .995
Specific gravity Oil = .895

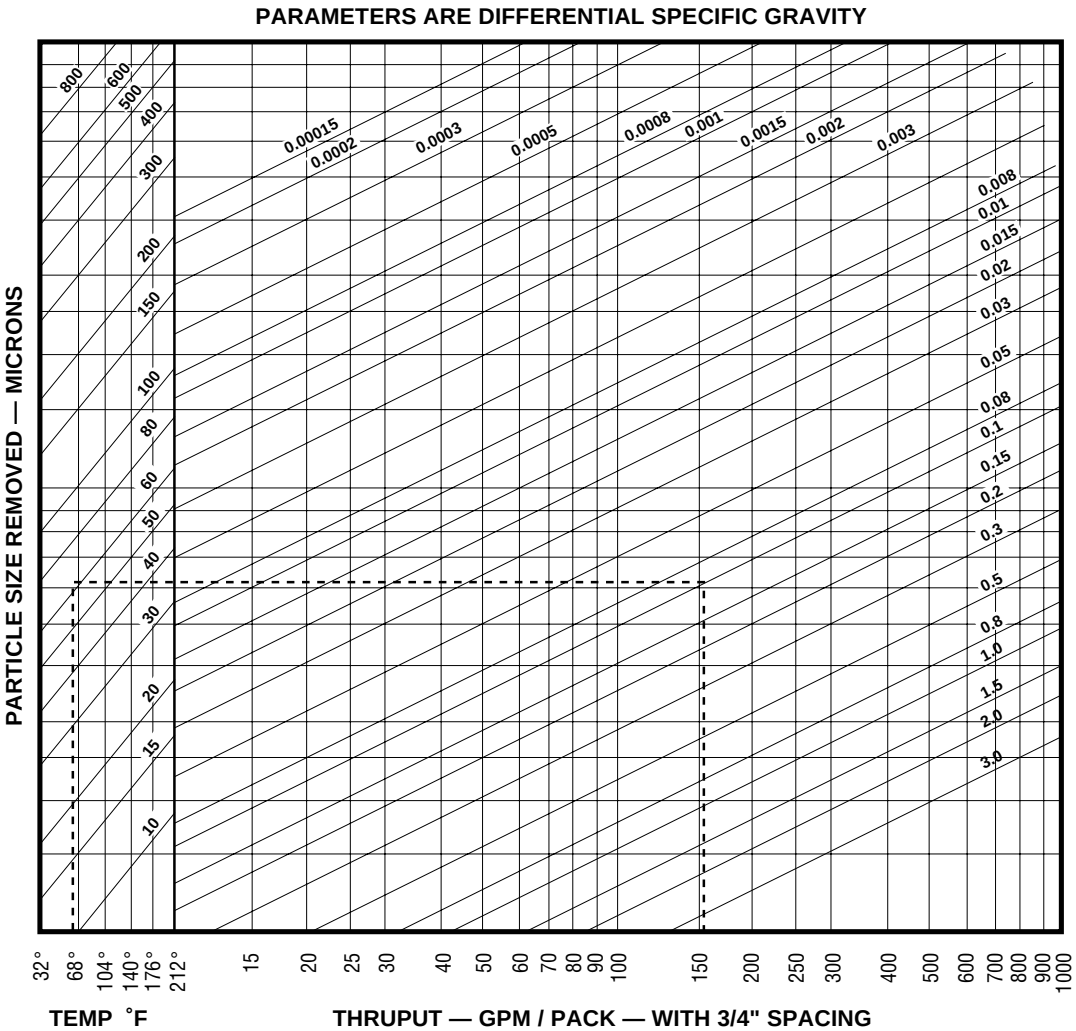
To determine the number of packs under these conditions, locate 68° F. on the horizontal temperature scale. Project vertically to intercept 60 microns on the particle size scale. Next project horizontally until one crosses the differential specific gravity of 0.1 (.995 - .895). Then project vertically down to the through-put scale and read 150 gpm. Divide 1700 by 150 = 11.35 packs. Therefore use 12 packs.

CPI Packs versus Surface Area Drained

The relationship between the surface area to be drained and the number of CPI packs required under various rainfall intensities is as follows: A nominal starting point for design is to use between 1/2" and 3/4" per hour of rainfall to determine the number of packs. The basis for this is that the oil concentration and oil droplet size will vary under storm conditions. In the early moments of the storm, much of the oil that has been spilled on the platforms and pads is washed into the sewer with relatively low volume of water. Thus while the oil concentration is high, the oil droplets are also large in size. Typical oil concentrations will be 2000 - 3000 ppm with oil droplets 60 microns and larger.

As the storm continues, the run-off rate increases while the oil concentration drops sharply because essentially all of the spilled oil has been previously rinsed away. Because of the agitation, the oil droplet size becomes much smaller, frequently with 2 – 3% less than 60 microns. However the concentration during the period is normally around 50 ppm.

It should be noted that the theoretical load for a standard pack is 700 gpm and still be laminar. However, at this load, oil sludge particles tend to be washed from the plates, which would impair the quality of the effluent. Thus storm water design is normally limited to 300 gpm. This is not for hydraulic considerations, so much as that once the separator, downstream of the plate pack, becomes coated with oil, it downgrades the effluent for some months thereafter. At a rainfall intensity of 1" per hour, the water rate is 20 GPM per 1000 sq. ft. of area drained or 450 GPM/acre.



Advantages of the Oil Liquid Separator

CONSISTENT LONG TERM PERFORMANCE

Precisioneering's Separators provide the same high quality performance year after year.

COMPACT

Uses less space, liquid detention time is only minutes compared to hours in conventional settling devices.

NO MOVING PARTS

Simple, better separation; minimum maintenance.

LOW INSTALLATION COST

Lightweight, can be installed above ground on a concrete pad or underground; several designs available.

QUALITY CORROSION RESISTANT FRP

Sturdy construction; CPI plates held in molded corrosion-resistant frame, will not become unglued in use.

LOW OPERATING COST

Gravity-design separates light from heavy materials in smooth, efficient, automatic flow.

PRECISIONEERING STREAMLINED GUTTERS

Provide better collecting troughs to remove oil and sludge out of the main flow.

CONSISTENT OPERATING RESULTS

Due to Precisioneering's unique design features, changes in flow rate, temperature and weather do not throw operation out of equilibrium.

PROVEN

Over 1,000 packs in operation.

AUTOMATIC SLUDGE REMOVAL

Sludge collects in the valley of the corrugations of the CPI plate pack and slides down by gravity to sludge compartment at the bottom of the unit where it can easily be removed.

APPLICATIONS

For use in refineries, oil terminals, coastal and offshore operations, fuel tank farms, transformer parks, oil tanker ballast water, petrochemical plant waste water, separating tramp oil from cutting oil, removes oil and sludge from storm water, separating cooling/lubricating fluid from central lubricating systems in metal machining plants, cooling water from turbines, compressors and generators, natural oil plants for removal of fats and other organic substances, sugar beet processors for removal of sand and clay, corn and potato processors for starch removal, fertilizer plants for the separation of gypsum from phosphoric acids, solvent recovery systems, liquid ion exchange, water treatment systems.

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Crown Central
Dow Chemical Corp.
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