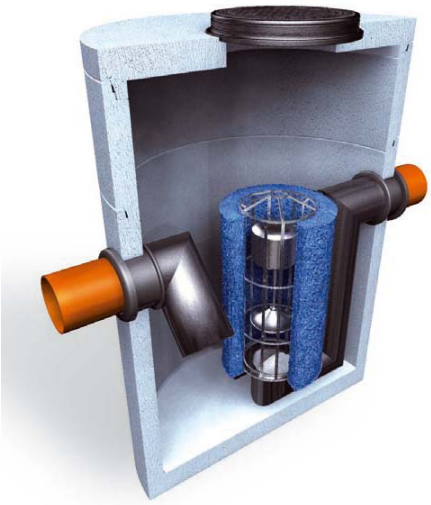
ESK Koala Oil/Water Separator



- **Single Structure Design**
- **Effective Removal Efficiency to 5 PPM (Parts Per Million)**
- **Optional Pre Treatment Grit Chamber**
- **European Tested and Certified**

Application

Cleaning of rainwater from petroleum derivative substances is the intended use of the ESK Separator. Equipment of this type can be used for treatment of rainwater coming from the areas that are highly exposed to contamination by petroleum derivative substances (e.g. fuel stations, fuel distribution stations, car servicing workshops, etc.) and those less exposed to the risks of this type (e.g. from roads, parking lots, manoeuvre yards, etc.). A suitable settling tank should be used upstream of the separator.

The separator can also be used for pre-treatment of process water coming from car wash stations (considering the specific nature of wastewater of such a type when selecting the device). In such circumstances, a settling tank of much higher volume than in case of rainwater pre-treatment system should be used upstream the separator.

See PN-EN 858-2 standard for the required minimum volume of the settling tank that operates together with the coalescence separator for a variety of applications.

Principle of Operation

Rain or process wastewater, cleaned from suspended matter comes to the ESK Separator. Separation of the petroleum derivative contamination occurs by gravitational separation of oil and water, which is supported by the coalescence effect of the media. Oil impurities lighter than water emerge to the surface where they are collected creating a film. Some small drops of the petroleum derivative substances without adequate buoyant force aggregate in bigger drops when flowing through the coalescence material (coalescence effect), which allows their gravitational separation. The submerged outlet prevents escape of the separated contamination downstream and provides resistance to encourage separation.

Recommended Application of Use

The separator is to be supplied by gravitational inflow. When wastewater must be pumped, either the pumping station should be located downstream or an accumulator should be installed upstream of the separator.

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Since the inside of the separator should be periodically inspected and cleaned, it is advisable to locate the unit outside any roads, parking lots, etc. Location of the unit should allow easy access of the vacuum trucks for performance of maintenance work.
When underground water surface elevation is expected to be above the device foundation then check the foundation stability conditions in the worst possible scenario, i.e. at the max. WSE of underground water with the separator emptied for cleaning.

Construction

The separator body is made of precast concrete. The ESK Separator is supplied with a precast structure and a minimum of a 36”sq Access Hatch. Both the structure and the access hatch may be supplied for any specified load rating as required by the project demands

The body is made of concrete sections joined by grout up to the level above the inlet and outlet openings. The tank may be supplied if required to be resistant to other chemical pollutants or ground infiltration.

There are internal fittings made of Polyethaline Plastic (i.e. inlet/outlet piping system) and stainless steel (i.e. the float guides, coalescence element supporting basket and float) installed in the tank. The coalescence element is made of polyurethane foam of specific parameters.

The standard separator is fitted with the protection system, consisting of a float that prevents outflow from the separator when the volume of light impurities in the tank reaches its maximum value (storage capacity). The float is calibrated to a density value of 0.85 g/cm^3. The design prevents contamination of surface water with petroleum derivative substances or their escape to the stormwater system.

If the foundations of the equipment are to be located deep in the ground, then additional concrete sections may to be built over them.

Accessories: The separator can be equipped in the alarm system that informs the user that the petroleum derivative contamination collected in the tank is to be disposed.

ESK Separator Capacity

The ESK Separator can be designed to accommodate a large variety of flows from 15 to 4700 gallons per minute (gpm) in our standard units. For flows greater than 4700 GPM please contact our engineering and sales office for assistance.
In addition the ESK Separator comes standard with a maximum capacity automatic shutoff valve, however the unit can also be equipped with a catastrophic spill shutoff thereby minimizing the possibly of downstream contamination.

How it works-Behind the Technology

Coalescing Oil Water Separators are passive, physical separation systems designed for removal of oils, fuels, and hydraulic fluid products from water. The ESK Koala designed performance can be described by a combination of Stoke's Law, Residence Time, Flow Path and current coalescing media theory, wherein, the oil droplets come in contact with other smaller droplets and combine to enhance the process.

Separation Process: The water/oil mixture enters the separator and is directed downward, allowing gravity to start the process of separation. The mixture enters the ESK Media where laminar and sinusoidal flow is established and the oils impinge on the media surface. As oils accumulate they coalesce into larger droplets, rising upward until they reach the top of the pack, where they detach and rise to the water's surface. At the same time solids encounter the media and slide down.

Stoke's Law: This equation relates the terminal settling or rise velocity of a smooth, rigid sphere in a viscous fluid of known density and viscosity to the diameter of the sphere when subjected to a known force field (gravity). The equation is:

$V = (2gr^2)(d1-d2)/9\mu$
where
V = velocity of rise (cm sec^{-1}),
g = acceleration of gravity (cm sec^{-2}),
r = "equivalent" radius of particle (cm),
dl = density of particle (g cm $^{-3}$),
d2 = density of medium (g cm^{-3}), and
μ = viscosity of medium (dyne sec cm^{-2}).

Coalescence: Gravity separation utilizes the difference in specific gravity between the oil and water. Oil separates from a fluid at a rate explained by Stoke's Law. The formula predicts how fast an oil droplet will rise or settle through water based on the density and size of the oil droplet and the distance it must travel. Our separators are built to exploit both variables of Stokes Law.

With the use of our coalescing media oil only need rise a short distance before encountering the media inside the separation chamber as opposed to rising a great distance to reach the water surface in gravity separation. Upon impinging on the media the oils coalesce (gather) into larger droplets until the droplet buoyancy is sufficient to pull away from the media and rise to the water's surface. The design will meet specific criteria as indicated below:

- The hydraulic distribution of the influent flow must assure full usage of the surface area of the media to fully utilize the media.
- Flow control and direction must be determined to prevent hydraulic short circuiting around, under or over the media pack.
- A laminar flow condition must be maintained (Reynolds "Re" number less than 2000) in order to assist droplets to rise.

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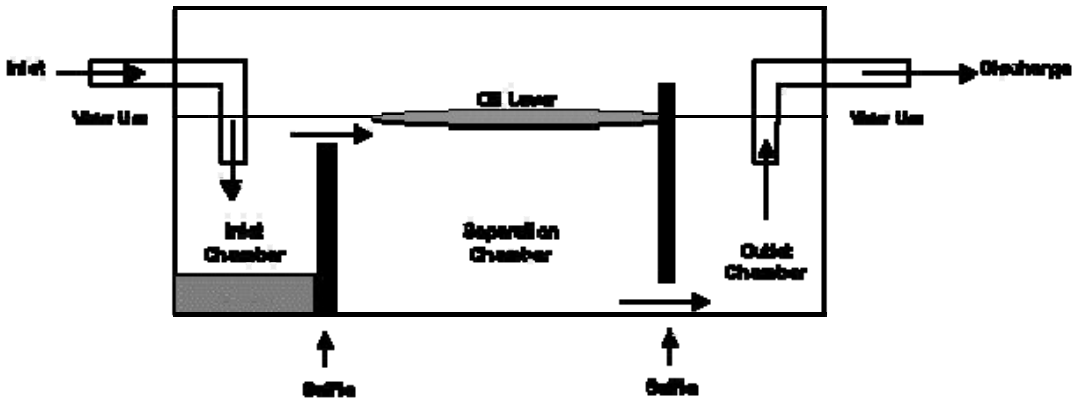
Gravity Separation vs Coalescing Plates vs Coalescing Media

Many oil/water separators exist today with varying designs. But they all are dependent on either gravity or coalescing separation.

The first and oldest type is gravity or conventional separation, simple separation via gravity (density differential between two immiscible liquids leads to one of them rising above the other). This design, when designed properly provides a certain tank length, width and depth that provides a wide, quiet spot in the pipeline to give oils time to rise. This design generally provides a discharge oil concentration of 100 ppm based on a 150 micron droplet size. The gravity separator design relies on a large water volume. This correlates to a tank size that can be 5 times the size of an equally sized coalescing separator.



The coalescing design is known by many names ie. parallel plate, corrugated plate, however the concept, operation and design are generally the same. The coalescing concept is based on having a large surface area in contact with the waste stream (coalescing plates). The more surface area provided, the more enhanced the separation process will typically be. By using the coalescing media, the size of the tank is reduced and a higher performance is attained than by gravity separation. Typical coalescing design provides a discharge oil concentration of 10-20 ppm or less with an oil droplet size of 30um or even as small as a 20 micron.

The Coalescing Media is technology that was developed in Europe. By providing a tighter media to direct the droplets of oil together as the flow passes thru the media, thus fine droplets that are too small to be separated by gravity alone are accumulated into bigger drops that rise to the surface. Coalescing media is made of reticular treated foam. The media-cartridge is very easy to lift out and reinstall once it is cleaned/rinsed with a garden hose. The ESK Koala applies sedimentation for particulate removal, and gravity separation and coalescing separation to provide discharge oil concentrations as low as 5 PPM or less with an oil droplet size of approximately 10 microns.

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