Oil Water Separator at Car Wash in Finland
HD Q-PAC® Eliminates Maintenance Headache

$10,000+ Per Year Media Savings
$1,200+ Per Year Maintenance Savings

1 ft³ module HD Q-PAC®
Surface area: 132 ft²/ft³
(432 m²/m³)

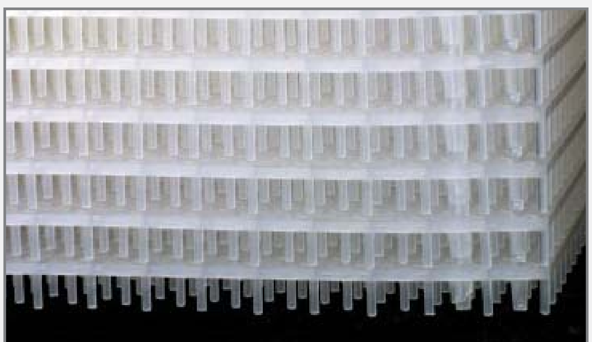
Introduction

Getting your vehicle washed is always a good idea. But the dirt (leaves, sand and other grit) and especially oils that wash off vehicles need to be collected and removed from the water before the water can be reused or discharged.

HD Q-PAC® is Installed in Car Truck Wash Oil Water Separator

A car wash (average 150 vehicles per day) located near Helsinki, Finland had an oil water separator that required frequent, costly maintenance. This was because the OWS unit contained a mesh pad that plugged frequently. The mesh pad, when fouled, proved impossible to clean. In May of 2002, the Labko Ab (now Wavin-Labko Ab) exchanged the mesh pad media in the oil water separator with HD Q-PAC® manufactured by Lantec Products. The result was a dramatic improvement of the oil water separator:

HD Q-PAC® now operates eight weeks between cleanings
and **Washing HD Q-PAC® is easy and quick**
therefore **Weekly Media Replacements Eliminated / Maintenance Savings Realized**



Up-Close: HD Q-PAC®
U.S. Patent #5,498,376; worldwide patents pending

HD Q-PAC Coalescing Media vs. Traditional Media

HD Q-PAC® can be seen to be a radical departure from the traditional, inclined or corrugated plate design of past OWS coalescing media. An obvious consequence of this difference in the design is that all of the surface area of HD Q-PAC® supports oil droplet coalescence. The design of HD Q-PAC® also allows for steady, unimpeded rise of oil droplets upward and sludge downward throughout its entire structure. This is a radical departure from traditional oil in water coalescing media designs such as mesh pads and inclined plates.

Also note, as previously mentioned, that water passes HD Q-PAC® at a 90º angle to the media. With 75,000 drip points (a forest of rods) per ft³ (2.65 x 10⁶ per m³), heavy objects fall readily into the sludge compartment. Therefore the design of HD Q-PAC® allows for self-cleaning or easy cleaning with a simple water spray when needed.

Note that this is two months between maintenance events vs. the previous biweekly events. The media is simply removed from the OWS unit and then washed with an ordinary high pressure water hose. Rather than disposal of the media, after 20 - 30 minutes of this type of washing the HD Q-PAC® is clean and returned to use in the OWS.

The cleaning of the HD Q-PAC® is shown (left) as well the result (right).

Discussion

The car wash owner was very pleased with the results of the retrofit:

Annual media savings = US$10,000+ per year

6 Washes Per Year vs. 26 Washes per Year With Mesh Pad, savings = $1,200 per year.

The design of HD Q-PAC® has been proven by this and many other projects to be superior to traditional coalescing media (inclined plates, mesh pads). When used in new oil water separators, the fact that all of the surface area of HD Q-PAC® supports oil droplet coalescence is reflected in the liquid flux of 12.7 gpm/ft^2 (31.0 m^3/m^2-h) achieved in the EN 858-1 testing. In the past a value of 2 - 3 gpm/ft^2 (5 - 7 m^3/m^2-h) has been a typical new design parameter. As a result, when using HD Q-PAC® to design new oil water separators, much smaller OWS units which require less coalescing media become very practical vs. historic design standards. Significant savings will be the result!

References

(1) American Petroleum Institute, "Design and Operations of Oil Water Separators", Publication 421, 1990

(2) Swedish Standards Institute, "Official English version of EN 858-1:2002", September 2002

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EN 858-1 Test Procedure

Light Liquid:	Density 0.85 g/cm^3
Water Quality:	Potable or purified surface water
Solubility of Light Liquid:	nil, unsaponifiable
Water Turn Over:	minimum of 4 volumes of test unit
Liquid Flux:	25-40 m^3/m^2-h (10-15 gpm/ft^2)
Max. Residual Light Liquid:	5 mg/L**

Results Using HD Q-PAC® at Danish Institute of Technology

Depth of HD Q-PAC®:	610 mm (24 inches)
Inlet Oil Concentration:	4250 mg/L
Liquid Flux:	31.0 m^3/m^2-h (12.7 gpm/ft^2)
Outlet Oil Concentration:	0.98 mg/L***
Oil Droplets >20µ	None Observed

* Fuel oil, per ISO 8217, designation ISO-F-DMA
** Hydrocarbon content per prescribed IR spectroscopy procedure
*** Average of five repetitions, data range 0.9-1.1 mg/L

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Oil in Water Coalescing Media - How it Works

An oil water separator, or OWS, contains coalescing media. This media provides a suitable surface for oil droplets to meet and grow, or coalesce, into larger droplets. As oil droplets grow in size the buoyancy of the droplets increases. The droplets rise towards the surface of the water due to the fact that the specific gravity of oil is less than the specific gravity of water. In this way the oil will form a layer that can be separated from the water by skimming action before the water is reused or discharged. Any heavy solids present in the water being treated, or sludge, in theory should fall into the sludge compartment of the OWS unit. As oil droplets coalesce into larger droplets, the buoyancy of the droplets increases. This is reflected in the known rise time for a given size of oil droplet. The more efficient the coalescing action of the media, the larger the oil droplets become. Note that larger oil droplets result in reduced rise time (1). This importance is also noted in Stoke's Law that defines the terminal rise velocity of a given size.

Time Needed for Oil Droplet (0.85 Sp. Gr.) in Water to Rise 3 inches

Droplet size, microns	Rise Time
300	12 sec
150	42 sec
60	4 min 12 sec
30	17 min 24 sec
15	1 hr 8 min 54 sec
5	10 hr 2 min 9 sec

$V = (2gr^2)(\Delta d) / 9\mu$
g = acceleration of gravity constant
r = oil droplet radius
Δd = difference in Sp. Gr. of water and oil
µ = viscosity of water
Note: V increases in proportion to the square of droplet radius!

Traditional oil water coalescing media have been variations of corrugated, inclined plates and mesh pads. By definition half of the surface of this type of media must always be aligned upward - which is the wrong direction for support of coalescing action. To attempt to overcome this problem by adding more specific surface, plate separation can be made more narrow. This solution only solves the problem partially as the ratio of incorrect to correctly oriented surface remains 50/50.

Possible plugging and fouling of the coalescing media is also supported by the ~ 45º angle of the inclined plate design and exacerbated in mesh pad design. Plugging of the existing oil water coalescing media was the major problem in the oil water separation unit at the car wash in Finland. Heavy particles could not fall into the sludge compartment due to interference from the inclined plates. HD Q-PAC®, made of oleophilic polypropylene, with all rounded surfaces at a 90º angle vs. the direction of water flow and many slender rods pointing down towards the sludge compartment, offers a solution to the maintenance problems that, until now, have been accepted in the oil water separation industry.