



Environmental Inc.
Authorized Distributor of In-Viro-Drum™

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In-Viro-COP is a compact, portable version of Coalescing Oil and Polishing technology (COP). The unit is specially designed to allow the components to easily be dismantled, palletized, and shipped to a remote location. Upon arrival at the site local crews can easily assemble the unit and initiate use.

Where it is necessary to separate crude oil, diesel fuel, or various other hydrocarbons from water the ability of the compact **In-Viro-COP** system to remove fine oil emulsions (down to 0.5 micron) makes it the solution for treatment options to achieve water discharge levels to well below 15 ppm. The smaller the oil droplet size, the more difficult it is to separate due to the long residence time required for the droplet to rise in a gravitational separator. The presence of small droplets of hydrocarbons can therefore create difficulty for gravitational separation. For this reason the COPS technology was developed, and then to accommodate remote locations **ABCAN Environmental Inc.** has customized this technology to suit each customer's logistical requirements, thus **In-Viro-COP**.

The **In-Viro-COP** System incorporates the latest design in coalescing technology. It is more efficient than most oil emulsions removal technologies previously available in the market, providing a very cost-effective solution to critical high flow separation requirements. This is key when operating in remote areas due to the fact that **In-Viro-COP** can get ppm levels of hydrocarbons in water to within regulatory discharge levels, while segregating the hydrocarbon to separate containment for transport to approved disposal.

Applications

The **In-Viro-COP** can handle anything from heavy to light and will separate any emulsified and/or free-floating hydrocarbons from water. The **In-Viro-COP** can only separate hydrocarbon compounds which are immiscible with water, remaining in an emulsion or free-floating state. The **In-Viro-COP** will not remove dissolved compounds. Soluble hydrocarbons that dissolve completely in water will pass right through the In-Viro-COP-System without being separated.

O/W Separation Technologies	Separation Principles used
O/W Separators	Gravity separation
Coalescers	Coalescence + gravity separation
DAF & IGF	Gravity separation
DAF + chemical injection	Coagulation + flocculation + gravity separation
GAC Filters	Adsorption
Hydrocyclones & Centrifuges	Acceleration Force
Membrane Technologies	Filtration
In-Viro-COP System	Filtration + Coalescence + Gravity Separation

Product, Systems & Services

The **In-Viro-COP** separates and recovers emulsified free floating oils (non-dissolved hydrocarbons) from water solutions using a combination of filtration, coalescence, and gravity. It is designed for the efficient removal of small oil droplets, down to 0.5 microns from water. Many traditional technologies cannot go below 10 to 50 microns.

The In-Viro-COP is a self-cleaning system that does not require the use of heat, chemicals or long residence times to separate hydrocarbons. It has an extremely low operational cost and small footprint. **In-Viro-COP** Media Systems, ROD Media is the **In-Viro-COPs'** quintessential component. It is a polyurethane based media developed for use in oily water separation processes. ROD Media is a chemically inert, odourless, and non-toxic organic substance. Its unique physical characteristics allow it to process (coalesce) smaller oil emulsion sizes than any other known media.

The media is oleophilic, meaning that it is attracted to oil, but not to water. The very fine oil droplets are attracted to the porous media cell structure walls where they begin to agglomerate with other incoming oil droplets/emulsions. Once an oil droplet grows to a certain size, its buoyancy causes it to lose its bond with the ROD Media. The droplet is released and then it is able to float to the top of the vessel and form an oil layer which is then easily recoverable.

The ROD Media within the **In-Viro-COP** has the ability to adsorb oil emulsions as fine as 0.5 micron in size (filtration). The ROD continues to adsorb until it gets fully saturated with oil (coalescence), and then it releases free-floating oil that rises to the water surface (gravity separation). This cycle is repeated. The ROD media works better in a saturated state, making it the exact opposite of other medias which require replacement when fully saturated. The ROD Media comes in cartridges.

Each cartridge has an empty central core, surrounded with 3" of ROD media. The flow through the cartridge is radial, i.e., from outside-in during the normal operation mode, and from inside-out during the backwash (cleaning) mode. A cartridge processes up to 10 m³/h of PW and is 10" in diameter (with a 4" diameter central core) by 30" high.

For optimum operational performance two different types of ROD media are used. The first is for coalescence (ROD GCC-1C). This is a coarser media which will be less susceptible to blockage from fine particulate and will provide initial coalescence. Then for polishing ROD GCP-2C is used. This is finer media which will trap and coalesce the majority of all the remaining droplets. These two types of media are usually installed in separate vessels. This makes backwashing and maintenance simpler.

In-Viro-COP System Backwashing

Most people assume that when there is a backwash, an introduction of fresh water and a purging of existing water take place. This is not the case with the **In-Viro-COP**. The backwash occurs without interrupting the flow and does not require the use of clean or filtered water. The backwash takes place by reversing the flow through the first stage ROD cartridge in the Coalescing vessel. The reversed flow will free up any collected solids which will pass out with the main flow into the final polishing vessel. During backwash the oily water stream will still pass through the ROD Media and will still coalesce. Therefore no loss in performance is experienced.

Replacement of Media

Cartridge replacement will vary, depending on the contents of your particular feed source. In controlled environments with only an oil and water mixture, the cartridges could last indefinitely. In circumstances where there are very high levels of suspended solids, poor mixture of chemicals, or where separator sand jetting is fed into the produced water stream, the cartridges may require replacement several times a year.

The ROD Media cartridges in the coalescing unit will need to be replaced when the flow decreases by more than 30% at a maximum pressure drop through the unit of 20 psi. This will happen over time when ROD Media cartridges begin to clog with large suspended solids and very viscous oils.

How effective is In-Viro-COP at separating the following emulsions:

A) Tight oil emulsions

Separating tight emulsions is what the **In-Viro-COP** was designed to do. Oil emulsions as fine as .5 microns are separated without difficulty. Very few competing separation technologies can recover emulsions as fine as that, and those that can have significantly higher operating costs. **In-Viro-COP** can handle the entire range of emulsions inexpensively. The **In-Viro-COP** will handle the entire process on its own and eliminates the need for a train of hydrocarbon separating technologies.

Table: Rising Velocity Vs Oil Emulsion Size

Emulsion Size (microns)	Time for the emulsion to rise 1 inch	Time for the emulsion to rise 1 cm	Separation technologies that can effectively remove these types of emulsions
300	5.2 s	2 s	O/W Sep, COP
150	20.7 s	8.2 s	O/W Sep, COP
100	46.6 s	18.3 s	O/W Sep, COP
50	3 min 6 s	1 min 13 s	O/W Sep with corrugated or parallel plates, COP
25	12 min 26 s	4 min 54 s	DAF, Hydrocyclones, Filters, COP
10	1 h 18 min	30 min 35 s	DAF with chemicals injection, Centrifuges, Hydro cyclones, Filters, COP
5	5 h 11 min	2 h	DAF with chemicals injection, Centrifuges, Ultra Filtration, COP
2	32 h 22 min	12 h 45 min	DAF with chemicals injection, Ultra Filtration, Granular Activated Carbon, COP
0.5	21.6 days	8.5 days	DAF with chemicals injection, Ultra Filtration, Granular Activated Carbon, COP

Note: Figures based on an oil with a specific gravity of 0.9

B) Chemically created emulsions

Surfactants (detergents) have two different functional groups attached to opposite ends of their molecular chains. One side is oleophilic and the other is hydrophilic. In the presence of oil, the surfactants oleophilic group is attracted to the oil, resulting in the surfactant surrounding the emulsion. At the same time, the surfactants hydrophilic group is attracted by water, which pseudo-dissolves the oil in water. The forces acting upon it will not allow the emulsion to rise, regardless of how light it is compared to the water. This explains why **In-Viro-COP** sometimes has difficulty with chemically emulsified oils that have had certain detergents and process chemicals added to them. This does not mean **In-Viro-COP** is completely ineffective at removing chemically emulsified oils, just less effective. Certain surfactants are less oleophilic than others, leaving portions of the emulsion exposed which may be enough to allow the ROD Media to attract them for long enough for coalescing to take place. Results will vary depending on the type and quantity of chemicals present in the effluent.

For further information on In-Viro-COP contact:

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