Separatech Canada Inc. is proud to present its recently invented **COP-System** brand of oily-water separators.

The COP-Systems ability to quickly separate and recover oil emulsions as fine as 0.5 micron, coupled with its exceptionally low operation and maintenance costs, make it an ideal candidate to replace (or be used in conjunction with) existing oil separation technologies used in water treatment processes worldwide.

The following document is the COP-System FAQ (Frequently Asked Questions). It should answer most of the questions you may have about the COP-System, particularly if you are unfamiliar with the technology.

Questions in the FAQ LIST have been linked to the corresponding answers below. Simply select the question you want answered from the list in order to avoid having to scroll through the entire document. Select any question contained in the answer section to return to the top of the FAQ List. You may also use the "Bookmarks" tab located near the upper left hand corner of the document to access the FAQ LIST.

If you have questions about the COP-System which do not appear on the FAQ, please feel free to email or call us at the following co-ordinates:

info@separatech.com or toll free 1-877-373-7272

You may also want to check our website for industry and application specific information, case studies and technical references.

www.separatech.com

COP-SYSTEM FAQ LIST
(Frequently Asked Questions)

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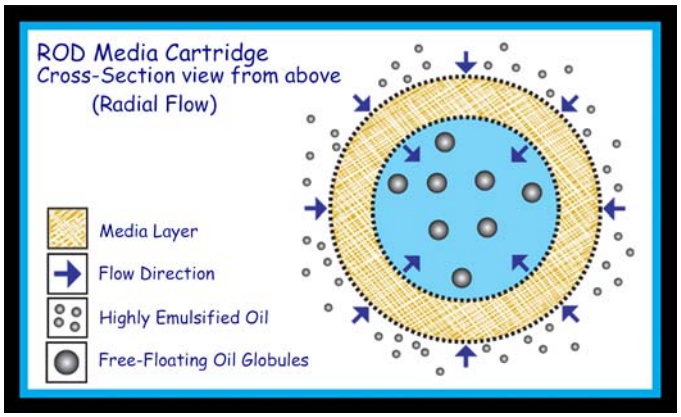
1. What is the COP-System?

COP is an acronym for Coalescing Oil & Polishing. The COP-System separates and recovers emulsified and free-floating oils (non-dissolved hydrocarbons) from water solutions using a combination of filtration, coalescence, and gravity. It separates oil emulsions as fine as 0.5 micron making it a lot more effective than standard commercial separators which typically have trouble removing emulsions finer than 30 micron. The COP-System is a self-cleaning system that doesn't require the use of heat, chemicals or long residence times to separate hydrocarbons. Extremely low operational expenses and a small footprint make this new system an ideal candidate to replace Dissolved Air Flotation systems, Induced Gas Flotation systems, Centrifuges, Hydro-cyclones, and a wide range of media filters and coalescers.

2. How does the COP-System work?

Stable oil emulsions in water are pumped through (applied pressure) one or more cartridges filled with ROD Media. As oily water passes through the ROD Media, oil emulsions as fine as 0.5 micron are absorbed, coalesced, and released as larger oil globules. Once coalesced, the globules are over 150 micron in size and therefore float quickly to the water surface where they pool together and are easily recovered.



3. What is ROD Media?

ROD Media is the COP-Systems' quintessential component. It is a polyurethane based media developed by Separatech Canada Inc. for use in oily water separation processes. ROD Media is a chemically inert, odorless, and a non-toxic organic substance. Its unique physical characteristics allow it to process (coalesce) smaller oil emulsion sizes than any other known coalescing media.

**** ROD Media comes in varying grades which are carefully chosen according to your particular oil content and flow rate.
**** Pictures of ROD Media and ROD Media cartridges can be found on the next page.

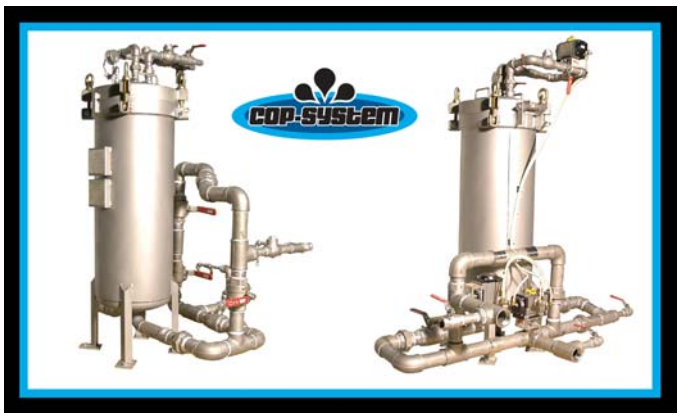
4. How does ROD Media alter emulsion sizes?

ROD Media is very oleophilic. As stable oil emulsions traverse through the ROD Media layer they momentarily attach themselves to the porous media's cell structure walls and begin to agglomerate with other incoming emulsions. Once the oil emulsions have grown to a certain size, they lose their bind with the ROD Media and are released in the direction of flow.

5. What does the COP-System look like?

The COP-System generally consists of two cylindrical vessels in series, a **Coalescing Vessel** and a **Polishing Vessel.** These pressurized vessels stand vertically. Cartridges containing ROD Media are loaded or replaced from hinged covers on the tops of the vessels.

*** Please note that Separatech concentrates primarily on the research and development of its technologies and is continually developing new COP-Systems in order to expand the brand. We would consider developing custom designed separators for large scale end users or distributors with clients whose specifications for a particular application are similar.



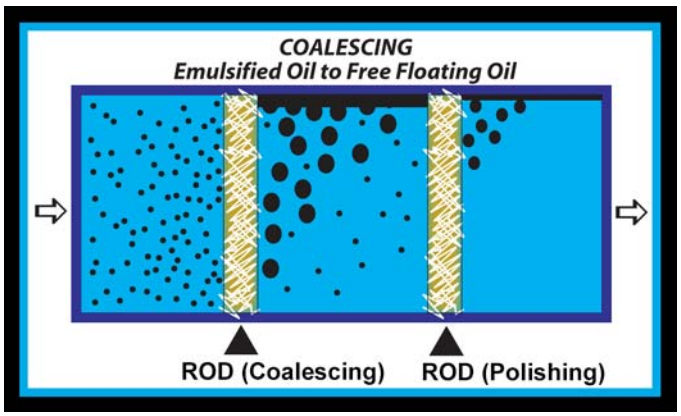
6. Is there a difference between the Coalescing and Polishing Vessels?

In terms of function, both cylinders are virtually the same. Both **Coalescing and Polishing Vessels** are pressurized vessels containing one or more ROD Media Cartridge. These vessels coalesce stable emulsions (non-dissolved) into larger free-floating globules and send them (along with water) back to a pre-treatment tank or an oil recovery tank where near pure oil can be separated from water.

However, there are some minor differences between the two vessels. For example, the Coalescing and Polishing Vessels typically contain different grades of ROD Media and cartridge replacement is required more frequently in the Coalescing Vessel.

Oil emulsions larger than 20-30 microns which enter the COP-System are removed after having passed through the initial grade of ROD Media at use within the Coalescing Vessel; they never enter the Polishing Vessel. Smaller oil droplets (0.5-20) traversing through the Coalescing Vessel media react similarly to the larger ones (they coalesce and agglomerate), however, their new increased size is often still not enough to enable them to escape through the Coalescing Vessels oil recovery lines. Their slow rising velocity and the short residence time allotted within the vessel do not enable them to reach the Coalescing Vessels surface. Instead, the smaller, remaining oil emulsions are pulled through the system into the Polishing Vessel where they are subjected to one more pass through an ROD Media layer before they can be removed and the COP-System can discharge a clean effluent.

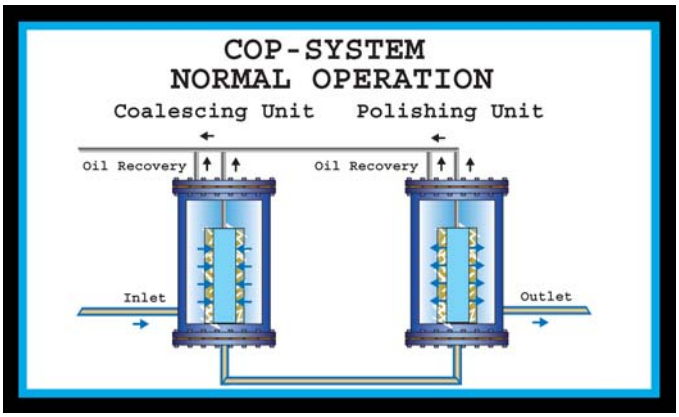
***The Polishing Vessel is not capable of backwashing. See questions #19 for more details.

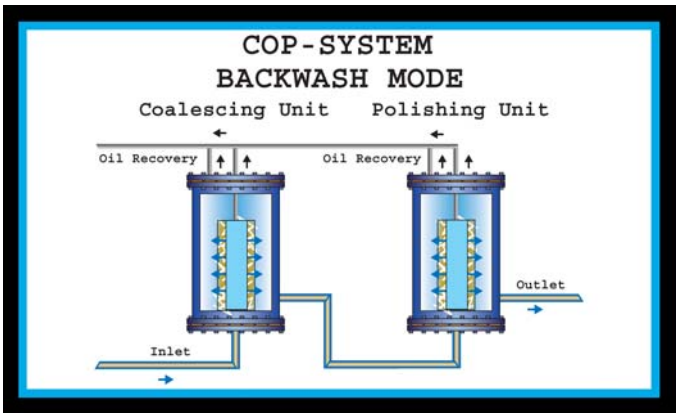


7. What flow path does water take through the COP-System?

Oily water is pumped by the COP-System's feed pump from a pre-treatment OWS tank, or directly from the source into the Coalescing Vessel. (Only if enough inline pressure is available). The flow enters the base of the vessel and is forced through the ROD Media cartridge from outside to inside. Cartridges are radial in design. Any free floating oil entering the Coalescing Vessel will be skimmed off the top of the cylinder prior to passing through the cartridge. Any stable emulsion which is transformed into free floating oil once having traversed through the ROD Media cartridge is collected from the top of the cartridge's center core. The now cleaner water is forced out the base of the Coalescing Vessel's cartridge and into the Polishing Vessel. Flow through the Polishing Vessel runs in the opposite direction of that seen in the Coalescing Vessel. Flow enters the cartridge first and is pushed through it from inside to out. Again, a mixture of oil and water is suctioned off the top within the Polishing Vessel's cartridge center core and in the vessel itself. The clean water exits this cylinder from its base.

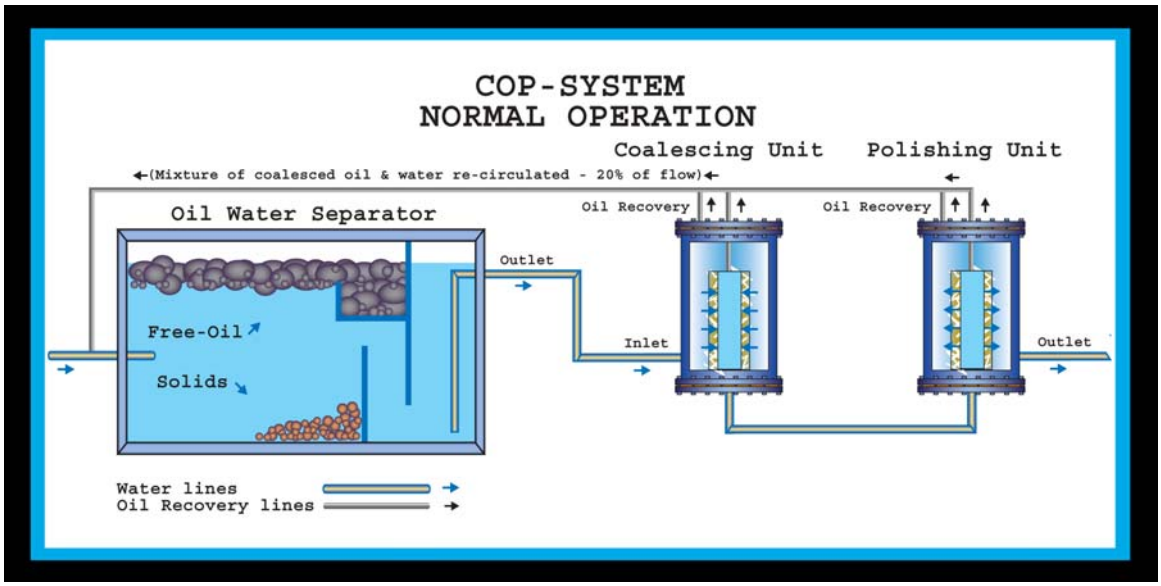
*** Please note that the COP-System's backwash feature will be discussed below in question 19.

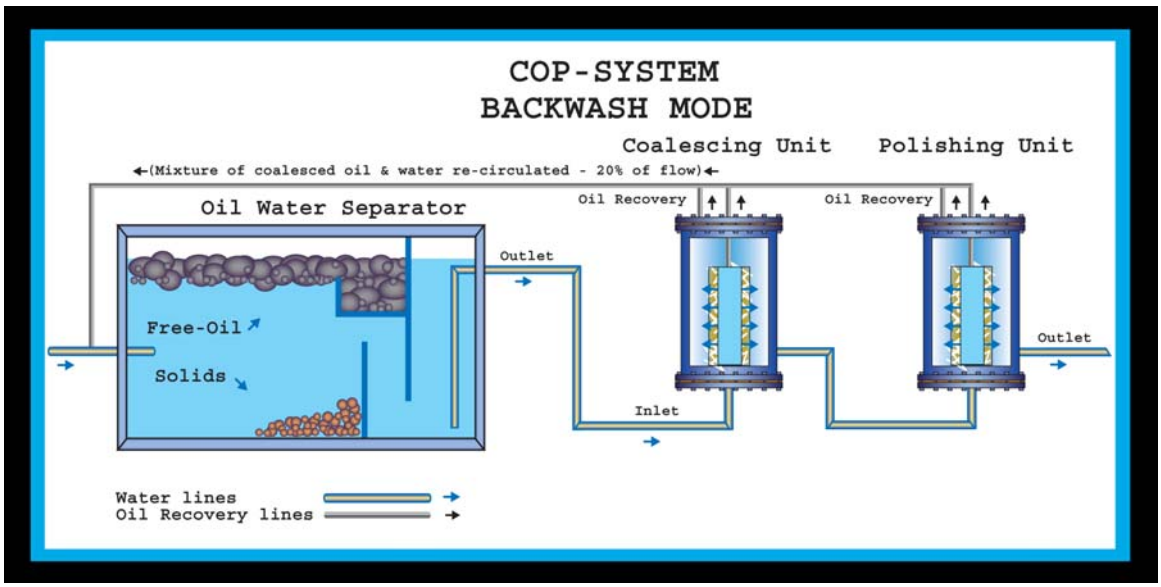




8. How is oil recovered from the COP-System?

When forced through ROD Media in the Coalescing and Polishing Vessels, tight oil emulsions which are evenly distributed throughout the water fuse together forming larger globules. This causes the emulsion to destabilize, free itself from the water and rise to the surface. A mixture of the now free-floating oil and water is continuously collected from the tops of both the Coalescing and Polishing cylinders as well as from the tops of their respective ROD Media cartridge center cores. Once collected, this mixture of free floating oil and water is sent back to the pre-treatment OWS, or an oil recovery tank where the now free-floating oil is easily separated and recovered, and where the decanted water is re-circulated through the COP-System. (Roughly 20% of total flow is sent back to the pre-treatment / oil recovery tank)



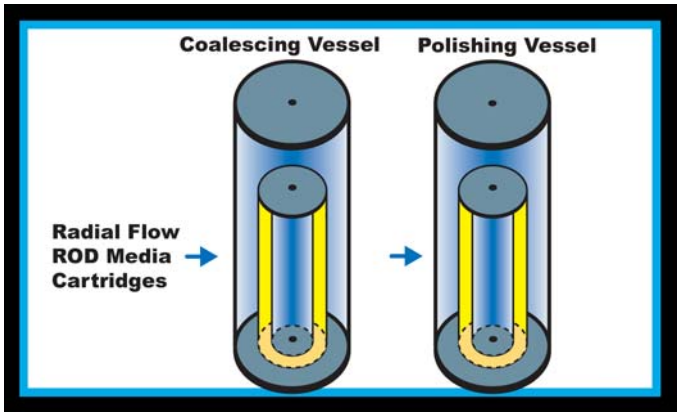


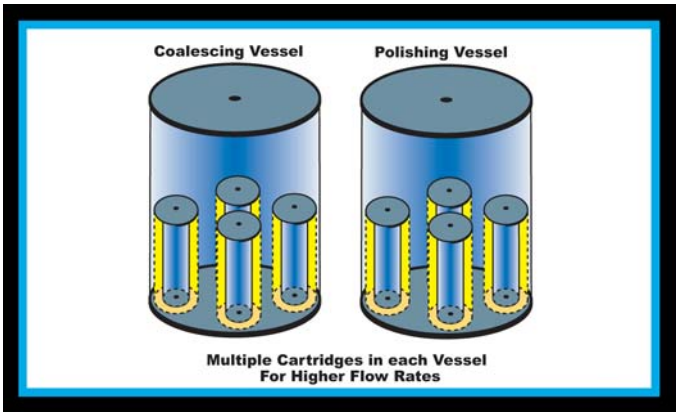
9. What range of flow rates has the COP-System been designed to process?

Separatech's standard ROD Media cartridge can process a max flow of 15 m^3/h. (Produced Water in Oil & Gas sector) The cartridges are 10" in diameter and are 40" long. The pictures used to help illustrate answers for question #5 are representative of a single cartridge system. (Pictures 1 and 2) The Coalescing and Polishing vessels each house one cartridge capable of processing 15 m^3/h of water. Two cartridges in one complete system do not mean the total throughput is doubled to 30 m^3/h. The vessels are in line, meaning the throughput is capped at 15 m^3/h.

The technology is scalable. For higher flow rates, multiple cartridges can be installed in a single vessel to match the flow required. For example, a flow of 150 m^3/h would require both the Coalescing and Polishing Vessels to house ten ROD Media cartridges, each one processing 15 m^3/h.

Separatech is currently developing and testing numerous other prototypes and is continually seeking trial sites to test them in. The company has begun the process of testing the technology in the Oil and Gas industry, where if successful, units will need to be scaled up to process up to 500m3/h (75,000 bpwd). Please feel free to call us with your specific requirements; we may be able to fabricate the COP-System to your particular specifications.





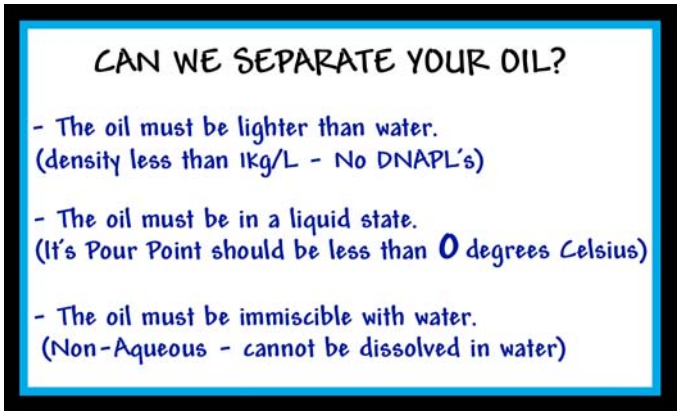
10. What separation principals does the COP-System make use of?

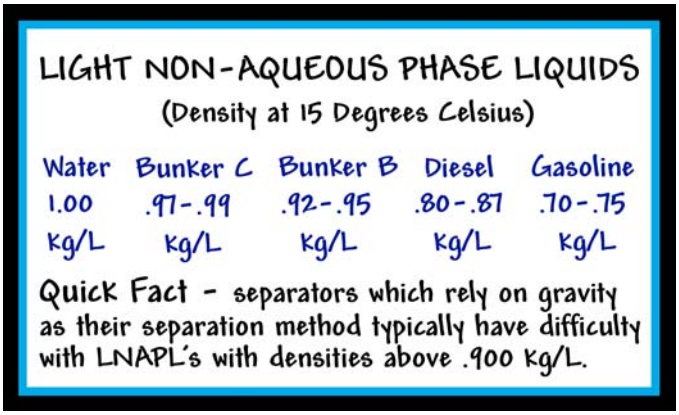
The COP-System makes use of a combination of three complementary principals in order to efficiently separate emulsified hydrocarbons from water. It makes use of filtration, coalescence, and gravity to do its work.
The ROD Media within the COP-System has the ability to absorb oil emulsions as fine as 0.5 micron in size (filtration). The ROD continues to absorb until it gets fully saturated with oil (coalescence), and then it releases free-floating oil that rises to the waters surface (gravity separation). This cycle is repeated over and over. The ROD Media's ability to absorb fine emulsions and release them as free-floating oil makes the COP-System a self-cleaning system. The ROD media only works in a saturated state, making it the exact opposite of other medias which require replacement when fully saturated.

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	Adsorbtion
Hydrocyclones & Centrifuges	Acceleration Force
Membrane Technologies	Filtration
COP System	Filtration + Coalescence + Gravity Separation

11. What types of hydrocarbons can it separate?

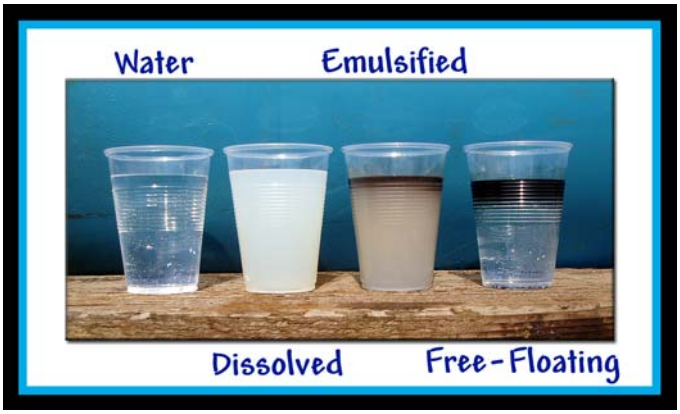
The COP-System doesn't play favorites; it will separate any emulsified and/or free-floating hydrocarbons from water. It can handle anything from heavy to light oils. See the only requirements listed below.





12. Are there any hydrocarbons that the COP-System can't separate?

The COP-System will not remove dissolved compounds. Soluble hydrocarbons that dissolve completely in water will pass right through the COP-System without being separated. The COP-System can only separate hydrocarbon compounds which are immiscible with water, remaining in an emulsion or free-floating state. Please see #15 for a special explanation about chemically created emulsions.



13. How effective is the COP-System at separating tight oil emulsions?

Separating tight (stable throughout water) emulsions is what the COP-System was designed to do. Oil emulsions as fine as 0.5 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. The COP-System can handle the entire range of emulsions thrown at it, inexpensively. The COP-System will eliminate the need for a train of hydrocarbon separating technologies; it will handle the entire process on its own.

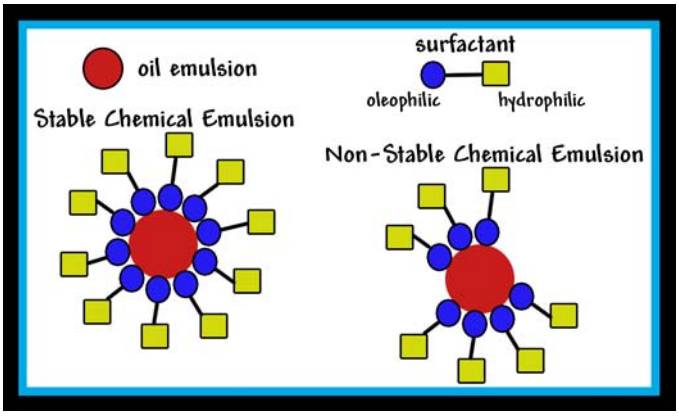
****See how other oil separation technologies compare below.

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

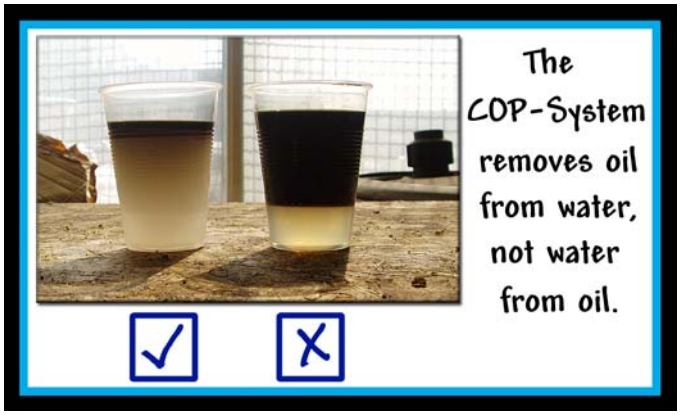
14. What about chemically created emulsions?



The COP-System is less effective at separating tight oil emulsions caused by the addition of certain detergents and process chemicals. 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 the COP-System sometimes has difficulty with chemically emulsified oils. If the oleophilic portion of the surfactant is strong enough to surround the entire emulsion, the ROD Media will be unable to attract it. The Pseudo-dissolved emulsions will pass through the system without being coalesced. This does not mean the COP-System 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 untreated water.

15. Is there any way of predicting what kind of results I can expect with my particular emulsion problems?

In most cases, there is a relatively simple way to determine how effective the COP-System will be at treating your specific emulsion problem, whether created mechanically or chemically. All you would need to do is filter a representative sample of your feed water through a 1 micron filter paper and then measure the oil content of the filtrate. The achieved results will be similar to that of a COP-Systems' treated water, within a range of 5 parts per million (±5ppm). Do not hesitate to contact Separatech for a more detailed explanation of the necessary materials and test procedures. Separatech is also willing to accept and test small samples of your untreated water in order to provide you with a more accurate estimate of the results you should expect from the COP-System. Please fill out our project assessment form (see "forms" tab along left side of website) and indicate your desire to have samples tested by Separatech.



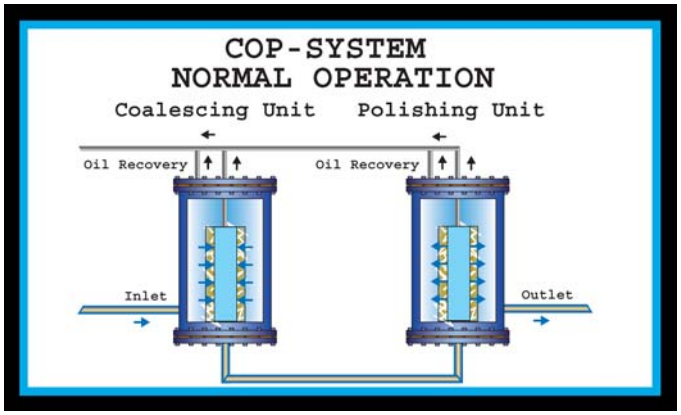
16. How effective is the COP-System at separating free-floating oils?

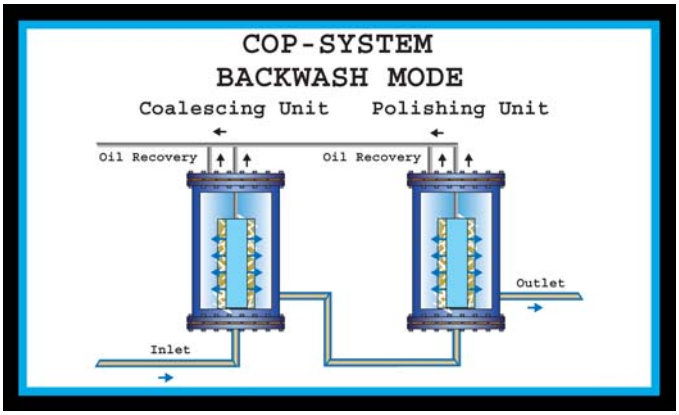
The COP-System separates free-floating oils out of necessity. The system transforms oils held in stable emulsions into free-floating oil. When this occurs, the free oil along with water is discharged from either the top of the vessel or from the center of the cartridge core. This discharged mixture is in no way pure oil. This mixture must be returned to the pre-treatment OWS / oil recovery tank where it can be decanted and pure oil can be separated. Certain COP-System models (marine bilge units) have been designed to handle oil slugs where the inlet oil content is greater than that of the water however typical systems are not to be operated under those conditions. The COP-System separates oil from water not water from oil. Separatech suggests decanting the water prior to its introduction into the COP-System whenever possible. Best results are achieved with less than .5% oil content (5,000 ppm) in your feed source. A standard OWS / gravity tank with a minute or two of residence time is usually more than enough to achieve acceptable oil content levels for the COP-System.

17. How effective is the COP-System in the presence of suspended solids and viscous oils?

Over time, the ROD Media cartridge will begin clogging with viscous oils and/or suspended solids creating an increasing inside pressure at the Coalescing Vessel's inlet. If left un-attended, this pressure would build resulting in the ROD Media's eventual compaction, creating a need for cartridge replacement. In order to avoid this, a timer has been set to reverse the flow within the Coalescing Vessel by simultaneously switching a set of three-way automatic valves for a predetermined period of time. The timer is adjusted according to the viscosity of the oil and amount of suspended solids present in your untreated water. The reversed flow purges the ROD Media cartridge from the opposite side freeing solids and viscous oils that have accumulated on the ROD Media cartridge surface during normal flow operation. Once the cartridge has been backwashed and the time has elapsed, the three-way automatic valves return to their initial position sending the flow back to its standard path through the Coalescing Vessel. In comparison to the backwash cycle, the COP-System operates in its normal flow mode for a much longer predetermined period of time. The backwash process repeats itself and will continue to do so until the unit is stopped or the settings are changed.

When the backwash is activated, the source oily water enters the Coalescing Vessel's ROD Media cartridge(s) and flows from inside to out. (Rather than outside to in). Both oil recovery lines are operational during this cycle and continue to recover a mixture of oil and water from both the vessel's top and cartridge core. During the backwash cycle, only the Coalescing Vessel has its flow direction reversed. The Polishing Vessel runs the same as during the normal flow operational mode.

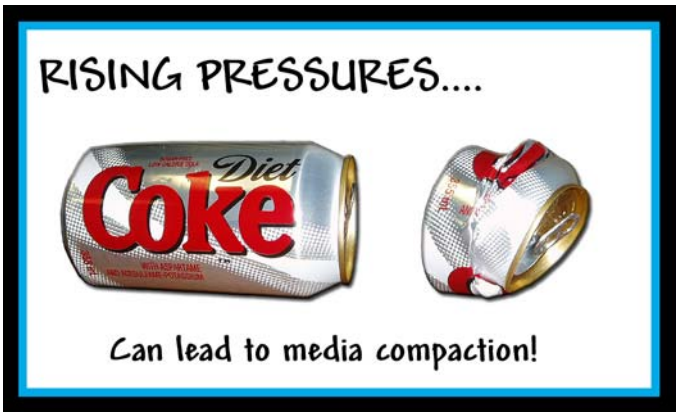




18. When the COP-System is in Backwash Mode is there an interruption of flow?

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 COP-System. The backwash occurs without interrupting the flow in any way and does ***not*** require the use of clean or filtered water. Only the Coalescing Vessel is backwashed. Water and solids leaving the Coalescing Vessel are subsequently treated in the Polishing Vessel whether the system is running in its normal flow mode or backwash mode. It is one of the COP-Systems features that allow us to label it as being a self-cleaning system.

19. How often must the ROD Media cartridges be replaced?



Cartridge replacement will vary, depending on the contents of your particular feed source. In controlled environments with only oil and water in mixture, the cartridges could last indefinitely. In instances where there are a lot of suspended solids and viscous oils being treated, the cartridges may require replacement up to 4 times a year in the Coalescing unit and 2 times a year in the Polishing Unit.

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

The ROD Media cartridge in the Polishing Unit will need to be replaced when it starts releasing oil from its base, allowing a significantly higher than normal oil content in your treated water. Replacement frequency in the Polishing Unit generally depends on the percentage of oil content consisting of emulsions finer than 20 microns in the untreated water. These fine emulsions are coalesced in the Coalescing Unit but are still small enough to avoid being recovered as free-floating oil within that unit. They are only transformed into free-

floating oil once in the Polishing Unit, which will eventually saturate this unit's ROD Media cartridge entirely causing a need for replacement.

20. Why must the ROD Media cartridges in the Coalescing Unit be replaced more frequently?

Coalescing Unit cartridges are constantly being subjected to suspended solids and viscous oils which could cause fouling. Polishing Unit cartridges are downstream of those in the Coalescing Unit and therefore see much less of these potentially harmful substances.

21. What else could cause the ROD Media cartridges to foul?

Apart from compaction resulting from a build-up of solids and viscous oils on the ROD Media cartridge surface, there is very little that can harm the ROD Media. The only other factor to be considered is the PH level of the water. Extremely acidic or basic waters could cause damage. It is suggested that the COP-System not be used with water that is less than 2 PH or above 12 PH.

22. How difficult is it to change ROD Media cartridges?

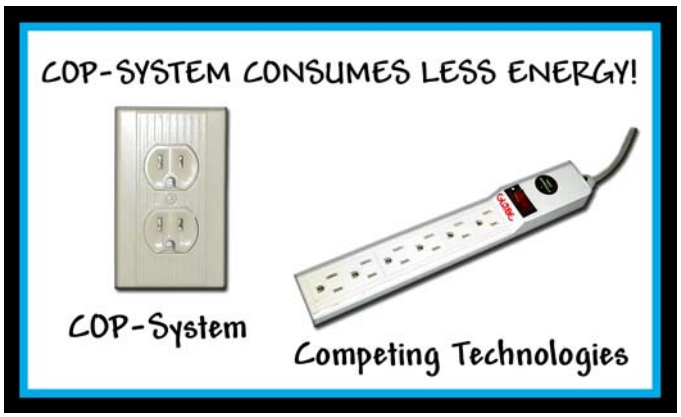
Our smaller units are quite simple to drain, open and close. Most vessel covers are hinged for easy access to the cartridge(s). Standard ROD Media cartridges are 10" in diameter and 40" in length. They weigh roughly 35lbs when dry and 90lbs when wet.

23. What happens to used ROD Media cartridges?

Because the cartridges and media will be saturated with oils, they must be treated as hazardous waste and disposed of according to your local, state, or national policies.

24. What type of pump should I use?

A progressive cavity pump is typically used as a feed pump. This type of pump is used to avoid emulsifying the oil any more than it already is prior to entering the COP-System.



25. Does the COP-System consume a lot of energy?

The COP-System is extremely energy efficient when compared to other separation technologies. The only power required is used for the operation of the feed pump and a few automatic valves. The COP-System can be custom designed to work with virtually any power supply.

26. Can the oil be re-used?

Recovered oil can be re-used or sold depending on the application. Much will depend on how pure the recovered oil must be. Process chemicals, suspended solids and water can all end up in the recovered oil, rendering it unfit for re-use. In the more ideal applications for the COP-System, revenue generated from recovered oil can often pay for the purchase of the COP-System in less than a few months.

27. Are there any other disposal fees?

Apart from the disposal of spent ROD Media cartridges, there are no other disposal fees. The COP-System works without the addition of any chemicals which means there will be no messy chemical sludge to clean up or dispose of. Even ROD Media cartridge replacement will cost only a fraction of what replacement generally costs with separators that make use of absorbents or activated carbon. ROD is not an absorbent; it is a self-cleaning media that has a much longer life cycle than any other known media.
If the COP-Systems recovered oil is unfit for re-use in your particular application it should not be difficult to find someone who could make use of it. In many cases, people who can make use of these types of “dirty oils” will collect the oil free of charge if you generate enough of it to justify sending a truck to your facility.

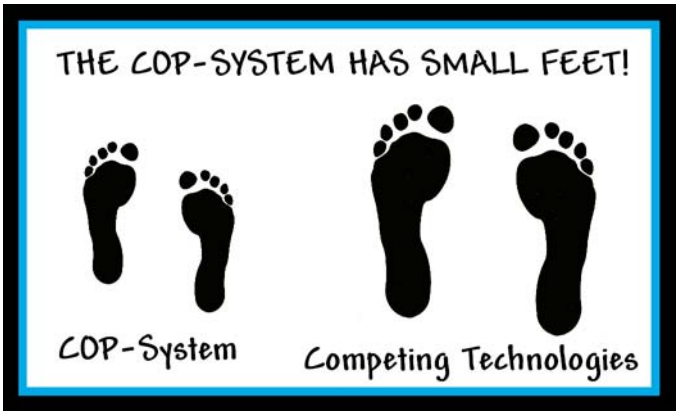
28. What other operating expenses can we expect?

Because there are very few moving parts, there is very little that can go wrong on a COP-System. Its design is very simple and will require virtually no replacement parts or maintenance.
Unlike DAF (Dissolved Air Floatation), IGF (Induced Gas Floatation) and hydro cyclone systems, there is never a need to add costly chemicals to the COP-System process in order to achieve optimal results. Not adding chemicals to the process will cut OPEX costs by not only saving you on the purchase price of the chemicals but also on the disposal fees associated with them.

The COP-Systems energy efficiency will also reduce operational expenses when compared to the above mentioned technologies. Compressors for injecting air & gases and huge motors to spin large vats of fluid at extremely high speeds amount to a lot of energy consumed. The COP-System is also more energy efficient than coalescers that make use of heat to speed up the rising velocity of dense oils like bunker fuel.
All of this amounts to one inexpensive separator to operate, even over lengthy periods of time. The only costs associated with the COP-System stem from ROD Media cartridge replacement and disposal fees and the amount of man hours required doing so.

29. How large is the COP-System's foot print?

The COP-System is extremely efficient for the space it occupies when compared with other oil separation technologies. It is this advantage that gives Separatech optimism about the COP-Systems potential in industries where space restrictions are always an issue. A few examples include offshore rigs, refineries and ship engine rooms.



Technologies	Size of the oil emulsion removed (micron)	Hydraulic Rate ($m^3/m^2.h$)	COP-SYSTEM Foot-Print Comparison
COP-SYSTEM	0.5	45	-
O/W Separators	150	5	9 times
Coalescers	50	5	9 times
DAF	0.5	10	4.5 times
Hydro cyclones	10	20	2.25 times
Centrifuges	5	20	2.25 times
GAC	≤ 5	10	4.5 times
UF	≤ 5	10	4.5 times

Note: a hydraulic rate of 10 m^3/m^2h means that a volume of 10 m^3 can be passed through 1 m^2 area within 1 hour.

30. How are solids removed from the system?

Heavy settle able solids should be removed prior to entering the COP-System. A standard Oil Water separator with a few minutes of residence time should be adequate. Smaller suspended solids will become coated with oil when being treated by the COP-System, making them lighter than water. As a result, the solids pass through the COP-System and are removed along with the recovered oil. In order to extend the longevity of the ROD Media, Separatech suggests removing TSS larger than 100 microns prior to entering the COP-System.