

## Oil Recycling Systems (ORS)

### INTRODUCTION

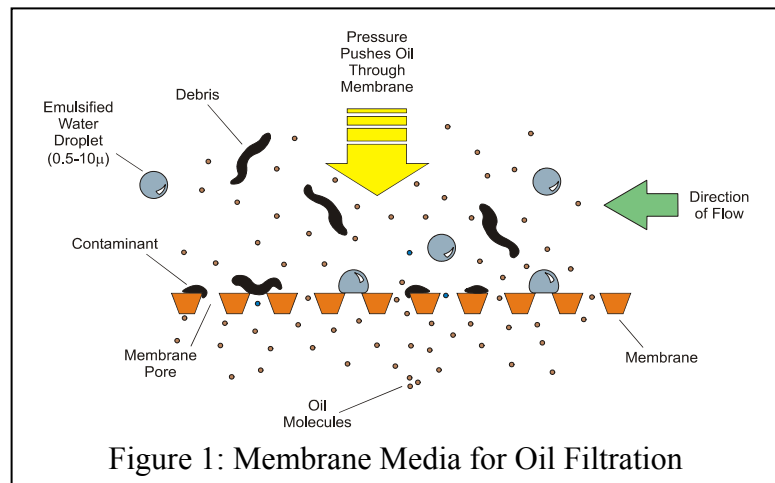
Lube oil contamination is generally recognized, evidenced by numerous tests and studies, to be responsible for the majority of machine wear. Consequently, it is imperative to have contaminations removed from any system as soon as possible. Other than common solid contamination, the lube oil for the journal bearings, transmission gears, and fluid drives of high speed rotating machines, such as boiler feed pumps, are prone to water contamination. This is especially true when leakage occurs in the pump stuffing box or steam seal system in a steam turbine driven unit. Water causes the loss of lubricating integrity of the lube oil, and the corrosion of mechanical components in high speed rotating machinery. However, separating free and emulsified water from the lube oil is much more difficult than removing debris due to the high viscosity of the lube oil.



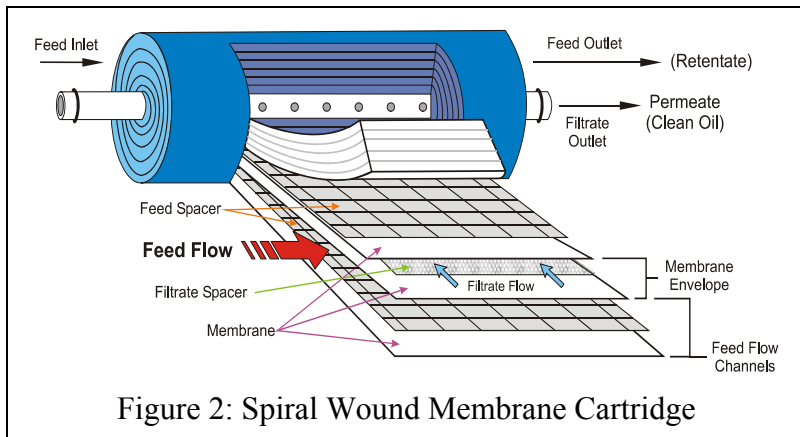
Traditional equipment used for oil purification includes coalescing filters, centrifugal purifiers, and thermal vacuum systems. Coalescing filters are not effective for water separation. Centrifugal purifiers and thermal vacuum systems may be effective, but both have a very high cost of ownership from the capital outlay to maintenance and operation. The state of the art lube Oil Recycling System (ORS) from FSI provides affordable and effective performance in water/debris separation.

### DESCRIPTION

The ORS system was originally designed for US Navy shipboard lube oil and hydraulic oil systems. It was designed to remove water and debris from a vast variety of oils. The system can handle oil with up to 20% free or emulsified water content to generate clean oil with less than 50 ppm water and 0.2 ppm suspended solids in a single pass. The cleanness of the filtered oil can reach the super cleaning level of ISO 13/08. The water/debris/oil separation is accomplished using a proprietary water-selective membrane (as shown in Figure 1) with a spiral wound cartridge design, as shown in Figure 2.



The spiral wound membrane cartridge design has two major benefits: 1) high surface-to-volume ratio, which means that the spiral wound membrane cartridge contains highly packed membrane media while occupying minimum space, 2) self-cleaning capability to extend the membrane cartridge service life by a cross-flow sweeping on the membrane surface. This cross-flow, generating hydraulic shear force on the membrane surface, carries any debris and free or emulsified water away from the membrane cartridge. The spiral wound membrane cartridge is installed in a tubular filter housing, which is made from standard schedule pipe. Both plastic and metal filter housings are available.



The ORS filtration system is self-contained and skid mounted. It can be constructed as a portable or stationary unit. The system consists of a prefilter, membrane filters, a pump, a water-settling container, an automatic power control system and a performance monitoring system. The prefilter is a regular particulate filter cartridge, used to remove dirt down to 10 micron in size. The water-settling container, which is used to collect any water removed from oil, is equipped with an automatic water level detector, alarm and manual water drain valve. As an option, an electric heater can be added if a constant temperature is required. The material of the major components in the system is 304 stainless steel. Fittings and piping are 304 stainless steel, bronze or brass.

## BENEFITS

The benefits of the ORS are

- 1) Eliminating the frequency of lube oil replacement and thus reducing maintenance and operating costs
- 2) Preventing unscheduled shut down
- 3) Extending the service life of the bearings and gears in a high speed rotating machine
- 4) Reducing waste oil volume and thus minimizing storage and process problems
- 5) Superior separation efficiency compared to coalescing filters
- 6) Lower overall cost of ownership than centrifugal purifier or vacuum system