

# Membrane Dehydrator FAQ

Q. How is water getting into my lubricant?

A. The most common routes of water ingress are:

- Worn stern tube seals.
- Condensed water on oil storage tanks caused by tank “breathing” at night.
- The dynamic water pressure outside the vessel exceeding the static oil pressure of a given seal.
- Slight bending of the propeller shaft creating a small gap where water can enter.
- Particle contamination from improper filtration of lubricant. Some seals can lose performance even with particles around 1 um in size.

Q. How much water can my oil hold?

A. It depends on many factors, including:

- The type of oil: Mineral oils can dissolve around 0.1% water before free water starts to form whereas esters can dissolve up to 5% water.
- Temperature: the warmer the oil the more water it will dissolve.

Q. How do I know if water is in my oil?

A. Outside of reduced system performance, the appearance of the oil itself is a good indicator if water is present. Water can appear as:

- Emulsified water: Oil will be cloudy/milky instead of its original amber color. You may be able to see small water droplets dispersed in the oil.
- Free water: Large drops of water or entire layers of water will separate from the oil. At this point the oil is heavily contaminated with water.

NOTE: Even if the oil looks dry it can still contain dissolved water that can damage your gears and hydraulic lines just as much as emulsified and free water.

Q. What kinds of technologies are available that can remove the water from my oil?

A. See table on third page of this document.

Q. The Phoenix Dehydrator sounds like the best option. What kinds of oil reservoirs can the unit dry?

A. For normal water ingress rates the Phoenix line can dry reservoirs up to 600 gallons. The unit can dry even larger volumes for cases of low water ingress

Q. How many options are in the Phoenix line?

A. There are two sizes: the C1 (small) and the C4 (large). The performance characteristics of the C1 and C4 units are described in the table below. In addition, it is possible to get the smaller version without an external pump for oil reservoirs with continually circulating oil. We call this option the “Mini”. Finally, it is also possible to obtain explosion-proof versions of both the C1 and C4 for areas where explosions can be an issue (e.g. refineries).

Q. What do I need on my ship to run the Phoenix?

A. The Phoenix units only require a 110 or 220 V power supply.

**Q. How much power?**

**A. Under max amp draw the small unit and large units require 1.5 and 2 kW, respectively.**

**Q. What else do I need to know about the Phoenix?**

	Small Unit	Large Unit
Dry Weight	180 lbs*	250 lbs
Max Amp Draw	7 Amps	10 Amps
Footprint	2.6 ft <sup>2</sup>	3.9 ft <sup>2</sup>
Unit Height	4'2" *	4'2"
Max Oil Reservoir Size	150 gal**	600 gal**
Max Free Water Removal	1 L/day	3 gal/day
Pumping Rate	1 GPM	4 GPM
Max Oil Viscosity	3000 cSt	3000 cSt
Min Oil Viscosity	10 cSt	10 cSt
Max Operating Temp	190°F (88°C)	190°F (88°C)
Minimum Operating Ambient	190°F (1/2°C)	190°F (1/2°C)
Max Inlet Pressure	10 psig	10 psig
Min Inlet Pressure	10" Hg	10" Hg

\*Mini version is 2' tall and 55 lbs      \*\*Can be higher depending on water ingress rate

**Q. What happens to the water that is removed from the oil?**

**A. The moisture is removed as clean water vapor with negligible contamination and is safe to vent to the surrounding air.**

**Q. Will the membrane remove the additives from my oil?**

**A. No, the membrane will only pull the unwanted water from the oil.**

**Q. How much water does the membrane remove from the oil?**

**A. The small unit can remove up to 1 L per day while the large unit can remove up to 3 gallons per day.**

**Q. How frequently do I need to dehydrate my oil?**

**A. High water ingress rates, large oil reservoirs, and super-dry oil specifications will require more frequent drying.**

**Q. What kinds of oils can the Phoenix process?**

**A. The Phoenix is capable of drying all types of oils used in marine applications including traditional mineral oils, synthetic esters, phosphate esters, vegetable-based oils, polyalkylene glycols (PAGS), and poly-alpha-olefins (PAOs).**

**Q. Do I have to wait until drydock to use the Phoenix?**

**A. No, the unit operates in a kidney loop fashion and only processes a fraction of the oil held in the reservoir at any given time.**

**Q. Where can I purchase the Phoenix membrane dehydrator?**

**A. You can purchase the Phoenix directly through CMS.**

Drying Technology	Removes			Advantages	Drawbacks
	Free Water	Emulsified Water	Dissolved Water		
<b>MEMBRANE DEHYDRATOR</b>	x	x	x	<ul style="list-style-type: none"> <li>• Small footprint</li> <li>• No membrane change-out required</li> <li>• Low maintenance costs.</li> <li>• Works on-line</li> </ul>	<ul style="list-style-type: none"> <li>• Requires filtration of lubricant to remove particulate</li> </ul>
Vacuum Dehydrator	x	x	x	<ul style="list-style-type: none"> <li>• Removes most of dissolved water</li> <li>• Removes low-boiling impurities</li> </ul>	<ul style="list-style-type: none"> <li>• Bulky and difficult to use on board</li> <li>• Foaming issues</li> <li>• Long process times</li> </ul>
Air Stripper	x	x	x	<ul style="list-style-type: none"> <li>• Cheaper to maintain than vacuum dehydrator</li> <li>• Also removes gaseous hydrocarbon impurities</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive purchase cost</li> </ul>
Centrifuge	x	x		<ul style="list-style-type: none"> <li>• Removes other contaminants</li> <li>• Short process times</li> <li>• Can dry large oil reservoir volumes</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive</li> <li>• Inefficient with heavier gear oils</li> <li>• High maintenance costs</li> <li>• No dissolved water removal</li> </ul>
Adsorption filters	x	x		<ul style="list-style-type: none"> <li>• Also removes solids.</li> <li>• Efficient for low levels of water ingress</li> </ul>	<ul style="list-style-type: none"> <li>• Requires frequent change-out of filter element</li> <li>• Inefficient for large systems/high water ingress</li> <li>• No dissolved water removal</li> </ul>
Gravity	x			<ul style="list-style-type: none"> <li>• Simple and cheap</li> </ul>	<ul style="list-style-type: none"> <li>• Only takes out free water</li> <li>• Long process times</li> </ul>
Heat	x			<ul style="list-style-type: none"> <li>• Simple, can be paired with gravity draining system</li> </ul>	<ul style="list-style-type: none"> <li>• Only takes out free water</li> <li>• High temperatures can damage oil</li> </ul>