

# Drying EALs

*"The real challenge with environmentally acceptable lubricants is water."*

- Ed Guevara, US Coast Guard, Lubrication program manager and user of CMS dehydration system



*"I used to have to buy expensive filters weekly to manage the water in my system. The CMS system has eliminated that cost."*

- Inland marine vessel user of CMS dehydration system

Remove free, emulsified, and dissolved water from EALs

#### EFFECTIVE

Maintains extremely low moisture levels, working inline while vessels are at sea. Removes water without depleting performance additives.

#### EASY TO USE

Simple, reliable, portable, and lightweight system with low energy usage, requiring only a common 120 or 220 volt connection. Fits through ship hatches and down steps by one person.

#### LOW COST

Low operational costs, competitive capital costs, and the ability to service multiple applications in rotation.

## WATER MANAGEMENT IS IMPORTANT

Hydraulic systems, bearings, and gears perform poorly and fail early from free, emulsified *and dissolved water* in lubrication systems.

High concentrations of water, even in dissolved states, pose an engineering and asset risk to mechanical components, as well as additional costs for downtime, maintenance, and replacement.

Reducing water concentrations and maintaining low levels of water in lubricating oils is critically important.

Managing dissolved water is a growing concern in marine lubrication, with the adoption of EALs, which are hygroscopic, attracting a high concentration of water, even in dissolved states.

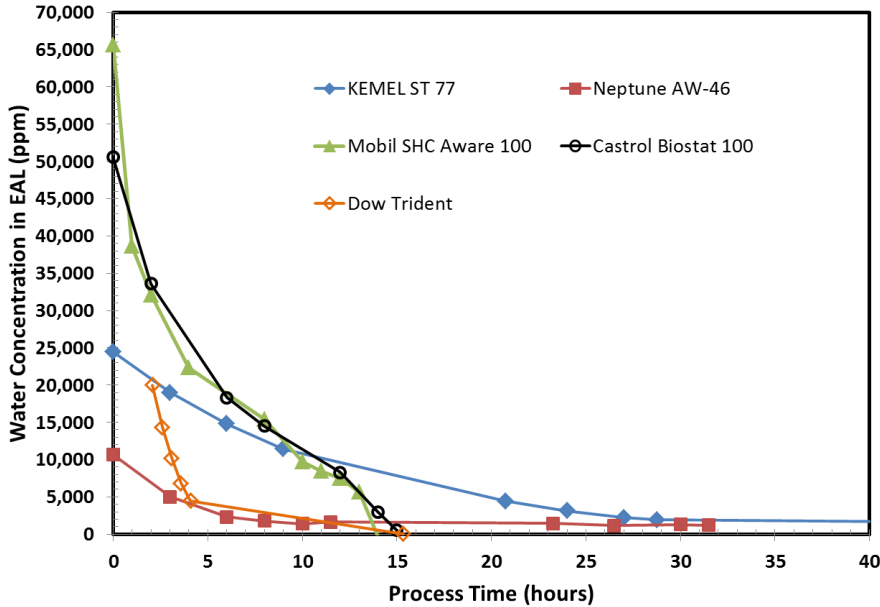
Esters, in particular, run additional risks of acid buildup in the presence of water. These design features create operational challenges as they address an environmental concern.



Compact Membrane Systems

# Proven performance

Laboratory testing shows rapid and continuous dehydration of commercially available EALs



- Dehydration using CMS system is effective on all chemistries on which it was attempted
- After loading to observed saturation level, EALs were dehydrated at room temperature
- In practice, dehydration would be done in-line, maintaining a very low water level over time

## HOW IT WORKS

### MEMBRANE TECHNOLOGY

CMS technology consists of a compact novel membrane-based system to dewater lubricating oil in real time.

### PERFORMANCE

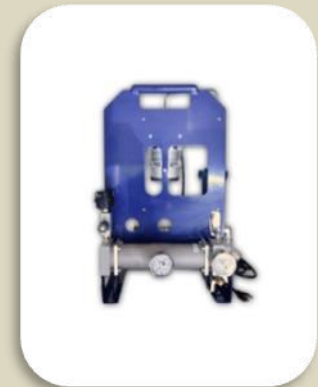
Demonstrated in controlled as well as in industrial environments and has been shown to remove virtually 100% of free and emulsified water, reduce dissolved water to well below 100 ppm. Reduces acid (TAN) in esters and reverses the acidification process.

### EXPERIENCE

Tested on over 20 lubricants, including different types of EALs (vegetable oil, PAG, Esters) as well as traditional mineral oils.

Currently operating successfully in demanding commercial environments (e.g., ice breaker)

## PRODUCTS FOR MULTIPLE SYSTEMS



Process 1 to 6 gallons per minute, for systems from 30 to over 2000 gallons

## ABOUT COMPACT MEMBRANE SYSTEMS

CMS is an advanced materials company, developing state of the art membrane technology and products for use in a variety of industrial applications. Compact Membrane Systems enables its customers to operate more efficiently and safely with increased uptime, lower costs, and a better environmental footprint

