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Best Practices in Choosing and Maintaining EALs for Marine Applications

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With the U.S. Environmental Protection Agency's Vessel General Permit (VGP) regulations in place for several years now and Small Vessel General Permit (sVGP) poised to expand these regulations to new classes of vessels, marine operators have embraced the use of environmentally acceptable lubricants (EALs) and become familiar with the inherent environmental and performance benefits of switching from conventional lubricants. However, there is still a great deal of confusion in the marketplace surrounding EAL choice and maintenance. It's important for operators to educate themselves on which type of EAL is best suited to different applications and strategies for maximizing ROI and equipment life.

The EPA recognizes four types of EALs. While all meet requirements, these lubricants vary widely in terms of suitability for different applications, performance characteristics, and fluid life, among other considerations. While all EALs offer the advantage of being high viscosity index lubricants (High-VI), it is important to understand the relative advantages and disadvantages of each type, based on its chemical composition.

VEGETABLE OILS (HETG) - Also known as triglycerides or natural esters, HETGs provide very good wear properties and are compatible with most seals and hoses, but are not as well suited to high temperature applications as other EALs. They are also more susceptible to hydrolysis in the presence of water and have a shorter lifespan than other EALs. They are best suited to land-based applications with scheduled change-out intervals.

SYNTHETIC ESTERS (HEES) - Esters are synthesized by the reaction of an alcohol with an acid. This reaction process allows for the flexibility to customize the type of ester used for a particular application. Generally, HEESs offer high performance, good oxidative and thermal stability and corrosion prevention, but they can be prone to hydrolysis in the presence of water. They work well in a wide range of land and marine applications with scheduled change-out intervals.

POLYALKYLENE GLYCOLS (HEPG) - Made of synthetic, petroleum based oil, HEPGs are created by the polymerization of ethylene or propylene oxide. HEPGs are designed to be water soluble, but this water solubility may increase toxicity. They are well suited to operate in high and low temperatures, and they have strong fire-resistant properties, which make them an excellent choice for volatile environments. HEPGs are typically recommended for use in a wide range of both land and marine applications with scheduled change-out intervals. On the downside, they are typically not derived from a renewable resource,and are not compatible with other mineral oils and EALs.

CHOOSING WISELY	HETG	HEES	HEPG	HEPR	STANDARD PETROLEUM
Readily Biodegradable	Yes	Yes	Yes	Yes	No
Ecotoxicity	Low	Low	Low*	Low	High
Bioaccumulation Potential	No	No	No	No	Yes
Sheen	No	No	No	No	Yes
Seal Compatibility	Good	Good	Poor	Good	Good
Wear Performance	Very Good	Very Good	Very Good	Very Good	Very Good
Oxidation Performance	Poor	Good	Very Good	Very Good	Very Good
Low Temperature Performance	Poor	Very Good	Very Good	Very Good	Poor
Viscosity Index	Very Good	Very Good	Very Good	Very Good	Poor

*Solubility may increase the toxicity of some PAGs

POLYALPHAOLEFINS (PAOS) AND RELATED HYDROCARBON PRODUCTS (HEPR) - HEPRs are synthesized hydrocarbons traditionally derived from crude oil meant to provide a low viscosity base oil that is readily biodegradable. However, more recently, HEPR type base stocks from renewable sources have been developed. HEPRs are highly durable and offer extended wear protection and fluid life, making them an ideal choice for equipment whose fluid cannot easily or frequently be changed.

Emulsifying vs Demulsifying Fluids

Another critical decision factor in EAL choice is how the lubricant interacts with water. While some operators choose to use emulsifying fluids that can essentially absorb this water, recent studies have shown that the presence of water in the system, even if it has been emulsified, serves as a catalyst for oxidation and hydrolysis These same studies suggest that the use of demulsifying EALs have the potential to greatly extend equipment service life and performance. Like conventional oil, HEPRs have the best demulsifying properties.

Maximizing ROI

Choosing the right EAL is only half the battle; measuring the effectiveness of your chosen lubricant and instituting a proper maintenance regime is essential to ensuring performance, protecting your equipment and getting the most for your money.

Maintenance Protocols

In addition to establishing performance benchmarks, logging issues and causes of downtime, making timely repairs and establishing a regular change out schedule, cleanliness control is one of the single most important aspects of effective lubricant maintenance. To ensure cleanliness and avoid contamination, refill or dispense only from clean, sealed containers. It's also important to follow OEM recommendations, establish a set protocol and document all maintenance, including fluid top-offs.

TOP TIPS on Switching Fuels in ECAs

EXXONMOBIL has compiled five 'top-tips' to help vessel operators effectively switch fuels when entering and exiting Emission Control Areas (ECAs) without introducing maintenance issues. Typically, inadequate management of the fuel switchover process can increase the risk of thermal shock to engine components, which can result in fuel pump seizures and engine shutdowns.

ExxonMobil advises operators to consider the following fuel switching tips:

HAVE A CLEAR SWITCHOVER PROCEDURE: It is important to ensure that the crew is familiar with the process. As an additional safety measure, the procedure should be tested prior to entering crowded and restricted channels.

OUTLINE THE BEST TIME TO SWITCHOVER: The optimal switchover period is unique for each vessel and operators must allow sufficient time for the system to be flushed of all non-compliant fuel before arriving at an ECA.

AVOID HAZARDS; KNOW THE CORRECT TEMPERATURE & VISCOSITY: The appropriate temperature must be achieved to ensure that the optimum viscosity at the injectors is reached. HFO is injected at ~130°C and MGO needs to be cooled to ~30°C in order to reach the correct viscosity.

UNDERSTAND COMPATIBILITY: In order to understand if fuels are compatible, an industry-standard spot test can be carried on-board or a more thorough compatibility test can be requested from a reputable testing laboratory.

CHOOSE THE CORRECT LUBRICANT: Cylinder oils need to be sufficiently alkaline to neutralize any corrosive acidic sulphur in the fuel. However, when less sulphur is present, less sulphuric acid is produced. Too much alkalinity in the cylinder oil can lead to liner wear, while too little increases the risk of acid corrosion. When burning low-sulphur fuels in slow-speed engines, it is recommended that a lower base number lubricant be used.

In addition to these top-tips, ExxonMobil has developed two ECA category fuels, ExxonMobil Premium AFME 200 and ExxonMobil Premium HDME 50, to help operators comply with ECA requirements safely.

Oil Analysis

Another critical component of maintenance is the laboratory analysis of a lubricant's properties, suspended contaminants and wear debris to provide a snapshot of how fluids and equipment are performing. By tracking oil analysis sample results over the life of a machine, trends can be established which can help extend equipment, eliminate costly emergency repairs and increase uptime, resulting in cost savings.

USE THE DATA – Failing to take appropriate recommended maintenance actions can be very detrimental, but use common sense to ensure that the suggested action is practical and cost effective and examine possible alternatives.

If you have questions about choosing the right EAL and maintenance practices for your operation, application and needs, the best place to start is to contact your OEM and possible vendors. *www.rscbio.com.*