

MITIGATING RISK, REAPING REWARDS

**Achieving Sustainable Operations
Through the Use of Environmentally
Acceptable Lubricants**

By: Mark Miller, Executive Vice President, RSC Bio Solutions



The marine industry continues to evolve. In addition to changing equipment needs and trends, there is an increasing need to utilize safer, more environmentally friendly products to meet industry regulations. In addition to their positive impact on the environment, readily biodegradable fluids and lubricants result in lower cleanup costs, fewer fines, and less downtime. This means that they can help to lower overall cost of operation—making them an attractive choice for many marine operations.

Within the marine industry, there are a variety of components that require lubricants, oils, or greases to function properly. Marine vessels, for example, contain bow thrusters, stabilizers, stern tubes, continuous pitch propellers, deck hydraulic equipment (winches and cranes), stern and elevator ramps, water-tight doors, and even anchor equipment. For the dredging industry, relevant equipment includes hopper dredgers, portable hydraulic dredgers, and mechanical dredgers. Each equipment type requires high-performing hydraulic fluids to operate successfully, but operators must also minimize the potential environmental and fiscal impact of equipment leaks and the accompanying public scrutiny that can follow. These challenges are further complicated by potential governmental regulation.

Operators can utilize a variety of environmentally friendly products to reduce not only the risk of environmental damage, but also the corresponding fines and cleanup costs. In a world where everything is labeled “green,” however, they may be unable to determine the best products from an environmental and performance standpoint. The decision to utilize products for risk mitigation should not be made exclusive of their performance and technical feasibility. Because of the close ties between sustainable and technical needs, it is critical to every operator’s bottom line and operational success to understand environmentally acceptable lubricants (EALs) in order to select the product that is best suited for their application.

The Legislation Surrounding EALs

An increasing number of operators recognize the benefits of EALs and have converted from petroleum-based products, but for those who are not using EALs, there is mounting pressure from the U.S. government to utilize these environmentally preferable products.

The Clean Water Act (CWA) of 1972 is the principal federal statute protecting navigable waters and adjoin-

ing shorelines from pollution. The CWA forms the foundation for regulations detailing specific requirements for pollution prevention and response measures. Section 311 of the CWA addresses pollution from oil and hazardous substance releases, providing the U.S. Environmental Protection Agency (EPA) and the U.S. Coast Guard with the authority to establish a program for preventing, preparing for, and responding to oil spills that occur in navigable waters of the United States. The EPA implements provisions of the CWA through a variety of regulations, including the National Contingency Plan and the Oil Pollution Prevention Regulations.

The 2013 Vessel General Permit (VGP) enacted by the EPA requires all vessels to use EALs in all oil-to-sea interfaces unless technically infeasible. The regulation is applicable to all commercial vessels larger than 79 ft, operating within 3 nmi of either the U.S. coastline or any one of the Great Lakes. The pending 2014 Small Vessel General Permit (sVGP) for non-recreational or non-military vessels less than 79 ft in length that are operating as a means of transportation will require compliance beginning 19 December 2017.

Finally, under the legal authority of the CWA, the Discharge of Oil Regulation, more commonly known as the “sheen rule,” provides the framework for determining whether an oil spill to inland and coastal waters and/or their adjoining shorelines should be reported to the National Response Center. Specifically, the regulation requires the person in charge of a facility or vessel responsible for discharging oil that may be “harmful to the public health or welfare” to report the spill to the federal government. The regulation also establishes the criteria for determining whether an oil spill needs to be reported.

The criteria for reporting are as follows:

- Discharges that cause a sheen or discoloration on the surface of a body of water;
- Discharges that violate applicable water quality standards;
- Discharges that cause a sludge or emulsion to be deposited beneath the surface of the water or on adjoining shorelines.

Discharges of petroleum-based lubricants trigger these reporting requirements. In some cases, discharges of EALs do not require the same reporting as petroleum-

based lubricants under CWA regulations (operators should check with local authorities for specific requirements) and, in cases where reporting is still needed, fines and remediation costs are often significantly reduced for operators using EALs.

In addition to the CWA, there are two pieces of legislation that designate preference to environmentally friendly products. The Farm Security and Rural Investment Act of 2002, otherwise known as the “Farm Bill,” was signed into law in May 2002. It requires all federal agencies to give procurement preference to biobased products. The language in Title IX, Section 9002 states, “...each Federal agency which procures any items designated in such guidelines shall, in making procurement decisions, give preference to such items composed of the highest percentage of biobased products practicable, consistent with main-

taining a satisfactory level of competition, considering such guidelines.” Additionally, Executive Order 13101 (The Greening of the Government), signed by President Clinton in 1998, calls for federal agencies and federally funded state agencies to purchase environmentally preferable and, specifically, biobased “products and/or services that have reduced effect on human health and the environment when compared with competing products or services.”

The Definition of EALs

With the increased focus on sustainable operations, many products claim to be “green” in an attempt to take advantage of companies’ desires to reduce their impact on the environment. Many of these products, however, fall short on performance or sustainability requirements—not meeting either regulatory standards or performance needs.



Simply claiming a product is biodegradable means very little in terms of its realistic impact on the environment. In fact, oil and other products that are potentially harmful for the environment are technically biodegradable, referred to as “inherently biodegradable”—they just take a long period of time. Biodegradation is when a given substance or fluid’s chemical bonds break apart into its component parts. Petroleum-based products have a high level of persistence (i.e., are not rapidly biodegradable) in the environment and provide a greater opportunity for bioaccumulation from organisms. Bioaccumulation occurs when an organism takes in a toxic substance faster than the substance goes away.

The important factor is not whether something is biodegradable but rather how long it takes to biodegrade. Technical terms like “inherently biodegrad-

able” and “readily biodegradable” are used to describe the rate and degree at which a substance or a fluid degrades and is broken up in the environment. A compound is considered inherently biodegradable as long as it shows evidence of biodegradation in any test for biodegradability. With no indication of timing or degree of biodegradation, these inherently biodegradable products can persist in the environment for years, continuing to cause substantial damage and requiring long-term remediation. Typically, these products are petroleum based, like conventional lubricants.

Readily biodegradable specifically defines a substance, fluid, or composition that will degrade 60% or greater within 28 days or less. This type of degradation is preferable because, in most cases, the fluid will degrade long before environmental damage has occurred. Because of this, little long-term bioremedi-



ation is required. There are several internationally recognized tests that confirm this degrading ability of a given product and allow companies to back up a readily biodegradable claim. In fact, the Federal Trade Commission (FTC) requires companies who use the term *readily biodegradable* in describing products to state the test (for example, “OECD 301B or ASTM D7373 compliant”) to validate the claim. Operators can learn a significant amount about a product’s effect on the environment simply by asking a few questions regarding the claims and statements made by a lubricant provider. The EPA defines an EAL as a “lubricant that is biodegradable, exhibits low toxicity to aquatic organisms, and has a low potential for bioaccumulation.”

The Categories and Technical Feasibility of EALs

According to International Organization for Standardization (ISO) standards for hydraulic fluids, there are four types of lubricant oils that offer a range of environmental benefits and performance attributes. Referencing ISO 6743-4, the main four ISO Classification of EAL types are as follows:

1. Vegetable oil-based (Hydraulic Environmental Triglyceride – HETG);
2. Polyalkylene glycol-based (Hydraulic Environmental Polyalkylene Glycol – HEPG);
3. Synthetic ester-based (Hydraulic Environmental Synthetic Ester – HEES); and
4. PAO and related types (Hydraulic Environmental PAO and others – HEPR).

Among EALs, there are a variety of performance levels. Many EALs can even meet ISO performance standards in the laboratory but may not perform well in a marine environment, forcing companies to choose between performance and sustainability. This tradeoff has been eliminated by some companies who are able to produce readily biodegradable products that meet or even exceed the performance of their petroleum-based counterparts. Marine original equipment manufacturers (OEMs) and hydraulic equipment suppliers continue to give approval to these products because they have successfully met or exceeded their extensive testing requirements.

Care must be taken in choosing the appropriate product for the specific application. Just as many would be EAL suppliers use misleading environmental claims such as “inherently biodegradable” or “food grade,” some suppliers can be intentionally vague or misleading about their product’s performance. Biobased lubricant suppliers should be able to support performance claims with testing data and real-world case studies. Performance data can include standard industry tests ASTM International, formerly known as the American Society for Testing and Materials (ASTM), field testing data and OEM tests or approvals.

Significant Marine Industry Field Experience

True proof of environmental sustainability and performance is found in the field. Any fluid supplier should be able to demonstrate the success of their product over time in a wide range of applications. It is important to partner with a fluid supplier with enough field and technical experience to provide a technically feasible EAL and then to support the product through an oil-monitoring program. A company’s expertise should not end at supplying the product, but they should be able to support their customers with a routine oil monitoring program and interpretation of results. Since readily biodegradable products behave differently than conventional petroleum products, one should not count exclusively on the conventional oil analyst’s interpretation of test lab results when comparing data. For example, routine oil sampling and analysis is offered as a service to customers of RSC Bio Solutions, a leading provider of EALs. Through the range of marine equipment in which the EnviroLogic® products are used as well as the extensive monitoring periods, this program has resulted in an expansive demonstration of the products’ performance in the marine industry.

RSC Bio Solutions has oil analysis data from 203 systems on 42 vessels representing 14 OEMs—totaling approximately 690 total combined years of service. The use of 11 different EnviroLogic lubricants and gear oils is represented in this data (see Figure 1, pg. 33). Since the start of the analysis in July 2004, there has never been an equipment failure related to EnviroLogic lubricant performance in any of these units or in any other application. Through the analysis of hours of real-world fluid performance, conclusions may be made about RSC Bio Solutions products. The products provide excellent

203

TOTAL SYSTEMS

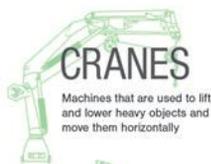
690

TOTAL YEARS IN SERVICE

6,123,240

TOTAL HOURS IN SERVICE

GENERAL DESCRIPTIONS



CRANES

Machines that are used to lift and lower heavy objects and move them horizontally



DECK HYDRAULICS

Hydraulically driven equipment that generally resides on the deck of a ship or vessel
Includes, but not limited to, hydraulic power units, mooring and windlass equipment



STERN TUBES

Circular bearings that support the propeller shaft of a vessel



THRUSTERS

Propulsion devices used on marine vessels or ships for maneuverability

Figure 1. Since analysis began in 2004, there has never been an equipment failure related to EnviroLogic lubricant performance in any of these units.

oxidative stability, meaning they are durable and can contribute to the extended life of equipment.

Additionally, due to their stable viscosity and the low levels of wear metals, the products offer continuous system protection. The EnviroLogic products have been widely proven across a range of applications and OEMs and demonstrate equal or superior performance to petroleum-based products, making them an ideal choice for a variety of marine systems.

Financial Analysis

RSC Bio Solutions and one of its drilling rig customers looked at the financial impact of converting from a traditional petroleum product to EnviroLogic® 3046 readily biodegradable synthetic hydraulic fluid in terms of four expense categories: 1) Regulatory fines; 2) Maintenance, repair, and operations (MRO) costs—mostly servo valve maintenance, downtime, and replacement; 3) Fluid cost at initial fill; and 4) Fluid top-up costs post initial fill. See Figure 2: Measured Savings.

Year 0 represents the operation before conversion. In Year 1, the company began using EnviroLogic 3046 hydraulic fluid. Initially top-up and MRO costs remained consistent, but there was an additional cost for the initial fluid change out. Downtime costs were reduced significantly due to a cleaner overall system with the EAL. This resulted in less servo valve sticking, which positively impacts the bottom line. In fact, according to a 2014 industry article, 1 hr of downtime

equates to more than \$15,000 in costs for an average floating rig operation.

Post-conversion, the company's fines related to spills and leaks were eliminated completely. An operation converting to EnviroLogic 3046 today may experience even greater savings as they could now incur additional fines from the U.S. EPA VGP that were not in place at the time of this conversion. Based on this analysis, the total measured savings from using an EAL like HEPR EnviroLogic 3046 can more than compensate for the initial fluid cost.

Spills and leaks of petroleum-based fluids can not only tarnish a company's reputation, but also lead to costly remediation from cleanup, potential regulatory fines, and equipment or employee downtime.

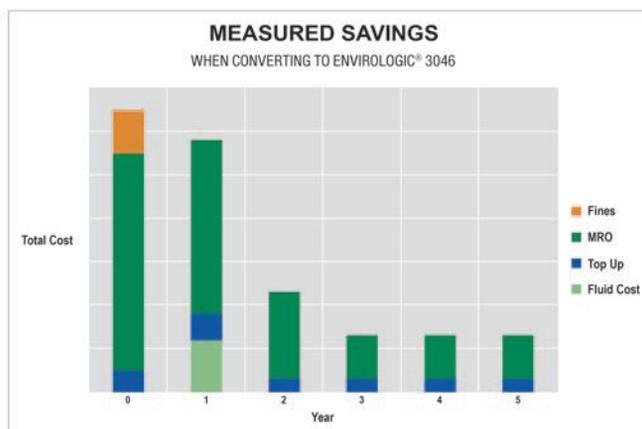


Figure 2. Measured Savings by Year.

The use of an EAL, however, can ensure regulatory compliance and a reduced risk of fines. Coupled with less downtime and better operational efficiency, proven readily biodegradable fluids can deliver both compliance and performance—attributes that contribute positively to a company's bottom line.

Mark Miller is executive vice president of business development for RSC Bio Solutions and was cofounder and CEO of Terresolve Technologies. Miller has a B.S. in chemical engineering from Tufts University and an M.B.A. from Manhattan College. He has engineered, sold, and marketed lubricants and lubricant additives for more than 30 years. For more information on RSC Bio Solutions, visit rscbio.com.