


your global specialist

A decorative graphic on the left side of the slide, consisting of a vertical strip with a diagonal white line. The background of this strip is a vibrant, abstract pattern of yellow and orange swirls, resembling oil or a microscopic view of a material.

Environmentally Acceptable Lubricants: Regulations, Applications, and Options

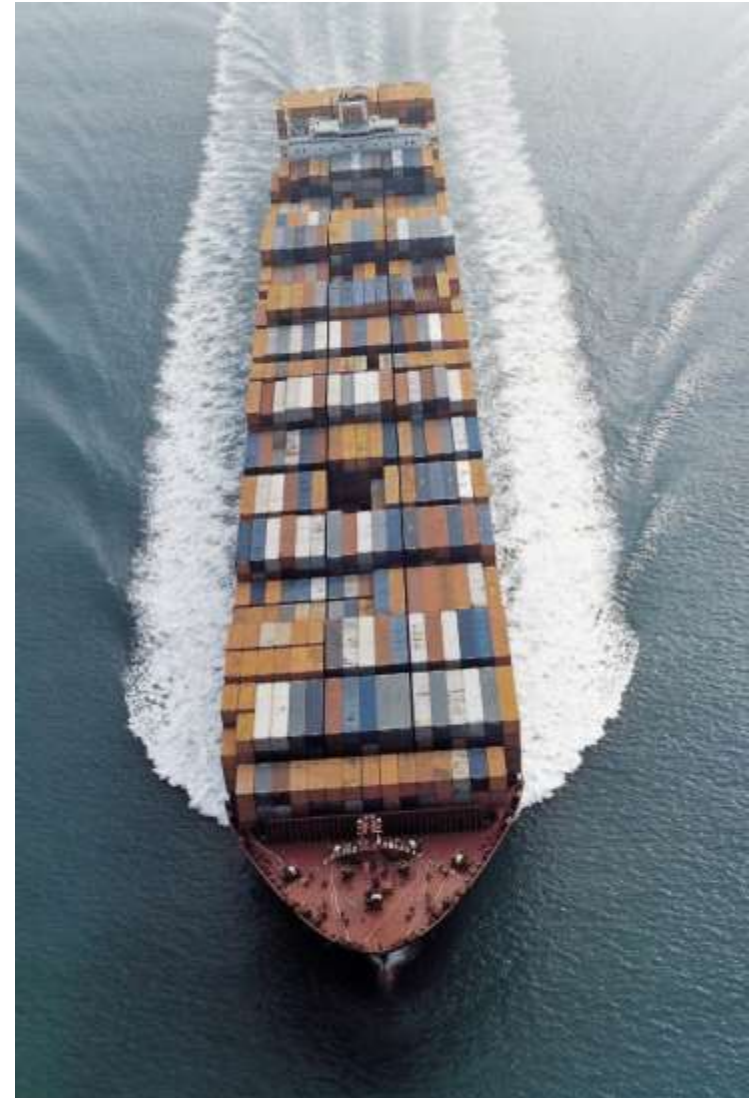
Green Boats and Ports for Blue Waters Workshop

URI GRADUATE SCHOOL OF OCEANOGRAPHY
University of Rhode Island, Narragansett, RI

April 8-9, 2014

Agenda:

1. Introduction: Klüber Lubrication
2. What is an Environmentally Acceptable Lubricant?
3. Regulatory review - EALs on large vessels
4. Regulatory review – EALs on small vessels and usage in ports and harbors.
5. EAL Applications – Oil-to-sea interfaces, lost in use, subject to emersion, high risk of spills
6. Alternative solutions
7. Suggestions for action
8. Questions



Our company.
Speciality lubricants for all industries

KLÜBER
LUBRICATION



What is an Environmentally Acceptable Lubricant

- The use of vegetable oils and animal fats for lubrication purposes has been practiced for thousands of years.



King Tut's Chariot: Circa 1300 BC

"The bearings are built exploiting the modern principle of a hard material against a soft material and by applying animal grease between the surfaces. The grease reduces friction and increases running duration,"

Alberto Rovetta, professor in robotics engineering at the Polytechnic of Milan



United States Environmental Protection Agency
Office of Wastewater Management
Washington, DC 20460

Environmentally Acceptable Lubricants

- “Environmentally Acceptable Lubricants means lubricants that are “biodegradable” and “minimally-toxic,” and are “not bio accumulative”
- Environmentally Acceptable Lubricant” include those labeled by the following **labeling programs**: Blue Angel, European Ecolabel, Nordic Swan, the Swedish Standards SS 155434 and 155470, Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) requirements, and EPA’s Design for the Environment (DfE).”

“[L]ubricants that may be expected to have desirable environmental qualities, but have not been demonstrated to meet [EAL] standards, are referred to as environmentally friendly lubricants”

Marketing Terms

- No Sheen
- White, Non-Toxic, Food Grade
- Ash-less formulation
- Reduces Energy consumption
- Highly Adhesive
- Plant Based
- Inherently Biodegradable

Beware of:



Environmentally Acceptable Lubricant Types

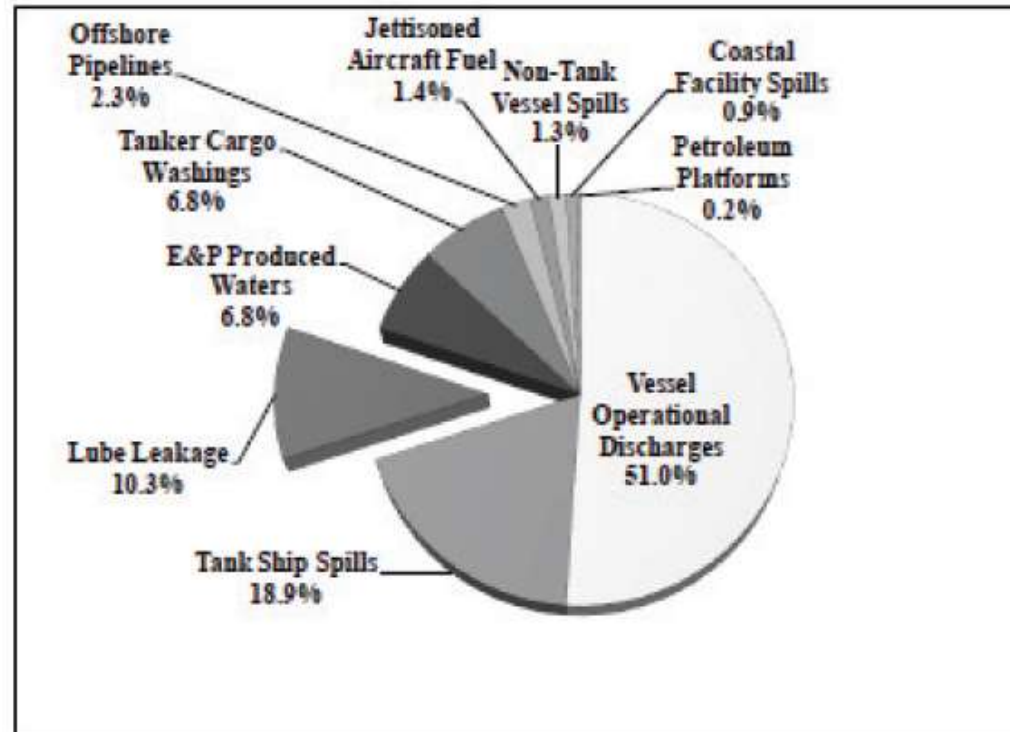
Lubricant base oil	Base oil source	Biodegradation	Potential for Bioaccumulation	Toxicity
Mineral oil	Petroleum	Persistent / Inherently	Yes	High
Polyalkylene glycols (PAG)	Petroleum - synthesized hydrocarbon	Readily	No	Low ^a
Synthetic Ester	Synthesized from biological sources	Readily	No	Low
Vegetable Oils	Naturally occurring vegetable oils	Readily	No	Low

Source: Mudge, 2010

a. Solubility may increase the toxicity of some PAGs

2013 Vessel General Permit – Game Changing Regulation

- Covers 28 discharges incidental to the normal operation of a vessel.
- Requires EAL in all oil-to-sea interfaces
- Between 36.9 and 1 million liters of petroleum lubricants leaked annually (Etkin, 2010)



Based on Etkin, 2010 and NRC, 2003

2013 VGP - Who is affected?



- Any owner or operator of a vessel being operated in a capacity as a means of transportation
- “waters of the United States”
- greater than 79 feet in length
- Vessels must submit a notice of intent to be covered by the VGP



- Any thru hull fitting or propulsion system with an oil-to-sea interface
- Equipment intended to be immersed in water
- EPA strongly encourages the use of environmentally acceptable lubricants in all above deck equipment

2013 VGP - When do vessels need to transition?

- 2013 VGP took effect on December 19, 2013
- Approved by the OEM
- Pre-lubricated – only until products are available
- Must be available in at least one harbor the vessel normally visits
- Vessel's next dry-dock – seals should be replaced unless technically infeasible



What about vessels under 79 feet?



- **Draft Small Vessel General Permit:** [A]ny non-recreational, non-military vessel less than 79 feet in length that is operating in a capacity as a means of transportation
 - **2.3 ENGINE AND OIL CONTROL** Unless technically infeasible, you must use environmentally acceptable lubricants (as defined in Part 6 of this permit) in all machinery and equipment, including but not limited to stern tubes, wires, and two-stroke engines, where discharges of oil to surrounding waters are likely to occur.
- **2008 Clean Boating Act:** The CBA requires EPA to identify discharges incidental to the normal operation of recreational vessels for which management practices are reasonable and practicable to develop.

Current rules on lubricants are associated with:

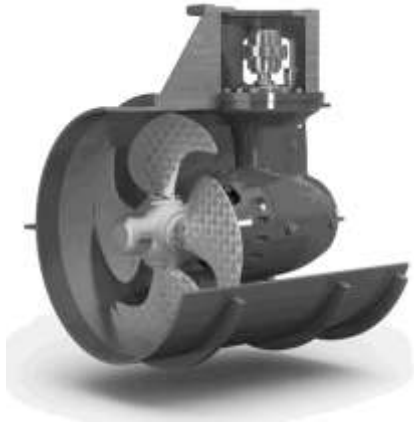
- Individual Permits
- General Permits
- Storm Water Pollution Prevention Plans
- Spill prevention and response
- Fuel Management

Additionally - Clean Harbor / Green Port Programs

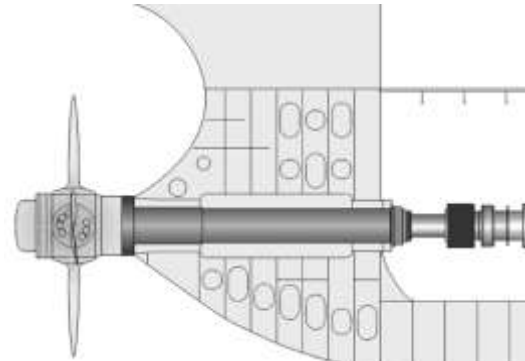
- Bio fuels
- Fueling Stations
- Geographic Response Strategies



Thrusters / Z-Drives / Pods



Stern Tube Seal System / CPP Propeller



Mechanical Equipment Subject to Immersion



Other oil-to-sea interfaces

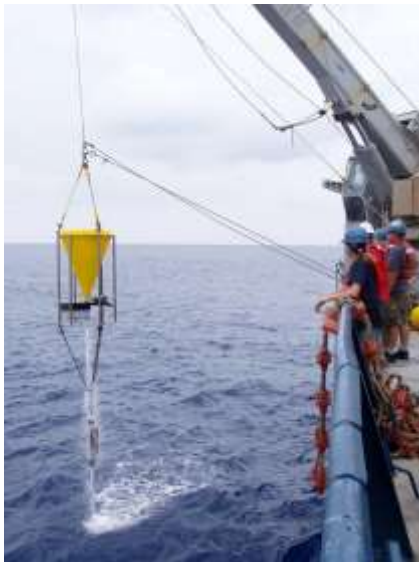


SVGP - Motor and Oil Control – Commercial Vessels

Two Stroke Engine Oils



Mounting Brackets / Grease



Wire rope



Dredging

Green Ports and Clean Harbor Plans – Lost in Use Applications / Accidental Spills

Hydraulic hoses / Chain Lubricants



Rail Grease



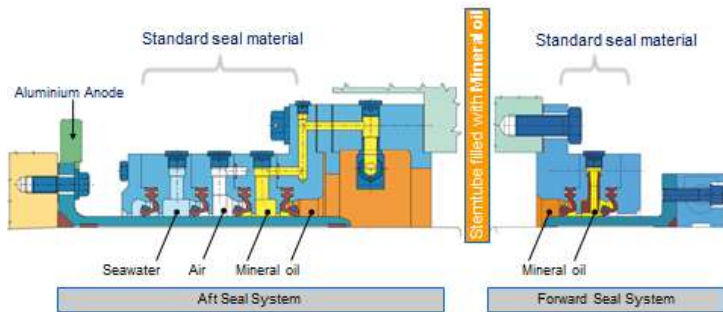
Gear lubricants / Wire Ropes



Air space seals

Non-oil-to-sea interfaces
Non-Pollution Simplex Airspace Assembly

- Possible use of mineral oil**
- Cathodic protection = Aluminium
 - Standard seal rings



Water Lubricated Bearings



Electric drive



- ✓ Have a transition plan by vessel
- ✓ Look for alternative solutions
- ✓ Go beyond the regulation in your clean/green plans
- ✓ Educate your vessel crews and your port visitors
- ✓ Promote use of EALs to customers
- ✓ Author study on lubricants lost in port/harbor operations

your global specialist



Thank you very much.

Discussion