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A close-up photograph of yellow oil being applied with a brush, showing thick, swirling, and textured strokes of the lubricant.

Environmental Management Plan: Lubricants

Greening the Research Fleet Workshop

January 10-11, 2012

Nicholas School of the Environment

Duke University, Durham NC

Environmental Management Plan: Lubricants

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Agenda:

1. Lubricant Usage on Vessels
2. The Clean Water Act and The Vessel General Permit
3. What is an “Environmentally Acceptable Lubricant”
4. Environmental Management Plan: Lubrication
5. Portfolio of Onboard Lubricants
6. Questions



Lubricating points on a typical offshore supply vessel.

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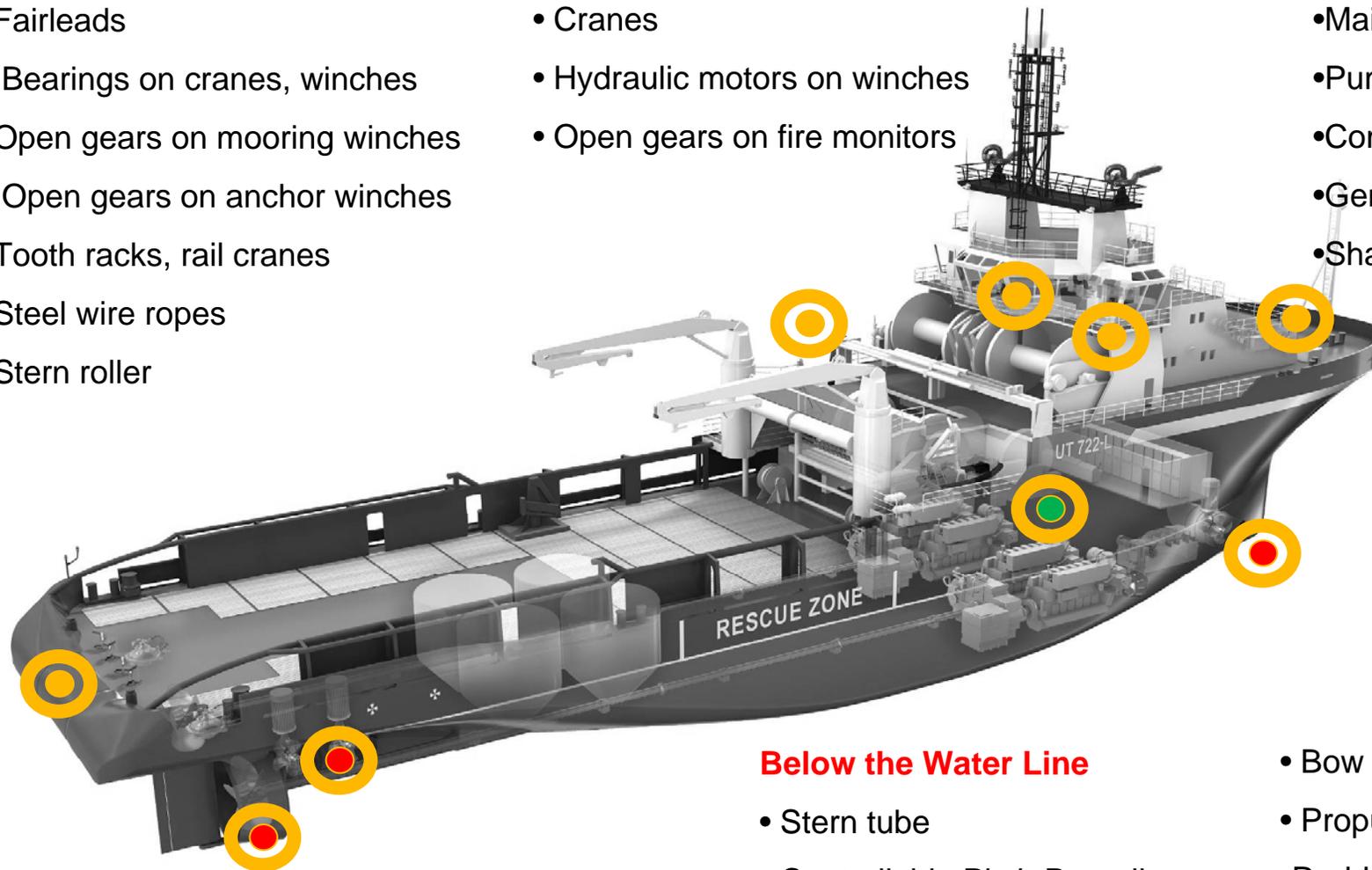
On Deck:

- Fairleads
- Bearings on cranes, winches
- Open gears on mooring winches
- Open gears on anchor winches
- Tooth racks, rail cranes
- Steel wire ropes
- Stern roller

- Cranes
- Hydraulic motors on winches
- Open gears on fire monitors

Below Deck:

- Main engines
- Pumps
- Compressors
- Generators
- Shaft Bearings



Below the Water Line

- Stern tube
- Controllable Pitch Propellers

- Bow / stern thruster
- Propulsion thruster
- Rudder Bearings

U.S Oil Spill Legislation and Regulation



Your lubricant choices and the your operational practices are influenced by the Clean Water Act:

- Discharge of any pollutant ... shall be unlawful. (Sec 301(a))
- No discharges of oil ... into or upon the navigable waters of the United States (Sec 311(b)(1))
- “Oil” means oil of any kind (Sec 311(a)(1))
- The Administrator [EPA] shall develop, promulgate, and revise ... regulations (Sec 311(b)2)(A)
- [M]ay be assessed a class I or class II civil penalty by the Secretary of the department in which the Coast Guard is operating or the Administrator (Sec 311(b)(6)(A))
- [T]he Administrator may, after opportunity for public hearing, issue a permit for the discharge of any pollutant... (Sec 402(a)(1))

U.S Oil Spill Legislation and Regulation



Oil pollution quantities are defined by regulation:

- Quantities that may be harmful are any discharge of oil that causes a film, sheen, sludge or emulsion (40 CFR 110.3)
- 40 CFR 110 is titled “Discharge of Oil” and is commonly referred to as the “sheen rule” because a sheen provides an indication that a discharge has taken place
- The definition of a sheen in 40 CFR 110 is “an iridescent appearance on the surface of the water.”
- Remember, a sheen is is not the only characteristic that triggers an incident (i.e. film, sludge, or emulsion)

The EPA's Vessel General Permit



Under §402 of the CWA, the EPA can in certain situations permit the discharge of pollutants.

- For marine vessels; incidental discharges of oil during normal operations is allowed as defined in the vessel general permit
 - Recognizes the loss of small amounts of lubricants into the marine environment through normal operations:
 - Mechanical equipment subject to emersion
 - Seepage of lubricants from machinery that have oil-water interfaces
 - Does not allow discharges of oil in quantities that may be harmful as defined in 40 CFR 110
 - Currently recommends the use of “environmentally preferable lubricants”, but does not define standards
 - A revised draft of the VGP was released on November 30, 2011 which proposes to make the use of “environmentally acceptable lubricants” lubricants mandatory in certain circumstances

Contents of Proposed VGP



The Proposed 2013 VGP was issued on November 30, 2011

- Affects vessels over 79 feet
- Takes effect on December 19, 2012
- Contains the following language regarding the use of lubricants:
 - “All vessels constructed **on or after December 19, 2013** must use an environmentally acceptable lubricant in all oil-to-sea interfaces. “Environmentally acceptable lubricants” means lubricants that are “biodegradable” and “non-toxic” and are not “bio-accumulative” as defined in Appendix A of this permit.”
 - “Controllable Pitch Propeller and Thruster Hydraulic Fluid and Other Oil-to-Sea Interfaces Including Lubrication Discharges from Paddle Wheel Propulsion, Stern Tubes, Thruster Bearings, Stabilizers, Rudder Bearings, Azimuth Thrusters, Propulsion Pod Lubrication, and Wire Rope and Mechanical Equipment Subject to Immersion”

Environmental Terminology



So, what is an “Environmentally Acceptable Lubricant”

Non-toxic, Non-bio-accumulating, and Biodegradable

- **Primary biodegradation.** is the alteration in the chemical structure of a substance, brought about by biological action, resulting in the loss of a specific property of that substance.
- **Ultimate biodegradation (aerobic)** is the level of degradation achieved when the test compound is totally utilized by microorganisms resulting in the production of carbon dioxide, water, mineral salts, and new microbial cellular constituents (biomass).
- **Inherently biodegradable** is a classification of chemicals for which there is unequivocal evidence of biodegradation (primary or ultimate) in Any test of biodegradability.
- **Readily biodegradable** is an arbitrary classification of chemicals which have passed certain specified screening tests for ultimate biodegradability; these tests are so stringent that it is assumed that such compounds will rapidly and completely biodegrade in aquatic environments Under aerobic conditions.

Appendix A of the Proposed VGP



With the issuance of the Proposed VGP, the EPA for the first time has provided guidance on what they consider an environmentally acceptable lubricant.

- “Bio-accumulative” using test Methods OECD 117 and 107
- “Biodegradable” acceptable test methods include: OECD Test Guidelines 301 A-F, 306, and 310, and International Organization for Standardization 14593:1999
- “Non-toxic” means a substance must pass both OECD 201 , 202, and 203 for acute toxicity testing, and OECD 210 and 211 for chronic toxicity testing

Environmentally Marketing Claims



Existing products that claim to be “Environmentally Safe” can now be judged against specific criteria.

- “No-Sheen” lubricants that are promoted as “inherently biodegradable” should be questioned
- “Food Grade” oils and greases may not meet the testing standards for bio-accumulation or chronic toxicity
- Oils and greases with a specific gravity > 1.0 will not be allowed in unless they also achieve the environmental standards

Environmental Management Plan: Lubricants



- 1. Determine which lubricants by application must meet defined environmental standards:**
 1. Separate your lubricants by the location in which they are used...
 1. Captured use below deck
 2. Captured use above deck or below the water line (but susceptible to accidental discharge)
 3. Lost in use (above deck and below the water line)
 2. Determine the regulations that apply and the standards that must be met for the transit areas.
 1. US Federal
 2. International IMO
 3. Local
 3. Apply your organizational values
 1. Will you “Go beyond the Regulations”

Environmental Management Plan: Lubricants



2. Select Environmentally Acceptable Lubricants (EAL) for the following applications:

1. In applications that have the potential for lost in use quantities and/or accidental discharge, identify potential lubricants that pass EPA's identified environmental standards
2. In addition, for those applications that discharge small quantities of oil during normal operations (per the VGP), choose a lubricant that does not create a lasting iridescent appearance on the water

Environmental Management Plan: Lubricants



3. Choose the right lubricant for the job;

1. Follow OEM recommendations for required lubricant properties
 1. A lubricant that fails to protect the machinery or significantly reduces its efficiency is not the best environmental solution
2. Choose a lubricant that provides for increased service life of the operation
 1. Reduce the amount of downtime in the operation
 2. Reduce the amount of lubricant entering the waste stream
 3. Reduce total cost of ownership
 4. Migrate from “time between failures, to time between overhauls”
3. Choose a lubricant that minimizes lost in operation quantities
 1. Higher viscosity oils can minimize leakage through shaft seals
 2. Highly adhesive greases can minimize lost in use quantities and reduce labor
4. Choose a lubricant that is compatible with the components of the system
 1. Seal compatibility

Environmental Management Plan: Lubricants



4. Include operational procedures in your EMP that reduce the risk of a discharge of lubricants into the environment.

1. Include routine maintenance procedures
2. Practice oil spill prevention and response
3. Train your crew

Portfolio of Lubricants Onboard Your Vessel

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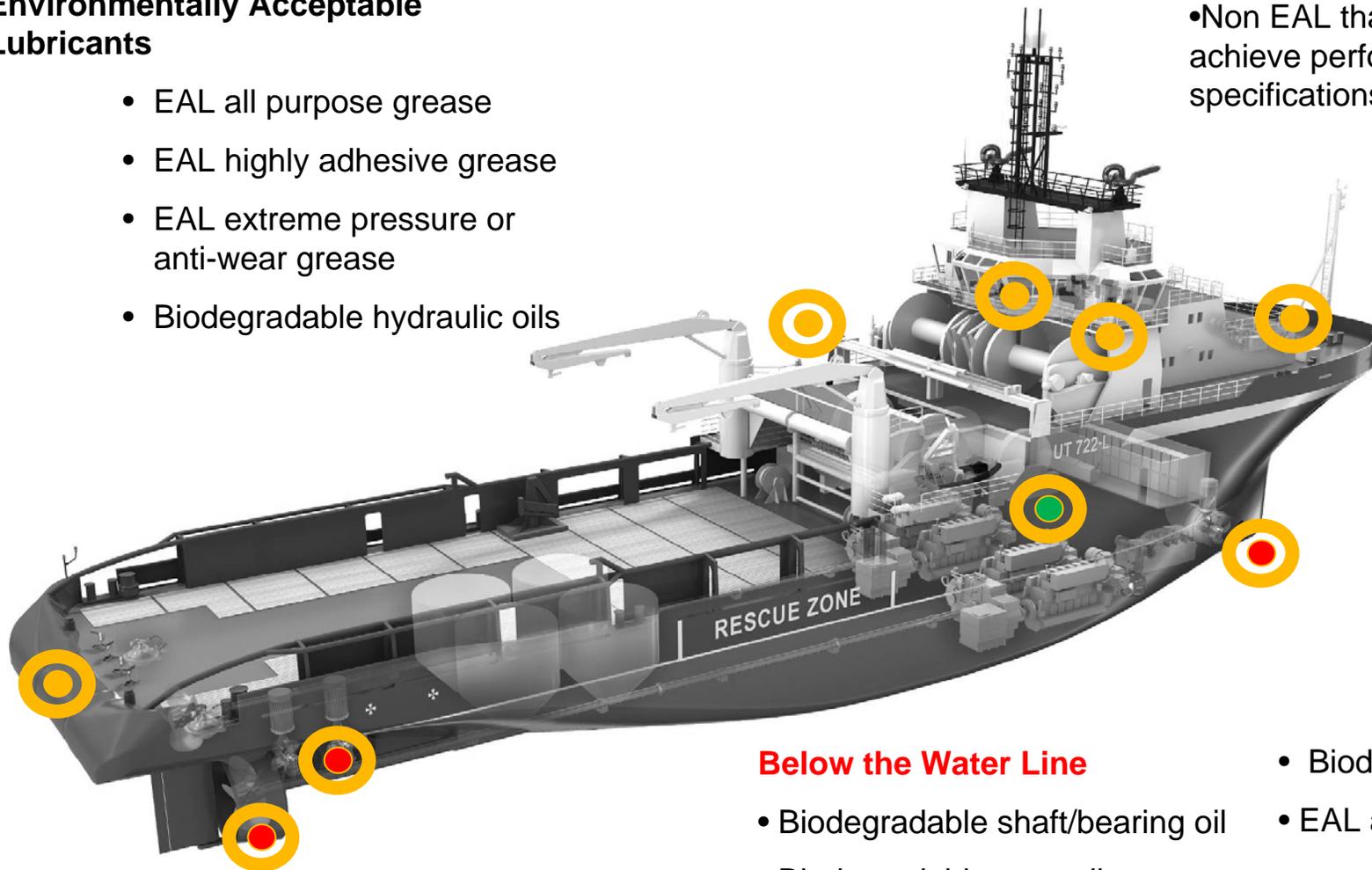
On Deck:

Environmentally Acceptable Lubricants

- EAL all purpose grease
- EAL highly adhesive grease
- EAL extreme pressure or anti-wear grease
- Biodegradable hydraulic oils

Below Deck:

- Non EAL that achieve performance specifications



Below the Water Line

- Biodegradable shaft/bearing oil
- Biodegradable gear oil
- Biodegradable hydraulic oil
- EAL anti-wear grease

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Thank you very much.

Discussion