

Case study: Use of fluoroelastomer Sealing elements in the Marine Propulsion



There is no other chemistry available to replace the performance that Fluoropolymers provide for chemical, thermal, plasma and radioactive resistance as seals. By definition any chemical that could withstand those situations would also be considered persistent.

A ban, or a class regulation, of polymeric PFAS materials and their raw materials will have a profound impact on global industry and everyday lives. The following case study is given to showcase just a tiny fraction of the uses of PFAS sealing materials where no alternative technology exists.

Key facts:

- The majority of ocean going ships operate with oil-lubricated stern tubes and use lubricating oils in on-deck and underwater (submerged) machinery.
- In 2010 between 36.9 to 61 million litres of lubricant leaked into global marine waters from stern tube and operational discharge from shipping ⁱ
- Mineral Oil was the preferred lubricant for global shipping, however, Mineral oil is harmful to aquatic and terrestrial ecosystems
- In 2013 the Vessel General Permit (VGP) from the Environmental Protection Agency (EPA) in the US mandated the use of Environmentally Acceptable Lubricants (EALs) in all oil-to-water interfaces for vessels 79 feet or longer that enter waters ⁱⁱ

Traditional marine sealing materials (e.g., nitrile) designed for use with mineral oil are incompatible with Environmentally Acceptable Lubricants (EALS). They experience changes in mechanical properties, their volume, hardness and tensile strength can all change, resulting in seal failure.

Three different types of EAL exist on the market; vegetable oils, synthetic esters and polyalkylene glycol lubricants. Each lubricant type breaks down chemically when mixed with water to release different bi-products.

Due to complexity in the supply chain and operational use sealing material must work with all types of EAL and be compatible with the cocktail of different bi-products. FKM Fluoroelastomers are the only seal material found to offer compatibility with all EAL type lubricants.

A ban on the use of FKM Fluoroelastomers would result in global supply chain disruption with frequent ship breakdown or would require the re-adoption of polluting mineral oil lubricants in combination non-fluoroelastomers seals.

Seawater lubricated open systems that use seawater as the lubrication medium in place of oil are an alternative for new build vessels, however, a mild steel propeller shaft is required for corrosion protection from the seawater. Upgrading existing vessels is extremely challenging and expensive.

ⁱ [Environmentally Acceptable Lubricant](#) United States Environmental Protection Agency, Nov 2011, (pp 2)

ⁱⁱ [VESSEL GENERAL PERMIT FOR DISCHARGES INCIDENTAL TO THE NORMAL OPERATION OF VESSELS \(VGP\)](#) Environment Protection Authority, USA, 2013 April 13