



# Materials Never Lie

## ENVIRONMENTALLY FRIENDLY LUBRICANT DEGRADATION

A global shipping company contacted Acuren when the propeller shaft seals on one of their container ships began to disintegrate. Propeller shaft seals are designed to last many years, so it came as a surprise when they started to fail after less than one year. According to the client, the lubricant used in conjunction with the propeller shaft seals was switched from mineral oil to an environmentally friendly biodegradable oil during the shaft seal installation. In addition to the failed seals, Acuren requested a sample of the previously used lubricant and a sample of the new lubricant.

In Acuren's laboratory analysis, it was determined that the biodegradable lubricant was partially degraded, which was the likely cause of the shaft seal failure. FTIR spectroscopy showed that the lubricant consisted of a long-chain ester oil that contained unsaturated olefinic groups, which are necessary to prevent the lubricant from solidifying. Unfortunately, these olefinic groups are prone to chemical attacks by atmospheric oxygen. This was confirmed by measuring the iodine value and acid number of the used and new lubricant samples. The used lubricant had a lower iodine value and a higher acid number, which showed that the unsaturated olefinic groups of the used lubricant were partially oxidized.

Acuren reviewed published literature of established environmentally acceptable lubricants and made recommendations to the customer regarding a more suitable and stable product.



Figure 1



Figure 2

Figure 1: Photograph of the damaged propeller shaft seal. Figure 2: Propeller shaft lubricant samples were collected at various locations of the shaft. The lubricant sample on the left is a new reference sample. The samples show varying degrees of darkening and turbidity, which is indicative of oxidation and water intrusion.

### MINIMIZE OPERATIONAL RISKS AND OPTIMIZE ASSETS

- With expertise in a wide spectrum of engineering disciplines, Acuren employs a cohesive team of engineers, scientists, technologists, and technicians
- Advanced analysis techniques save clients time and money in avoided repairs, reduced business interruption, and improved reliability
- Organic testing lab provides a variety of testing to our clients, involving plastics, rubbers, coatings, and fluids for quality control, failure analysis, and litigation support
- Provide solutions to improve operation and extend life of fixed equipment
- Deepest pool of expertise and solutions in the market
- In-house experts across all disciplines available through our North American network, eliminating the need to outsource
- Rather than simply reporting results, we lead the industry by going a step further – we assist customers in interpreting results and designing solutions



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