

# THORDON SOLVES USCG STERN TUBE

Thordon XL propeller shaft bearings have helped solve a stern tube problem that has plagued the U.S. Coast Guard Ice-Breaker *Polar Sea* since 1992.

Due to the harsh arctic environment in which it operates, the 13,500-ton displacement *Polar Sea*, one of the world's most powerful non-nuclear powered triple screw icebreakers, suffered repeated corrosion and fretting wear within the shafts. This resulted in damage to the support lands for the stern tube bearing carriers.

The U.S. Coast Guard effected repairs and repeatedly 'built up' the support rings using a metallic polymer to improve the fit of the bronze carriers to the stern tubes. But this method of repair proved to be only temporary - short lived and expensive to maintain.

So in an effort to find a solution, the USCG hired engineering consulting firm LamaLo Technology to investigate the problem. And a project was undertaken to develop a permanent repair to prevent the 'loss of fit' between the bearing housings and the stern frame castings.



122 m (399 ft.) U.S. Coast Guard icebreaker *Polar Sea* with Thordon pollution-free XL propeller shaft bearings



Easy installation of split XL propeller shaft bearings with tapered double key design allows bearings to be removed without shaft withdrawal

"We commissioned the study because we had a problem with maintaining the bronze carriers fit," said USCG staff engineer James Happe. "Ice-breaking operations and ice impact pounded the carrier shells and when they are loose, this can be a real problem."

The original arrangement consisted of a bearing housing with dovetail slots in which Thordon XL bearing staves were inserted. The study concluded that the best

approach would be to permanently fix the bronze carrier shells into the frame of the stern tube, so they effectively became part of the ship's structure. Such a change would, however, still have to facilitate bearing removal with the shaft still in place. After investigating various alternative arrangements a shortened, double keyed, segmented, split tube, fully grooved type bearing was recommended.

These bearing types offer a larger surface area that supports the shafting, resulting in better distribution of the ice loads to the bearing housing and bossing. In addition, these bearing designs provide for a much better condition for hydrodynamic lift than the existing dovetail slot design.

"This would provide the required high ratio of bearing surface to water groove and provide more support for the shaft," said LamaLo's Bruce Cowper. "We also shortened the housing/bearing length in the bossing to ease alignment requirements. But it was Thordon who came up with the double-key bearing design."

Based on over 20 years experience with the existing Thordon XL staves on the Polar vessels and acceptable performance in other applications in the USCG fleet, XL was chosen as the preferred material for the new bearings. Thordon XL is approved down to 2:1 L/D ratio and comes in a variety of configurations including staves, full form tube and split tube. Thordon also provided the bronze double key sets for this project.

"The USCG is a very important customer with a long history of successful Thordon bearing installations so we brought in all

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# PROBLEM WITH A SOLUTION FOR THE FUTURE



*Ice breaker Polar Sea first equipped with propeller shaft bearings in 1983*

our resources to quickly assist in coming up with a solution to this problem,” said Todd Terry of Pacific Marine Equipment, the authorized US-based distributor of Thordon Bearings in the

vessels’ home port of Seattle. “We used the same Thordon XL material in a completely different configuration. This configuration is unusual in that it is a segmented split tube bearing with a double key arrangement so that the upper and lower tube halves can remain secured or be released independently. We provided a flexible bearing solution that allowed the Coast Guard to solve their bearing carrier interface problems.”

James Happe said: “The Thordon element went pretty much like clockwork and the sea trials in April went well, showing no signs of problems. Underwater divers were also positive about the installation. We are now considering the same system for *Polar Sea’s* sister ship *Polar Star*.”

Since no work on the new bearings is expected for 8 to 10 years, annual savings in repair/maintenance costs of about \$230,000 per bearing are expected. In addition, there will be a reduced risk of unscheduled dockings due to premature bearing or seal failures.

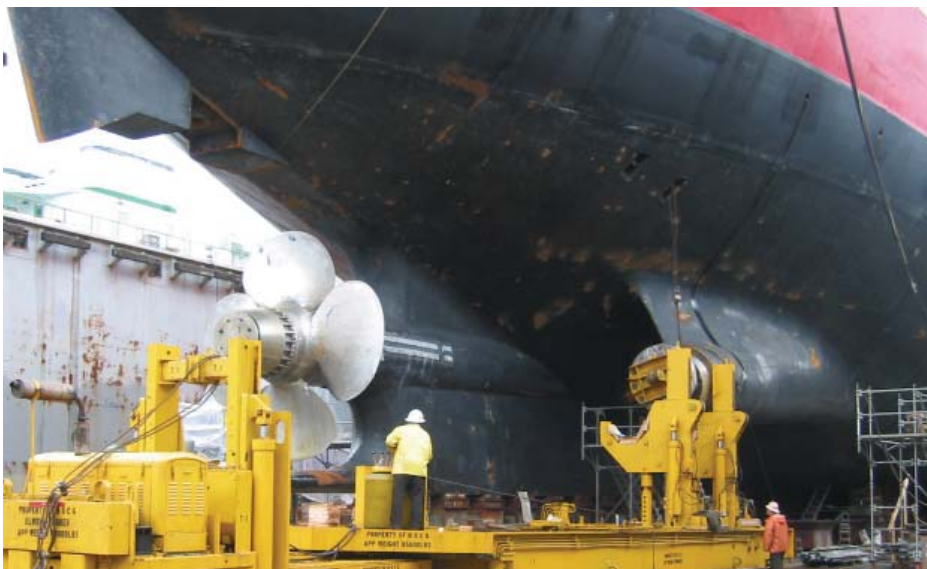
Thordon estimates that over a 20-year period, potential savings of \$13 million

can realistically be gained by implementing the proposed modifications.

“It’s a definite solution for the future,” said James Happe. 

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*James Happe  
U.S. Coast Guard*



*Polar Sea with triple screw shaft diameters of 922 mm (36.2") in drydock at Todd Pacific Shipyards, Seattle, WA, U.S.A.*