THORDON

THORDON BEARINGS INC.

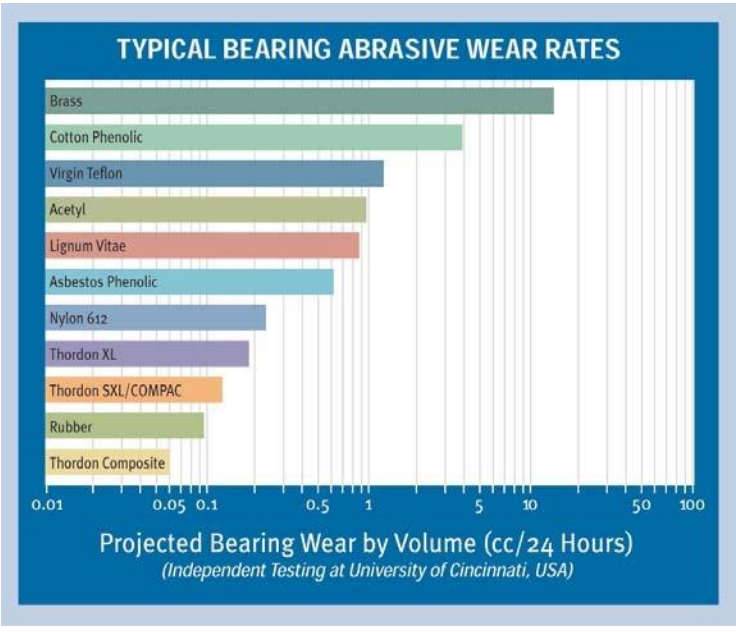
Oil and Grease Free Bearing Applications for Dredgers

DB2014.1

Thordon Composite

Thordon Composite is a two component bearing formulated specifically for use in very abrasive environments such as water lubricated cutterhead shafts or open water propeller shaft bearings. The actual bearing surface is a black material and is referred to as GM2401. This softer material is fused to a yellow, stiff, high strength polymer sleeve. GM2401 is homogeneous - there are no layers of differing materials and properties are consistent through the wall thickness.

Composite bearings are available in a full range of sizes in both tube and stave configurations.



Dredge bearing Applications

Composite Water Lubricated Cutterhead Shaft Bearings

Thordon Composite bearings were introduced in 1974 after laboratory tests on a highly abrasion resistant compound known as GM2401 (black wear surface) showed wear resistance to be better than rubber in dirty water conditions. Thordon's first large cutter head shaft bearings were installed in August 1978 on the Zanen Verstoop Dredge, Gouda, operating in the Middle East. The Thordon Composite bearing outperformed the previous cutless rubber bearing by a factor of approximately 2 times.

Due to their tough, elastomeric properties, Thordon Composite bearings resist wear by tending to deflect, and then reject, abrasive particles allowing them to be flushed through the bearing without tearing away bearing material. Less wear translates into less downtime and fewer bearing replacements over the operating life of the vessel.

The design pressure for cutterhead shaft bearings is between 0.4 MPa (58 psi) and 0.6 MPa (87 psi). The maximum design pressure for full rotation is 1.4MPa (203 psi). Typically, the L/D ratio is 3:1.

The mating surface (shaft liner) should be corrosion resistant and as hard as possible: mimimum 40 HRC; typically 60 HRC or greater such as Ni-Cr-B.

The required water flow for flushing and cooling the bearings is 0.15 L/min/mm (1 U.S.Gal./min./inch) of shaft diameter. Thordon Composite in combination with a hard shaft liner offers the best combination for long bearing wear life in abrasive environments. However, a good quality water flush also prevents the bearing from being clogged from the sand and rock particles from the cutterhead operation. Reducing the level of abrasive particles in the water flush to the bearings will translate into a longer wear life of the bearing.

Composite cutterhead shaft bearing removed from dry ice and ready to be installed in housing

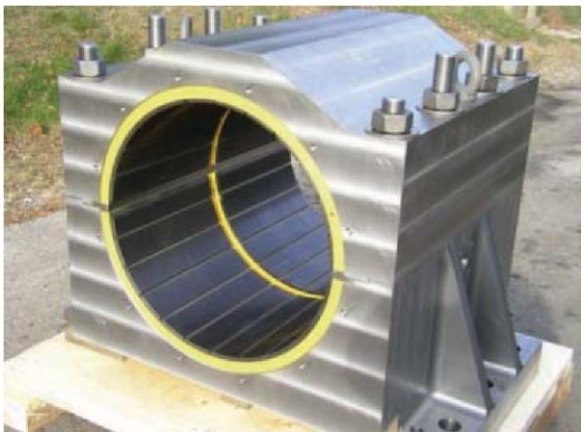
Composite cutterhead shaft bearing being installed on CSD J.F.J. de Nul

Composite Water Lubricated Cutterhead Intermediate Lineshaft Bearings

Thordon Composite has consistently outperformed rubber in dredge cutter head shaft bearing applications for many years. Now, Thordon has built on this success and developed a water lubricated intermediate lineshaft bearing utilizing Thordon Composite. The risks for pollution from grease leaking out, or damage to the bearing from water leaking in, that conventional bearings face, are totally eliminated with this new Thordon design.

Thordon cutterhead intermediate lineshaft bearings offer the following benefits to the owner:

- Uses seawater for lubrication
    - Eliminates grease and greasing system
    - No pollution
    - No clean-up after dredging
    - Improved safety for crew (no slippery ladder)
- Lower maintenance costs
    - Able to change bearing with shaft in place
    - Ship's crew can change bearing
    - no grease purchases
- High abrasion resistance
- Less friction; no noise or vibration
- Accommodates edge loading caused by shaft misalignment
- Greater impact resistance/resilience



New Composite cutterhead intermediate lineshaft bearing

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ZERO POLLUTION | HIGH PERFORMANCE | BEARING & SEAL SYSTEMS

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