For Successful Installation & Operation of

THORDON

COMPAC

Seawater Lubricated Propeller Shaft Bearings

MUST READ CONTENTS

COMPAC BEARINGS

The information in this document has been prepared based upon Thordon Bearings experience and best practices developed over many years in designing and installing propeller shaft bearings.

The information provided here is a general guideline for the installation and operation of COMPAC bearings.

Detailed technical information can be found in the Thordon Marine Bearing Installation Manual in conjunction with Thordon's Bearing Sizing Calculation Program.

If there are any questions regarding this document, please contact the authorized Thordon Bearings distributor in your area. A list of global distributors can be found at:

www.ThordonBearings.com

COMPAC BEARING SHAFT BEARINGS SPECIFICATION

DESIGN

1. General

The bearing wear surface is Thordon COMPAC, a non-metallic, elastomeric polymer alloy. Special lubricants are included in the formulation to reduce start-up friction and eliminate stick-slip, providing a low coefficient of friction. To promote early formation of a hydrodynamic film between the shaft and bearing, the lower (loaded) portion of the bearing is without grooves, while the upper half of the bearing incorporates axial grooves for enhanced flow of the water lubricant/coolant. Since angular orientation of the bearing is important, mechanical means of anti-rotation should be fitted.

2. Arrangement

Interference fitting is the recommended method for fitting the propeller shaft bearings. To achieve this, the bearing shall have a minimum wall thickness to permit interference fitting as specified by the Thordon Bearing Sizing Calculation Program.

The bearing may be a solid tube or split and may comprise of single or multiple axial bearing segments.

3. Axial Retention

All bearings must be fitted with mechanical means for limiting axial movement. Most commonly, this will be a shoulder in the bore at one end and a circular, bolted retaining ring at the other.

4. Shaft Liner *(if required)*

The shaft in way of the bearing should have a cylindrical, smooth continuous non-corroding surface. Welded layers or shrunk-on liners can be used. If a shaft liner is to be used, the liner shall be made from a good quality centrifugally cast bronze alloy or equivalent material with minimum thickness in accordance with Classification Society requirements.

Ideally, surface finish should be 0.8 micro-metres (32 micro-inches) Ra; up to 1.6 micro-metres (63 micro-inches) Ra can perform satisfactorily.

Aluminum bronzes are not recommended as a shaft liner material. Please contact Thordon Bearings for other options.

5. Corrosion Protection

If the shafting is made from a ferrous material, then the sections of the shaft exposed to seawater shall be suitably protected from corrosion. Thordon's tough, modified epoxy coating system, ThorShield, is designed to provide propeller shaft corrosion protection to extend shaft withdrawal periods. The shaft coating shall be applied in accordance with the manufacturer's recommendations with care to be taken to ensure the integrity of the coating where it meets the shaft liners.

6. Cooling Seawater

The minimum water flow rate for COMPAC bearings is 0.15 litres per minute per millimetre (1 US gal. per minute per inch) of shaft diameter.

The recommended method of supplying water to the bearings is with a dedicated pump to each shaftline, however other methods are acceptable provided that the minimum water flow requirements are met.

The lubrication water should be as cool as possible and water above 40°C (104°F) should be avoided. Use of water, already heated, from previous cooling duty is discouraged.

The water supply piping arrangement shall include a flow meter indicating low flow that is connected to an alarm in the control room or bridge. The low flow alarm should be set at the recommended minimum water flow required for the bearings.

Cooling / lubrication water shall normally be supplied at the forward end of the stern tube so that it flows over the full length of the forward bearing through the stern tube, then over the full length of the aft bearing before exiting outboard.

For strut bearings, where water flow is provided by the movement of the vessel through the water, fairwaters and rope guards should include design features to encourage water flow into and out of the bearing. Pumped water flow may also be an option.

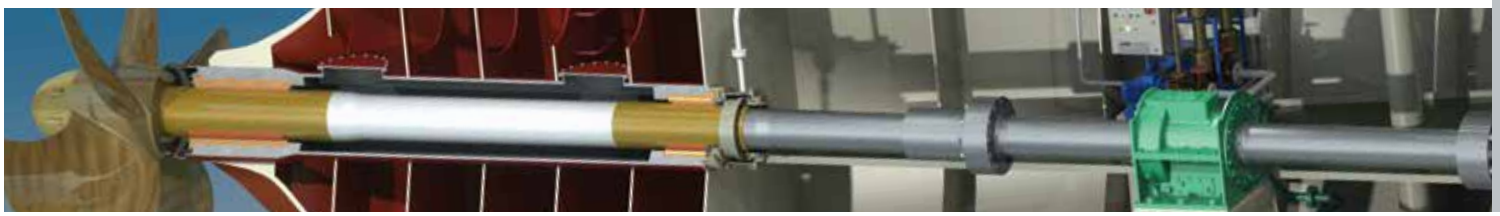
7. Clean Seawater

Typically, the removal of abrasives between two operating surfaces will prolong the wear life in most mechanical systems. If the vessel is to operate in waters containing sand or other abrasives, it is recommended to remove such abrasives to minimize bearing wear.

The removal of abrasives can be accomplished by many methods. The method chosen should ideally remove suspended solids with a specific gravity of 1.2 or higher and greater than 100 (0.004") microns.

8. Seals

A face or lip seal is recommended, however other water lubricated seal options can be used.



INSTALLATION

The recommended method for fitting COMPAC bearings is to install using an interference fit. To ensure that the force generated to hold the bearings is sufficient, the dimensions of the machined bearing should be verified against the design dimensions for the installation.

The bearings can be installed with either dry ice or liquid nitrogen. During installation, it is recommended to leave axial gaps between the bearing segments and the retaining rings. The gaps will reduce as the chilled bearing re-warms, due to thermal expansion of the bearing material. The lower (loaded) part of the bearing I.D. is smooth and the upper half of the bearing has grooves. With multiple bearing segments, the grooves in the bearings should be aligned.

Liquid soap (without particulates) can be used as a lubricant to assist in shaft insertion.

Important: please refer to our Marine Bearing Installation Manual regarding installation and precautions when using a chocking compound.

Bearing Care – Installation to Delivery

Once the COMPAC bearing has been installed in the ship, it should be protected from:

1. **Debris** – the bearing should be protected against debris entering the bearing such as sandblasting material, paint, weld slag, etc. The ship's propulsion system should not be tested at dockside or in dry dock basin where large amounts of debris can be stirred, allowing entry into the bearing.
2. **Heat** – the bearing should be protected from temperatures in excess of 50°C (122°F), especially from the heat of welding.
3. **Chemical Attack** – the bearing should be protected from any chemicals.
4. **Corrosion** – adjacent metal parts should be protected from corrosion as the corrosion particles could enter the bearing and cause premature wear.

MAINTENANCE

Marine Growth – Surfaces exposed to seawater are subject to fouling by marine growth and other shaft deposits and since seawater lubricated bearing systems are open to seawater, the surfaces can experience fouling.

While fouling tends to be more aggressive in warmer waters than in colder areas, marine growth can be relatively limited in areas where the water is brackish, where there is tidal exchange seawater/freshwater, or where suspended oxygen levels are reduced.

Where a vessel is idle for periods lasting longer than two days, good marine practice is to slowly rotate the shaft on turning gear for 2 revolutions every 1-2 days to dislodge marine growth and salt deposits on journal surfaces. When seawater temperature exceeds 25°C (77°F) it is recommended that shafts are rotated at least daily.

Shaft surface roughness should be maintained at less than 1.6 micro-metres (63 micro-inches) Ra to prevent accelerated bearing wear.

Continuous flow of the bearing cooling water will prevent stagnation and further discourage growth on surfaces within the system.

Where a vessel will outfit at wet-dock for extended periods, the local water conditions may be better understood to determine what countermeasures, if any, are necessary.

Some examples include, but are not limited to, a slow continuous supply or periodical flush of the system with freshwater [chlorinated drinking water is OK], or temporarily closing the system apertures with canvas (or similar) to prevent the ingress of the marine organisms.

Propeller Shafts and liners in way of the bearings must be kept clean and smooth.

Bearing Measurements – Bearing wear down or clearances should be recorded periodically.

STORAGE

Long-term exposure to sun (ultraviolet radiation) may cause the surface of the bearing material to undergo a colour change. However, once the surface layer is removed, the underlying material will be the original colour and still maintain its physical properties.

Testing and experience indicate that Thordon COMPAC bearings can be stored for 20 years or longer if stored in controlled environmental conditions.

The following steps will extend the life of the bearing in storage:

1. Store out of direct sunlight protected from weather, preferably in warehouse or similar.
2. If possible, wrap the bearing in plastic wrapping or similar.
3. Store at ambient temperature – avoid excessive humidity and temperatures above 40°C (104°F).
4. Avoid contact with solvents.
5. Store tubular material on end to minimize product deformation.

THORDON

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