

ENVIRONMENTALLY FRIENDLY BEARING SOLUTIONS

BP GOES OIL FREE ON TANKER PROP SHAFTS

Safer than safe. That sums up the design philosophy on four 185,000 DWT Alaskan-class tankers that will soon be carrying oil along the U.S. West Coast. Currently being built in San Diego, USA by National Steel and Shipbuilding Company (NASSCO), a wholly owned subsidiary of General Dynamics, the BP Shipping-owned vessels feature the latest innovations in safe-ship design, including Thordon COMPAC water lubricated propeller shaft bearings.

“When moving oil by sea,” says Stan Taylor, Technical Manager for BP, “our philosophy everywhere in the world has always been on safety.” In fact, it is an expressed business policy of BP to aim “...to do no damage to people, or to the environment.”

During the design phase of the vessels, BP was determined to leave no stone unturned in its quest to minimize the risk of oil leakage. This included building in multiple redundant systems, and

eliminating the use of oil wherever possible. “The prop shaft is an area where, traditionally, some lubricating oil can leak into the sea,” says Taylor. “So we needed to look for alternatives.”

Traditionally, propeller shaft bearings on commercial tankers are made of white metal lubricated by oil. Although these systems work well, keeping the oil and water separate can be a challenge. If seawater contaminates the bearing area, prop shaft performance can be compromised. If oil escapes into the sea, that’s pollution. “Even a small leakage from the prop shaft,” says Taylor, “can result in a visible sheen when in port.”

This is one of several reasons that made Thordon’s pollution free alternative so appealing.

The Thordon COMPAC propeller shaft bearing systems now being installed on each of the BP vessels feature water lubrication (a renewed innovation

pioneered for the 21st century by Thordon), no use of oil (and therefore zero risk of pollution), and an expected minimum 10 year bearing wear life based on systems currently in operation.

To ensure a steady supply of abrasive free seawater to the bearings, Thordon also supplied its integrated Water Quality Package. This maintenance free system includes pumps, flow alarms and a separator capable of eliminating particles down to 50

(continued on page 6)

BP Alaskan Class tanker to be equipped with water-lubricated COMPAC Propeller Shaft Bearing System



Photo courtesy of NASSCO

THIS ISSUE

MARINE

BP Goes Oil Free on Tanker Prop Shafts . . . **1**

Composite a Key Component of the Most Advanced Dredger . . . **3**

OFFSHORE

Second FPSO Turret System Built with SXL Bearings. . . **2**

INDUSTRIAL

Low Wear on Thordon Tank Rollers at Florida Sewage Treatment Plant . . . **4**

HYDRO-TURBINE

Extending Bearing Wear Life for Large Shafts in Russia . . . **5**

ANOTHER FPSO TURRET SYSTEM BUILT WITH HIGH PERFORMANCE, SELF-LUBRICATING SXL BEARINGS

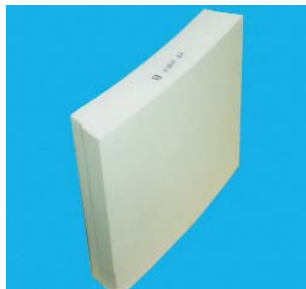
FARWAH — the latest floating production storage offshore (FPSO) platform on duty in the Mediterranean — is an exception to the norm in many ways. It was constructed in Europe, while most such vessels are built in the Far East. It was built from scratch, rather than via a ship conversion. And its turret system features the oil-free, high-performance advantages of Thordon SXL bearing pads.

Owned by Exmar Offshore of Belgium, *FARWAH* was built at IZAR's Fene shipyard in northwestern Spain. The innovative turret system was designed by London Marine Consultants (LMC), a U.K.-based company that specializes in mooring systems for FPSO's and FSO's.

"When we were awarded the contract," says Jon Dunston, Director of LMC, "we knew that this would be a challenging design." An FPSO turret system is exposed to a variety of demanding load conditions. Operating fully submerged, the lower turret bearing must be able to handle extreme loads while providing the means to allow the FPSO to 'weathervane' in accordance with prevailing weather.

"Our selection of bearing material was crucial," says Dunston. "Not only did it have to perform well under the sea, it also needed to be relatively low maintenance and have a design life of 15 years!"

After exploring the options, LMC discovered that the best choice for the job was Thordon SXL.




SXL Turret Bearing

Backed by dozens of references, Thordon products have an excellent track record in numerous offshore oil applications. The Thordon SXL bearing pads for this turret system are self-lubricating with a low coefficient of friction (0.15 to 0.20); can bear a load of up to nearly 2000 tons and provide a maximum deflection of 2.5 mm (0.098").

"We were particularly impressed that there was an operational precedent to support Thordon SXL," says Dunston. *FARWAH* is, in fact, the second FPSO to use the bearing pads. The *Ramform B-380* FPSO, which operates in the Banff oil fields, has been using Thordon SXL for over five years with an exceptional record of performance.

As expected, the design of the turret system wasn't easy. "We overcame one challenge after another for many months," says Dunston, "But the people at Thordon were extremely helpful. There were some very complicated analysis required and they assisted us in developing the data we needed." The final bearing design included 24 Thordon SXL pads mounted into a fabricated steel housing roughly 4.2 m (13.8 ft.) in diameter.

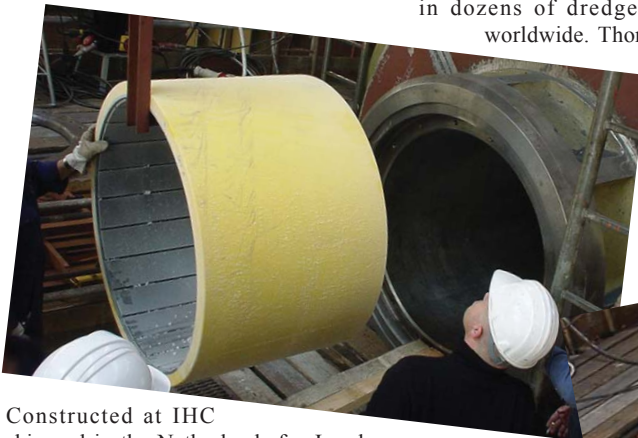
Today, *FARWAH* is in service on the TFE (TotalFinaELF) CPTL-137B oil fields off the coast of Libya. Thanks to the efforts of LMC, Thordon Bearings and others associated with the project, the bow-mounted external turret system is considered one of the most innovative in the world. 



FPSO *FARWAH* equipped with Thordon SXL turret bearing pads

COMPOSITE A KEY COMPONENT OF THE MOST ADVANCED DREDGER IN WORLD

When Caesar conquered Egypt in 48 B.C., he used dredgers to clear the way for his ships into the Alexandra Harbour. No one knows for sure what these dredgers looked like or how they worked. We can speculate, however, that if the Roman engineers who built them could see into the future, they would be astonished by the size and power of the *J.F.J. de Nul*.



Constructed at IHC shipyard in the Netherlands for Jan de Nul of Belgium, the *J.F.J. de Nul* is the most advanced self-propelled cutter suction dredger ever built. Her 6,000kW cutter drive, 30% more powerful than cutters currently in use, is capable of dredging from a depth of 6.5 m to 35 m (21 ft. to 115 ft.). According to IHC, the vessel incorporates the latest advances into dredging systems, engineering, and materials technology.

These advances included specifying Thordon Composite as the bearing material for the 950 mm (37.4") diameter cutterhead drive shaft.

"Thordon was selected for a number of reasons," says Marc Butzelaar, Sales Manager for Sandfirden Technics BV, a Netherlands-based company that, in addition to being a Thordon Distributor, specializes in engineered products for industrial and marine applications. "Dredging systems are exposed to

extreme underwater forces and unpredictable torque peaks. The *J.F.J. de Nul* needed a cutterhead bearing that not only performs well, but also has a long wear life in dirty, sandy water."

Introduced in 1977, Thordon Composite was first installed as a cutterhead bearing on the dredger, *Gouda*. Since that time the product has been installed in dozens of dredger applications worldwide. Thordon Composite

performs reliably in highly loaded and abrasive laden water conditions - its wear life is

typically twice that of rubber or more.

"Dredge vessels often work in remote locations, dredging new ports and waterways," says Butzelaar. "They can often be hundreds of miles away from an airport or commercial port where a bearing can be replaced. That's why reliability and long wear life is so crucial."

Portability is also an issue. Because dredgers can work in isolated areas around the globe, they must stow most of the materials they need for maintenance and repair onboard. At 958 mm (38") ID x 1084 mm (42.7") OD x 3475 mm (136.8") long, the required size of the cutter bearing for

the *J.F.J. de Nul* was huge. So, to accommodate the need for both ease-of-maintenance and portability, the Thordon Composite bearing was engineered into five, 695 mm (27") long bearing tube segments. Each was shipped to the construction location, placed in dry ice, then inserted one by one into the 1080 mm (42.4")-cutterhead housing. "At installation, there was a 3 mm to 4 mm (0.1181" to 0.1574") gap left between the frozen bearing segments so that as the bearings reached ambient temperature, they would have room to expand and fit in place," says Butzelaar.

Although the overall size of the cutter



Thordon Composite bearing freeze-fit installation on *J.F.J. de Nul* cutterhead drive shaft

bearing is the largest ever for a dredger, each individual segment weighs a manageable 258 kg (570 lbs.). The smaller bearing tubes are easier to transport and, if necessary, easy to stow aboard the *J.F.J. de Nul*.

Advanced materials like Thordon Composite are enabling dredge vessels to operate more productively with less down time. Sea trials for *J.F.J. de Nul* are planned to be completed by the end of November and handed over to Jan de Nul in the spring of 2004. **NW**

LOW WEAR ON THORDON TANK ROLLERS AT FLORIDA SEWAGE & WASTEWATER TREATMENT PLANT

During the summer, temperature and UV (ultra violet) radiation in Southern Florida can be higher than anywhere else in North America. So any equipment operating under the south Floridian sun must be able to, euphemistically, “take the heat”. That’s why the engineers at a large South Florida Sewage & Wastewater Treatment Plant were reluctant to switch to Thordon SXL Tank Rollers until the product was thoroughly tested in *their* climate and on *their* tanks.

Did Thordon SXL pass the test? It did, well beyond expectations.

Floating tank covers are commonly used for flocculation and other tanks at wastewater treatment plants when the liquid level is not held at a constant level. According to Ed Coppedge, Manager of Coppedge Marine & Industrial located in Jacksonville, Florida, “On the digester tanks at the wastewater treatment plant, the top of the tank floats and adjusts with the material inside. The dozen or so rollers keep the tank

centered but also give it the ability to roll.”

The challenge is, tank rollers are subjected to sludge, grit, corrosives and sunlight, causing them to wear quickly. The most common material for tank rollers is still metal, which compounds the maintenance problem because metal needs to be greased regularly. In addition, metal can damage the concrete walls. A liner often needs to be installed to protect the tank.


Thordon SXL Tank Rollers, of course, do not need to be lubricated. The product features a low coefficient of friction, high resistance to shock loading and vibration, and long service life under extremes of heat and UV radiation. Thordon SXL is a significantly softer material than metal, so it will not damage the tank. No liner is required.

To test the product, “We convinced the plant to install two Thordon SXL rollers on one of their digester tanks,” says Coppedge. “Then we monitored

its performance and visually inspected it for signs of wear and cracking.”

After three years of rigorous service, the Thordon tank rollers were removed and inspected. No signs of mechanical damage or noticeable chemical degradation were found. The surface condition was still smooth and in excellent condition. The tank interior retained its original appearance with no signs of changes.

Further tests were conducted to assess wear and material properties. The conclusion? The Thordon SXL Tank Rollers showed no measurable wear.

As a result of the successful outcome of the inspection, and the product’s excellent track record of performance on site, the wastewater treatment plant has subsequently installed full sets of Thordon SXL rollers on two digester tanks. “They are very happy with the product,” says Coppedge. “They expect a long service life with Thordon SXL and a reduction in their maintenance time and costs.” 



Thordon SXL Tank Roller Application at a Florida Sewage & Wastewater Treatment Facility

EXTENDING BEARING WEAR LIFE FOR LARGE DIAMETER SHAFTS IN RUSSIA

When the largest hydro-turbine manufacturer in Russia needed to find the right bearing supplier, they researched several companies. After an exhaustive process, which included copious testing of numerous bearing materials, the company that Leningrad Metal Works (LMZ) choose to partner with was Thordon International.

Today that partnership is represented as INTERPLAST, a joint venture company between LMZ and Thordon International. “We provide the technology and base materials that the bearings are made from,” says Craig Carter, Marketing Manager for Thordon Bearings. “Interplast produces the finished products for customers throughout the former Soviet Union.”

Recent success stories for Interplast include solving serious problems at two hydro power stations.

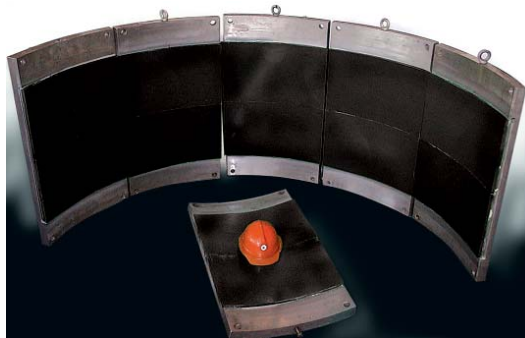
Narva Hydro Power Station

Owned by AO Lenenergo, Narva Hydro Power Station is located in western Russia near the Estonian border. The facility has four turbines with an annual generating capacity of 40 MW each.

The problem centered around the main guide bearings. At 955 mm (38”) in diameter, these bearings would wear

too quickly, which was mainly the result of spring flooding contributing abrasives to the penstock water.

In 2000, Interplast introduced Narva to the benefits of Thordon GM2401. A marine and pump bearing material, Thordon GM2401 is specifically formulated for use in extreme abrasive environments.



Thordon GM2401 segmented main shaft guide bearings

Subsequently, Navra agreed to use the Thordon material in one of their turbines. The result? After two years of operation, the wear was minimal.

Navra Hydro Power Station has since converted the remaining three turbine main guide bearings to Thordon GM2401. “The owners are very pleased,” says Vladimir Zvyagintsev, Thordon Area Sales Manager for Russia and Eastern Europe. “Thordon

is now included in the next wicket gate bearing conversion scheduled for 2004.”

Krasnoyarsk Hydro Power Station


Located in western Siberia, Krasnoyarsk Hydro Power Station is Russia’s second largest. The facility generates 6,000 MW.

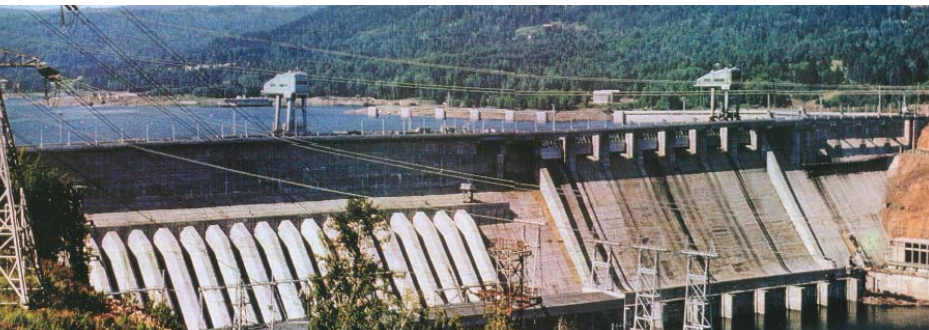
The problem was finding a bearing material that could take the vibration of the huge 2.39 m (94 in.) diameter main guide shaft. In the past, Krasnoyarsk used rubber bearings, but these quickly wore and would need to be replaced every two to three years. A carbon phenolic material was tested in 1999, but cracks quickly developed in just three months.

During an extensive search for a solution in 1999, the facility engineers met with Interplast. “We recommended Thordon SXL,” says Zvyagintsev, “because it’s stiffer than rubber but still elastomeric.”

Impressed by the features and references of the Thordon material, Krasnoyarsk immediately ordered Thordon for one of it’s main guide bearings. The large bearing segments were sent to Interplast who bonded

Thordon SXL to the metal. After nearly four years of service, the bearing was inspected. No significant wear was found.

Satisfied with the results, Krasnoyarsk Hydro Power Station has placed a new order with Interplast for a second main guide bearing with Thordon SXL. 



JOIN OUR NEWSWORKS MAILING LIST

If you would like to be added to our mailing list for Thordon NEWSWORKS newsletter please fill in the following information and fax, mail or visit our website at www.thordonbearings.com 'What's New' section:

Your Name: _____

Company: _____

Address: _____

City: _____

State/Prov.: _____ Postal Code/Zip: _____

Country: _____

No - Remove me from your mailing list

Yes - send by postal services only

Yes - send by e-mail only

My e-mail address is: _____

(photocopy and ...)


FAX TO: +1 905 335 4033

BP Goes Oil Free... *(continued from page 1)*

microns from the seawater lubricating the bearings.

“The Thordon system is the perfect choice for BP,” says Taylor, “because its pollution free characteristics are consistent with the design philosophy of the ships.” The first vessel is due to launch in Spring 2004 and because of a dedication to protecting the environment, these ships are set to carry oil by sea, *safely*, for decades to come.

Thordon Bearings Inc. is the leading supplier of high performance, environmentally friendly propeller shaft and rudder bearing systems to the global marine market. Thordon bearings are

available worldwide through over 70 agents and distributors. The company is a member of the Thomson-Gordon Group, a 3rd generation family-owned business founded in 1911. 

*Thor-Lube Water Quality Package
supplied to NASSCO, San Diego, USA
for BP Alaskan Class Tankers*



THORDON
BEARINGS INC. A member of the Thomson-Gordon Group

3225 Mainway, Burlington, Ontario L7M 1A6 Canada
Tel: (905) 335-1440 Fax: (905) 335-4033 info@thordonbearings.com


ISO 9001:2000
CGSB
Registration #93649

www.thordonbearings.com