



Thordon Compac bearings in the sterntube of the bulker *Peter R Cresswell*

Sterntube conversions reduce pollution risk

The 'zero tolerance' of ship source pollution increasingly being pursued by authorities applies equally to all ships, and the prospect of eliminating a pollutant source entirely below the waterline is an attractive one.

Last year oil discharges from sterntubes were specifically targeted by new US Environmental Protection Agency National Pollutant Discharge Elimination System (NPDES) rules. The new requirements carry extensive civil and criminal penalties for violations, including the threat of imprisonment. In Europe, meanwhile, the 2007 European Union Maritime Policy specifies the elimination of all vessel discharges into the marine environment by 2020.

Leakage from an oil lubricated sterntube doesn't necessarily mean negligence. Currently, the majority of commercial ocean-going ships operate with a propulsion system using a propeller shaft supported by oil lubricated metal bearings with oil contained in the sterntube by

The recent conversion from oil lubricated bearings to open water lubricated bearings on the 30,735 dwt bulk carrier *Peter R Cresswell* demonstrates the commitment many shipowners have to protecting the environment

forward and aft shaft seals. According to seal manufacturers, a small amount of leakage is required at the shaft/seal interface in order to lubricate the seal. Fishing nets or rope caught on a ship's rotating shaft can damage the aft seal, allowing oil to leak into the sea.

Owners most recently persuaded of the benefits of water lubricated bearings include Algoma Central Corp, whose vessels are managed by Seaway Marine Transport (SMT).

During the recent St Lawrence Seaway freeze, SMT took the opportunity to convert the sterntube bearings on board the 30,735

dwt bulk carrier *Peter R Cresswell* to the Compac water lubricated system delivered by Thordon Bearings. The scope of supply included a water quality package designed to ensure that abrasives are removed from the seawater using centrifugal forces and provide a consistent flow of flushing water to the bearings. Thor-Coat shaft coating to ensure the mild steel shaft stays free of corrosion and bronze shaft liners to operate in way of the bearings were also included.

Using the Compac system, seawater is pumped through elastomeric polymer shaft bearings and into the sea, so no oil is required in the sterntube. "New materials and designs of non-metallic bearings now offer performance similar to metal shaft bearings with a life expectancy of 15 to 20 years," said Scott Groves, Thordon Bearings area manager for Canada and Western USA.

The self-unloading bulk, delivered in 1982, was converted at Canada's Seaway Marine & Industrial Shipyard, as part of a 12-week

overhaul project including the five-year survey and hull work. The decision to convert to water lubricated bearings was based on the fact that the oil lubricated stern tube bearings had become increasingly problematic.

"The whole environmental issue became a source of grief with Transport Canada," said Al Davies, operations director at SMT. "As a company we are part of a collective programme to introduce green marine policies, extending across emissions, ballast water management, grey and black water discharges. It's pretty clear that the end game will be no discharges allowed at all, and we have bought into a process that is externally audited by Lloyd's Register. The initiative with water lubricated stern tube bearings is an example of that commitment.

"Essentially, there came a point when the ship's stern tube bearing was getting tired and we knew that the tail shaft had to come out for survey. With Thordon half an hour away and the ship yard 10 minutes down the road; it seemed like a good opportunity to take another look at this solution. We already had experience of what Thordon could do as 10 years ago we replaced the bearing system on the 27,800 dwt bulk carrier *Quebecois* because of reports that lignum vitae might not be available anymore. We knew that the Compac system worked, and the closed season meant that we had time to order the liners."

Mr Davies added, "Selecting bio-degradable oils did not offer a viable solution. Regulations dictate that bio-degradables are considered a discharge even if they do not leave a sheen. Any external leak, even using those products,

would require us to notify Transport Canada and they could potentially stop the vessel until completion of an investigation. The presumption is that you are guilty off the bat."

"Of course, one significant difference with using elastomer bearings is that the mild steel propeller shaft requires corrosion protection from seawater," Mr Groves acknowledged. "This may mean a higher up-front cost for the water lubricated stern tube bearing system, but the elimination of aft seal maintenance means that the up-front costs are recouped in lower in-service costs along with no aft seal damage worries, no stern tube oil costs and no oil pollution risk."

Mr Groves explained some of the key considerations owners should address when contemplating a stern tube bearing conversion. This requires a review of the existing shafting and stern tube arrangement drawings. The planning required to convert a vessel also includes a review of the existing oil system to determine if any modifications are required to fit a water lubricated system.

Owners may also have to accept planning for conversion well ahead of any expected docking. "The longest lead-time items for such projects are the shaft liners," said Mr Groves. "The number of foundries that can manufacture centrifugally cast single piece liners is limited and there is normally a 6-8 week lead-time to obtain these."

Mr Davies said: "Thordon performed all of the measurements and clearances on *Peter R Creswell* and LR approved all of the drawings. Since going back into operation in March, the ship has performed well." Increasingly, owners

of older tonnage were seeing the switch to water lubricated bearings as a maintenance, as well as a 'green' issue. The shallow waters of the St Lawrence Seaway placed restrictions on navigation, with high potential for vessels to run aground, damage their blade tip and their oil lubricated shaft seals.

"The amount of manoeuvring in confined water can bring ships close to the bottom," said Mr Davies. "Mud, debris, obstructions and ice conditions, and even rogue nets, can cause blade damage and subsequent seal failures."

"The water lubricated bearings available today from Thordon offer the same lifespan as an oil lubricating solution, but owners avoid the prospect of having to be tugged into port in the case of an oil leak," said Mr Groves. "That means both expense and lost revenue due to downtime are avoided."

Encouraged by the results on board *Peter R Creswell*, SMT is considering a new conversion project, this time involving the 1967-vintage gearless bulk carrier *Tim S Dool*. Other ships were also being considered for conversion.

"We will evaluate every ship due into drydock to see if the conversion is appropriate," said Mr Davies. "Those decisions will be based on the expected longevity of the ship, and on planning well in advance. But this will surely be part of this year's winter budgetary considerations."

There are over 600 ships equipped with Compac water lubricated stern tube bearings, with the first ship converted from oil to water in 1998. Conversions have been increasing with four completed in the past six months, including two VLCC's operating out of US waters, a Canadian icebreaker and the *Peter R Creswell*.

Indian market open to power measurement products

A recent agreement with Wärtsilä Ship Power to market shaft power measurement products manufactured by UK based Datum Electronics has increased the company's exposure to the growing marine market in India.

Following on from Datum's considerable success in land based and automotive applications the company is expanding its network of distributors with an increasing depth of experience in marine installation and shaft power systems. Datum has developed marine torsionmeter and shaft power trials products that are capable of delivering accurate data relating to the powertrain performance.

The marine torsionmeter range includes a naval and commercial version, both with all the required defence standard and classification society approval. The systems have been designed to provide accurate torque and shaft power data with the added ability to measure dynamic torque and additional strain parameters. The dynamic



The marine torsionmeter range includes models for commercial and naval ships

torque data can be used to monitor the condition of many of the key propulsion components. The data will show shaft alignment, vibration, engine drive cycles and propeller cycles.

To complement the permanent marine torsionmeter products, Datum has launched a range of shaft power trials systems designed to be fitted by a technician and operational within two hours on most shaftlines. The standard installation provides two channels of measurement – torque and another strain value such as bending or thrust. The data is transmitted from the shaft to a receiver with an interface to a PC or data-logger. Data rates for average power measurements are normally set at 10/second and give a battery life of over 30 days, higher data rates up to 15 kHz are also available for more advanced analysis. A smaller compact version of the trials system is available with a single channel and a 30 hour battery life.