

THORDON

THORDON BEARINGS INC.

Offshore Bearing Applications Product Manual



OS2015.1

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The information contained in this document has been prepared from the company's many years of experience in the manufacturing and installing of Thordon Bearings worldwide.

This information is offered as part of our service to customers. It is intended for use by persons having technical training and skill, at their discretion and risk.

The company reserves the right to change or amend any specification without notice.

Corporate Profile

Thordon Bearings Inc., a member of the Thomson-Gordon Group of Burlington, Ontario, Canada, designs and manufactures a complete range of high performance, environmentally friendly marine propeller shaft and rudder bearing systems. Recognized internationally for superior performance in marine applications, Thordon bearings are sold in over 80 countries throughout the world. Utilizing Thordon, a unique elastomeric polymer as the bearing wear surface, Thordon bearing systems offer exceptional wear life, a low coefficient of friction and can be easily machined on site. In-house design engineers consult with customers to provide innovative bearing system designs that meet or exceed the customer's technical requirements.

For superior performance in propeller shaft bearing systems, Thordon's **COMPAC open water lubricated stern tube bearing system** offers low friction, zero pollution risk and long wear life in blue water operation. Another Thordon first is the factory guaranteed wear life performance of **Thordon SXL** self-lubricating pintle and stock rudder bearings. **Thordon Composite** bearings are designed for high performance in dredge, workboat and ferry applications, consistently deliver a wear life of more than twice that of other non-metallic bearings resulting in significantly reduced life cycle costs. Thordon's superior pollution-free performance on-board ships has been successfully transferred to bearing applications in the offshore industry including stern rollers, FPSO mooring and rotation equipment, turret systems and many others.

A dedicated team of Research and Development Engineers continually develop and test new generation polymers and bearing designs to further improve the performance of the bearing systems being supplied. Products include Thor-Coat, a marine shaft coating system to prevent shaftline corrosion and Thorseal, a long life rudder stock seal.

Since the turn of the century Thordon Bearings' parent company, the Thomson-Gordon Group, has recognized the importance of superior products, precision manufacturing and application engineering support. Thordon Bearings' engineering and quality focus has earned worldwide recognition. Quality procedures are certified to the ISO 9001:2008 Quality System - the most rigorous system in the world. Thordon bearing systems are proven, cost effective, environmentally positive solutions for both marine and industrial applications. Thordon bearings are available worldwide from distributors whose factory trained specialists work with customers from establishing specifications to ensuring correct field installation.

Overview of Thordon Offshore Applications

An application with no margin for error, the offshore industry has turned to Thordon Bearings for its unique bearing needs when faced with the unpredictable challenges of extracting oil at sea. Thordon bearing system solutions are being designed into oil platform and FPSO vessel applications where reliability, long life, low friction and non-polluting grease free operations are of key importance.

Typical applications include:

- FPSO mooring and rotation equipment
- FPSO turret bearings
- Stern roller radial and thrust bearings
- Fairlead bearings
- Alternatives to slewing bearings
- Other platform applications including spherical net catcher bearings and deck pad bearings
- Vertical pump bearings



Offshore Oil Application References

Vessel Name	Vessel Type	DWT	Owner	Install Location	Application	Thordon Grade	Shaft Diameter (mm)	Initial Installation Date
<i>Petrojarl Banff</i>	Supply Vessel	20,800	Teekay Corp Canada		Turret Bearings	SXL	8,710	Jul -1998
<i>Espoir Ivoirien</i>	Supply Vessel	132,500	Prosafe ASA Norway	Singapore	Turret Bearings	SXL TRAXL	8,500	Jan -2001
<i>FPSO Petrojarl Cidade de Itajai</i>	Offshore	273,187	PETROBRAS Brazil	Singapore	Turret Bearings	SXL	8,320	Jul -2008
<i>Golar Frost</i>	Offshore	79,984	OLT Offshore LNG Toscana SpA Italy	U.A.E.	Turret Bearings	SXL	5,050	Dec -2009
<i>FPSO Ningaloo Vision</i>	FPSO	101,832	Prosafe SE Singapore		Turret Bearings	SXL	4,930	Aug -2008
<i>FPSO Polvo</i>	Offshore	247,131	Prosafe SE Singapore		Turret Bearings	SXL	4,930	Aug -2006
<i>FPSO Umuoya</i>	FPSO	119,990	Prosafe SE Singapore		Turret Bearings	SXL	4,930	Aug -2006
<i>FPSO Firenze</i>	FPSO	110,000	Salpem Italy	Dubai Dry Docks U.A.E.	Turret Bearings	SXL	4,466	Oct -2010
<i>Betatank II</i>	FPSO	110,371	Salpem Italy	Dubai Drydocks U.A.E.	Turret Bearings	SXL	4,456	Dec -2009
<i>Farwah</i>	Supply Vessel	135,514	CMB SA Belgium		Turret Bearings	SXL	4,120	Jan -2002
<i>Statoil - Lufeng</i>			Statoil - Lufeng Norway		Turret Bearings	SXL	2,980	Jul -1996
<i>Ruby Princess</i>		140,905	PETROVIETNAM Vietnam		Turret Bearings	SXL TRAXL	2,265	Jul -1998
<i>Njord Field Development</i>			Njord Field Development Norway		Turret Bearings	SXL	2,250	Jul -1996
<i>Ruby Princess</i>		140,905	PETROVIETNAM Vietnam		Turret Bearings	SXL TRAXL	2,190	Jul -1998

Offshore Oil Application References

Vessel Name	Vessel Type	DWT	Owner	Install Location	Application	Thordon Grade	Shaft Diameter (mm)	Initial Installation Date
<i>Anglian Earl</i>	Anchor Handling Tug	2,499	Klyne Marine Denmark	Patje Shipyards BV Netherlands	Stern Roller Thrust Washer	SXL	2,012	Jul -1987
<i>Maersk Detector</i>	Anchor Handling Tug	4,028	Moller AP Denmark	Volkswerft Stralsund Germany	Stern Roller Thorseal	SXL	1,960	Jun -2006
<i>Maersk Dispatcher</i>	Anchor Handling Tug	4,028	Moller AP Denmark	Volkswerft Stralsund Germany	Stern Roller Thorseal	SXL	1,960	Oct -2005
<i>Maersk Lancer</i>	Anchor Handling Tug	2,819	Moller AP Denmark	Volkswerft Stralsund Germany	Stern Roller Bearing	SXL	1,960	May -2010
<i>Maersk Laser</i>	Anchor Handling Tug	2,649	Moller AP Denmark	Volkswerft Stralsund Germany	Stern Roller Thorseal	SXL	1,960	Jul -2010
<i>Maersk Leader</i>	Anchor Handling Tug	4,028	Moller AP Denmark	Volkswerft Stralsund Germany	Stern Roller Thorseal	SXL	1,960	Jul -2009
<i>Maersk Lifter</i>	Anchor Handling Tug	4,470	Moller AP Denmark	Volkswerft Stralsund Germany	Stern Roller Thorseal	SXL	1,960	Nov -2009
<i>Toisa Elan</i>	Anchor Handling Tug	4,427	Sealion Shipping Ltd United Kingdom	CSIC Wuchang Shipyard China	Stern Roller Thorseal	Thorseal	1,930	Mar -2013
<i>Toisa Envoy</i>	Anchor Handling Tug	3,600	Sealion Shipping Ltd United Kingdom	CSIC Wuchang Shipyard China	Stern Roller Thorseal	Thorseal	1,930	Sep -2013
<i>Toisa Explorer</i>	Anchor Handling Tug	3,600	Sealion Shipping Ltd United Kingdom	CSIC Wuchang Shipyard China	Stern Roller Thorseal	Thorseal	1,930	Nov -2013
<i>Ruby Princess</i>	Anchor Handling Tug	140,905	Nortrans Offshore Ltd. Singapore		Stern Roller Thrust Washer	SXL TRAXL	1,920	Jul -1998
<i>Loke Viking</i>	Anchor Handling Tug	2,750	Transatlantic Rederi AB Sweden	Zamakona-Bilbao Shipyard Spain	Stern Roller Thorseal	Thorseal	1,870	Sep -2009
<i>Maersk Battler</i>	Anchor Handling Tug	4,201	Moller AP Denmark	Simek As Norway	Stern Roller Bearing	SXL	1,870	Jan -1998
<i>Norjrd Viking</i>	Anchor Handling Tug	2,750	Transatlantic Rederi AB Sweden	Zamakona-Bilbao Shipyard Spain	Stern Roller Thorseal	Thorseal	1,870	Jun -2010

Offshore Oil Application References

Vessel Name	Vessel Type	DWT	Owner	Install Location	Application	Thordon Grade	Shaft Diameter (mm)	Initial Installation Date
<i>Trans Barents</i>	Anchor Handling Tug	2,750	Transatlantic Rederi AB Sweden	Zamakona-Bilbao Shipyard Spain	Stern Roller Thorseal	Thorseal	1,870	Dec -2010
<i>Trans Bering</i>	Anchor Handling Tug	2,750	Transatlantic Rederi AB Sweden	Zamakona-Bilbao Shipyard Spain	Stern Roller Thorseal	Thorseal	1,870	Oct -2010
<i>Maersk Achiever</i>	Anchor Handling Tug	4,577	Moller AP Denmark	Volkswerft Stralsund GmbH Germany	Stern Roller Bearing	SXL	1,860	Dec -2003
<i>Maersk Achiever</i>	Anchor Handling Tug	4,577	Moller AP Denmark	Volkswerft Stralsund GmbH Germany	Stern Roller Thorseal	SXL	1,860	Dec -2003
<i>Maersk Advancer</i>	Anchor Handling Tug	4,614	Maersk Co Ltd United Kingdom	Volkswerft Stralsund GmbH Germany	Stern Roller Bearing	SXL	1,860	Feb -2003
<i>Maersk Advancer</i>	Anchor Handling Tug	4,614	Maersk Co Ltd United Kingdom	Volkswerft Stralsund GmbH Germany	Stern Roller Thorseal	SXL	1,860	Feb -2003
<i>Maersk Asserter</i>	Anchor Handling Tug	4,597	Moller AP Denmark	Volkswerft Stralsund GmbH Germany	Stern Roller Bearing	SXL	1,860	Jan -2003
<i>Maersk Asserter</i>	Anchor Handling Tug	4,597	Moller AP Denmark	Volkswerft Stralsund GmbH Germany	Stern Roller Thorseal	SXL	1,860	Jan -2003
<i>Maersk Attender</i>	Anchor Handling Tug	5,010	Moller AP Denmark	Volkswerft Stralsund GmbH Germany	Stern Roller Bearing	SXL	1,860	Jan -2000
<i>Maersk Attender</i>	Anchor Handling Tug	5,010	Moller AP Denmark	Volkswerft Stralsund GmbH Germany	Stern Roller Thorseal	SXL	1,860	Jan -2000
<i>Maersk Winner</i>	Anchor Handling Tug	3,400	Moller AP Denmark	Volkswerft Stralsund GmbH Germany	Stern Roller Bearing	SXL	1,860	Jan -2003
<i>Maersk Advancer</i>	Anchor Handling Tug	4,614	Maersk Co Ltd United Kingdom	Volkswerft Stralsund GmbH Germany	Stern Roller Thorseal	SXL	1,855	Feb -2003
<i>Maersk Advancer</i>	Anchor Handling Tug	4,614	Maersk Co Ltd United Kingdom	Volkswerft Stralsund GmbH Germany	Stern Roller Thrust Washer	SXL	1,855	Feb -2003
<i>Maersk Asserter</i>	Anchor Handling Tug	4,597	Moller AP Denmark	Volkswerft Stralsund GmbH Germany	Stern Roller Thorseal	SXL	1,855	Jan -2003

Offshore Oil Application References

Vessel Name	Vessel Type	DWT	Owner	Install Location	Application	Thordon Grade	Shaft Diameter (mm)	Initial Installation Date
<i>Maersk Assefter</i>	Anchor Handling Tug	4,597	Moller AP Denmark	Volkswert Stralsund GmbH Germany	Stern Roller Thrust Washer	SXL	1,855	Jan -2003
<i>Maersk Champion</i>	Anchor Handling Tug	2,546	Moller AP Denmark	Orskov Christensens Stalskil Denmark	Stern Roller Thrust Washer	SXL	1,855	Dec -2004
<i>Maersk Winner</i>	Anchor Handling Tug	3,400	Moller AP Denmark	Volkswert Stralsund GmbH Germany	Stern Roller Thrust Washer	SXL	1,855	Jan -2003
<i>Maersk Winner</i>	Anchor Handling Tug	3,400	Moller AP Denmark	Volkswert, Stralsund GmbH Germany	Stern Roller Thorseal	SXL	1,855	Jan -2003
<i>Maersk Detector</i>	Anchor Handling Tug	4,028	Moller AP Denmark	Volkswert Stralsund Germany	Stern Roller Bearing	SXL	1,825	Jun -2006
<i>Maersk Dispatcher</i>	Anchor Handling Tug	4,028	Moller AP Denmark	Volkswert Stralsund Germany	Stern Roller Bearing	SXL	1,825	Oct -2005
<i>Maersk Lancer</i>	Anchor Handling Tug	2,819	Moller AP Denmark	Volkswert Stralsund Germany	Stern Roller Bearing	SXL	1,825	May -2010
<i>Maersk Laser</i>	Anchor Handling Tug	2,649	Moller AP Denmark	Volkswert Stralsund Germany	Stern Roller Bearing	SXL	1,825	Jul -2010
<i>Maersk Launcher</i>	Anchor Handling Tug		Moller AP Denmark	Volkswert Stralsund Germany	Stern Roller Bearing	SXL	1,825	Jan -2010
<i>Maersk Leader</i>	Anchor Handling Tug	4,028	Moller AP Denmark	Volkswert Stralsund Germany	Stern Roller Bearing	SXL	1,825	Jul -2009
<i>Maersk Lifter</i>	Anchor Handling Tug		Moller AP Denmark	Volkswert Stralsund Germany	Stern Roller Bearing	SXL	1,825	Nov -2009
<i>Maersk Server</i>	Anchor Handling Tug	3,472	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Bearing	SXL	1,504	Jan -2000
<i>Maersk Server</i>	Anchor Handling Tug	3,472	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Thorseal	SXL	1,504	Jan -2000
<i>Maersk Seeker</i>	Anchor Handling Tug	3,465	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Bearing	SXL	1,504	Jan -1999

Offshore Oil Application References

Vessel Name	Vessel Type	DWT	Owner	Install Location	Application	Thordon Grade	Shaft Diameter (mm)	Initial Installation Date
<i>Maersk Seeker</i>	Anchor Handling Tug	3,465	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Thorseal	SXL	1,504	Jan -1999
<i>Maersk Shipper</i>	Anchor Handling Tug	3,903	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Bearing	SXL	1,504	Jan -1998
<i>Maersk Supplier</i>	Anchor Handling Tug	3,446	Maersk (London) Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Thorseal	SXL	1,504	Jul -1999
<i>Maersk Supporter</i>	Anchor Handling Tug	3,455	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Bearing	SXL	1,504	Jun -1999
<i>Maersk Supplier</i>	Anchor Handling Tug	3,446	AP Moller United Kingdom	Keppel Hitachi Zosen Singapore	Stern Roller Bearing	SXL	1,504	Jul -1999
<i>Maersk Supporter</i>	Anchor Handling Tug	3,455	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Thorseal	SXL	1,504	Jun -1999
<i>Maersk Battler</i>	Anchor Handling Tug	4,201	Moller AP Denmark	Simek AS Norway	Stern Roller Thrust Washer	SXL	1,500	Jan -1998
<i>Maersk Promoter</i>	Anchor Handling Tug	3,423	Moller AP Denmark	Soviknes Verft AS Norway	Stern Roller Thrust Washer	SXL	1,323	May -1992
<i>Maersk Provider</i>	Anchor Handling Tug	2,792	Moller AP Denmark	Soviknes Verft AS Norway	Stern Roller Thorseal	SXL	1,323	Jul -1996
<i>Maersk Provider</i>	Anchor Handling Tug	2,792	Moller AP Denmark	Soviknes Verft AS Norway	Stern Roller Thrust Washer	SXL	1,323	Jul -1996
<i>Maersk Puncher</i>	Anchor Handling Tug	3,393	Moller AP Denmark	Nordfjord Norway	Stern Roller Thrust Washer	SXL	1,323	Mar -1992
<i>Maersk Provider</i>	Anchor Handling Tug	2,792	Moller AP Denmark	Soviknes Verft AS Norway	Stern Roller Bearing	SXL	1,234	Jul -1996
<i>Al Zaafarana</i>	FPSO	107,943	Nortrans Shipping Singapore	Turret Bearings	SXL TRAXL		1,000	Aug -2004
<i>Skandi Admiral</i>	Anchor Handling Tug	4,400	DOF Rederi Norway	Stern Roller Bearing	SXL		807	Jun -2009

Offshore Oil Application References

Vessel Name	Vessel Type	DWT	Owner	Install Location	Application	Thordon Grade	Shaft Diameter (mm)	Initial Installation Date
<i>Northern Chaser</i>	Anchor Handling Tug	2,800	Trico Marine Norway	Argos Engineering Co Pte Ltd Singapore	Stern Roller Bearing	SXL TRAXL	670	Dec -1991
<i>Maersk Server</i>	Anchor Handling Tug	3,472	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Thorseal	SXL	650	Jan -2000
<i>Maersk Server</i>	Anchor Handling Tug	3,472	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Thrust Washer	SXL	650	Jan -2000
<i>Maersk Shipper</i>	Anchor Handling Tug	3,903	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Thorseal	SXL	650	Jan -1998
<i>Maersk Shipper</i>	Anchor Handling Tug	3,903	Moller AP Denmark	Keppel Hitachi Zosen Singapore	Stern Roller Thrust Washer	SXL	650	Jan -1998
<i>Sea Lynx</i>	Anchor Handling Tug	2,900	Deep Sea Supply Asa Norway	Norway	Stern Roller Bearing	SXL	620	Oct -2006
<i>Sea Tiger</i>	Anchor Handling Tug	2,802	Deep Sea Supply Asa Norway	Norway	Stern Roller Bearing	SXL	620	Sep -2006
<i>Anglian Earl</i>	Anchor Handling Tug	2,499	Klyne Marine Denmark	Malta Dry Docks Malta	Stern Roller Bearing	SXL	576	May -2002
<i>Maersk Gabaras</i>	Anchor Handling Tug	2,170	Maersk Canada Canada	St. John's Dockyard Canada	Stern Roller Bearing	SXL	425	Nov -2009
<i>Lamnalco Manakin</i>	Anchor Handling Tug	840	Lamnalco Group U.A.E.	Jadaf-Dubai U.A.E.	Stern Roller Bearing	SXL	400	Jul -2011
<i>Gulf Backer 1</i>	Anchor Handling Tug	765	Tidewater	Tidewater	Stern Roller Bearing	SXL	393	Jan -2006
<i>Gulf Backer I</i>	Anchor Handling Tug	765	Tidewater Inc U.S.A.	Tidewater United Kingdom	Stern Roller Bearing	SXL	393	Nov -2007
<i>Gulf Balder</i>	Anchor Handling Tug	765	Tidewater	Tidewater	Stern Roller Bearing	SXL	393	Apr -2006
<i>Gulf Balder</i>	Anchor Handling Tug	765	Tidewater	Tidewater	Stern Roller Bearing	SXL	393	Nov -2007

Offshore Oil Application References

Vessel Name	Vessel Type	DWT	Owner	Install Location	Application	Thordon Grade	Shaft Diameter (mm)	Initial Installation Date
<i>Gulf Balder</i>	Anchor Handling Tug	765	Tidewater Inc U.S.A.	Tidewater United Kingdom	Stern Roller Bearing	SXL	393	Apr -2006
<i>Marco Star</i>	Anchor Handling Tug	1,800	Marco Shipping U.A.E.	Dubai Shipbuilding & Engineering U.A.E.	Stern Roller Bearing	SXL	380	Jan -2013
<i>Maersk Chignecto</i>	Anchor Handling Tug	2,170	Maersk Canada Canada	East Isle and Newdock Canada	Stern Roller Bearing	SXL	330	Jul -2009
<i>John Coghill</i>	Anchor Handling Tug	4,500	Seacor Marine U.S.A.	Bender Shipbuilding & Repair U.S.A.	Stern Roller Bearing	SXL	254	Sep -2007
<i>Norman F McCall</i>	Anchor Handling Tug	4,500	Seacor Marine U.S.A.	Bender Shipbuilding & Repair U.S.A.	Stern Roller Bearing	SXL	254	Jun -2008
<i>Seacor Davis</i>	Anchor Handling Tug	4,500	Seacor Marine U.S.A.	Bender Shipbuilding & Repair U.S.A.	Stern Roller Bearing	SXL	254	Sep -2008
<i>Seacor Grant</i>	Anchor Handling Tug	4,500	Seacor Marine U.S.A.	Bender Shipbuilding & Repair U.S.A.	Stern Roller Bearing	SXL	254	Oct -2007
<i>Seacor Lee</i>	Anchor Handling Tug	4,500	Seacor Marine U.S.A.	Bender Shipbuilding & Repair U.S.A.	Stern Roller Bearing	SXL	254	Jun -2008
<i>Seacor Sherman</i>	Anchor Handling Tug	4,500	Seacor Marine U.S.A.	Bender Shipbuilding & Repair U.S.A.	Stern Roller Bearing	SXL	254	Jan -2008
<i>Pacific Battler</i>	Anchor Handling Tug	2,090	Swire Pacific Offshore (Pte) Singapore	Ustein Verft As Norway	Stern Roller Bearing	SXL	250	Apr -2000
<i>Anglian Earl</i>	Anchor Handling Tug	2,499	Klyne Marine Denmark	Patije Shipyards BV Netherlands	Stern Roller Bearing	SXL		Jul -1987
<i>Blizzard</i>	Anchor Handling Tug	2,499	Tschudi Shipping Co AS Denmark	Patije Shipyards Netherlands	Stern Roller Bearing	SXL		Apr -1987
<i>Blizzard</i>	Anchor Handling Tug	2,499	Tschudi Shipping Co AS Denmark	Patije Shipyards BV Netherlands	Stern Roller Thrust Washer	SXL		Apr -1987
<i>BLUSTER</i>	Anchor Handling Tug	2,499	Tschudi Shipping Co AS Norway	Patije Shipyards BV Netherlands	Stern Roller Thrust Washer	SXL		Jul -1986

Thordon Offshore Applications

SXL Turret Mooring Bearings for *Ruby Princess* FPSO Conversion



Installing SXL into bronze carrier



SXL turret bearing

Thordon Offshore Applications

SXL Turret Mooring Bearings for *Ruby Princess* FPSO Conversion



Bow turret of Ruby Princess prior to installation



Bow turret installed on Ruby Princess with SXL turret mooring bearing

Thordon Offshore Applications

Thordon Supplies SXL/Thor-Flex Turret Bearing Pads for Ramform B-380 FPSO, Banff Oil Field

Thordon Bearings designed, tested and manufactured the lower turret bearing pads for the turret moored Ramform B-380 FPSO vessel for use in the Banff Oil Field Project. The 50 bearing pads supplied by Thordon have a total diameter greater than 8.0 m.

The turret bearing consists of Thordon SXL polymerized to Thor-Flex. As the wear surface of the loaded face, Thordon SXL is self-lubricating with a low coefficient of friction. Thor-Flex, an elastomeric polymer with high impact absorption properties was specified for the base material.

The turret bearing pads are designed to support a maximum load of 450 metric tonnes per metre bearing length while providing a maximum deflection of 10 mm. Various forms of scaled testing were carried out at Thordon's R&D laboratory while full scale test pads were tested at DNV (Det Norske Veritas) in Norway.



FPSO Ramform B-380 vessel fitted with SXL turret pads



Thordon Offshore Applications

Thordon SXL Lower Turret Bearing Pads for Exmar Offshore FPSO “Farwah” for C137B Field off the Coast of Libya

Novel turret design speeds Libyan vessel construction

TotalFinaElf's FPSO-based development plans for its CPTL 137B field offshore Libya moved ahead recently with the completion by London Marine Consultants of the loadout and transport of an innovative external turret mooring system for the field's FPSO.

The turret was designed and fabricated under an EPC contract, London-based LMC's first, from Doris Engineering, as part of the construction of the offshore facilities at the field, a concept built around the FPSO and a process platform, known as BD1.

Specifically designed for single lift, minimal hook-up installation onto the FPSO hull – aimed at 'significantly reducing the interface issues' associated

with conventional internal turret systems, while allowing vessel fabrication to proceed in parallel – the turret will be lifted and connected to the hull in the Fene yard of Spain's Izar which is providing the FPSO hull. Doris is supplying process facilities for the vessel.

To be installed in 83m of water in a 3x3 configuration off Libya, the newbuild FPSO has been designed with a 900,000 barrels storage capacity and will go into service early next year.

'The turret design is novel in its external use of a twin bearing column type structure, which is more frequently used in conventional internal turret/moonpool systems, but has been modified to provide rigid cantilever structures at

top and bottom, connected by an outer shaft structure to minimise relative deflections,' explains LMC director Jon Dunstan.

The outer shaft of the turret protects the inner shaft, which connects to the chain table and the nine 5in mooring chains. Once on-line at the field, the structure will take a 10in production line from BD1, located 3km away, and pass three 6.6kV power umbilicals from FPSO to power the platform.

The equipment is protected by an upper deck mounted housing structure that has been 'rigorously designed' to resist possible greenwater loading, which can result from the design significant wave height of 9m.



FPSO Farwah equipped with Thordon SXL turret bearing pads



Thordon Offshore Applications

Thordon SXL Lower Turret Bearing Pads for Exmar Offshore FPSO “Farwah” for C137B Field Off the Coast of Libya

floating production systems

The FPSO for the CPTL 137B field will be owned by Exmar Offshore and leased to TotalFinaElf subsidiary Compagnie des Pétroles Total Libye.

‘The CPTL 137 project marks a huge step forward for our company,’ believes Dunstan.

Detailed design for the turret was carried out in LMC’s London offices, with fabrication contracted to Scotland’s Burntisland Fabrications. The 10in axial fluid swivel was provided by Rolls Royce in Fife, the electrical slip-ring swivel by Trolex and the ESDV by Hopkinsons.

Other key suppliers included Roballo/Rothe Erde, which provided the three-way roller bearing, and Canada’s Thordon, which supplied the lower bearing pads.

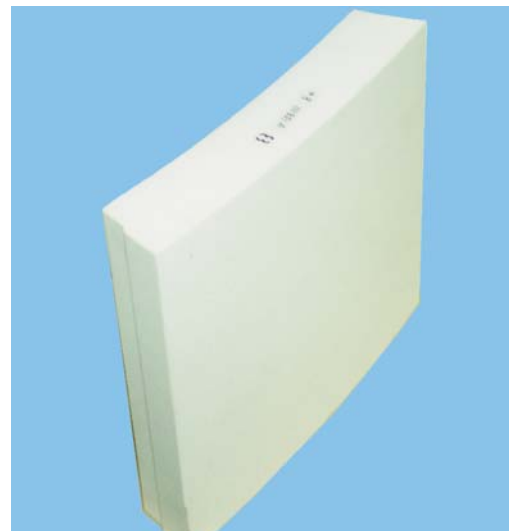
LMC is part of the London Marine Group, which also includes London Offshore Consultants and Vanguard Floating Production. The 25-strong engineering consultancy’s recent contracts have included detailed design and procurement work for turrets for Shell on the Soroosh FSU offshore Iran, and for Saipem on the CTOC Cakerawala FSO offshore Malaysia.

Meanwhile, LMC’s sister Vanguard Floating Production, as part of JV company Four Vanguard SNL, recently purchased a 94,000dwt tanker, the *Four Lakes*, to kick start a contract that will see it deliver an FPSO for Agip’s Woollybutt field offshore Western Australia. The conversion, currently under way at the Keppel FELS shipyard in Singapore, is being managed by Vanguard’s Australian subsidiary, along with the vessel’s installation and operation at the field. **OE**

***From ‘Offshore Engineering’,
September 2002 (pg. 26-27)***



Loadout of the Libyan FPSO turret at Burntisland.



SXL lower turret bearing pad

Thordon Offshore Applications

Thordon HPSXL TRAXL Bearings for Tower Yoke U-Joint Assembly for FMC SOFEC ESSO Chad Development FPSO

In the SOFEC design (shown below) a fixed tower brings crude oil from the ocean floor to the FPSO. The oil is then transferred to the ship by the pipes shown on the top of the unit. Thordon HPSXL TRAXL bearings are in the cylinder shaped unit between the ship and the fixed tower. The cylinder is a hinge to allow relative movement between the ship and the fixed tower. When the unit is installed the cylinder is filled with water to make it very heavy. When the distance between the ship and the tower changes, due to weather or tides, the cylinder is lifted. The lifted weight of the cylinder then acts as a restoring force trying to maintain the correct distance between the ship and the tower.



HPSXL TRAXL bearings



SOFEC ESSO Chad Development FPSO

Thordon Offshore Applications

Thordon SXL Stern Roller Bearings and Thrust Washers



Thordon SXL stern roller bearings



Thordon SXL stern roller thrust washers

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Thordon SXL Stern Roller Bearings and Thrust Washers



Thordon SXL bearing being installed in stern roller



Thordon SXL bearing installed

Thordon Offshore Applications

Thordon SXL Stern Roller Bearings and Thrust Washers



Maersk AHT equipped with Thordon SXL stern rollers and thrust washers

Thordon Offshore Applications

Troll Olje Project Pull-In Tube Guide

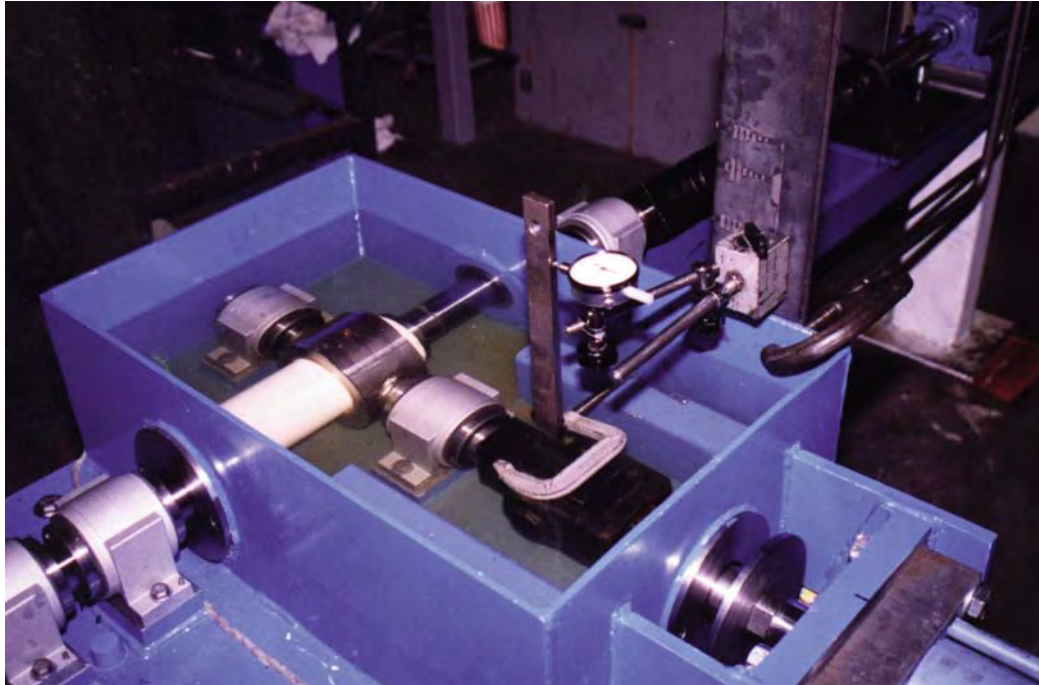


SXL Pull-In Tube Guide Bearings Supplied to Troll 'B' Olje Floater

- Proven 25 Year Guarantee
- Low Coefficient of Friction
- Custom Built Engineered Solution
- Self-Lubricating
- Non-Polluting

Thordon Offshore Applications

Troll Olje Project Pull-In Tube Guide



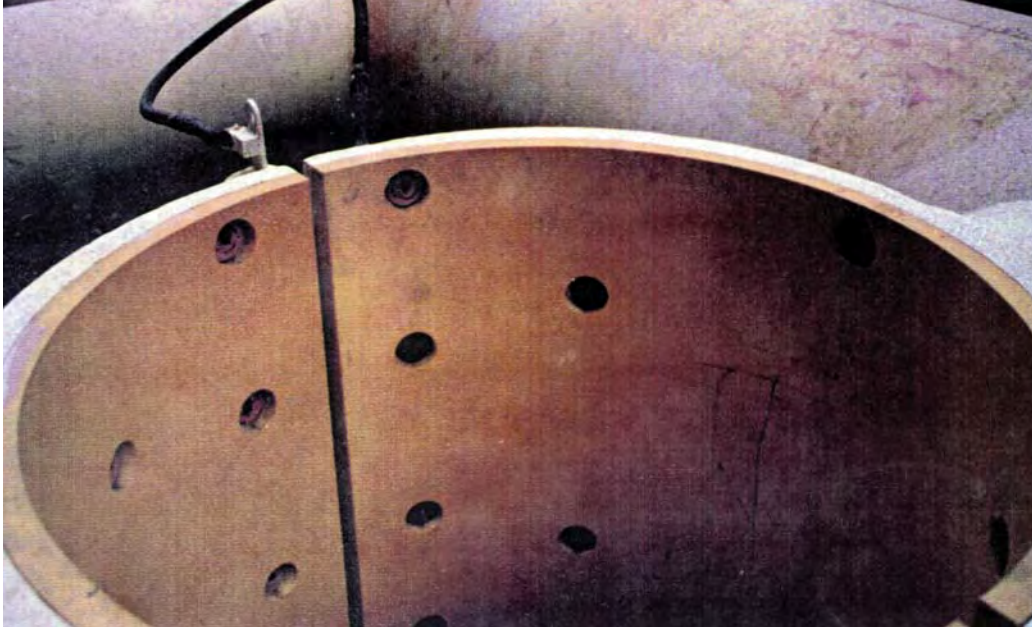
Long term linear movement test rig



Test bearing and spool after 38,000 test cycles

Thordon Offshore Applications

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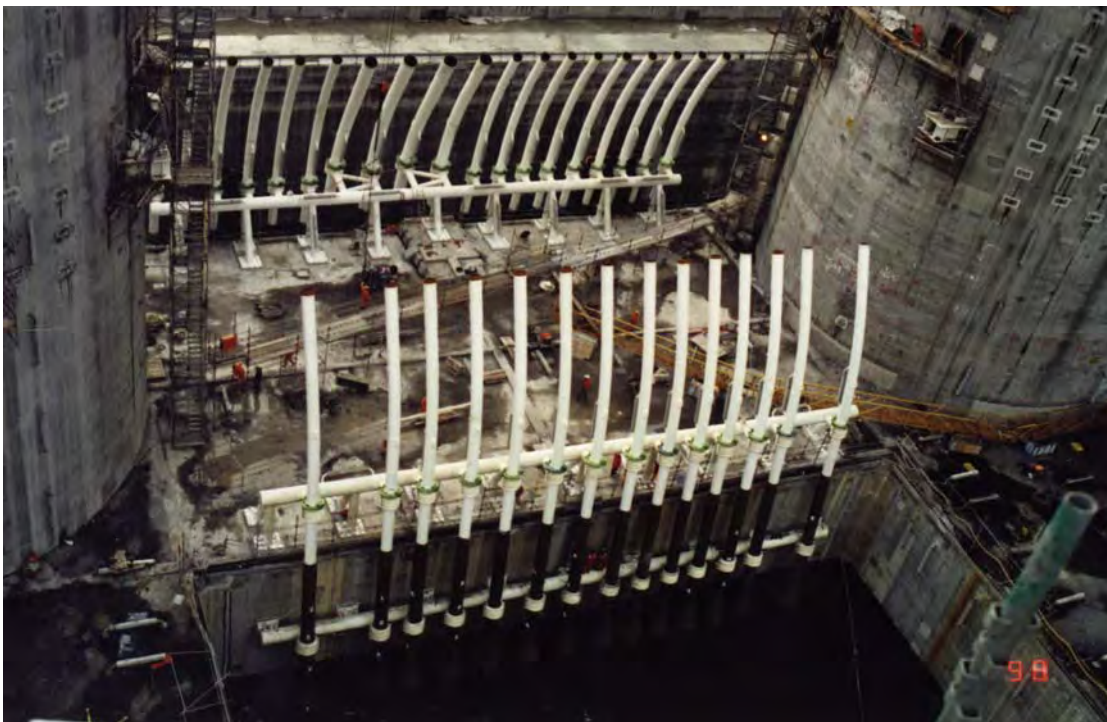
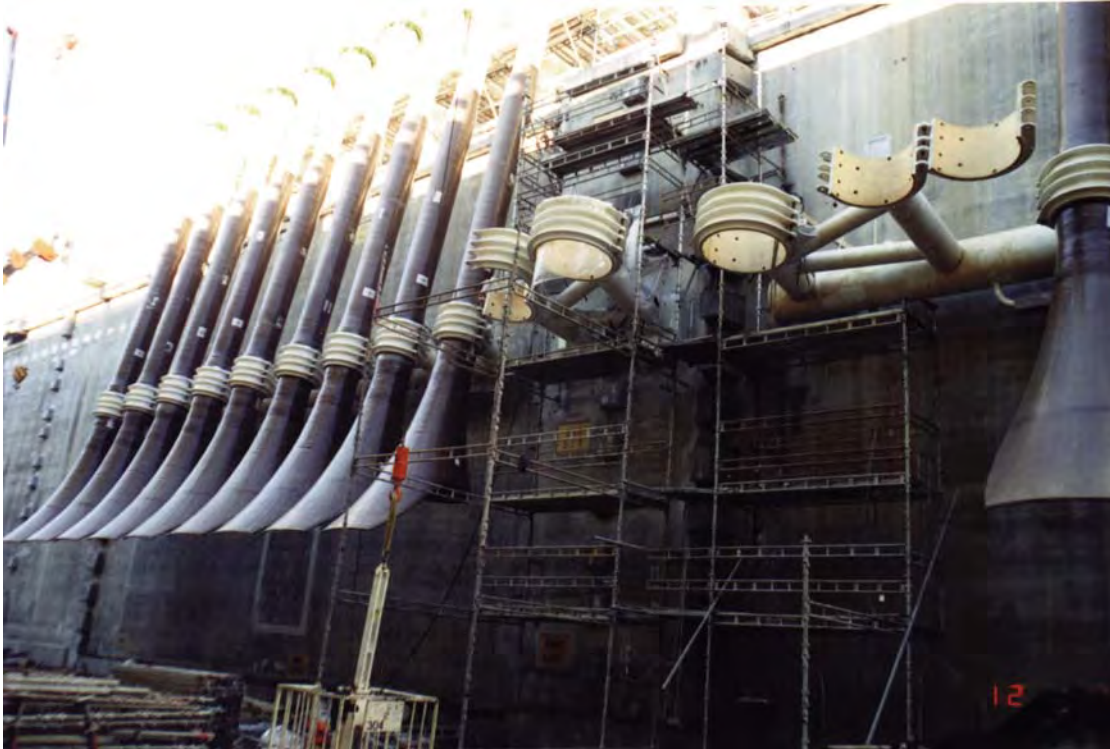
Bearings installed in bearing holders



Bearing support structure

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SXL TRAXL Net Catcher Bearing Supplied to Eureka Heidrun Project





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