



HYDRO-TURBINE BEARINGS

THORDON

ZERO POLLUTION | HIGH PERFORMANCE | BEARING SYSTEMS

INNOVATIVE SOLUTIONS FOR HYDRO TURBINE REHABILITATION AND NEW PROJECTS

Thordon Bearings is a pioneer in producing high performance, long lasting bearing system designs that require no oil or grease.

Our elastomer grades offer the best combination of strength/stiffness with flexibility/elasticity and abrasion resistance. The thermoplastic grade is a full form bearing that can operate at higher pressures than Thordon elastomers. Regardless of grade or configuration, Thordon bearings do not require grease or oil lubrication in dry or wet conditions.

- Long wear life and lower maintenance costs mean lower life-cycle costs
- Self-lubrication eliminates pollution risk
- Superior customer service means quick delivery and less downtime
- Full-cycle technical support includes system design, machining, installation and after-sales service
- Certification to ISO 9001:2000 ensures consistent custom and stock solutions

Thousands of customers across the world, in both rehabilitation and new turbine projects, know Thordon bearings is the proven choice for performance and value. Thordon bearings last.

Zero Pollution Bearing Systems

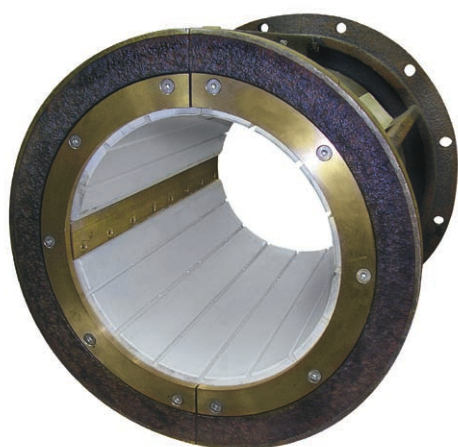
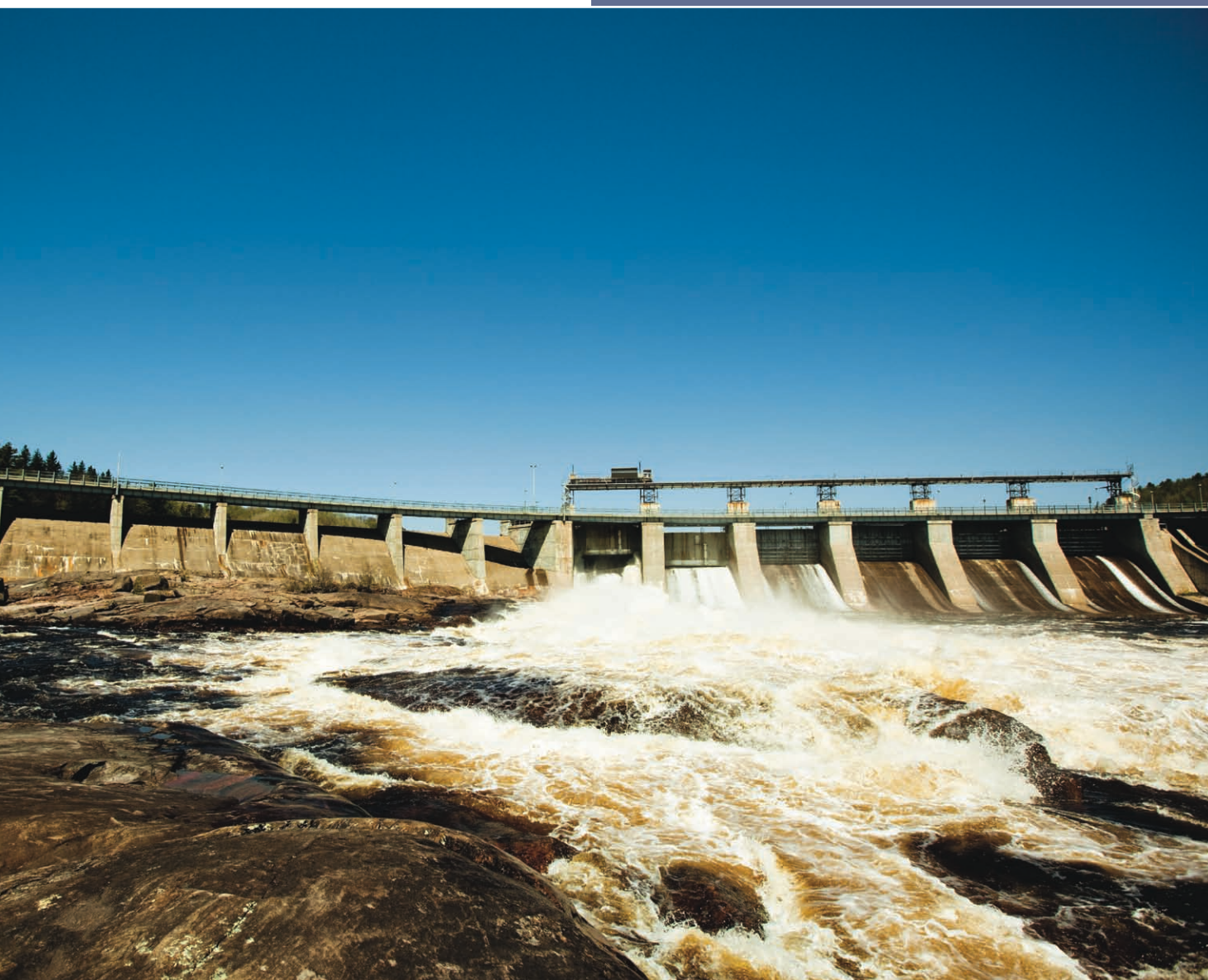
Thordon bearings help preserve the natural environments in which they operate. Our bearings and seals are pollution-free solutions.

- No oil or grease lubrication, wet or dry
- Extremely long wear life
- Reliable - no headaches with grease lines failing

High Performance Bearing Solutions with No Oil or Grease.



ZERO POLLUTION | HIGH PERFORMANCE | BEARING SYSTEMS



"By replacing the use of grease with self-lubricating Thordon, we have prevented a source of river pollution and eliminated maintenance associated with the greasing systems."

Keith Eastman, Senior Plant Engineer
Ottawa/St. Lawrence Group, Ontario Power Generation

"We have a consistent operating history with Thordon... We just didn't get the service life we wanted out of the rubber turbine marine bearings that we were using. The Thordon bearings have reduced our downtime and operating costs."

Dave Crandell, President
Mercer Construction Company, Inc., New York State



"The Thordon SXL bearing has been a complete success. This unit has operated with minimal wear or issues..."

Conrad St. Pierre,
Director of Mechanical Maintenance & Repair
Enel North America, Inc.
Star Lake Hydropower Station, Newfoundland

"Thordon bearings provided the added bonus of minimizing the greased systems used for lubrication at the powerhouse."

Bill Collins
Principal Mechanical Engineer
Sacramento Municipal Utility District

List of Additional Products:

- Operating Ring Wear Pads
- Servo-Motor and Servo-Link Bearings
- Wicket Gate Thrust Bearings
- Butterfly Valve Seals and Trunnion Bearings
- Screen Bearings and Wear Pads
- Pump Bearings
- Control Gate Bearings
- Wicket Gate and Operating Mechanism Seals
- Hydraulic Seals
- Kaplan Turbine Runner Blade Stem Seals
- Kaplan Blade Bushings
- Head Gate Bearing Rollers
- Thrust Cap Washers



THORDON – LONG LIFE-CYCLE SOLUTIONS, LOWER COST AND DOWNTIME

Now you can cut maintenance costs, reduce downtime and get longer, more reliable bearings. This lowers the life-cycle costs for your core bearing needs.

Thordon's unique polymers outperform other bearings:

- Low coefficient of friction
- Very low wear in abrasive water environments
- High resistance to shock loading and vibration
- High pressure performance to 70MPa (10,000 psi)
- High resilience

Turbine Main Shaft Guide Bearings

Thordon bearings are the superior choice for new turbines, upgrades from other bearings and full conversions of sealed oil systems.

Choose Thordon SXL or GM2401, depending on the abrasive concentration in your water.

We supply main shaft guide bearings:

- Bonded/mechanically fastened into split or non-split bearing housings
- Full form tubes
- On multiple guide blocks for larger bearings
- Stave configuration
- Custom designed, if required.

Wicket Gate and Operating Linkage Bearings

Thordon Wicket Gate and Linkage bearings operate wet or dry and eliminate the cost, maintenance and pollution risk associated with greased bearings.

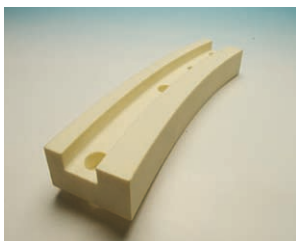
- Self-lubricating to ensure performance in limited-motion applications
- No galling from edge loading caused by minor misalignments or gate deflections
- Can be machined on site to accommodate dimensional inconsistencies and avoid replacement parts
- Quick stock and custom delivery to meet demanding rehabilitation schedules

Choose Thordon HPSXL, HPSXL TRAXL or ThorPlas, depending on size and pressure.

Segmented Turbine Shaft Seals

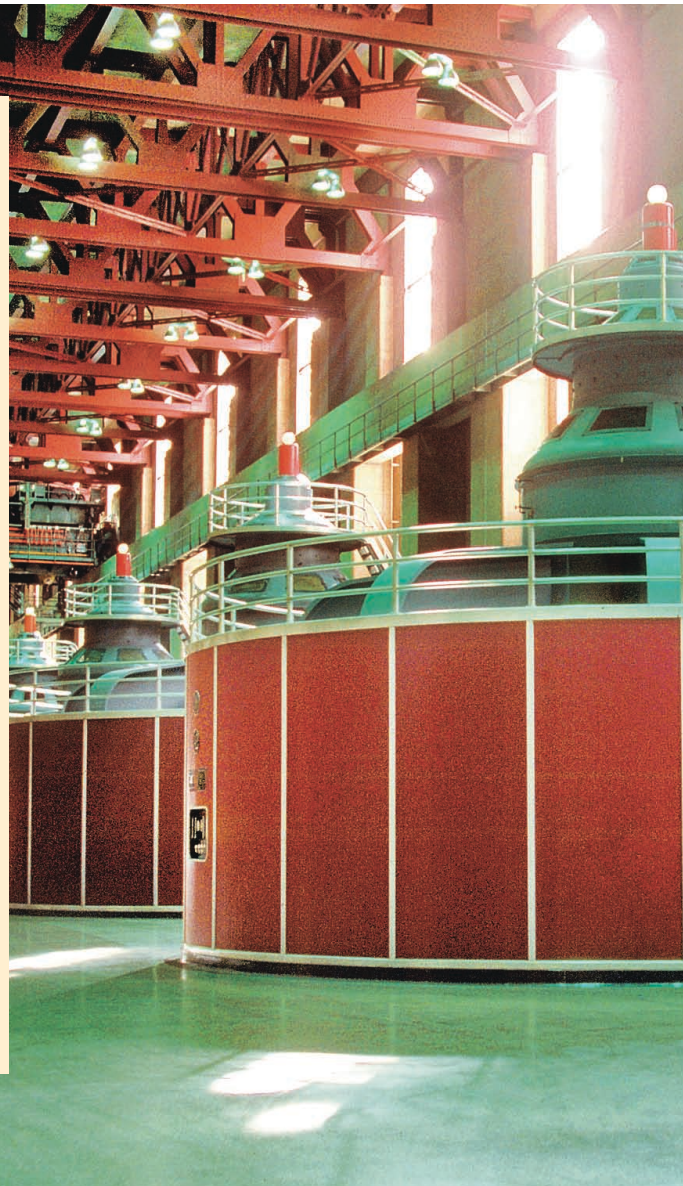
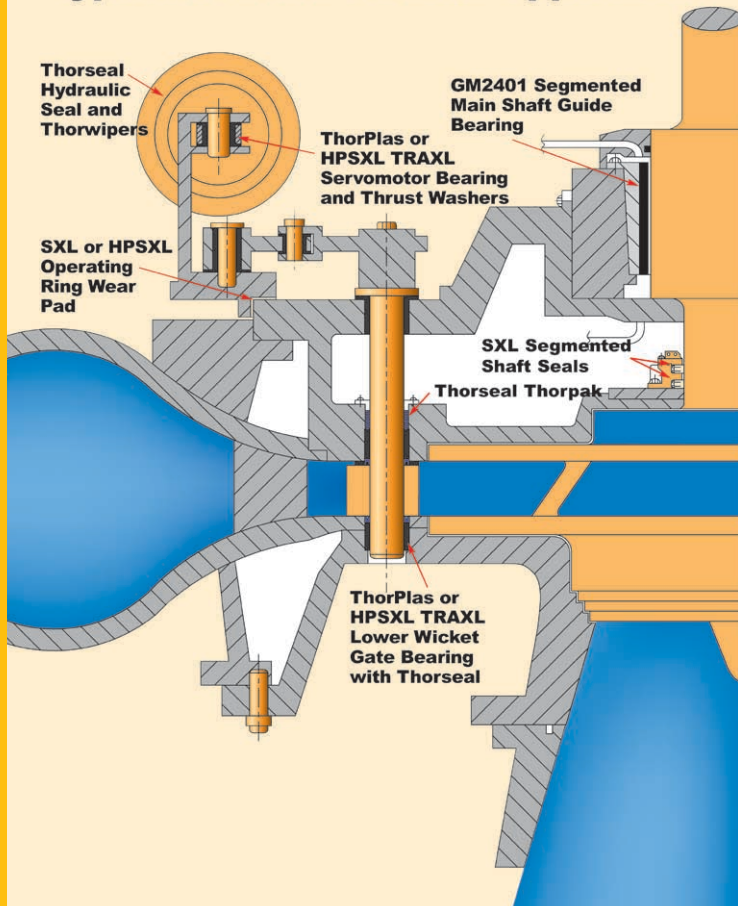
Thordon SXL segmented axial and radial seals last longer and cut life-cycle costs compared to carbon seals.

- Won't damage during installation like carbon
- High abrasion resistance
- Easy installation and misalignment tolerance
- Supplied molded to size



ZERO POLLUTION | HIGH PERFORMANCE | BEARING SYSTEMS

Typical Francis Turbine Applications



ThorPlas Bushings for Kaplan Runner Blade

"We chose the Thordon bushing because we have been using a Thordon turbine main guide bearing without any problems since 1984. These bushings are easy to work with and in the year they have been in use at the plant they have been trouble free."

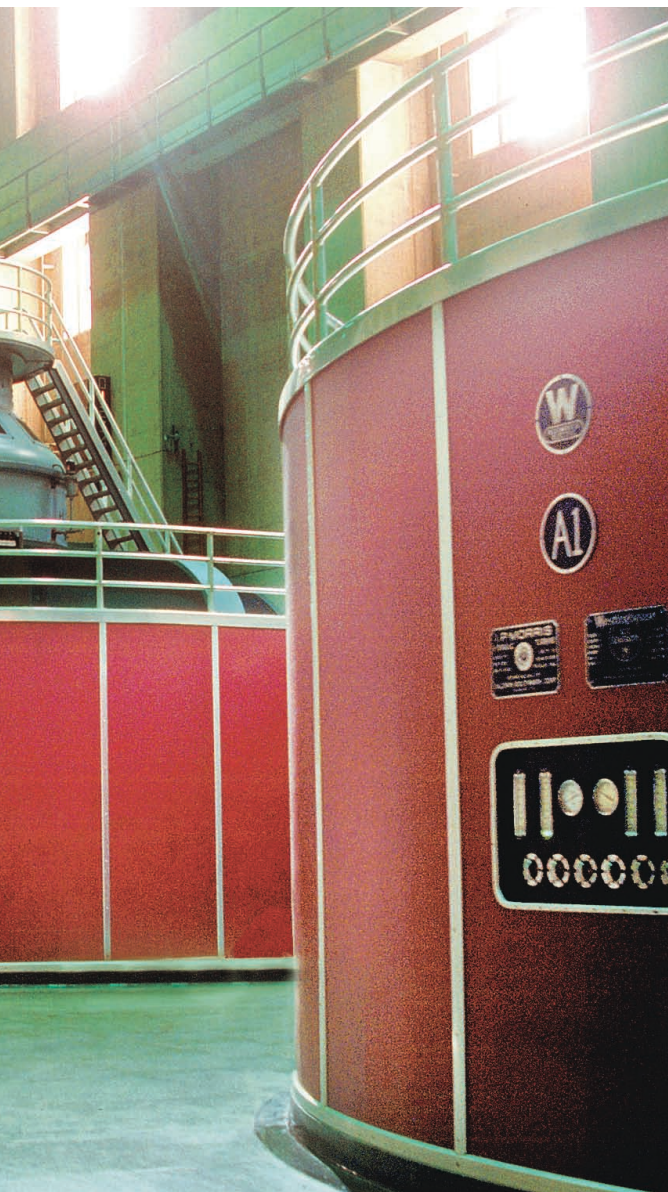
Wes Thomasson
Central Generation, Alabama Electric

Thordon Seals Success

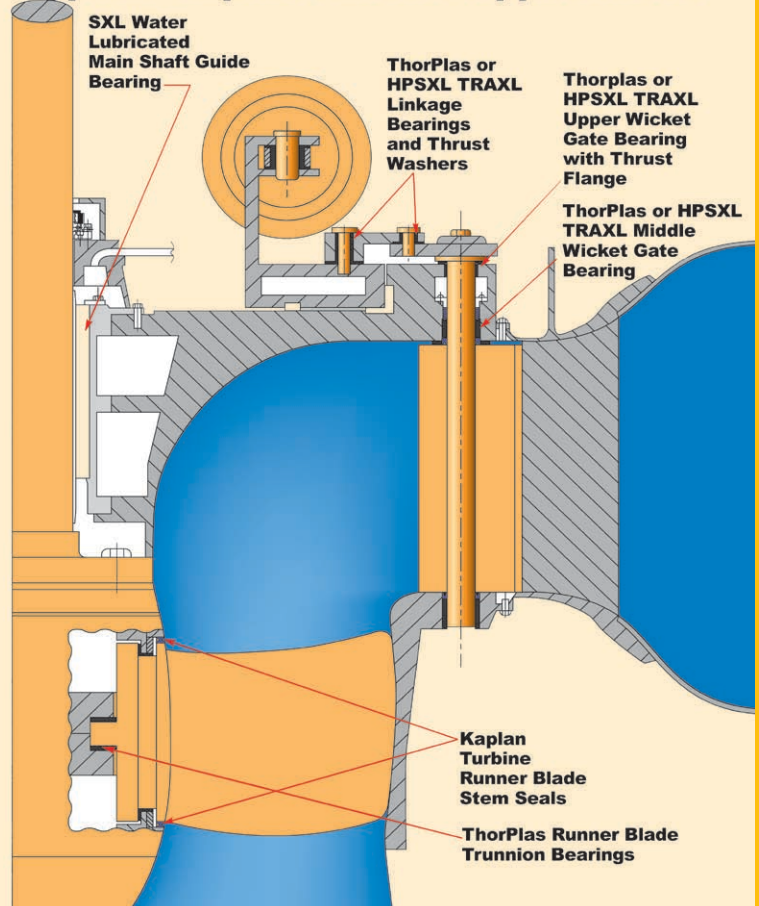
"We have been really pleased with the success we've had with the Thordon seals in the pumping units. Thordon SXL is a good product that has multiple uses."

Glenn Weddle, Supervisor of Mechanical Maintenance
Central Arizona Water Conservation District

ZERO POLLUTION | HIGH PER



Typical Kaplan Turbine Applications



Thordon Bearings Prove Reliability

"With Thordon, we got a much longer service life and extended our dewatering schedule from one to three years. These bearings are just more reliable."

Dave Crandell, President
Mercer Construction Company, Inc., New York State

Thordon SXL Main Guide Bearings Slash Maintenance and Downtime

"Thordon has lasted twice as long as the previous phenolic bearing. And the longer lifespan has kept labor and material costs down while expanding uptime."

Claude Mailloux, Planner/Supervisor
Inco Generating Plant, Spanish River, Northern Ontario



Rehab Speed and Reliability with Thordon SXL Guide Bearing

"It was certainly the right choice for us. The drastic cut in downtime and no realignment was a large saving in time and money."

Robert Conlon
Star Lake Generating Station, Newfoundland

Thorseals and HPSXL Solve Wicket Gate Leakage

"We were dealing with an infiltration rate of 20 gallons per minute on some units. Today, there's virtually no leakage at all."

Ken Anderson, PUD Project Engineer
Chelan County Public Utility District, Columbia River, Washington State

Thordon Offers You Even More Benefits:

- Long Wear Life
- Low Friction/No "Stick-Slip"
- High Abrasion Resistance
- Sizing Flexibility – Easily Machined On site
- Pollution Free Operation – Wet or Dry
- Accommodates Edge Loading
- High Resilience/Impact Resistance
- Hardened Journals Not Required



THORDON – HIGH PERFORMANCE THAT OTHERS CAN'T MATCH

More than 40 years ago, we launched Thordon, an elastomeric polymer alloy that combines strength/stiffness with high toughness and abrasion resistance. This combination results in a line of bearing products that is capable of carrying the operating loads found in this demanding application yet are flexible enough to resist wear due to 3rd particle abrasion.

The unique polymer structure is fully homogeneous so all the properties – abrasion resistance, self-lubrication, low coefficient of friction, resistance to vibration and shock loading – are consistent throughout the entire bearing wall thickness.

We continue to innovate for the hydro-electric industry and offer different bearing grades and configurations to meet the demanding needs of your applications.

ThorPlas

- Engineered thermoplastic for high pressure applications up to 31.0 MPa (4500 psi) dynamic or 45MPa (6500 psi) static.
- Full-form tubular configuration
- Very low wear in non-abrasive environments
- Operates in water up to 80°C (176°F)

Thordon HPSXL TRAXL

- For high pressure applications up to 55 MPa (8000 psi) dynamic or 70 MPa (10,000 psi) static peak.
- Friction coefficient typically 0.06-0.12
- High resistance to shock loading and vibration

Thordon SXL

- Working pressure to 10 MPa (1450 psi)
- Friction coefficient typically 0.10-0.20
- Wet or dry operation
- High resistance to abrasion, shock loading and vibration
- Dry start-up capability

Thordon GM2401

- Made specifically for use in very abrasive water environments
- Stiffer and at least twice the abrasion resistance of rubber
- Lower friction coefficient than rubber

Thorseal Hydraulic Seal

- Keep abrasives from bearing surface
- Pressures from 0 -100 MPa (0-15,000psi)
- Tough - won't cut or tear
- Low friction – self lubricating
- Single and stacked for limited motion and reciprocating linear applications
- Can be custom designed to solve difficult sealing solutions



THORDON BEARINGS: CUSTOMER FOCUSED TO QUICKLY MEET YOUR NEEDS

Quick and Responsive Service

It takes quality products to be successful around the world in the hydro power generation industry. It also takes great service to keep customers coming back.

Thordon Bearings Inc. appreciates that downtime is to be prevented. We have geared our company to respond quickly for rehabilitation projects and new turbine construction. Thordon bearings arrive quickly, fit right and last!

Extensive Distribution Network

Thordon Bearings has an extensive distribution network to supply our customers around the world. More than 70 distributors in 85 countries carry extensive inventories of Thordon's common bearing sizes which are backed by large regional and head office inventories.

Non-standard requests are met with responsive design, quick machining and speedy delivery.

Application Engineering

Thordon engineers work closely with customers to provide innovative bearing system designs and solutions. We use the proprietary Thordon Bearing Sizing Calculation Program to help correctly size our bearings.

Our decades of experience mean that we offer the right technical support during machining and installation.

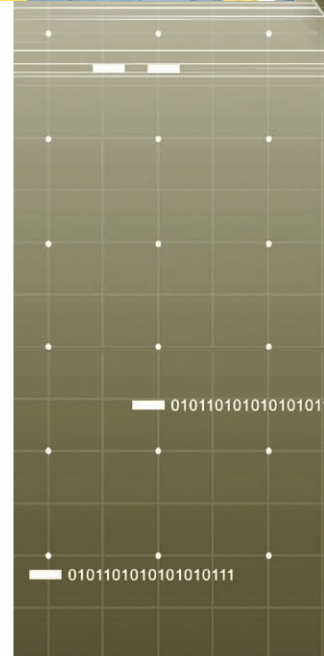
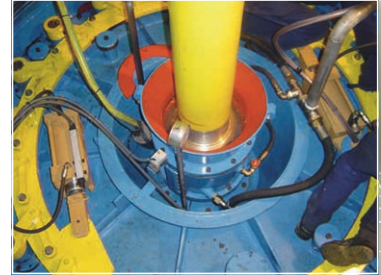
Manufacturing Quality

Thordon Bearings Inc. is a family-owned company that operates a state-of-the-art polymer processing plant as well as in-house design, CAD and R&D facilities in Burlington, Ontario, Canada.

We also operate a joint venture with Leningradsky Metallichesky Zavod (LMZ) – Russia's largest hydro-turbine manufacturer and the fourth-largest in the world - to supply Thordon bearings to domestic and foreign markets.

Installations around the world range from micro-turbines to units with main shafts up to 3.7 m (94") diameter.

We manufacture to ISO 9001:2000 Quality System requirements. Contact us for references for our installations.



ZERO POLLUTION | HIGH PERFORMANCE | BEARING SYSTEMS



"We are very pleased with both the performance and cost of Thordon products and services and plan to continue working with their team to ensure smooth operation of the Henry M. Jackson Project in the future."

Martin Bradley, Mechanical Constructor
Snohomish Co. P.U.D.

"We have used Thordon since 2002 and found that we can trust them much more than the previous bearings' material as we have not had any failures since then."

Viktor Polumbo, Chief Engineer
Kolenergo, Kola Peninsular

Your Authorized Thordon Distributor

**High Performance Bearings and Seals,
Industry-Leading Service**

Thordon Bearings is an industry leader in the design, manufacture, supply and installation of high performance, pollution-free, hydro turbine bearings and seals.

THORDON

Thordon Bearings Inc.

3225 Mainway, Burlington, Ontario, Canada L7M 1A6

Tel: (905) 335-1440 Fax: (905) 335-4033 Email: info@thordonbearings.com Website: www.thordonbearings.com

ZERO POLLUTION | HIGH PERFORMANCE | BEARING SYSTEMS



TBIHB 09/07/4000
PRINTED IN CANADA