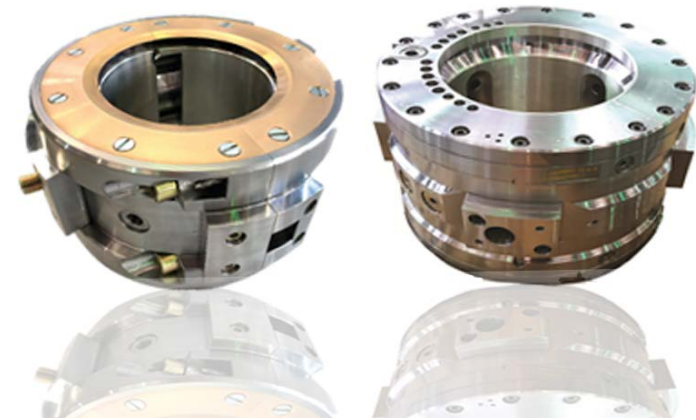


DYM CO., LTD.

Hydrodynamic Bearings, Seals and Packings

DYM products allow for optimized performance in a broad range of rotating equipment with unmatched knowledge and experience.

We strive to produce correctly, the first time, products and services which consistently meet or exceed, our customer's requirements and specifications.



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BEARING DESIGN AND ANALYSIS

MANUFACTURING LEAD TIME

WEBSITE – WWW.DYMBRG.COM

History

- MARINE DIESEL ENGINE PROJECT EXPERIENCE : 1981 ~ NOW
- POWER PLANT PROJECT EXPERIENCE : 1989 ~ NOW
- REDUCTION GEAR & COMPRESSOR EXPERIENCE : 1986 ~ NOW
- STEEL PLANT PROJECT EXPERIENCE : 1986 ~ NOW
- NUCLEAR PLANT PROJECT EXPERIENCE : 2008 ~ NOW



STEEL PLANT



HYDRO



THERMAL



GEOTHERMAL



NUCLEAR



MARINE



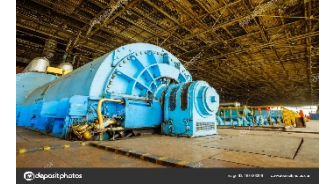
TRANSMISSION



GAS TURBINE



INDUSTRIAL MOTOR

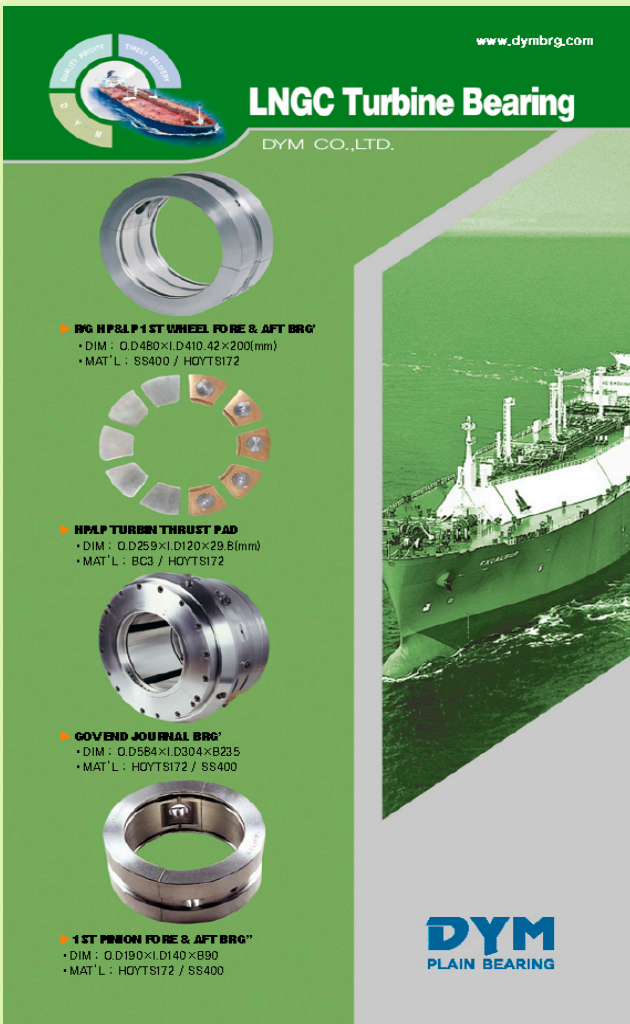


PUMP

History



- 1981** Established the company named "DONG YANG METAL CO., LTD." JUNE 1, 1981.
- 1986** Localized the Tilting Pad Bearing for the Centrifugal Compressor (32,000 RPM) and delivered to POSCO.
- 1987** Manufactured White Metal Bearing for the Engine (RTA84C, 54,000HP) of the Project APL #1 ~#5, delivered to HSD(EX.HANJUNG).
- 1989** Localized Turbine and Generator Bearing for Nuclear Power Station and delivered to DOOSAN (EX.HANJUNG).
- 1994** Contract with Sulzer (Now Wartsila) in Switzerland for Marine engine bearing supplier.
- 1997** Qualified by FUJI Electronic, Japan as a Bearing supplier
- 1997** Qualified by VOITH FUJI, Japan as a Hydro turbine bearing
- 1999** Developed the Tilting Pad Bearing for Centrifugal Compressor. (SAMSUNG TECHWIN)
- 2001** Qualified by GE Power systems, U.S.A as a Steam Turbine & Generator Bearing supplier.
- 2001** Qualified by GE Oil & Gas Nuovo Pignone, Italy as a Centrifugal Compressor Bearing.



- 2002** Qualified by POSCO, Korea as a shell & Sleeve bearing supplier.
- 2003** Qualified by MAN B&W, Denmark as a Thin Shell Bearing supplier.
- 2003** Qualified by HITACHI, Ltd. Power Systems, Japan as a Bearing supplier.
- 2004** Qualified by TOSHIBA Corporation, Japan as a Generator Bearing supplier.
- 2004** Qualified by SEISA Gear LTD, Japan as a Thrust Pad Bearing supplier.
- 2004** Qualified by GE Power systems, USA as a 390H type End shield Generator Bearing and delivered to Harbin electric machinery China.
- 2004** Qualified by HITACHI NICO, JAPAN as a Bearing Supplier
- 2005** Qualified by GE Power systems, USA as a 330H type End shield Generator Bearing.
- 2007** Supplied Thrust Plate for Nuclear Power to Nuclear Power Corporation India Limited.
- 2007** Contract with FORMOSA for Gear Shaft Bearing in Taiwan for GE.
- 2008** Qualified by SIEMENS, GERMANY as a Steam Turbine Bearing.
- 2008** Qualified by GE, Large Steam Turbine Generator Bearing



- 2009** Qualified by TOSHIBA for all of Nuclear Metal Bearing supplier.
- 2010** ISO 14001, OHSAS 18001 Approved by DET NORSKE VERITAS Q.A
- 2010** Supplied OM-1 PROJECT Bearing for Nuclear Power to Toshiba.
- 2010** Qualified by MITSUBISHI ELECTRIC, Japan as a Generator Bearing supplier.
- 2010** Qualified by ALSTOM, FRANCE as a Nuclear bearing supplier.
- 2011** Supplied AP1000 Bearing for Nuclear Power to Toshiba.
- 2013** Qualified by GE, 6B, 7EA, 9EA Gas Turbine Bearing.
- 2013** Qualified by GE, Packing Casing & Packing Head.
- 2013** Supplied Generator H2 Seal Rings for Andritz Hydro.
- 2013** Qualified by BHEL as bearing supplier.
- 2014** Approved by GE to manufacture Hardware.
- 2015** Supplied High speed bearing for steam turbine to Larsen & Turbo in India.
- 2016** Delivered Packing head to Toshiba.
- 2017** Qualified by GE as L-Alstom type bearing supplier

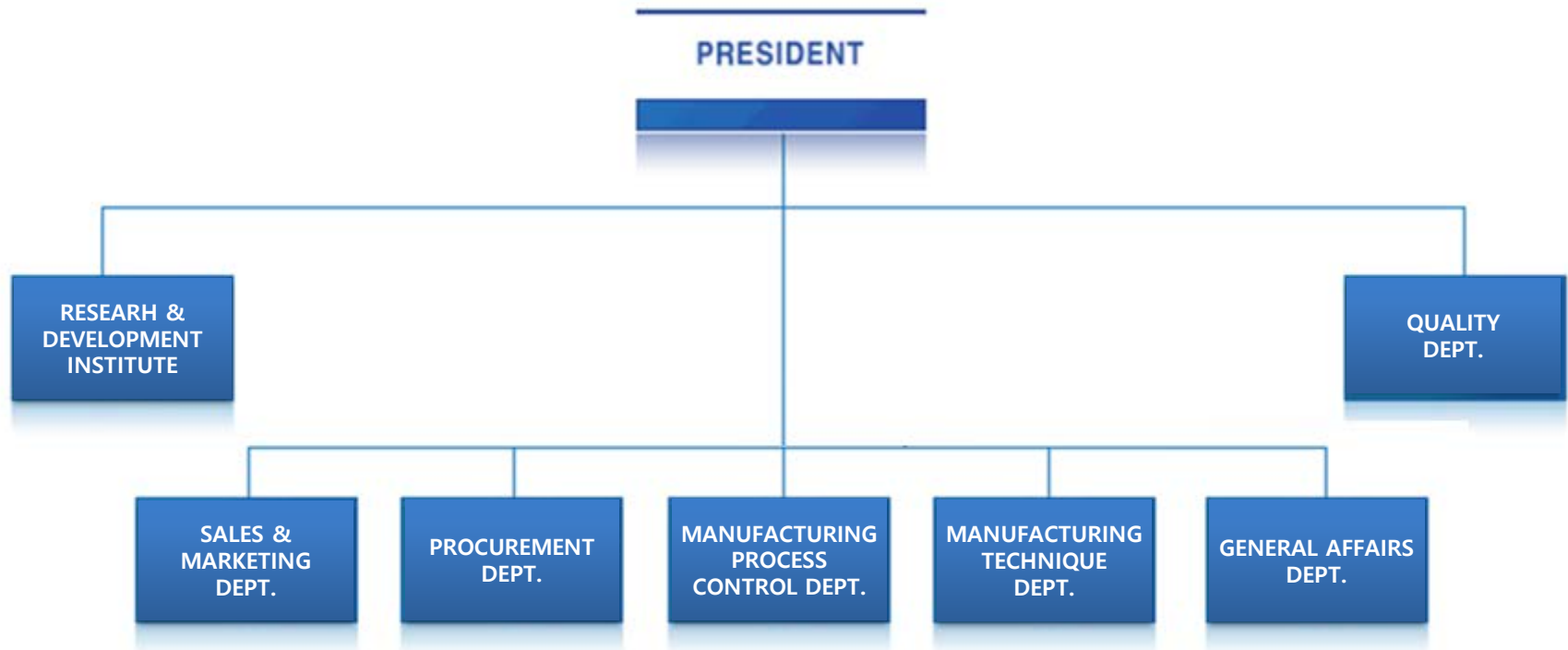
History



- 2017** Qualified by FUJI, Motor bearing bracket delivered to Japan.
- 2017** Support Bearing repair and replacement for SK Energy.
- 2017** Support Bearing and casing upgrade for POSCO Plant.
- 2018** Excellence Awarded 2018 as Excellence Supplier by GE POWER.
- 2018** Qualified as 2Pad bearing supplier by MHPS.
- 2018** Delivered Bearing bush to Nippon Steel Japan.
- 2019** Developed bearing bush for Yeah shin Taiwan.
- 2020** Support Repair solution anchor bolt and plate for Samsung C&T
- 2020** Qualified Air guide supplier by GE.
- 2020** Support 2Pad Bearing for Mitsubishi Power .
- 2020** Support Upper and Lower Guide Bearing (Welding Type) for Voith Fuji , Fuji Electric.



DYM Organization



Quality Management System

QUALITY SYSTEM

ISO 9001;2015 CERTIFIED BY DNV

ISO 14001;2015 CERTIFIED BY DNV

OHSAS 18001;2007 CERTIFIED BY DNV



SUPPORTING FIRM

KIMM (KOREA INSTITUTE OF MACHINERY & MATERIALS)

ECKA GRANULES® - SUPPLIER OF WHITE METAL INGOT

KTR (KOREA TESTING & RESEARCH INSTITUTE)

KOTRA (KOREA TRADE INVESTMENT AGENCY)



<GE POWER & WATER>

PART 1 - IDENTIFICATION		Supplier Qualification Form				
Oracle Code	071063	Qual Status	Closed			
Supplier Name	Jeong Yang Metal Inc. Co., Ltd	Supplier Site	Pusan -			
Supplier Contact	Ahn Sung-jin	Buyer Name				
Supplier Phone	02-41-587-4797	SOE Name	Jeong Jong-ku			
If Subtier Name						
Supplier Location						
EDR						
Product						
Line/Program						
Business	POS	Qual Type	F2			
Drawing #						
Part	Living assembly(1x1d ELLIP)	Customer	BA			
Process	Subbiting Heat Treatment Machining NDT - Liquid Penetrant Testing NDT - Ultrasonic Testing NDT - Visual Testing	PO #	023907384			
Supp Qual #	02-11365					
PART 2						
Qualification Req	Similar qualification: SQ-05162-01789					
Qual Restrictions						
QE Frozen MFP #		MPE MO #				
Qualification Team Participants - Minimum Sourcing Quality and Engineering Signatures (To be signed after qualification is complete)						
Required	Approved	Rejected	Department	Printed Name	Signature	Date
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	SOE	Jeong Jong-ku	Jeong Jong-ku	16/2019
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	SOL	Jeong Yong-uk	Jeong Yong-uk	16/2019
Date Completed				0216.0928		
				FISSO 6.2.3 A		

TOSHIBA

(品 7) 通達 7-7092 様式 7-1

(Contract No. VAPK19172559)

Issued Date: Nov. 5, 2019

品質監査結果通知書 VENDOR CERTIFICATE

会社名 Vendor	DYM CO.,LTD
工場名 Shop	
住所 Address	Dadao-dong 139, Hongi-ro Seha gu, Busan, Korea
連絡先 Contact	Quality Assurance Team

先般実施しました貴社に対する品質監査の結果を通知申し上げます。

We are pleased to inform you the result of the last audit.

結果Result	合格 Acceptable
認定範囲 Scope	BEA-WMG ME-1AL
有効期限 Valid:	Dec. 5, 2019 ~ Dec. 5, 2022.

結果の詳細はホームページに掲載しております。疑問点やご不明な点がございましたら、ご連絡ください。引き続き宜しくお願い致します。

The content of this qualifier and brief summary of this audit result are shown on subsequent page(s) of this report. If you have any questions, please do not hesitate to contact us for our convenience. Thank you for the continuous cooperation.

TOSHIBA ENERGY SYSTEMS & SOLUTIONS CORPORATION
KEMENY PRODUCT OPERATIONS

Authorized: Nov. 19, 2019

Erika Miki

Production Quality Control Group

Quality Assurance Department

(Signature) M. Okawa

Makiko Okawa

Group Manager

Production Quality Control Group

Quality Assurance Department

CC:

(Signature)


Nov. 5, 2019

Y. Miyajima

Senior Manager

Quality Assurance Department

取引先品質監査結果通知書(フローシート)			
Result notification for audit of quality of supplier			
<p>先に実施いたしました貴社品質監査の結果、以下の事項について通知致します。</p> <p>弊企業及び貴取引所を記入の上の事項に記入します。</p> <p>This is to notify you of our comments regarding the quality audit of your company after the findings were fully studied. Please fill in from the corrective measures, due date for implementation and other necessary information on your side and send the form back to us. Thank you.</p>			
発行名 販売業者 販売先名	DYM Co. Ltd. Toyoi Management, Ltd. Manager Akagi M. Sales, Purchasing Control Dept.	受取年月日 受取者 受取部	2019.7.4.7:5 (大島、三好、深井、山田、 高島、田中、深井、小澤)
貴社監査記入欄 Please be filled by you		受取企業記入欄 Please be filled by supplier	
品質改善項目 Quality Improvement Items		品質改善項目 Quality Improvement Items	
①品質改善項目 QMSB-1 新樹林外、外注品・機械の故障 規格 DYM-QS7-100 4.6 の内容と変更の対応方法など ②品質改善項目 ③品質改善項目 ④品質改善項目	DYM-QS7-100 4.6 の内容と実際の評価方法を 改定して本館では内容を変更しました。 DYM-QS7-100 4.6 の内容と実際の評価方法を 改定しました。本館方法の改定も変更しました。		
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 **Mitsubishi Hitachi Power Systems**

Certificate No. : 2249-02

Certificate of Qualification

This is to certify that

DYM Co.,Ltd.

Address : #1506-4, DADAE-DONG, SAHA-GU, BUSAN, KOREA

has been approved by Mitsubishi Hitachi Power Systems Ltd. as a qualified partner.

The approved quality management system is applicable to following item(s) being supplied to Mitsubishi Hitachi Power Systems Ltd.


Item(s) : BEARING (not applicable to nuclear facilities)

All above item(s) shall be subject to "Quality Assurance General Requirement: MS04-ZQ-QA001".

Y M

Expiry Date : 31 October 2022

Date of Certification : 28 October 2019

Issued by : 

Seigo Taniguchi
Director
Quality Management Department
Quality Management Division
Mitsubishi Hitachi Power Systems, Ltd.

<FUJI ELECTRIC >

<Mitsubishi Power>

Certificates of Approval



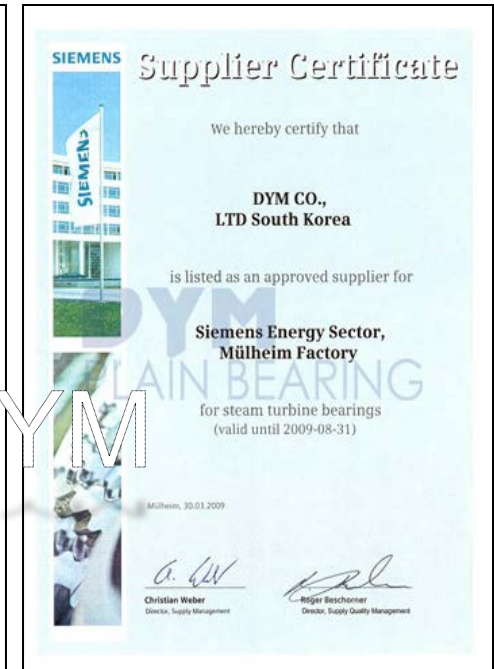
<MAN DIESEL>



<WÄRTSILÄ>



<HYUNDAI>



<SIEMENS>
(STEAM TURBINE)

Our Customers

ANDRITZ

DOOSAN

FE Fuji Electric



HEC
哈电集团

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

NICO

MITSUBISHI
POWER

बी एच ई एल
BHEL

L&T

MHPS

SIEMENS

新日鐵住金株式会社
しんにってつすみきん



ALSTOM

MAN

WÄRTSILÄ

MITSUBISHI
ELECTRIC

Sumitomo Heavy Industries Gearbox Co., Ltd.

한국전력공사
KOREA ELECTRIC POWER CORPORATION

TOSHIBA
Leading Innovation >>>

FLSMIDTH
MAAG GEAR



POSCO

VOITH FUJI
HYDRO POWER GENERATION

KOBELCO

SAMSUNG
삼성물산

NUCLEAR POWER CORPORATION OF INDIA LIMITED
A Government of India Enterprise

ENERGYEN

DNV-GL

Lloyd's
Register

千代田商事 株式会社
CHIYODA SHOJI CO., LTD.



Blohm+Voss

Main Facilities



◆ DOOSAN Puma UTS 1620

- Maximum machining range : $\phi 2000 \times H1556$
 - STROKE
 - X : 1727 mm
 - Z : 960 mm
- Installed Sep 2014.



◆ DOOSAN Puma 280 Turn/Mill Centre

- Maximum machining range : $\phi 420 \times L658$, 3600 r/m
 - STROKE
 - X : 242 mm
 - C : 360 mm
 - Z : 680 mm
- Installed Sep 2015.

Main Facilities



◆ YAMAZAKI MAZAK NEXUS 8800 with 6 Pallet

- Maximum machining range : $\phi 1,450 \times H1,450$ / 2,200 kg
(FH 8,800 : $\phi 1,250 \times H1,250$ / 2,200 kg)
 - STROKE
 - X : 1,400 mm
 - Y : 1,200 mm
 - Z : 1,325 mm
- #1. Installed on JAN. 2009.



◆ DOOSAN DS – 130C

- Maximum machining range : $L3,000 \times H2,000 \times W1,600$ / 15,000 kg
(FH 4,000 x H2,000 x H1,600 / 15,000 kg)
 - STROKE
 - X : 2,800 mm
 - Y : 1,800 mm
 - Z : 1,425 mm
- #1. Installed on MAR. 2009, #2. Installed on APR. 2009
#3. Installed on OCT. 2016, #4. Installed on NOV. 2016

Main Facilities

Horizontal Boring Machine

- Stroke (X/Z) : 1600 / 1300 mm, 10 Equip.

Vertical Turning Machine

- Table size : 1600mm, 16 Equip



Main Facilities

Centrifugal Casting Machine



Maximum Casting Capacity Size : $\varnothing 1,500\text{mm} \times \text{L}2,500\text{mm}$
Maximum Capacity Weight : 5Ton

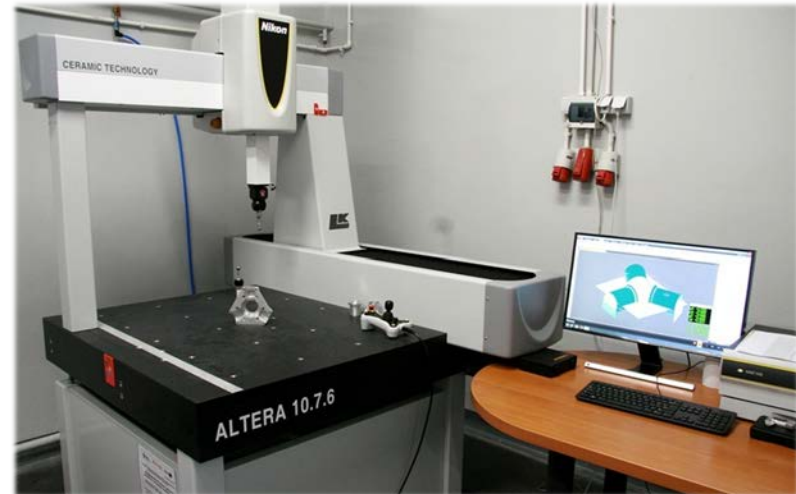
Centrifugal / Gravity casting is core technology of DYM.

We continuously put effort and investment to enhance casting ability so that we achieved optimized casting formula and digital monitoring system.

Casting facility is strictly controlled and monitored to satisfy with customer expectation.

Main Facilities

Coordinate Measuring Machine



NIKON ALTERA 15.12.10

SCANNING STROKE

- X : 1,525mm
- Y : 1,220mm
- Z : 1,016mm
- MAXIMUM WEIGHT : 5,500kg
- ACCURACY : 1.9 μ m

Main Facilities

Nozzle Flow Tester

One of important in hydro dynamic bearing is to check oil flow so that create correct oil layer in turbine operation.

DYM service provide customer bearing oil flow simulation with Nozzle flow taster.

Currently DYM cooperate with Mitsubishi to 2 Pad bearing and bearing nozzle simulation test result.



Category	Spec
Water Tank	1,000 L
Pressure Gauge	0~6 BAR
Flowmeter	300 LPM
	1,500 LPM
Thermometer	0~150℃
Pipe	50A-SUS304
	150A-SUS304

NX9 Model based Manufacturing



JOURNAL TYPE BEARING

APPLICATION : Turbine, Motor, Generator, Transmission, Pump, Compressor

MATERIAL : Carbon steel, Cast iron, Copper

FEATURE : Most commonly and frequently used basic type bearing.

It can be divided basic cylindrical and elliptical bearing.

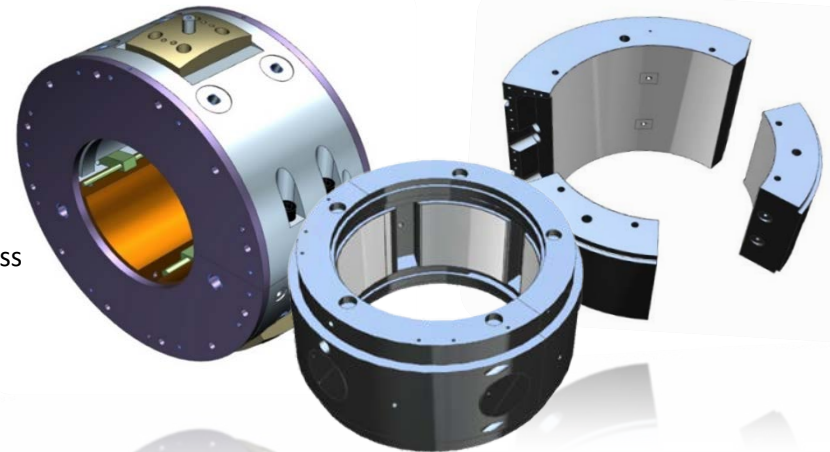
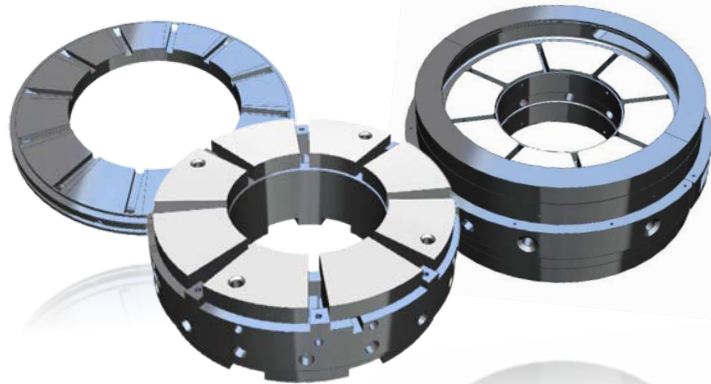
Recent development is moving to carbon from Cast iron.

TILTING PAD TYPE BEARING

APPLICATION : Turbine, Generator

MATERIAL : Carbon steel, Copper

FEATURE : Multiple number bearing pad will support dynamic stiffness and guide journal while rotation. Copper alloy high conductivity will be solution to discharge operation heat.



THRUST BEARING AND PLATE

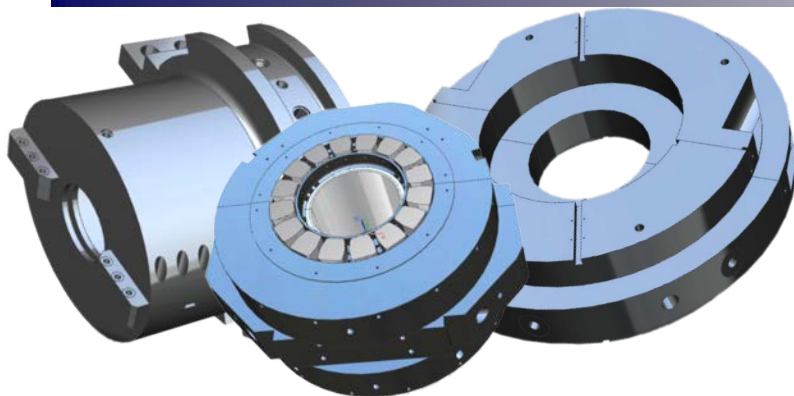
APPLICATION : Turbine, Generator

MATERIAL : Carbon steel, Copper

FEATURE : This particular bearing designed to support axial load.

Bearing create wedge shaped oil barrier inside oil groove which will protect journal collar and turbine.

NX9 Model based Manufacturing



COMBINED BEARING

APPLICATION : Turbine, Generator

MATERIAL : Carbon steel, Cast iron, Copper

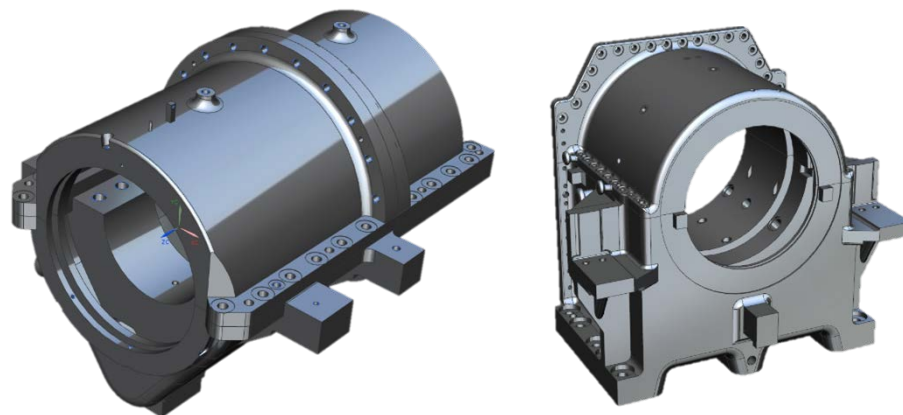
FEATURE : Most maker apply to use combined bearing which can be source to support axial and radial both load with one bearing.
Material selection has various option as per operation condition.

BEARING HOUSING / PEDESTAL

APPLICATION : Turbine, Generator

MATERIAL : Welding plate, Cast iron

FEATURE : For optimized price and outsource management, DYM suggest full assembly bearing and bearing housing/pedestal.
Customer achieve price save and comfortable management through one source order.



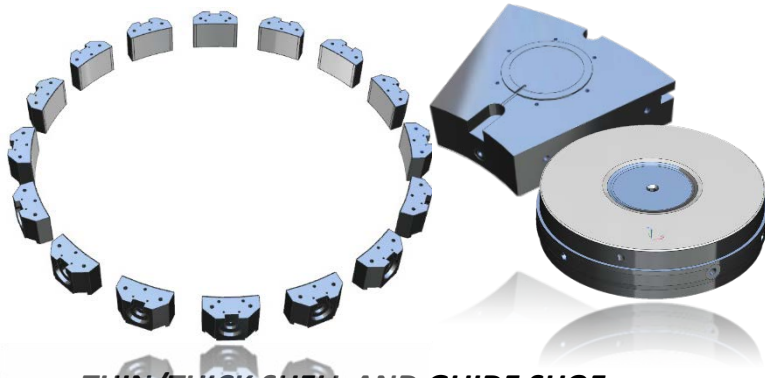
PACKING AND SEALS

APPLICATION : Turbine, Generator

MATERIAL : Carbon steel, Cast iron, Copper, Aluminum

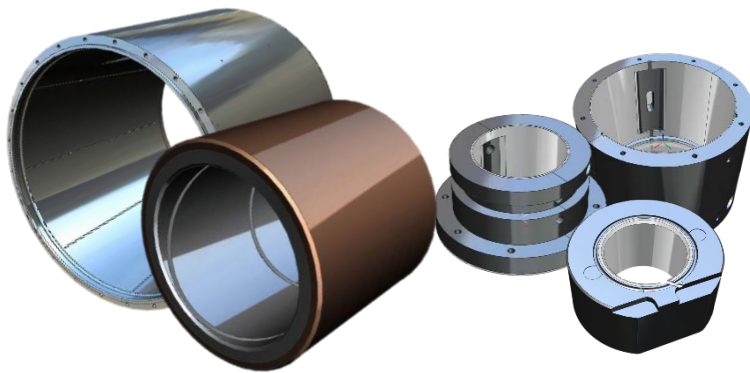
FEATURE : These packing and seals will be solution from leakage of machine.
These precise parts are one of our proud show evidence our technic and quality.

NX9 Model based Manufacturing



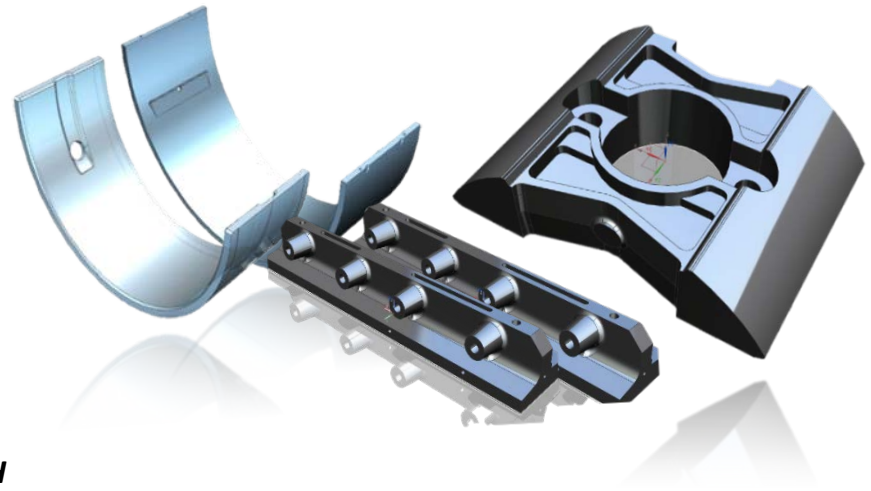
THIN/THICK SHELL AND GUIDE SHOE

APPLICATION : Marine engine
MATERIAL : Carbon steel, Cast iron
FEATURE : These pillow stably support crank shaft piston movement.
Double layer will minimize friction and make ship engine life longer.



THRUST PAD

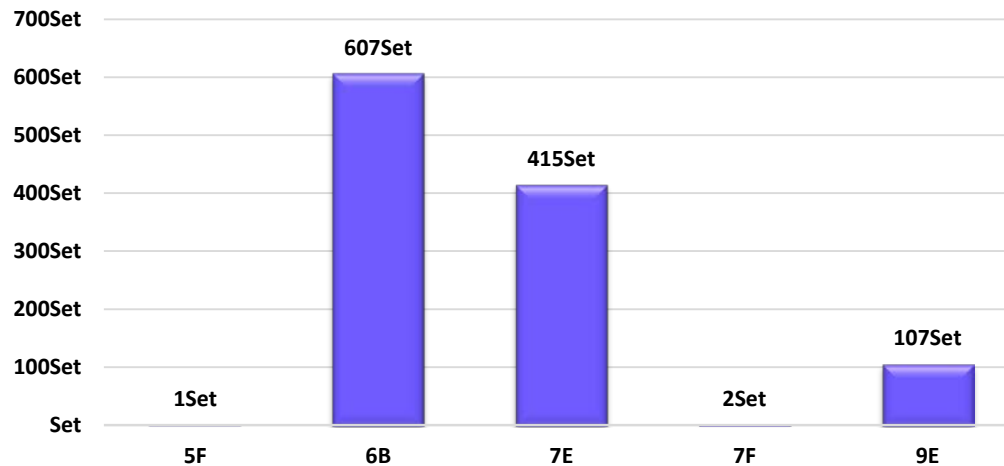
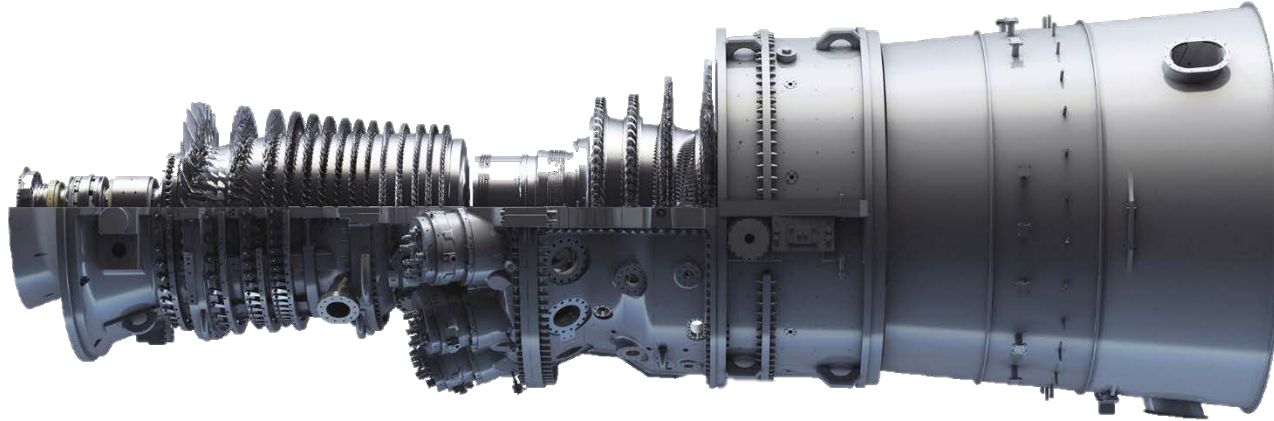
APPLICATION : Hydro, Transmission
MATERIAL : Carbon steel, Cast iron, Copper
FEATURE : Thrust pad main propose is equalized support axial load with multiple number of pad. That reason, most case these are used at Hydro generator, reduction gear.



BUSH

APPLICATION : Steel mill, Pump, Compressor
MATERIAL : Carbon steel, Copper
FEATURE : These bearing are designed to operate at extreme environment like high temperature or super speed. Usually this will be adapted multiple layer to cover debonding machine operation.

Gas Turbine Business



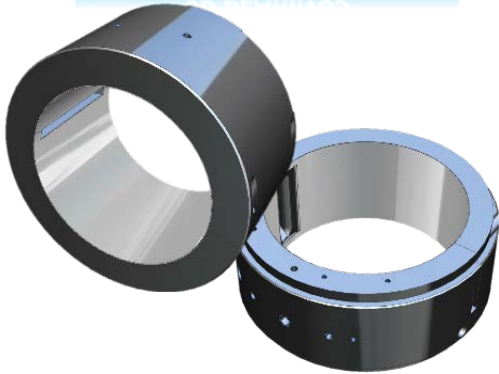
During past several years, DYM has dedicated to support Gas turbine business for GE.

This chart shows DYM performance for main frame of GE Gas turbine during last 10 years.

DYM qualified as 6 series turbine bearing manufacturer. Also DYM are supporting Housing and bearing assembly package. DYM keep effort to improve better quality extended service scope for customer satisfaction.

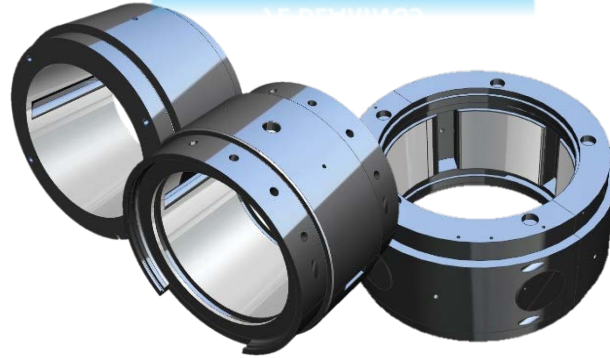
Gas Turbine Business

6B BEARINGS



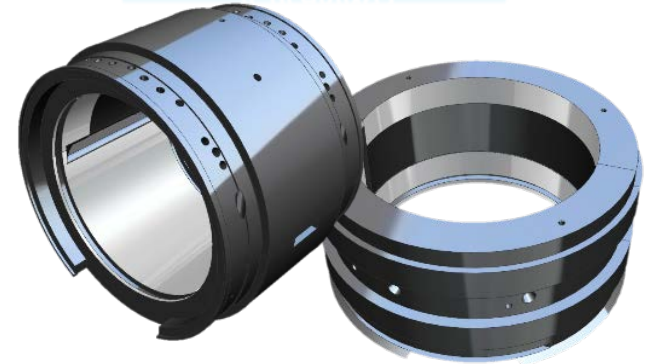
< 6B JOURNAL BEARINGS >

7E BEARINGS



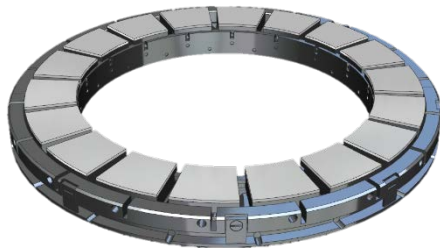
< 7E JOURNAL AND TILTING PAD BEARINGS >

9E BEARINGS



< 9E - NO.1 AND NO.2 Bearing >

FRAME 5 BEARING



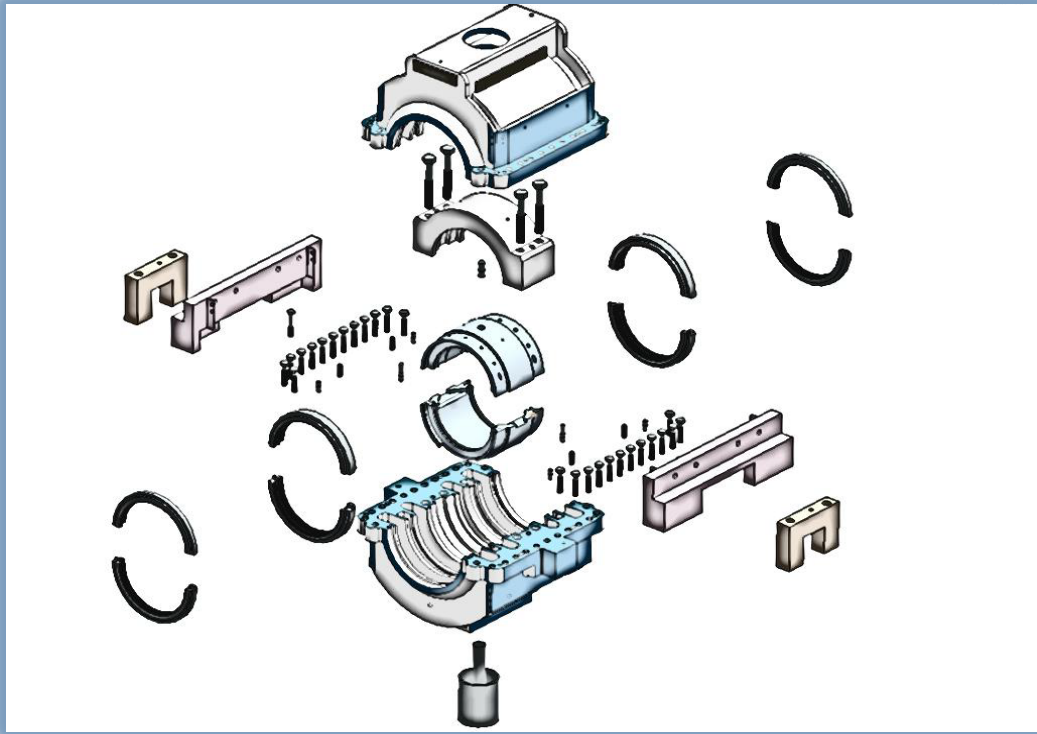
< FRAME 5 UNLOADED BEARING >

7F BEARINGS



< 7F BEARINGS AND HOUSING >

Gas Turbine Business



The optimal integration of the bearing housing into your overall process is at the center of our attention. We continue to expand our product range by permanently driving new technologies. DYM's cost leadership and on-time delivery performance ensure quick return on investment.

Vendor Inventory System

VMI System – Express lead time

DYM implement VMI system.

Every year we analysis frequently ordered item common size and purchase raw material with volume price to obtain lower price and reduce lead time.

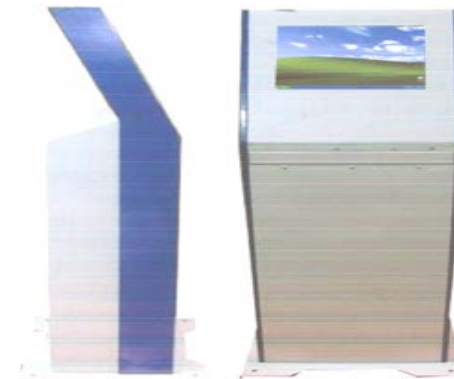
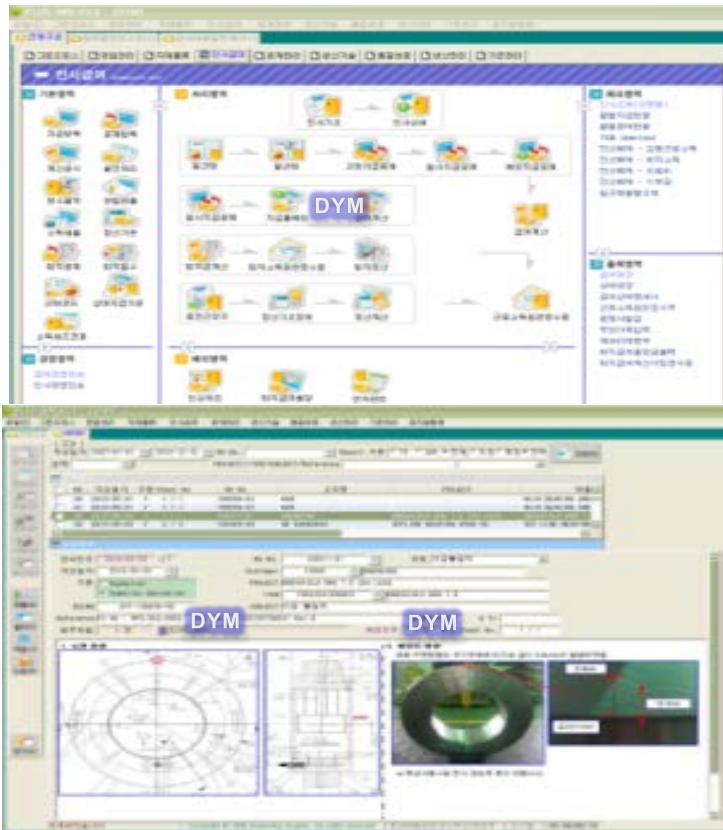
In normal production, raw material lead time take 40% proportion in whole lead time.

So we eliminate unnecessary time through this system and give our customer shorten delivery.



ERP & POP System

Easy and safe document preservation ERP system dedicates strong data traceability.
ERP connected to POP system at factory so that we can see real time product progressed.



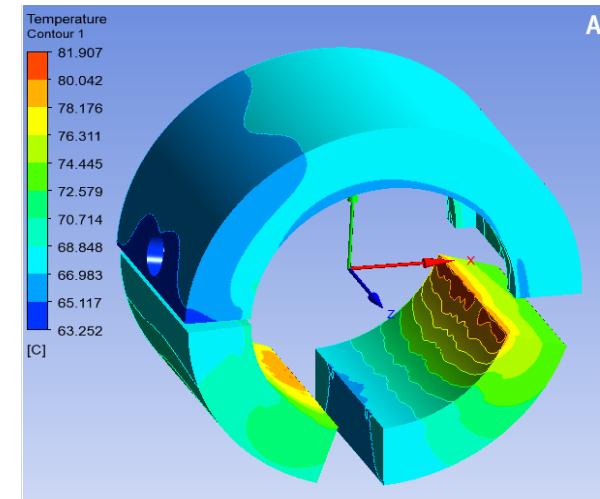
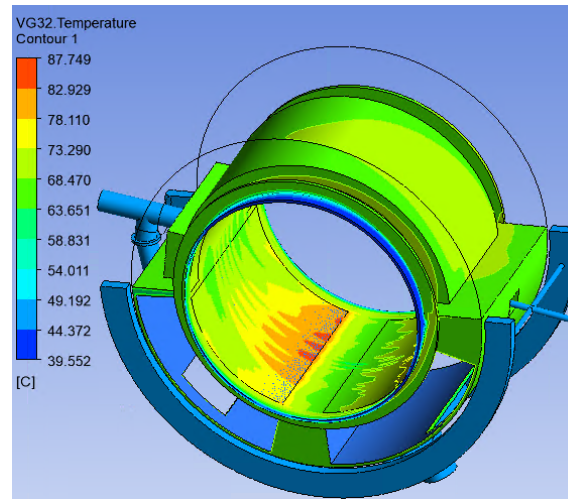
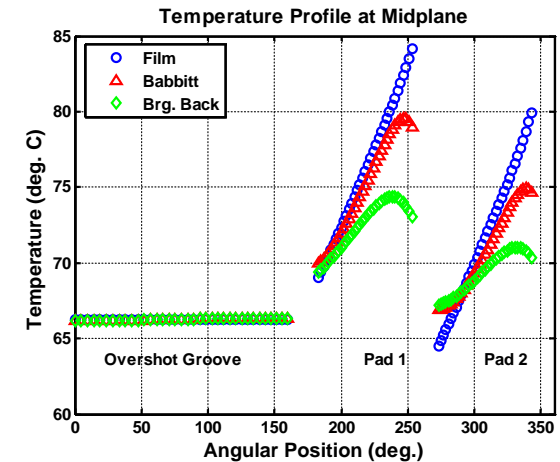
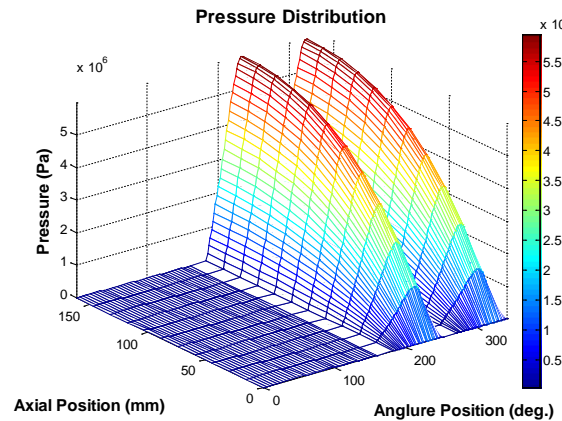
Bearing Design and Analysis

Customized Design

DYM service provide customized bearing which is developed to improved bearing function to consider turbine condition.

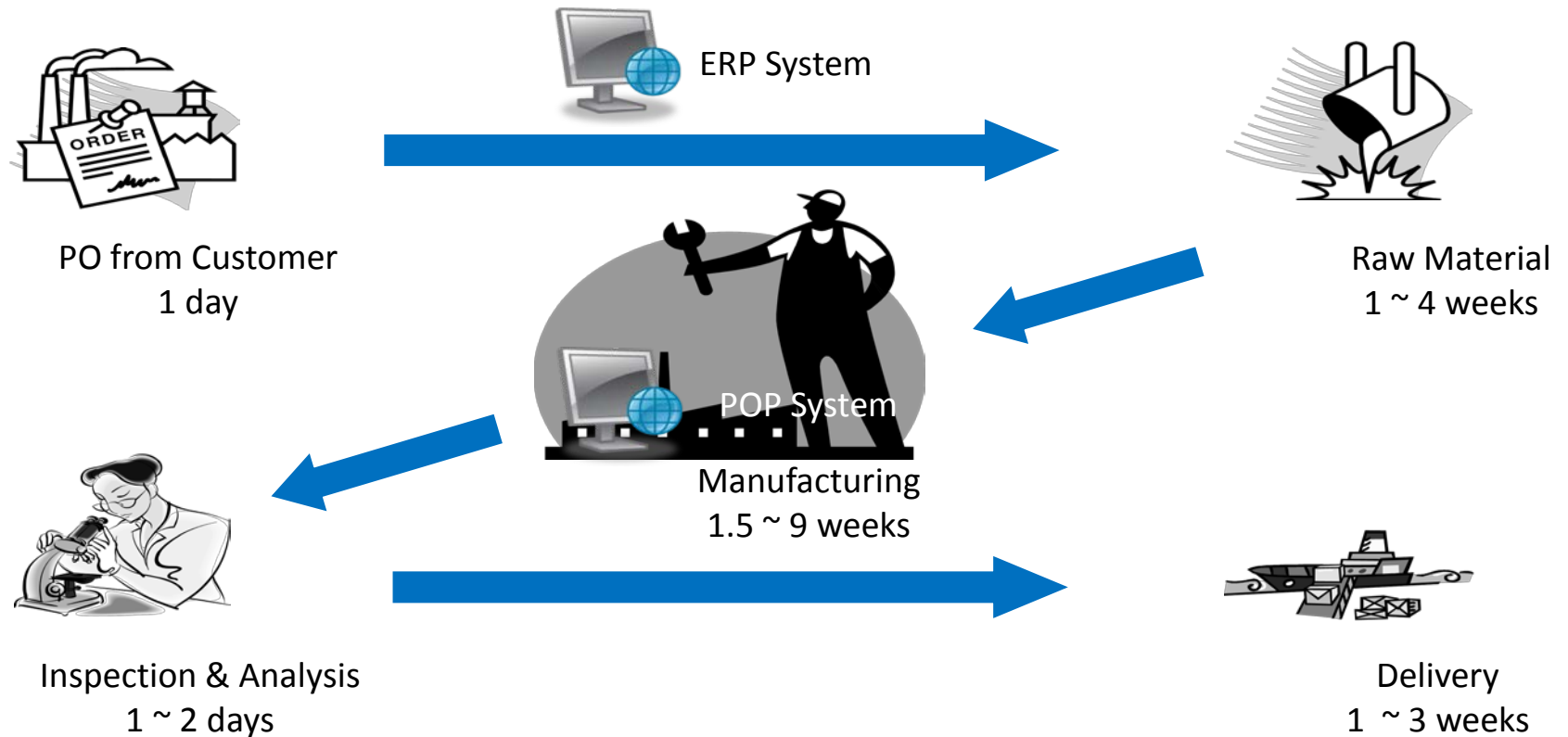
Our design team analysis bearing through simulation of bearing to verify stable Temperature, dynamic coefficient, eccentricity, power loss.

Our bearing outstanding feature will be solution to support machine longer life and stable operation.



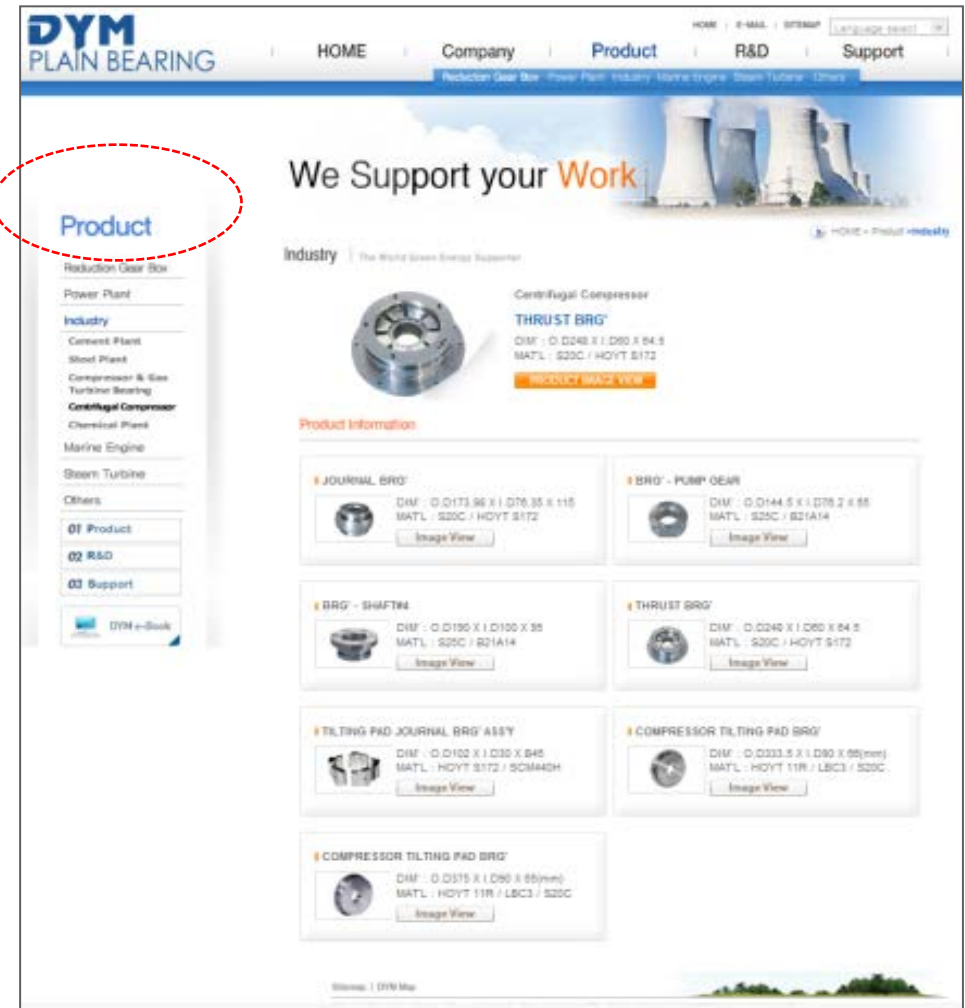
Manufacturing Lead Time

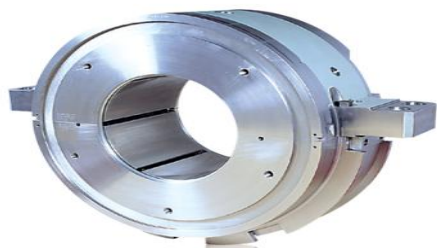
ISO 9001, 14001, OHSAS 18001



Total weeks from PO to Delivery : 4 weeks(minimum) ~ 12 weeks (maximum)

Website – WWW.DYMBRG.COM





THANK YOU FOR YOUR ATTENTION.

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