



**BEST-IN-CLASS
REPLACEMENT SOLUTIONS**

PERFORMANCE | RELIABILITY | TRUST

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» About Triveni Group

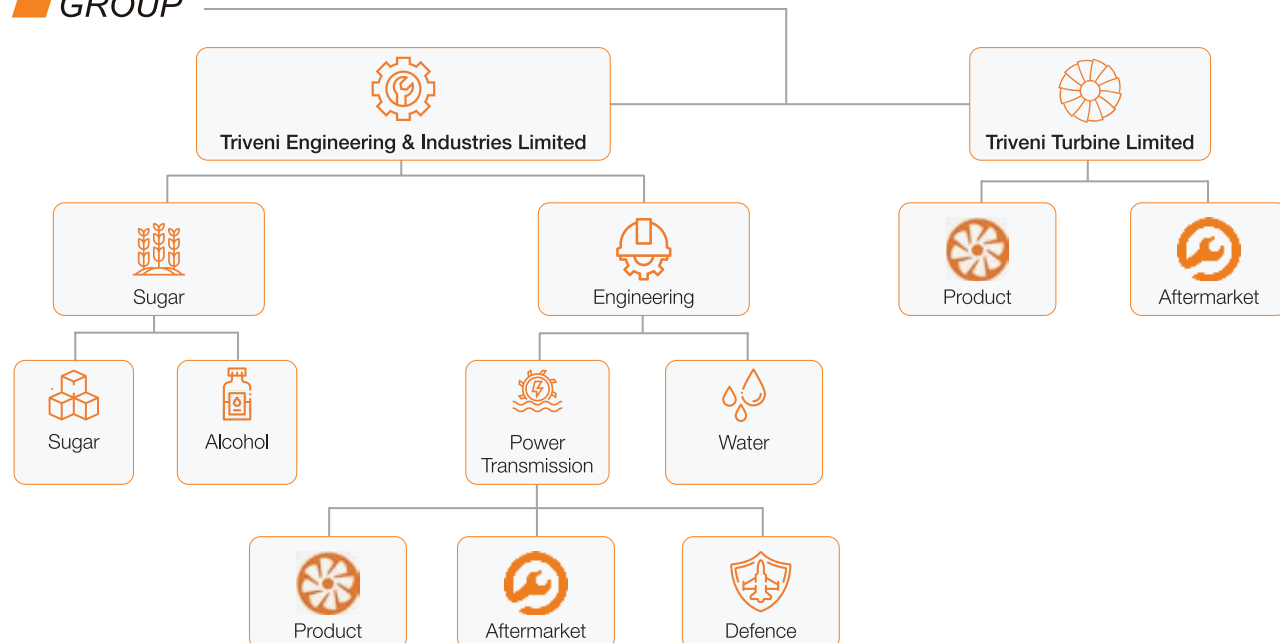
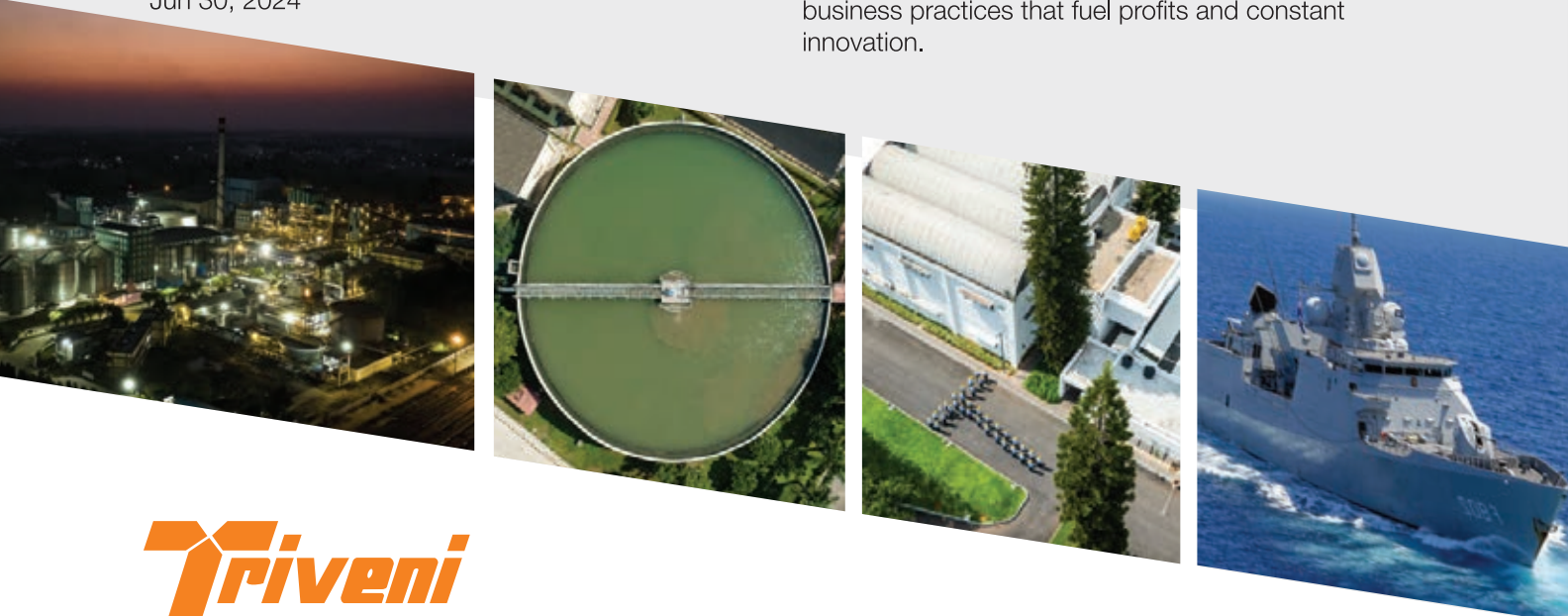
A LEGACY OF LEADERSHIP

Formed in the 1930's, the Group has two listed companies that function in a variety of industries including: Sugar, Fuel Ethanol, Water, Power Transmission and Industrial Steam Turbines. Triveni Turbine Ltd. & Triveni Engineering & Industries Ltd., two publicly listed companies of Triveni Group, had market capitalizations of US\$ 2.4 Billion & US\$ 1.0 Billion respectively, as on Jun 30, 2024

TRIVENI ENGINEERING & INDUSTRIES LTD (TEIL)

Triveni Engineering is one of the largest integrated sugar producers in the country, a market leader of engineered-to-order high speed gears & gearboxes, and a leading player in water and wastewater management business.

Our results over the years showcase sustainable business practices that fuel profits and constant innovation.



» Triveni Power Transmission Business

POWERED TO INSPIRE

Established in 1976 to fulfil the in-house demand for high-speed gears, Triveni PTB has since grown by leaps and bounds into India's leading High Speed Gears Company. Today Triveni PTB has an installation base of over 12000 gearboxes, spanning 80+ countries, and catering to diverse applications and industrial segments.

Triveni PTB, with committed focus on quality and compliance, has crossed many milestones on various fronts. Powered with cutting edge technology and fully integrated manufacturing infrastructure under one roof, and an unflinching commitment to operational excellence and customer satisfaction, Triveni PTB continues to deliver world class products to its patrons and markets. Thanks to the technical know-how and decades of experience in serving multiple industries, Triveni PTB is able to support the customer in finding the best way forward with an eye on their individual requirement.



» PTB through the Years

1976

Started at Mysore, to cater to captive consumption



1980

First gearbox supplied to a non-captive steam turbine OEM



1982

First hydro gearbox supplied



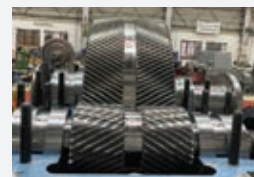
1991

First integrally geared internal replacement



1994

15 MW replacement Steam Turbine application



1998

First 6 MW gas turbine gearbox to USA



2002

First export of API gearbox



2005

First Integrally Geared Compressor gearbox



2009

First locally manufactured drop-in replacement of Frame 6 gearbox for India's leading petrochemical company



2024

Highest power 27.5 MW Compressor Gearbox for installation in China via European OEM



2022

4.5 MW High Speed Planetary Gearbox for process Air Compressor, replacing European Brand and supplied to Fertilizer Complex



2019

Highest Power Indigenous 63.5 MW STG Gearbox for installation in West Africa



2018

Spare Gear Internals for Nitrogen Expander Planetary gearbox as replacement to European Brand for a Petrochemical Complex



2016

40 MW Test Rig Gearbox for Compressor testing to Japanese steel company



2014

- Frame 6 gearbox replacement to USA
- Supplied 15 MW test rig gearbox for testing 1000 MW capacity generator



2013

- First indigenously manufactured drop-in replacement unit for LM 6000 Gas Turbine Load gearbox
- 850 KW Planetary gearbox developed/ supplied for a sugar mill



2011

Highest Power Local Gearbox 38 MW for an automobile company



» The Go-To Supply Partner for all Global OEMs

Triveni PTB has been a committed long term supply partner to major OEMs in India, SE Asia and other parts of the world, offering power transmission solutions for various applications across industrial segments like Power, Oil & Gas, Refineries, Petrochemical, Cement, Steel, Fertiliser, Sugar, Rubber & Plastic, and Marine covering all geographies.

Triveni PTB's expertise in understanding and catering to the latest gear standards, API or AGMA has given way to approvals for supply of gearboxes through major engineering consultants and EPC contractors.

SUPPLY PARTNER TO GLOBAL OEMS



Steam Turbines

Triveni Turbine Ltd, Siemens Energy, Shin Nippon, BHEL, Doosan Skoda, Man – Energy Systems, Elliot, Skinner, Ebara, NG Allen, EKOL, Turboden & others



Gas Turbines

BHEL, MHPS



Rotary Compressors

Man Energy, BHEL, Siemens Energy, Elliot Ebara, Atlas Copco, Kobelco, Howden, ELGI.



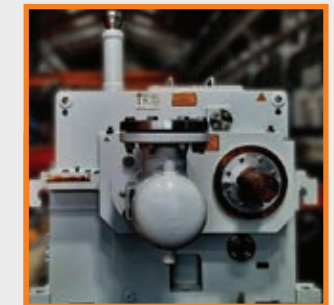
Reciprocating Compressors

Siemens Energy, BPCL, Burckhardt Compression, Kobelco.



Centrifugal Pumps

BHEL, Flowserve, Sulzer, KSB-AG, Celeros, GE-NP, GD- Nash, KBL, Ebara Japan, MHI Japan, Hitachi, Kirloskar Ebara, WLO, Trillium Pumps, Hyosung, CW-Hydro, ITT, Goma Pumps, V-Flow



Fans and Blowers

Boldrochhi, Strainich, BHEL, TLT, Ingersoll Rand



Hydel Turbines

Andritz, Flovel, Global Hydro, BF Hydro, Boom Systems, Jyoti, Mechamidi



Test Rig

DRDO, ISRO, CVRDE, CABS, INS Eksila, HAL, Kobelco, KSB, Sulzer, JSW-Toshiba



Built to Print

Atlas Copco, Siemens, Voith

» Supplies to Various OEMs

STEAM TURBINE GEARBOXES



Customer: Siemens
Specification: 49440 kW,
 6000 to 1500 RPM
Standard: API 613



Customer: BHEL
Specification: 41000 kW,
 5650 to 3000 RPM
Standard: API 613



Customer: Triveni Turbines
Specification: 24990 kW,
 6150 to 1800 RPM
Standard: AGMA 6011 J14



Customer: GE
Specification: 63800 kW,
 4769 to 1500 RPM
Standard: AGMA 6011 J14



Customer: Man Energy Solutions
Specification: 24200 kW,
 5595 to 1500 RPM
Standard: AGMA 6011 J14



Customer: Skoda Power
Specification : 32000 kW,
 5468 to 1500 RPM
Standard: AGMA 6011 J14

GAS TURBINE GEARBOXES



Customer: BHEL
Specification: 54000 kW,
 FRAME 6
Application: Gas Turbine



Customer: MHPS
Specification: 39000 kW,
 7280 to 1800 RPM
Application: Load cum Accessory Gearbox

COMPRESSOR GEARBOXES



Customer: Siemens Ltd
Specification: 56700 kW,
 4925 to 1000 RPM
Standard: AGMA 6011 J14



Customer: Man Energy Solutions
Specification: 27500 kW,
 1500 to 4790 RPM
Standard: API 613

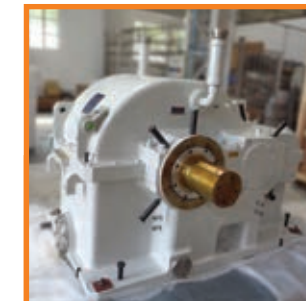


Customer: Atlascopco
Specification: 2900 kW,
 1480 to 5100 RPM
Standard: API613

PUMP GEARBOXES



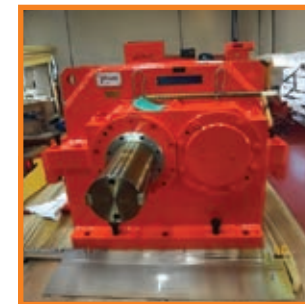
Customer: Flowserve, Argentina
Specification: 6075 kW,
 15000 to 3620 RPM, API 613
Application: Gas Turbine driven pump



Customer: Siemens Ltd
Specification: 2900 kW,
 5633 to 494 RPM, API 677
Application: Cooling Water Pump



Customer: Elliott Ebara
Specification: 785 kW,
 5200 to 2980 RPM, API 677
Application: BFW pump



Customer: KSB Ltd
Specification: 2233 kW,
 1493 to 3964 RPM, API 613
Application: HDT Feed Pumps



Customer: Gardner Denver Engg.
Specification: 451 kW,
 1480 to 402 RPM, API 677
Application: Vaccum Pump



Customer: Sulzer
Specification: 1520 kW,
 3735 to 1560 RPM, API 613
Application: Boiler Feed Pump

» Replacement Solutions

TEST RIG GEARBOXES



Customer: CVRDE - Defence R&D
Specification: 113 kW, 5000 to 70546 RPM
Application: Bearing Endurance Test



Customer: BHEL Bhopal
Specification: 1500 kW, 4000 RPM (1:1 Ratio), 8 Stage, 3 Inputs & 3 Outputs
Application: Traction Motor Testing



Customer: Voith
Specification: 1000 kW, 7000 to 3544 RPM
Application: Hydraulic Coupling Testing



Customer: GTRE
Specification: 45 kW, 3000 to 30073 RPM
Application: Pump Testing



Customer: Indian Navy
Specification: 9000 kW, 833 to 1699 RPM
Application: M-15 Gas Engines Testing



Customer: LPSC
Specification: 500 Kw, 1500 to 15000 RPM
Application: Semi cryogenic pump Testing

Any Brand, Any Application, Any Where.

In the life-cycle of any gearbox, there inevitably comes a point where replacements or upgradations have to be made to ensure optimum performance according to the ever-changing demands of the industry. Highly skilled and experienced engineering and service resources enable Triveni PTB to undertake repair and refurbishment of predominantly world-renowned brands in addition to the domestic brands with inherent issues.

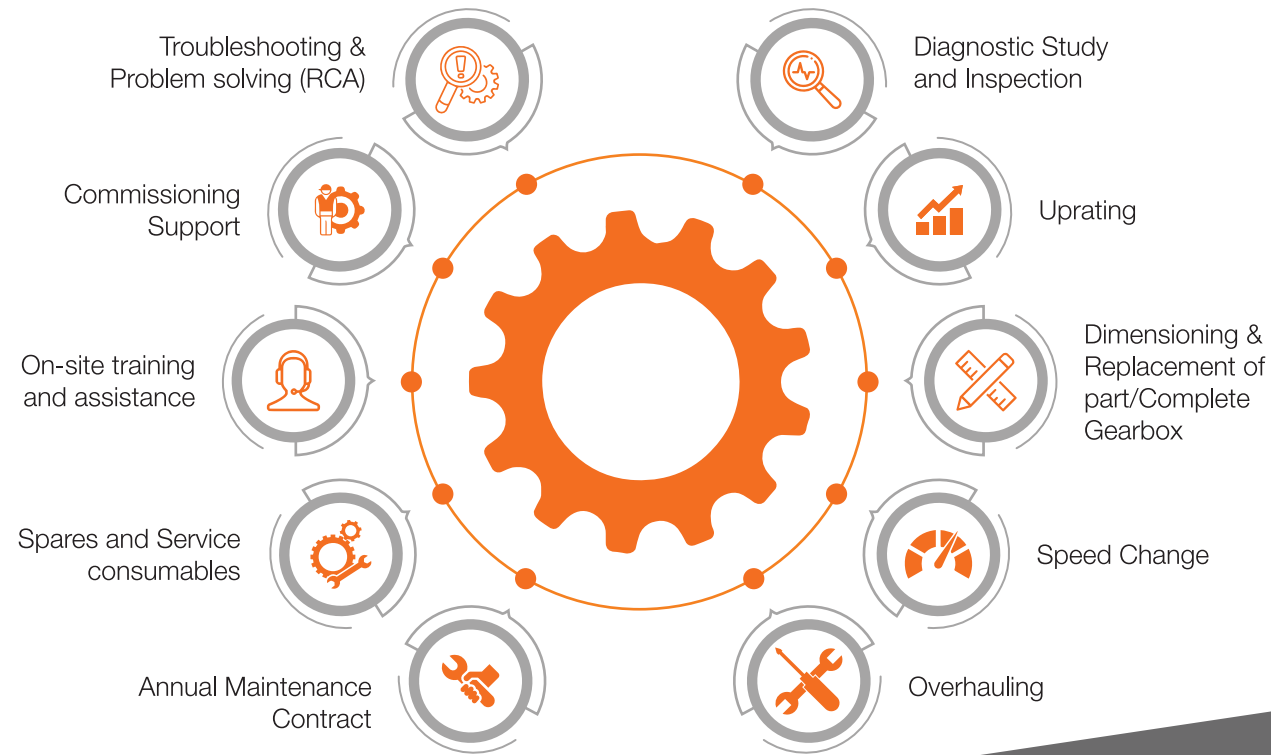
Two-pronged strategy is adopted in the event of failure – Short term & Long-term solutions. Short term solutions include minor repair with least lead time to maximise the up time of the equipment whereas long term solutions are aimed at creating higher order of reliability which

includes major repair and replacement of parts. Triveni PTB's replacement solutions provided to industries across the globe are a testament of high-reliability and low product life cycle costs. Strategic creation of dedicated dimensioning assets facilitates setting up of a large pool of dimension ready sites (DRS) at no cost to the customer helps in developing parts during distress, and in a significantly lower lead time as compared to global OEMs.

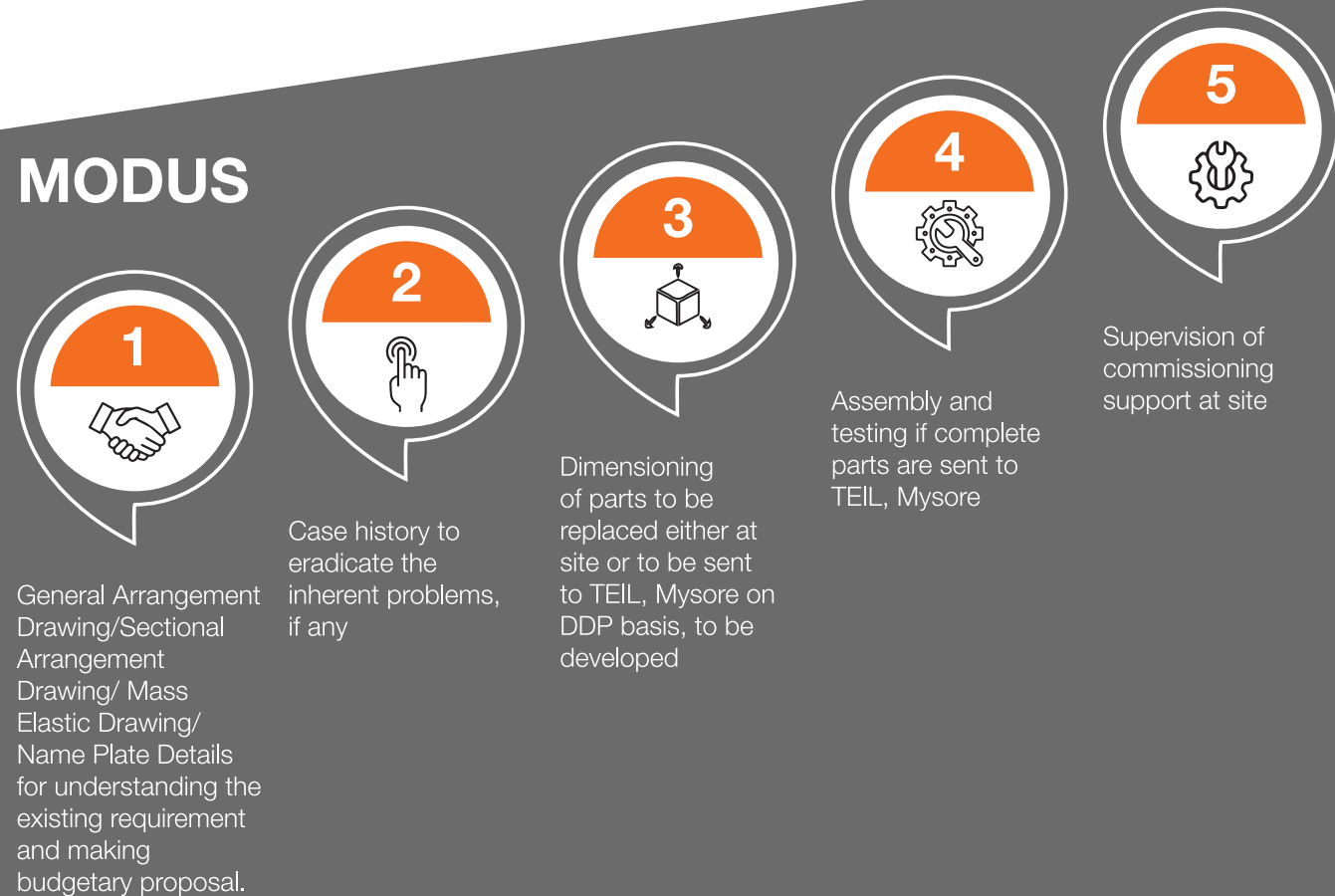
Triveni PTB's reverse engineering technology revolves around deep understanding of application dynamics and know-how which influences and enhances overall train performance. Triveni PTB's capability to diagnose is key to providing long-lasting solutions to chronic problems and providing comprehensive solutions with enhanced value proposition.



» Replacement Solution Portfolio



MODUS

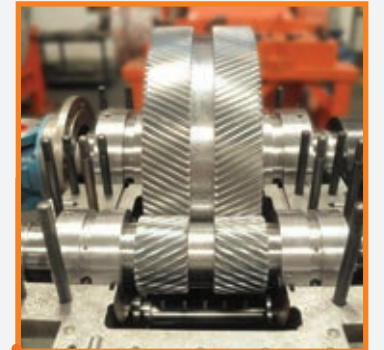


» Repair Solutions

Horizontal offset gearbox converted to vertical offset gearbox to avoid teeth end loading /damage due to tilt of turbine axis



Split single helical wheel converted into a solid double helical design to prevent apex shift during over speed



Service Factor increased to eliminate frequent failure



Power enhanced from 16MW to 18MW with same foundation foot print and Centre Distance



Bearing housing modified with improved routing for thermocouple wires & provision for attending the bearing thermocouple externally for Low-Speed Shaft to improve maintainability of RTD.



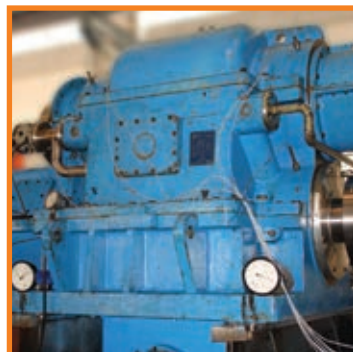
Repair of damaged Shaft Journal Area and supply of undersized bearings



Repair of damaged Gear Wheel and supply of matching Pinion Shaft



Input Speed changed to enhance Power output by 2 MW



Speed Change to reduce power consumption & increase production



» References of Replacement of World Renowned Brands

UK

- ALLEN - BERRY
- BELLIS - MORCOM
- BROWN BOVERI
- DAVID BROWN
- G.J.WEIR
- LIGHTNING MAKE
- GREENWOOD & BATELY
- OPPERMANN MASTERGEAR
- R.W TRANSMISSIONS

Germany

- RENK
- BHS - VOITH
- KKK
- DEMAG
- FLENDER
- KOPPEN
- KREBER
- MAN - GHH
- PIV
- G.H.H.
- HUTTENWERK
- KRUPP
- BLOHM VOSS
- MIRLEES
- PEKRUN
- RENK TACKE
- SIEMENS
- SMS
- STEPHEN WERK
- VICKERS
- SAWA
- BLOHM VOSS
- DESCH

Rest of Europe

- FLENDER GRAFFENSTADEN
- MAAG
- GUSTI (OTG)
- COMELOR
- VALMET
- ECHESA
- METSO
- PEKRUN
- POMINI
- ATLAS COPCO
- WORTHINGTON
- POMINI FARREL
- POMPE
- SCHILLE & CO
- BENZLERS
- KAZAN
- MOVENTAS
- G.ELLI RIDUTTORI SEITES
- ROSSI
- SANTASALO
- JEUMOUNT - SCHNEIDER
- ZAMBELLO
- BOLSHIEVIK

USA

- PHILADELPHIA
- CAMERON
- SUNDYNE
- TURBODYNE
- WESTING HOUSE
- DRESSER RAND
- STORK
- TERRY
- NPK
- CHEMINEER
- LENN MASS
- FALK
- INGERSOLL RAND
- COOPER
- MURRY
- AMARILLO

Rest of Asia

- HANGZHOU
- NANJING (NGC)
- FORMOSA
- KANGPU
- DOUBLE ELEPHANT
- JEIL - SOUTH KOREA
- GUANGZHOU

Japan

- SHINKO MITSUBISHI
- KUBOTA
- MKK
- OSAKA
- GENSOKUKI
- SEISAKUSHO
- ISHIBASHI
- SHIMADZU
- ABEX
- PARAMAX
- SIESA
- JSW

More than 90+ International make gearboxes replaced.
More than 1400+ installations, across applications.

» Supplies as Replacement to Global Brands

GAS TURBINE GEARBOXES



Frame 6
API 613
Replacement to Flender Graffenstaden



Frame 5
API 613
Replacement to Hitachi



LM6000
API 613
Replacement to IHI



Frame 6
API 613
Replacement to BHS Voith



Frame 6 Internals
API 613
Replacement to Flender Graffenstaden



Frame 6
API 613
Replacement to Lenn Mass, USA



Frame 6 FA
API 613
Replacement to Flender Graffenstaden



Accessory Gearbox
Frame 9/6
API 613
Replacement to Flender Graffenstaden

STEAM TURBINE GEARBOXES



Replacement: Seisa
Specification: 32000 kW,
4909 to 1500 RPM
Industry: Steel



Replacement: BHS Voith
Specification: 11460 kW,
8025 to 3000 RPM
Industry: Chemicals



Replacement: Flender Graffenstaden
Specification: 43000 kW,
7065 to 1500 RPM
Industry: Steel



Replacement: MAAG
Specification: 15420 kW,
6526 to 3000 RPM
Industry: Paper



Replacement: Flender Graffenstaden
Specification: 36300 kW,
6042 to 1500 RPM
Industry: Steel



Replacement: Renk
Specification: 12000 kW,
6503 to 1800 RPM
Industry: Power Generation

COMPRESSOR GEARBOXES



Replacement: BHS Voith
Specification: 5000 kW, 1480 to
15581/18094/20775 RPM, API613
Industry: Petro Chemicals



Replacement: Seisa
Specification: 1150 kW,
1500 to 19050/15783 RPM, AGMA,
Industry: Chemicals & Fertilizers



Replacement: Siemens
Specification: 4650 kW,
9138 to 10751 RPM, API 613,
Industry: Steel



Replacement: Demag
Specification: 5300 kW,
5982 to 8376 RPM, API 613
Industry: Steel



Replacement: Flender Graffenstaden
Specification: 1400 kW,
2980 to 27685 RPM, API 672,
Industry: Oil & Gas



Replacement: MHI
Specification: 16330 kW,
8025 to 11787 RPM, API 613,
Industry: Steel

PUMP GEARBOXES



Replacement: Turbodyne
Specification: 1630 kW, 2958 to 4900 RPM, API 613
Industry: Refinery



Replacement: Ebara
Specification: 162 kW, 2965 to 12981 RPM, AGMA
Industry: Refinery



Replacement: Nippon
Specification: 395 kW, 1480 to 178 RPM, AGMA
Industry: Chemicals and Fertilizers



Replacement: Pomini Farrel
Specification: 237 kW, 4750 to 754 RPM, AGMA
Industry: Chemicals and Fertilizers



Replacement: Shimadzu
Specification: 1800 kW, 9860.87 to 650 RPM, AGMA
Industry: Chemicals & Fertilizers



Replacement: Gusti
Specification: 1145 kW, 5000 to 2980 RPM, AGMA
Industry: Chemicals and Fertilizers

NICHE LOW SPEED APPLICATIONS GEARBOXES



Replacement: Kopperrn
Specification: 640 kW, 1470 to 16.61 RPM
Application: Briquetting Press
Industry: Steel



Replacement: David Brown
Specification: 260 kW, 970 to 40 RPM
Application: Coal Pulverizer
Industry: Steel



Replacement: MAAG
Specification: 600 kW, 1000 to 33.38 RPM
Application: HDPE Extruder
Industry: Refinery & Petro Chemicals



Replacement: Flender
Specification: 1600 kW, 990 to 32.8 RPM
Application: Vertical Roller Mill
Industry: Cement



Replacement: Guangzhou
Specification: 450 kW, 1000 to 38.4 RPM
Application: Extruder
Industry: Rubber



Replacement: Flender
Specification: 559 kW, 1500 to 30.55RPM
Application: Mill - Cane Crushing
Industry: Sugar

» Design & Engineering

Triveni PTB's expertise accumulated over the past four decades in designing tailor-made gearboxes for a wide application spectrum ensures that all engineered products stand firm on the pedestals of reliability and performance. The highly experienced design team, equipped with the knowledge of latest technological advancements and prevailing industry practices can provide comprehensive solutions be it power enhancement, speed alteration, or any other customized requirement.

Some salient features of Triveni PTB's design practices also include:

- Parametric 3D modelling of gearbox with latest Pro-E Creo software
 - Customised software and Kissoft for Gear design optimisation
 - Rotodynamic critical speed analysis of rotors through "XL-Rotor" software
 - Lead and Profile correction of gear tooth for enhanced life
 - Hydro dynamic bearing design optimization to enhance efficiency
 - FEA through Hypermesh and ANSYS software
 - Independent Cell for New Product Development and R&D
 - Skilled and experienced design resources
- All of Triveni PTB's designs conform to latest Industry standards:
 - API
 - AGMA
 - DIN
 - ISO

TRIVENI HAS CARVED A PLACE FOR ITSELF IN EXCLUSIVE NICHEs IN MULTIPLE PARAMETERS.

64 MW
 Max Power Manufactured

178 m/s
 Max PLV

70 Tonne
 Max Weight

70,000 RPM
 Max Speed

90 MW
 Max Power of Gearbox Tested

90+
 Global Brands replaced

1400+
 Replacements done

3190 kNm
 Max Torque

» Supply Chain Management

HIGHLY NETWORKED SUPPLY CHAIN ECOSYSTEM TO SERVE ALL YOUR NEEDS

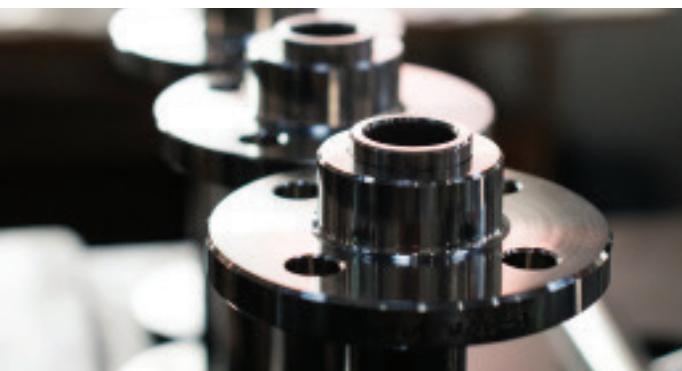
Triveni PTB has a dedicated supply chain with long term partnerships spanning over decades, quality benchmarked to global standards including robust process capability to meet stringent demands of customer and product reliability. Triveni PTB understands inter woven quality needs across the value chain, which consistently helps in producing best-quality products.

A well-established metallurgical laboratory with the latest state of the art equipment ensures stringent

and comprehensive control on quality of input raw materials and at the same time helps Triveni PTB to create a constructive and specific loop with all supply chain partners to improve and control their process parameters for long term sustenance.

Standardization of input material and accessories provides an advantage on long term commitment and leads to regular flow of high-quality input materials, even during peak industrial demand cycles, ensuring committed delivery to the customer.

Seamless integration of all partners in Triveni PTB's supply chain ensures perfect synergy to deliver products, strongly woven around high-quality standards.



» Manufacturing



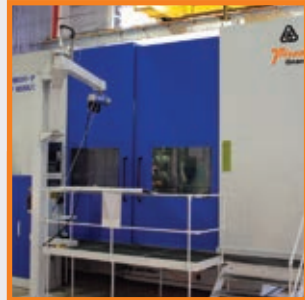
SOPHISTICATED AND SPECIALIZED MANUFACTURING THROUGH ULTRA-MODERN FACILITY

Triveni PTB's fully integrated world-class manufacturing facility has well-established process capability as well as process flow and plant layout for optimum cycle time.

Centred on operational excellence, Triveni PTB's manufacturing facility

is equipped with state-of-the-art infrastructure to handle all the critical operations in-house imperative to produce quality products in a controlled environment. The manufacturing layout, with multiple bays, is designed for minimum material movement and maximum process efficiency. High-precision multi-axis European CNC machines for hobbing, cylindrical grinding, teeth profile grinding, and casing machining along with highly skilled manpower ensure a reliable product.

» Manufacturing Assets



5 Axis CNC Pfauter Gear Hobbers with Siemens 840D Control
Upto 2.8 Meter Dia X 1800 meter table diameter, 30 Module



7 Axis CNC Pfauter Gear Profile Grinders with Siemens 840D Control
Upto 2.8 meter external grinding, 20 tons table load, 2 meters Internal grinding attachment with Hirth Cutting



GER Hydraulic Cylindrical Grinder
Ø1X3 mtrs. Length



GIORIA Heavy Duty Cylindrical Grinder Travelling Wheel Head Type
Ø2X6 mtrs. Length



Juaristi Horizontal Boring Machine ATC with 60 tools, 4X2 Mtrs. Traverse



CNC Lathe GT3100L/M, Doosan



Mitsubishi Double Column Milling Machine with 4 mtrs Traverse & 25 tons capacity



Favretto CNC Vertical Grinding Centre
Ø1.2 mtrs.



Proteck CNC Lathe, Siemens 802D Controls 3 mtrs Length

» Manufacturing Assets



Premier CNC Vertical Turning Centre swing 2.3 mtrs.



Hankook – Dyna Turn, Siemens 840D SL + MPG, 5 mtrs length



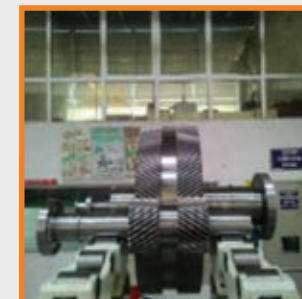
HMC – HW 1250W, Doosan



Sophisticated Heat Treatment facility for Carburizing & Nitriding
Quenching Tank of 1,00,000 L capacity along with advanced cooling & churning process



Dynamic Balancing upto 10 tons



CNC controlled Mesh Checking stand



Assembly Bays with a combined handling capacity of 70 tons

» Quality System

Certifying Unlimited Conformity



CMM Inspection



Barkhausen Noise Analyzer



EMR Inspection



MPI Inspection

Every Triveni PTB product passes through stringent quality checks from raw material to final run test, to ensure that the product meets or exceeds customer expectations.

Triveni PTB has an in-house metallurgical laboratory with state of art equipment to inspect the material properties such as chemical composition, grain size, inclusions, banding, and microstructure. This also ensures complete quality requirements of the case-hardened gear teeth as regards to the hardness gradient, case and core hardness and microstructure.

Basic raw material chemical composition and carbon percentage in heat treated teeth are tightly controlled through sophisticated optical spectrometer. Magnetic particle testing and surface etch inspection also ensures defect free gear teeth that last long.

All these equipment and quality infrastructure undergo predetermined calibration regime. This also includes heat treatment furnaces and quenching station to consistently produce high-quality gear.

» Testing

Putting The Technology to Test



Every Triveni PTB product passes through rigorous inspection before dispatch. Stringent tests are conducted to ensure that the product meets design specifications and exceeds customer requirements. The unit's test stand consists of three fully instrumented test benches for testing gearboxes up to 90 MW capacities, with additional capability of tandem testing. The test stands are equipped with:

- Bently Nevada vibration monitoring system with ADRE software
- SKF Micrology vibration analyser and Bruel & Kjaer Noise Analyser
- Facility to carry out extreme condition test (Low Oil Pressure – High Oil Temperature)
- Capability to test back-to-back lock torque test, unbalance response verification test, sound power level test, partial load testing.
- Laser alignment on test stands.
- Compliant with API standards as required.

With the latest digital up-gradation, Triveni PTB offers a remote witness testing facility including the witness of real time test parameters to all the customers across the globe.

ISO 9001:2015
for QMS

ISO 14001:2015 for QMS

OHSAS 45001:2018

CE, ATEX, TRCU, UL

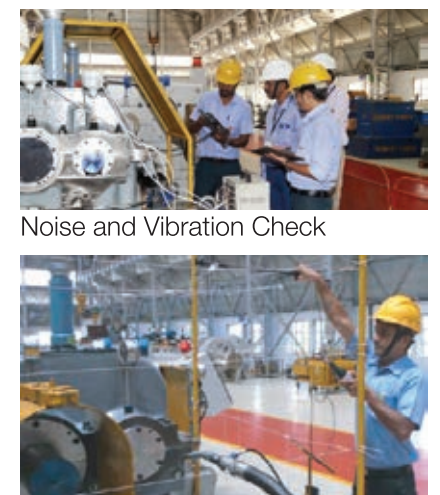
CII-Exim Bank Award for Business Excellence for "Strong Commitment to Excel" for 2013, 2014 and 2016



Back to Back Testing



Partial Load Testing upto 1.2 MW



Noise and Vibration Check

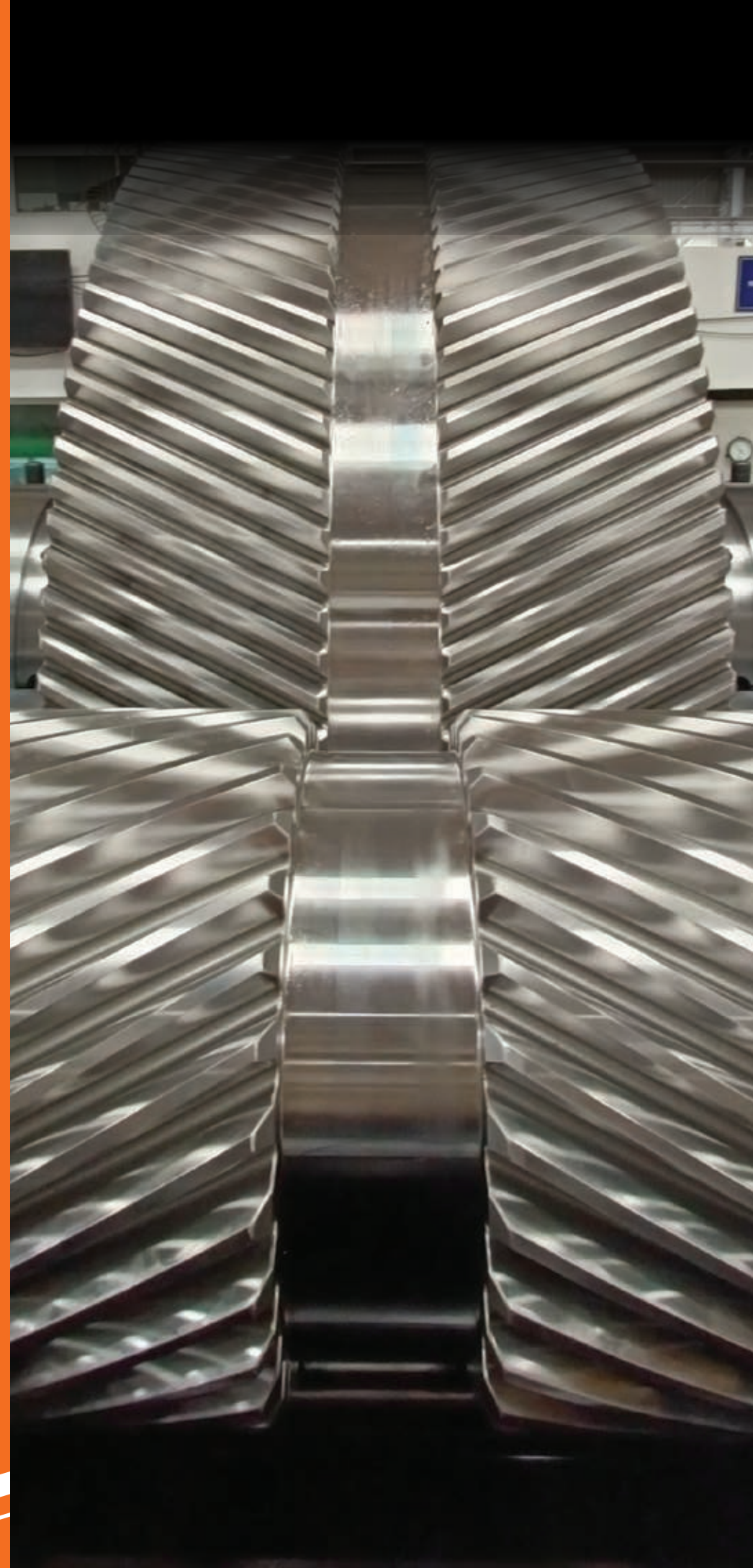


Sound Power Analysis

Triveni's test data acquisition system monitors and records all gearbox test results, enabling a complete analysis of bearing temperatures, vibration spectrums and noise to ensure perfect assembly.

» Advantage Triveni







Registered office

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Power Transmission Business

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