Clean Energy
Turbine Solutions
Clean Energy Turbine Solutions

The power generation industry is evolving continuously. The demand for higher efficiencies and lower cost are constantly being stretched. At Triveni Turbines, we understand the economics and needs of the power producers to have equipment with better operating efficiencies, long term reliability, maximum availability and extended operating life to maximise return on investment.

We offer steam turbine solutions for Industrial Captive and Renewable Power. We manufacture world class steam turbines up to 100 MW that enable our customers to achieve unhindered performance and power self-sufficiency at an optimal cost while minimizing environmental impact. Triveni Turbines partners with customers to provide a comprehensive range of service solutions for the complete life cycle of steam turbines.

We are one of the world’s largest manufacturer of steam turbines ranging up to 30 MW for providing renewable power solutions specifically for Biomass, Sugar & Process Co-generation, Waste-to-energy and District Heating.
Our focus on entering new markets and geographies has led to a strong and credible presence in the global market. We have already installed globally competitive and technologically advanced products in over 70 countries. The important aspects of expanding our horizons in the global markets include our capability to offer customer specific solutions in new geographies while serving them efficiently.

Triveni Turbines has a dominant market share in India and is constantly increasing its market share globally. Our market leadership has been built on a foundation of strong and continuously evolving product research, development and engineering capabilities.
We also operate in a higher capacity range of above 30 MW to 100 MW Steam turbines through our subsidiary, GE Triveni Limited (GETL), a joint venture company with GE Oil & Gas. GETL is engaged in the design, supply and service of steam turbines. Manufactured in a state-of-the-art plant at Triveni Turbines, Bengaluru, the product is marketed globally under the brand of “GE Triveni”. Our partnership with GE is a testimony of the globally benchmarked processes followed at Triveni Turbines.
Triveni Turbines offers robust back-pressure and condensing steam turbines up to 100 MW that work across a wide range of pressure and flow applications.

**Upto 30 MW Range**

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<thead>
<tr>
<th>Types</th>
<th>Condensing Steam Turbines</th>
<th>Back Pressure Steam Turbines</th>
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<tr>
<td>Straight Condensing Type</td>
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<td>Straight Back Pressure Type</td>
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<td>Injection Condensing Type</td>
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Above 30 MW to 100 MW Range (GE Triveni Products)

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Up to 100 MW Standard scope includes Supply and Commissioning of:

- Steam turbine and its control system
- Control oil system
- Lubricating oil system
- Condensing system (as applicable)
- Gear box
- Alternator
- Electrical metering/control/protection system
- Turbovisory system
INDUSTRIES & APPLICATIONS

Triveni Turbines serves the power generation needs in diverse industry segments like Sugar, Steel, Cement, Pulp & Paper, Textiles, Chemicals, Palm Oil, Food Processing, Solar, Geothermal etc. The turbines are used in a wide range of applications such as Co-generation, Combined Heat & Power Generation, Waste to Energy, Captive Power Generation and Independent Power Generation.

MANUFACTURING EXCELLENCE

Our state-of-the-art facility, with an installed capacity to manufacture over 200 turbines annually, is equipped to provide complete manufacturing, assembly, testing and refurbishing services. The facility is equipped with precision equipments and the latest softwares for seamless manufacturing of all critical components. Our in-house manufacturing for all critical components along with a strong network of global suppliers enables faster delivery of products to our customers.
AS9100D, ISO 14001 EMS, OHSAS 18001 Standards

IEC, BS, API, NEMA, DIN, ASME, CE, PED, AGMA, TEMA, HEI

5S, TPM, employee involvements through QCs

5-face CNC Gantry Machine

Zeiss Co-ordinate Measuring Machines

Computerised Test Facility

Vacuum Tunnel

Full-speed Mechanical Steam Run Test

Integrated CAD/CAM

Five-axis CNC Machining Center

Large Fleet of Four-axis CNC Machines

Five-axis CNC Mill Turn Center

GHTM Goratu Turn Milling Machine

Industry Best Practices
Higher Sustained Efficiency

Our advanced design concepts have been developed in collaboration with the world’s leading design houses in India & the USA to provide maximum performance. Globally benchmarked well proven processes are adopted at Triveni Turbines. Our turbines meet even the most stringent international quality standards which lead to maintaining efficiency throughout the turbine lifecycle.

We use the latest design tools and software to deliver higher performance and added value to our customers.
INNOVATION & TECHNOLOGY

Our endeavour towards continuous product development by deploying cutting edge technology has delivered innovative solutions to customers. Our time tested product development process constantly upgrades steam turbine designs for higher inlet temperature and pressure, to maximise efficiency and reliability features in the turbine. We are constantly working towards developing technologically superior designs using the latest design tools and software, like Turbo-machinery CFD tools, FEA tools, CAD modelling, lateral and torsional rotor dynamics software, that deliver higher performance and add value to customers.

Our product development program is designed to meet all customer requirements for economic installation and operation. Various reliability and operations improvement features such as quick start cycles and high automation levels are incorporated in the steam turbines.

Triveni Turbines leverages on continuous technology development, which is the result of its innovative ecosystem. Triveni Turbines draws from the extensive knowledge base of domain experts in steam turbine technology as well as its related fields, which enhances the skill base of the entire R&D team.
INTELLECTUAL PROPERTY RIGHTS

Operating in a technology intensive industry, we value Intellectual Property Rights and ensure that our IP team gets involved from the planning and conceptualisation stage to the final design and development of products. We have a comprehensive IP strategy for creation and protection of long-term IP assets. The IP policy covers patents, industrial designs, copyrights and trademarks protection. The IP team undertakes complete technology scanning of all R&D projects as well as other protectable IPs.

QUALITY ASSURANCE

Our products are manufactured in accordance with international standards such as API, ASME, AGMA, NEMA, IEC, CE/PED Mark among others. Our best-in-class testing facilities for extensive validation of design help to ensure excellent products that meet even the most stringent international quality standards. We ensure that our network of quality suppliers and dedicated sub-contractors also comply with these standards through QAPs and Standard Operating Practices to maintain a comprehensive quality control of the turbine and its auxiliary systems.
Ultrasonic Test
Magnetic Particle Test
Radiography
Zyglo Test
Casing Hydro Test
Thermal Stability Test
Sound Level Measurement
Profile Measurement Through CMM
Natural Frequency Test
Alignment Check
Full Speed Mechanical Steam Run Test
Low Speed Dynamic Balancing
Governor Response
Full Speed Vacuum Tunnel Balancing
Vibration Measurement

Our products meet the most stringent international quality standards
Lower Lifecycle Cost

Our products are designed to meet all customer requirements for an economic installation, generating competitive power and reduced operating cost. Maximum availability and extended operating life of the product leads to lower lifecycle cost.

Custom-built software is used for steam path aero and structural design of each turbine.
BENEFITS WITH TRIVENI TURBINES

COMPACT DESIGN
- Lower civil cost
- Quicker installation
- Easier maintenance

EXCELLENT ROTOR DYNAMICS
- Solid forged rotor with integral discs to improve reliability. Rotor dynamic analysis for lateral critical speeds for each shaft and bearing configuration.

OPTIMISED CASING
- Horizontally split casing is designed symmetrically to reduce thermal stress.

ADVANCED TECHNOLOGY FOR HIGHER EFFICIENCIES
- Auto-start option for turbines
- Custom-built software used for steam path aero and structural design of each turbine
- Advanced aero LP modules
- Optimum combination of Impulse and Reaction blade path that maximises efficiency

ADVANCED BLADING
- Blades are designed to achieve maximum performance. Disc & blade stress and vibration simulations carried out for each turbine stage.

ROBUST & RELIABLE
- High speed vacuum balancing of rotors
- In-house thermal stability test
- Transient Analysis for faster start-ups
COMPREHENSIVE SERVICE SOLUTIONS

We offer a unique combination of the latest equipment, a highly skilled team and OEM expertise to provide a comprehensive range of customised service solutions for industrial steam turbines. Our aim is to deliver total customer satisfaction and this customer centric approach has enabled us to attain extremely high repeat customer orders. Our customers can visit the facility during the repair process and review the progress.

SERVICE OFFERINGS

1. Full speed Schenck Rotec vacuum balancing tunnel for balancing turbines, compressors/alternators
2. Overhauling & troubleshooting
3. Customisation & upgradation of old turbines for both industrial and utility segments
4. Refurbishment solutions for higher MW turbines, upto 100MW for all makes
   - Efficiency restoration/improvement
   - Health survey & condition assessment
   - Relocations of turbine
   - Upgradation
   - Re-engineering
   - Full speed balancing under vacuum
   - Retrofitting turbovisory systems
   - Modernisation of power plants
   - Indigenisation
   - Residual Life Assessment
Our Learning Centre is the fulcrum for all the technical training needs of Triveni Turbines. We have a world-class learning centre to enable continuous learning for our own corporate, design and field service engineers on a variety of subjects including the latest technology offerings and solutions. This is congruous to our goal of human resources development to meet the growing challenges in terms of engineering, design and development that in turn helps us to serve our customers better.

The Company also undertakes training of customers’ personnel in the areas of operations & maintenance. Apart from training in advanced CAE system such as ANSYS, ABACUS, CFX and so on, Engineers are also trained in the following:

- Turbine aero design/ computational fluid dynamics
- Advanced structural design which includes elasto plastic analysis, turbine transient analysis, creep-fatigue damage analysis, heat transfers etc.
- Lateral, torsional rotor dynamics of geared and direct drive trains
- Lifting analysis of Turbo machinery components
- State-of- the-art control system including dynamic load simulation
- Prototype developments and validation tests
- Training with US design houses and universities
GLOBAL NETWORK

INDIA
SALES, SERVICE AND MANUFACTURING FACILITY

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COUNTRIES OF PRESENCE

1. Australia
2. Austria
3. Bangladesh
4. Belize
5. Bosnia and Herzegovina
6. Brazil
7. Cameroon
8. China
9. Colombia
10. Democratic Republic of the Congo
11. Costa Rica
12. Cote d’Ivoire (Ivory Coast)
13. Croatia
14. Ecuador
15. El Salvador
16. Eritrea
17. Estonia
18. Ethiopia
19. Finland
20. France
21. Ghana
22. Guatemala
23. Guyana
24. Honduras
25. Hungary
26. India
27. Indonesia
28. Ireland
29. Italy
30. Jamaica
31. Kenya
32. Korea, South
33. Kuwait
34. Laos
35. Lebanon
36. Lithuania
37. Malawi
38. Malaysia
39. Mauritius
40. Mexico
41. Mosambique
42. Myanmar
43. Nepal
44. Netherlands
45. Nicaragua
46. Nigeria
47. Pakistan
48. Panama
49. Papua New Guinea
50. Peru
51. Philippines
52. Poland
53. Romania
54. Russia
55. Saudi Arabia
56. Serbia
57. South Africa
58. Spain
59. Sri Lanka
60. Swaziland
61. Sweden
62. Switzerland
63. Tanzania
64. Thailand
65. Tunisia
66. Turkey
67. Uganda
68. Ukraine
69. United Arab Emirates
70. United Kingdom
71. Uzbekistan
72. Venezuela
73. Vietnam
74. Zambia