

turbines that use medium pressure steam as turbine inlet and low pressure as injection steam.

The Steel industry is characterised by high load variations on account of many on and off conditions of furnace and kiln, causing load fluctuations in furnaces and kilns, and thus affecting the stability of the grid and quality of power supply. Therefore, it is extremely critical to have a constant and reliable source of power. Power has been one of the major cost components of the Steel industry. Hence, the availability of captive power becomes crucial for continuous operation of a steel plant. The opportunity for steam turbines from integrated steel plants in India for Direct-Reduced Iron (DRI) processes is quite significant. The waste heat recovered from the DRI plant will meet the captive power requirement of the steel plant.

The Oil & Gas Industry is encountering several difficulties due to contemporary energy refining methods. As a result, customers are actively seeking ways to optimise energy efficiency, decrease their carbon footprint, and reduce operating expenses. The cost-competitive nature and the ever-changing demands of end-users have motivated them to pursue plant efficiency improvements through energy recovery technologies, ultimately minimising energy wastage. In this scenario, the potential for steam turbines can be harnessed by providing high efficiency turbines for both power generation and drive applications.

ADVANTAGES OF TRIVENI'S STEAM TURBINE GENERATORS IN COMBINED HEAT AND POWER APPLICATIONS (CHP)

Triveni Turbines provides steam turbine solutions that use low pressure steam, generated through extraction turbine for heating application by producing both heat and electric power. The cost of power generated through this process is 14-15% lower as against that of power generated through IPPs.

While solar renewable energy is used as a utility power plant only during the day, power produced through CHP/ cogeneration benefits the plant throughout the day by addressing its combined heat and power requirements. This gives the latter a strong edge. As a result, the ongoing rapid increase in electricity consumption, coupled with growing focus on electricity generation through biomass energy sources, thermal treatment of waste and recovery of waste heat, is expected to unleash sustainable power generation through the cost-effective approach of combining both heat and power.

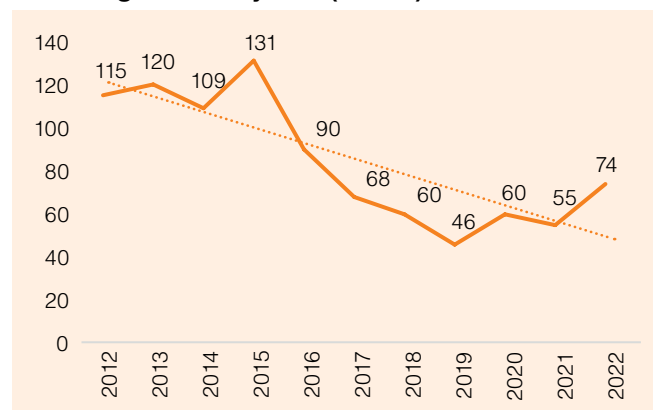
GLOBAL STEAM TURBINE MARKET OVERVIEW

Utility Turbines leading to long-term decline in global steam turbine market

The global steam turbine market has witnessed a decline of 4% per annum, from 115 GW in 2012 to 74 GW in 2022. This is largely attributable to a 4.7% p.a. decline during 2012-2022 in the >100 MW market category (utility turbines), due to transition to renewable and clean energy technologies from coal-based power technologies in countries across the globe. This segment currently accounts for 88% of the overall market.

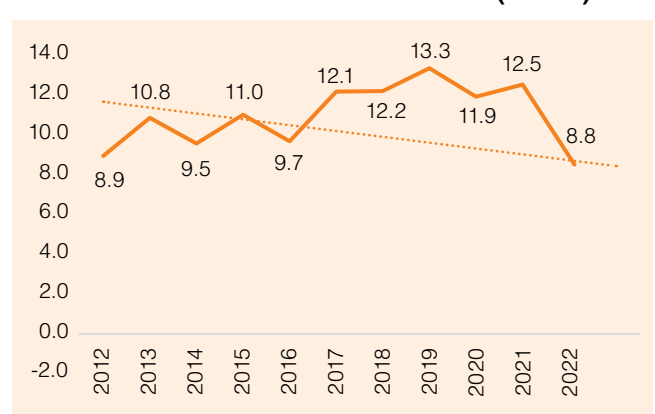
In 2022, the overall global steam turbine market grew to 74 GW, up 34% year-on-year driven by growth in the segment of utility turbines driven by increased global demand following a sluggish year due to the pandemic.

Overall Global Steam Turbine Market has been Declining over the years (in GW)



...However the Below 100 MW Segment where Triveni Turbines operates is largely flat

Steam Turbine Market Below 100 MW (in GW)



Source: Mc Coy Report 2022

Note: Data pertains to calendar years

Triveni Turbines operates in the industrial steam turbines market below 100 MW, and this segment is marginally down (CAGR of -0.1% p.a.) during 2012-2022. Within this, the <30 MW or smaller range, the market has registered a CAGR of 1.2%. And in the 30.1 to 100 MW range, the market has seen a decline of 1.1% CAGR.

In 2022, the <100 MW global steam turbine market declined 30% year-on-year to 8.8 GW, majorly due to lower demand from China on account of continued lockdowns along with Russia.

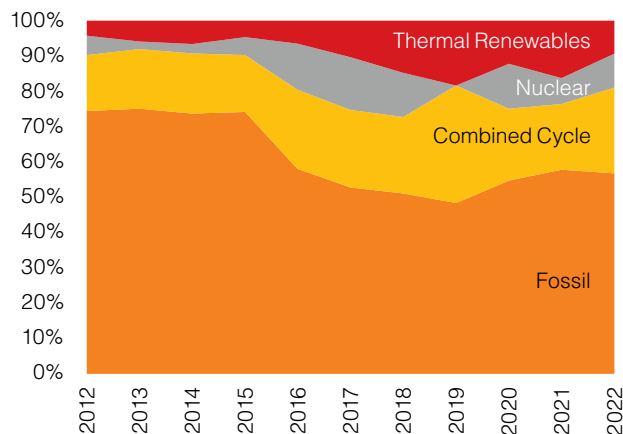
Triveni Turbines is among the Top two players globally in <100 MW segment

In the last decade, Triveni Turbines, has outperformed broader market trends owing to the increasing demand for steam turbines in its addressable markets as well as expansion in the Company's market share. Triveni Turbines' market leadership has been built on a foundation of strong and continuously evolving research, development and engineering capabilities. The customer-centric approach to R&D, along with a keen focus on delivered product and life-cycle cost has allowed Triveni Turbines to set benchmarks for efficiency, robustness and up-time of the turbine. As a result, the Company is among the top 2 globally in a technically challenging field dominated by large multinationals. The Company has also benefited from a dominant position in the renewable-fuel based segments such as biomass-based power production, Waste to Energy (WtE), Waste Heat Recovery.

Thermal renewable fuel-based power generation increasing

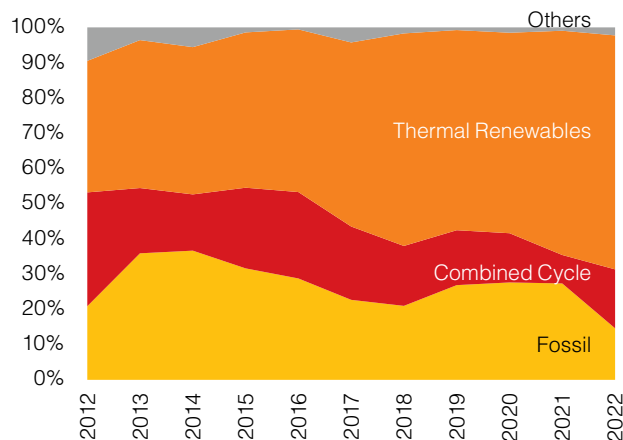
In the last 10 years, in the overall steam turbine market, fossil fuel-based power generation, previously the main source of fuel, declined to 57% in 2022 from 74% in 2012, whereas thermal renewable fuel-based power generation increased to 9% in 2022 from 4% in 2012.

Global Steam Turbine Market, By Fuel



However, unlike the global steam turbine market where fossil fuel dominates, in the <100 MW range, where Triveni operates the growth of thermal renewables has been quite consistent and strong. The share of thermal renewable fuels is quite significant, at 66% in 2022 compared to 37% in 2012. In contrast, the share of the fossil fuel declined to 15% in 2022 from 21% in 2012.

Global Steam Turbine Market (<100 MW range), By Fuel



Source: Mc Coy Report 2022

INDIAN STEAM TURBINE MARKET OVERVIEW

In 2022, the Indian Steam Turbine market for sub-100 MW range grew 15% (in MW terms) over 2021, whereas the sub-30 MW range grew 22% (in MW terms) over 2021. The demand for heat and power from the industrial segment was the key factor contributing to the rebound in the Steam Turbine market to the 2019 levels.

The market was primarily driven by thermal renewable based power plants (including biomass, waste heat and WtE), followed by fossil fuel fired power plants. Majority of the steam turbines' requirement in 2022 came from power generation applications (using MSW, biomass, waste heat and fossil as the fuel), and from energy-intensive segments like Steel, Cement, besides segments like Sugar, Distillery, Food Processing, Pulp and Paper, Chemicals and Oil & Gas for Combined Heat and Power applications.

With the manufacturing sector on a growth trajectory, the demand for steam turbines is expected to remain robust in the future, owing to investments for increasing the production capacities among industries such as Sugar, Distillery, Steel, Cement, Pulp and Paper, Food Processing and Chemicals, among others.