

# **Enquiry Generation**

Although the COVID-19 threat still persists, many developing and developed nations have introduced vaccination programmes and are moving towards "business as-usual" scenario. This is manifest in the overall enquiry growth of 36% YoY in FY 22.

Domestic enquiry generation increased by 57% YoY, with the West region garnering the highest enquiry base followed by the South and North regions. In terms of segments, Process industries comprising Food Processing, Distillery, Pulp & Paper, Chemicals contributed the most to the enquiry base, followed by Cement, Sugar and Oil & Gas segments.

International enquiry generation increased by 25% YoY compared to FY 21. Southeast Asia generated more enquiries, followed by Europe and Turkey regions. Among industry segments, IPP segment was the biggest contributor of the enquiry base, followed by Process industries and Oil & Gas segment.

## **Approach to Market**

The Company's enquiry pipeline looks healthy due to its strong presence in the **sub-30 MW** business segment and dominant share in the Indian market.

The Company was successful in winning orders in API business segment in FY 22 due to its ability to supply energy-efficient API (American Petroleum Institute) 611 and 612 compliant Steam Turbines, ranging from 10 kW to 100 MW. These turbines are designed to meet every challenging requirement of the Oil & Gas industry, comprising Petroleum Refineries, Chemicals, Petrochemicals and Fertilisers.

The Company's newly developed **Sub-3 MW** products will cater to the demand for PRDS (Pressure Reducing and De-superheating System) replacement in Rice Mill, Palm Oil Mill and other industries. This product range, to be marketed through the Company's channel partners, secured some significant orders in Q4 FY 22 from both domestic and overseas markets.

Following the termination of the Joint Venture with GE parties on September 6, 2021, both parties were free to approach the **30.1-100 MW** market independently. Thus, the Company approached this segment with renewed vigour from Q3 FY 22, and focussed on larger machines business segment. The Company has since gained good initial traction with orders both from India and overseas.

Triveni Turbines was successful in finalising an order in the Steel segment in South Korea. The customer awarded orders for three (3) steam turbines - 2 of 35 MW and 1 of 41 MW, during FY 22. This order was won against stiff competition from international players. (Refer to the page no 14 of the annual report for more details on this order)

Triveni Turbines currently has orders/installations in over 75 countries and will be focussing on underserved markets such as North America and East Asia in the coming years.

Triveni Turbines provides its customers a complete solution for sustainable power requirements. The Company offers total solutions for the Turbo generator operation (i.e. supply of steam turbine, steam piping, fire fighting system and entire cables), thereby providing an end-to-end solution.

The Company believes that the outlook for product order booking in the near-term is strong, on the back of its healthy enquiry pipeline.

### **AFTERMARKET BUSINESS REVIEW**

The Aftermarket business of Triveni Turbines is a customer focussed business unit (BU), entrusted with strengthening the Company's relationship with its customers over the entire lifecycle of the turbine, spanning several decades. This BU has the key responsibility of promoting customer retention and building loyalty through various modes, such as increased product efficiencies and machine uptime. Aftermarket business endeavours to do this not only for the products supplied by the Company but also for rotating equipment of other makes. Being an OEM of steam turbines, the services provided by the Company to turbines of other makes lend high levels of credibility as perceived by customers.

Aftermarket business has been further strengthened in FY 22 with new technology-backed modernisation, upgrades, refurbishing and efficiency improvements solutions for all makes of turbines. These enhancement packages guarantee adequate Return on Investment (RoI) for end users, thus creating value for them and augmenting their relation with the Company.

The Company has consistently strengthened and grown its field service force across all offices in India and abroad, to effectively establish strong customer connect and promote brand awareness, thus reinforcing customer-centricity as the core of its business philosophy. The financial year under review saw the Company acquire a stake in a service company, TSE Engineering Pvt. Ltd. with an existing workshop facility in South Africa. This would



greatly enhance its ability to provide faster response to its customers in the SADC (South African Development Community) region and build relationships with new customers requiring service and upgrades on turbines of other makes.

The Company continues to leverage rapid gains in digitisation and remote connect, necessitated by the pandemic, to bolster its service support. Its team of highly trained and experienced engineers utilise the latest and most advanced communication tools for live and secure customer engagement with actual face time via screens of personal devices, irrespective of distances and varied time zones. This has helped the Company provide its customers with added comfort that expert guidance is available at the click of a button.

During FY 22, the Aftermarket business consolidated its foray into new industrial segments such as Geothermal, by bagging repeat orders from prestigious customers in Southeast Asia and East Africa. Buoyed by this success, the Company initiated brand building efforts in Europe,

where Geothermal is a significant source of renewable energy. Further, the reference created in the Utility turbine repair space has helped acquire new customers in India and even generate enquiries from international markets.

The revenues from Aftermarket business in FY 22 grew 18% over the previous year. The order booking from Aftermarket business rose 21% in FY 22 on a YoY basis. The Company will continue to invest in this profitable business unit to build local presence overseas and generate a higher share from international markets.

#### **MANUFACTURING**

Triveni Turbine's manufacturing facilities at Bengaluru and Sompura are successfully maintaining their certifications for Quality Management System (AS 9100D / ISO 9001:2015), Environmental Management System (ISO 14001:2015) and Occupational Health & Safety Management System (ISO 45001:2018) implementation.





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Going beyond these certification requirements, the Company's operations are focussed on continuous improvement across the 3Ps of People, Process and Planet.

- People competencies are developed on a continual basis,
- Manufacturing processes are reviewed and upgraded regularly, and
- Environmental performance is sustained and improved.

Continuous engagement of operational personnel in various cross-functional teams (CFTs), Kaizen, Daily Work Management (DWM) as well as Root Cause Analysis and Corrective Actions (RCCA) keep the entire team involved and motivated. Coupled with application of lean principles and agile manufacturing culture, this ensures faster flow of material and information at all times.

Triveni Turbines is one of the few industrial steam turbine manufacturing companies that has in-house capability for complete manufacturing of critical components such as blades, rotors and casings. Seamless integration of CAD-CAM enables speedy product realisation without compromising on quality. The entire CNC machining shop of the Company is IoT-enabled, which helps in monitoring and continually improving the overall equipment effectiveness (OEE) of the machine shop. Latest CNC machinery (turn mill centres, milling machines, 5-axis blade machining centres), along with testing equipment (high speed balancing tunnels, integrated steam test facility with high pressure and temperature boilers) enable production of turbines from 100 kW to 100 MW, to exceed customer expectations. The Company also stays committed to improving its in-house processes, thus enhancing quality by investing in high precision Co-ordinate Measuring Machine (CMM) with portable scanner, which enables

inspection of blades. The Company conducts prototype testing of blade profiles, with live steam testing, for validation of new designs. It has also installed runout measurement equipment to facilitate specific inspection requirements of its rotating equipment.

In order to facilitate remote factory acceptance testing (FAT), the Company provides option to its customers of live streaming of the test bed SCADA screens with all relevant parameters. While this facility provided the much-needed convenience and safety during the times of pandemic, it continues to help customers to manage business travel restrictions and to rationalise their travel costs even after the easing of lockdowns.

As part of its continued endeavour to fulfil and exceed requirements of environment management system, the Company engages in various initiatives of sustainable operations by conserving electricity, water and providing green cover in both its premises. As a result, the Bengaluru premises are maintaining a Platinum-rated certificate by the Indian Green Building Council (IGBC).

The Company in the past has risen to the challenge of execution and delivery of products from its manufacturing facilities that meet the ever-changing customer expectations (global and domestic) in terms of Quality, Cost and Delivery. Manufacturing remains a core strength for the Company, along with its responsive and agile customer service.

After the pandemic-induced lull in order inflows during FY 21, the Company posted record order booking during FY 22. This posed a positive challenge for its manufacturing to ramp up production in terms of volumes and new products. This is being managed with a two-pronged approach to enhance capacities – both internally and externally.

Additional assembly space of 3,750 sq.m. is already under construction at Sompura facility. This will augment the space for assembly and testing of steam turbines at the Sompura factory. Some of the sub-assemblies are also additionally outsourced to competent sub-contractors to free up in-house capacity on value-added, core activities.

To enhance capacities for sub-contracted activities, 20+ additional sub-contractors and suppliers were introduced during the year. Some of the sub-assemblies are now supplied by successful sub-contractors and by ex-employees, who are operating independently as entrepreneurs. Irrespective of their past association with the Company, all new sub-contractors and suppliers are screened through Supplier Qualification process to minimise risks to the operations with their supplies.

This addition to internal and external capacity is subject to stringent requirements of customer segments (e.g. API). Entire manufacturing value chain is revisited every time to include sector-specific requirements. Increased inspection stages, third-party inspections, additional documentation and testing are implemented with the CFT approach. In order to focus on sector-specific nuances, specialised resources and personnel are deployed, where appropriate.

Similarly, to meet the Aftermarket requirements, new processes such as LASER hardening on blade edges, introduction of high alloy steels etc. are implemented. To increase the speed of execution in Refurbishing, fitment of blade roots on to the existing old rotors is verified through 3D printing instead of physical machining of prototype from steel material.

Necessary resources are aligned to meet the production targets with increased number of turbines.

# **TECHNOLOGY, RESEARCH & DEVELOPMENT**

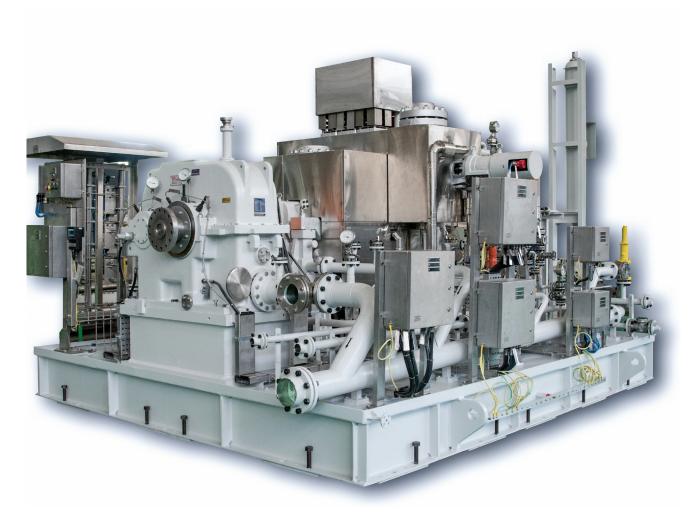
Triveni Turbines' Research & Development (R&D) function plays a critical role in enhancing product offerings, thus supplementing the value delivered to customers.

In FY 22, the Company's R&D programmes were focussed on:

- Developing products & solutions for diverse industrial heat and power applications
- ii) Enhancing energy efficiency of customer plant operations
- iii) Providing value for customers with competitive product offerings

Triveni, through its DSIR (Department of Scientific & Industrial Research) approved in-house R&D facility, is engaged in market-oriented product development and innovation.

The Company's association with globally-renowned research institutes, such as IISc. (Indian Institute of Science, Bangalore), Politechnico De Milano, Cambridge





University, IIT (Indian Institute of Technology, Bombay) in the areas of fluid dynamics, aerodynamics contributes significantly towards advancing its energy conversion efficiency benchmarks.

With engagement of domain experts in turbo machinery, the Company has enabled conversion of academic research contents into cutting edge industrial applications for the benefit of its customers.

During the year, the Company enhanced its steam turbine solutions with high speed applications, which resulted in higher power density models. This also enabled the Company to expand in cold country markets, which predominantly have more vacuum applications.

The Company has made further inroads in the domestic and international Oil & Gas markets. This includes API drive turbines with single stage and multi-stage designs. Triveni's in-house facilities and expertise for carrying out stringent API tests, such as unbalanced rotor response tests and steam run tests including load tests, are instrumental in steering its expansion in the stringent hydrocarbon markets.

The Company continues to execute highly customengineered turbine projects, which also include 50 MW double extraction turbine application to chemical processing.

The Company carried out several specialised turbine projects, such as injection turbines for cement industry, high back pressure turbines for Oil & Gas and distillery industries during the year. Triveni's axial exhaust turbines helped customers achieve significant reduction in their power plant footprint and civil cost.

With innovative product solutions, the Company continued its expansion into international markets and diversified segments, which included Waste-to-heat applications, Chemicals, Paper, Cement, Pharma, Distillery and Hydrocarbon industries for both captive and process cogeneration applications.

The Company also carried out several projects in the Renewable sector, which included Geothermal projects. In addition, it is also involved in refurbishing of other turbo machinery products such as compressors, blowers and gas expanders.

The Company continues to partner with the Indian Navy for specialised turbo machinery projects. As part of its thrust towards advanced, environment-friendly products and solutions, Triveni Turbine's R&D is engaged in the development of carbon dioxide  $(CO_2)$  cooling products and supercritical turbo machinery products.

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Following the tightening of environmental regulations in North America and Europe, governments are globally pushing for reduction in Hydrofluorocarbons (HFC) based cooling systems. With its academic associations, the Company is developing cooling solution, which will address the upcoming global market needs.

Globally, there has been increased focus on supercritical  $\mathrm{CO}_2$  based power generation. This brings advantages of higher efficiency, lower footprint, faster start-ups and easy maintenance. Triveni Turbine, along with IISc. Bangalore, is involved in the development of  $\mathrm{CO}_2$  based thermal cycles and power block equipment. This involves development of turbomachinery, such as  $\mathrm{CO}_2$  gas expander, compressor and high-pressure heaters, as well as control system to manage quick transients. Triveni Turbine's R&D is working in this futuristic energy area, which will position the Company to be future-ready for the upcoming energy transition scenario.

# **INTELLECTUAL PROPERTY RIGHTS**

Innovations and technological improvements undertaken by the Company through research generate invaluable, in-house Intellectual Property (IP). These innovations and improvements need to be adequately protected for safeguarding the Company's innovative edge in the industry and for preventing potential losses. A dedicated team of IP specialists works closely with the R&D team, from the initial planning and conceptualisation stage to the manufacturing stage, in order to capture and protect the generated IP.

As the creation and protection of the IP portfolio is of utmost importance for the Company and all its stakeholders, TTL has instituted a robust IP strategy for the protection of its long-term IP assets, with the aim to

secure and preserve its technological advantage over its competitors. With its global focus and reach, the Company constantly undertakes patent and industrial design filings in various international jurisdictions, while enhancing its IP portfolio in India. The Company has filed for IP protection via patents and industrial design registrations in India, Europe, South East Asia, and in the United States of America, and plans to protect its IP in the new international markets where it serves. A substantial number of Intellectual Property Rights (IPR) have already been awarded to the Company in India and other jurisdictions. The Company had filed 316 IPR in the market globally till March 2022. These include IPR filings in steam turbines and CO<sub>2</sub> based power systems.

### IT AND DIGITALISATION

The Company recognises that digitalisation is the key to achieving excellence in business operations. Its digitalisation process is focussed on:

- 1. Improving internal operational efficiency of business process.
- 2. Enhancing product and service value to the customer.

The application landscape has been continuously upgraded to improve productivity - from market enquiry process to revenue receipt stage. Most of the internal business softwares have been largely migrated to cloud platforms, which ensures continuous support and upgrades.

Business operation, from enquiry to order and order to revenue process, has been streamlined with industry standard software viz. Salesforce, SAP and Oracle Primavera. Engineering process is managed through product life cycle management (PLM) software 'Teamcenter' and technology specific high-end tools. Manufacturing and supply chain process is managed on SAP and IoT applications in line with Industry. Digital Mechanical Run Testing (DMRT) helped global customers manage the turbine test protocols during COVID-19 induced travel restrictions. The Company's field service team used the remote application software to manage turbine system commissioning centrally from Bengaluru.

The Company's Aftermarket business, along with its Technology team, has developed IoT (internet of things) applications with leading IT services provider for enhancing customer value in terms of:

- a) Plant operation monitoring and asset base productivity.
- b) Providing extended flexibility and operability advantages.
- Preventive and diagnostic services for product life extension.

Triveni uses industry standard cloud-based applications in various business operational areas, such as SAP Order to Revenue, Oracle Primavera for Project management, Teamcenter PLM and advanced CAD/CAE tools for R&D and engineering processes, IoT-based platforms by manufacturing and field services. These have enabled the Company to achieve higher internal productivity and provide value to its customers. During FY 22, the Company set new benchmarks on its IT landscape through its initiatives, which it will further consolidate in FY 23.

### **SUPPLY CHAIN**

A reliable supplier base developed over the years continues to be the key strength for Triveni Turbines. The Company remains consistently focussed on improving the development of its global supply chain by involving suppliers in early stages on new technology and product development, and by leveraging world-class supply chain management processes using appropriate tools and systems across functions. The Company also continues to invest in training and developing leaders to create one of the best supply chains in the industry.

During FY 22, the Company designed and implemented a number of participatory workshops for suppliers, covering health, safety and environment requirements, as well as legal compliances related to labour conditions and COVID-19 protocols. Triveni provided support to its vendors during the entire pandemic period through various interventions, such as vaccination drives for their employees and families, financial assistance as needed and remote inspection.

The Company gives due importance and emphasis to inventory control in order to maintain the essential stock of raw material and other commodities at appropriate levels, for enabling seamless flow of production. At the same time, optimal inventory buffer is created in such a manner so as to enable the Company to navigate through supply chain interruptions due to COVID-19 and other geopolitical changes across the world. This has resulted in smooth and uninterrupted customer experience in terms of product and services support.

The Company undertakes periodic vendor-wise spend analysis and has established adequate control processes with suppliers to ensure compliance standards, desired quality, good ratings and loyal trade relations.

The Company's focus has been on ensuring that its supply chain partners grow in a participatory and mutually beneficial manner, and strives continuously to improve on the customer experience in terms of quality, delivery and cost. And this journey of excellence and customer engagement continues.



### **QUALITY ASSURANCE**

The Company continues with its AS9100D / ISO 9001:2015 certifications, with matured quality management system elements implemented throughout the organisation. Net Promoter Score (NPS®) is one of the key driver for the Company to improve its customer experience on a continual basis. NPS® survey is undertaken by the Company on annual basis to measure the health of relationship with customers. It also helps the Company capture customers' expectations by evaluating their experience and identifying value levers. NPS® has improved by more than 25% during the year and the Company progressed closer to its goal of Total Customer Satisfaction. One of the reasons for this remarkable increase in NPS® is the Company's responsive service to customers. The Company was able to close customer issues faster than in the previous year. This is also evident from the improved Customer Satisfaction Index (CSI) for the Company's Product business for FY 22.

Validation of new steam path designs from recent installations has helped the Company respond to the growing demand for higher efficiency turbines. The success of its indigenous R&D efforts was the result of its quality operating system. The Company's R&D processes are tuned for refinements in turbine technology, in order to deliver world-class product designs to compete with global competition. With these agile yet robust design processes, the Company developed more efficient airfoil designs, using cutting-edge design principles and tools during the year. These designs were realised using reliable and quality conscious supplier base and TTL's in-house manufacturing prowess. Compliance throughout the design realisation stage was ensured with customised quality assurance practices.

The Company is all geared up to cater to customer requirements across segments, including API. Its facilities/resources are further strengthened by:

- addition of Electrical & Mechanical Runout (EMR) machine to ensure electrical runout at higher accuracy,
- installation of customised Magnetic Particle Inspection (MPI) head shot machine, where MPI of longer blades can be done in a single set-up, and
- dedicated Positive Material Identification (PMI) machine to ensure material conformance.

More emphasis is laid on analysing and preventing defects at source – whether that are at suppliers' end or for in-house processes. For protecting TTL products from

incoming defects, if any, multi-layered Quality Assurance (QA) practices are strengthened with digitisation. All QA processes are digitised by integrating them with the Company's Oracle-based, common project execution platform (Primavera). The process of ensuring root cause and corrective action (RCCA) for identified defects has yielded positive returns in terms of increase in first pass yield (FPY) of turbine's Factory Acceptance Testing (FAT) and also kept the CoPQ (cost of poor quality) value under control.

Suppliers have been an integral part of the Company's successful journey. While the Company's Quality Assurance team continues to support the supply chain with collaborative approach of continuous improvements, FY 22 saw an increase in numbers in the supplier base. A digitised supplier evaluation process ensured a balance between risks and opportunities, and helped meet the demand of on-time delivery of products with increase in number of turbines manufactured.

The Company was quick to adopt technology in a bigger way in the pandemic period by offering remote FAT inspection options to customers. This philosophy was also extended to supplier inspections. With completion of digitisation of QA processes, TTL is also poised for improved data-based decision-making for delivering better quality.

The year's theme for World Quality Day celebrations, during November 2021, was "Sustainability: Improving our Products, People and Planet". The response to various events organised on this occasion was immense and the programmes saw huge participation from employees, while maintaining COVID-19 protocols. This, along with the Company's sustained Kaizen programme, ensured that all employees remained engaged in quality compliance, improvements and defect prevention initiatives.

The Company remains consistently focussed on building a robust quality culture at all levels through behaviour-based quality model.

### **HUMAN RESOURCE**

Triveni Turbines has always believed people to be the key differentiator in the success of the organisation. Technology, manufacturing, customisation, optimising solutions are the outcome of their brilliance.

COVID-19 has, over the last two years, impacted industries across the spectrum. The team at Triveni Turbine showed commendable resilience in adjusting to the change and staying focussed on progressing with their journey of learning and contribution to growth. Their perseverance



The Company's employee engagement initiatives are crafted to energise, motivate and create opportunities to remain flexible and agile in order to mitigate the challenges successfully in the VUCA (volatile, uncertain, complex and ambiguous) world.

and "Never-Say-Die" attitude had a great impact on the Company's efforts to gain back its winning ways, which were endangered by the pandemic.

Triveni Turbine's people strategy is aligned to complement and support its business strategy, keeping in perspective both short and long-term business objectives on value creation for customers and stakeholders. Initiatives and measures drawn from the people strategy are directed towards enriching, enhancing and building competencies in people to deliver consistently and ensure sustainability. The focus lies on creating a high-performance culture by ensuring that the right person is there in each role, enabling employees to experience learning as part of their daily life in pursuit of creating customer-centric innovation, thriving on continuous improvement, and enriching organisational capabilities to stay relevant and competent for the marketplace.

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HR policies are regularly reviewed for relevance and effectiveness to enhance employee experience. The HR processes facilitate augmentation of the organisational capabilities to build a highly engaged, motivated, growth-oriented mindset workforce in the Company. The Company continues its sustained focus on attracting, developing and retaining talent with a "Ready for Future" approach.

Triveni Turbines has been instrumental in putting in place policies, driving measures and sensitising and

orienting the organisation towards ensuring the safety, security and well-being (both physical and mental) of its employees.

It has been the Company's endeavour to nurture homegrown talent to help the organisation navigate its growth journey effectively and successfully. This has provided the Company a strong competitive edge over Technology, Products, Services and Processes. Triveni Turbine's Learning Centre is a dedicated, worldclass, in-house training facility, located in the midst of a green environment to make learning more fun and focussed. It has re-aligned its offerings to align with the transforming eco-system, including the pandemic, over the last several months. Uninterrupted learning with fun has excited young employees recruited from various engineering college campuses. Budding engineers fresh from colleges/universities undergo a structured 2-year training programme to empower them to become ready for the work environment before being inducted into various departments. The enthusiasm and energy levels of subject matter experts and in-house training faculties, blended with the employees' appetite for learning, give a new direction to the Learning Centre that is equipped with multiple classrooms, Computer Based Product Training Lab (CBT), a library, as well as a highly trained in-house faculty. The pandemic could not dampen the spirit of the team on their way to build knowledge and skills to be ready for various business challenges.

Building partnerships and drawing synergies with technological and management institutes enable the Company to create talent availability for the future and stay competent to augment future technologies for creating customer value.



Keeping pace with the ongoing change, Triveni Turbines' Performance Management System (PMS) is focussed on the development of conversations to enable employees to accomplish individual and organisational objectives. The rewards and recognition framework has been articulated to sustain the employees' high performance culture and ensure timely appreciation of their achievements. Competency development and job enrichment are an integral part of the PMS, aimed at striking a balance between the employees' career aspirations and organisational growth.

Events such as "World Quality Day", "Triveni Talk", among others, draw rich participation from the employees, reaffirming the Company's beliefs in continuous improvement and collective learning.

# **ENVIRONMENT, HEALTH AND SAFETY (EHS)**

Environment-friendly manufacturing facilities is the trademark of Triveni Turbine. The Company's facilities in Bengaluru and Sompura stand apart in their respective surroundings in terms of upkeep and improvement of environment. Both these facilities have plenty of green cover and are zero discharge plants. These facilities are eco-friendly, with large trees, natural landscaping, rain water harvesting facilities, and solar panels for harnessing renewable energy.

These facilities have been certified for their Environmental Management System (EMS) and Occupational Health and Safety System (OHS) standards as per ISO 14001 and ISO 45001.

The Company constantly improves its environmental performance by focussing on conservation of water, energy and materials, as well as waste reduction. Employees are involved in ensuring good EHS practices through various joint management committees.

The Company has enhanced its focus on improving the health of the employees and its supply chain partners. During the pandemic period, the Company extended COVID-19 vaccination to all employees and their family members. Community vaccination programmes were also organised for the benefit of the surrounding communities. Stringent protocols were introduced in the factory and office premises as per the relevant Government guidelines to contain the spread of COVID-19. Work from home (WFH) was also encouraged by providing appropriate facilities. With its focussed efforts, the Company was consistently able to maintain the health of its employees.

The Bengaluru factory has installed solar panels of 300 kW capacity, with net metering facility to export



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surplus energy. The entire sewage water is treated at the plant, and used for landscaping and gardening. Energy-efficient LEDs are being introduced in a phased manner to replace the conventional CFLs/fluorescent lights. Variable frequency drives are used in power intensive areas (cranes, boiler etc.) in order to reduce energy consumption. Power factor at both the facilities is maintained at near 1.0 to conserve energy.

TTL has an impeccable record of zero reportable accidents over the past many years. The entire campus is covered with electronic surveillance through CCTV and IT-enabled security systems.