



ARDS Reactor for ADNOC, UAE

HEAVY ENGINEERING BUSINESS

Overview:

L&T Heavy Engineering is amongst the top 3 global fabricators. The business has achieved international recognition through an impeccable track record of executing large complex projects and constantly creating international benchmarks. Capabilities include state-of-the-art, fully integrated globally benchmarked manufacturing facilities, an experienced skilled talent pool and fully equipped technology centres. The safety standards at its manufacturing facilities located in Mumbai, Hazira and Vadodara are on par with international standards.

The business is organised into Product Business Units (PBU) based on their specialisation.

- **Reactor & Pressure Vessels (RPV)** PBU specialises in fabrication of hydro-processing reactors, tubular

reactors, gasifiers, ammonia converters, urea reactors, coke drums, FCC reactor – regenerator system, LNG / gas processing pressure vessels and heavy columns

- **Heat Transfer Equipment (HTE)** PBU specialises in ammonia & urea plant exchangers, hydrocracker BLE high pressure heat exchangers, methanol converters, PO reactors, VAM reactors and fired-tube waste heat boiler packages
- **Process Plant Internals (PPI)** PBU specialises in reactor and proprietary process plant internals
- **Modification, Revamp & Upgrade (MRU)** PBU offers value-added end-to-end solutions for FCC reactor, CDU / VDU revamps, urea reactor life extension, coke drum repairs, heat exchanger revamp, urea energy saving projects and emergency repairs
- **Nuclear** PBU specialises in core nuclear island equipment such as steam generators, reactor components (end shield assembly, end fittings), pressurisers, safety heat exchanger, spent fuel storage cask / canister, fusion reactor (ITER assemblies), fast breeder reactor critical for nuclear power sector and critical equipment for ATVP / BARC programmes
- The **Piping center** fabricates critical piping spools for power plants and other process industries

L&T Special Steels and Heavy Forgings Private Limited (LTSSHF) is a JV with Nuclear Power Corporation India Limited (NPCIL) and caters to the demand for



Ethylene Oxide Reactor weighing 1157 MT for IOCL's Paradip Refinery

critical forgings required for the Indian Nuclear Power programme and for other critical sectors, such as Defence, Hydrocarbon and Oil & Gas. The JV has set up a fully integrated forging facility (from steel scrap to finished forgings of alloy steels, carbon steel & stainless steels) with the capacity to produce a single piece ingot up to 200 MT and finished forgings up to 120 MT.

Business Environment

The business was impacted due to the challenges posed by the unprecedented Covid-19 pandemic. Oil prices touched historic lows and are now seen settling in the price band of \$55-65 per barrel. This led to many projects in the refinery sector being shelved or deferred. In the USA and the EU, enforcement of clean fuel standards – Renewable Energy Directive (RED) II, Renewable Fuel Standard (RFS) & Low Carbon Fuel Standard (LCFS) – and Government subsidies have attracted investments to convert old refineries to produce 'Green Diesel / Biofuel'. The business has been successful in making inroads into these new areas and has booked a few orders recently from customers in the USA and the EU. The business also expects growth in the Petrochemical sector due to higher demand of pet-chem products and less volatility in the product prices. Good impetus is expected for integrated petrochemical plants, especially in Asia led by China and the Middle East.

The Government has approved mega projects as a part of economic stimulus to revive the pandemic-affected economy. The 'Atmanirbhar Bharat' initiative to drive self-sufficiency is helping local industry. As a commitment

to the 21st Conference of the Parties (COP 21) environment regulation, the Government has launched an initiative to gasify Indian coal (100 million tonnes) to methanol. These initiatives have improved the prospects for the business.

The MRU business is identified as a growth initiative, since clients increasingly opt for revamps and defer investments in new greenfield projects. There are good revamp and upgrade opportunities expected in the coming years.

The Indian Nuclear programme entered fleet mode procurement for 700 MWe PHWR. NPCIL has introduced a tender clause to recognise good performance of suppliers by their commitment to award repeat orders. The business stands to gain on this based on the good delivery performance in recent orders.

Major Achievements

In the **domestic market**, the business secured breakthrough orders of acrylic acid reactors for Indian refineries, breaking the monopoly of European manufacturers, and received an order for supply of titanium heat exchangers for IOCL's PTA plant.

During the year, the world's heaviest LC-MAX reactor, weighing 2313 MT, was dispatched to HPCL's Vizag Refinery.

In the **international market**, the business secured orders for the supply of 11 hydro processing reactors for renewable diesel projects in the EU and the USA. In the Petrochemical sector, the business secured orders for new products: four



The world's heaviest LC MAX Reactors, weighing 2313 MT, on the way to HPCL, Vizag

PO reactors from Thyssenkrupp Industrial Solutions, a VAM reactor from Sheng Hong, China and an ethylene oxide reactor from Sibur, Russia.

The business ensured uninterrupted customer supplies throughout the pandemic year by dispatch of four ARDS reactors to Takreer, Abu Dhabi; four coke drums to DUQM, Oman; two EO reactors to Lianyungang, China and the ITER top lid assemblies to France.

In the Nuclear business, good performance in the execution of the ITER cryostat was rewarded with a contract for assembly integration work of the vacuum vessel at Cadarache, France. The business team flagged off the most complex and final assembly of the cryostat, the world's largest stainless-steel, high-vacuum pressure chamber. This was an important milestone in the global nuclear fusion arena as well as a moment of pride for the Make in India initiative. The business has secured an order for 12 Steam Generators (SGs) from NPCIL for the prestigious 3 x 700 MWe Pressurised Heavy Water Reactor (PHWR), strengthening its position as a key nuclear power equipment supplier for the Government of India's fleet-mode procurement programme. The business also created a new global benchmark in nuclear manufacturing by delivering the first out of four 700 MWe steam generators for the Gorakhpur Haryana Anu Vidyut Pariyojana (GHAVP) 1 & 2 project in 36 months (12 months in advance) and also dispatched three Ti steam generators for ATVP (3 months in advance of the schedule).

In the Nuclear sector, the LTSSHF JV has received orders for the supply of steam generator forgings for 6 units, end shield plates for 4 units and forgings for pressuriser and bleed cooler for 4 units, to be set up in fleet mode. In the Defence sector, the JV has been certified as the only indigenous producer of large and heavy forgings and thick plates for the prestigious submarine programmes.

Significant Initiatives

The business weathered the challenges posed by the pandemic by adopting safe working practices, encouraging work from home, increasing virtual meetings, virtual audits and inspections, online approvals, etc.

The business launched the 'Knowledge Management' initiative with the aim of being a 'one stop solution' for young engineers seeking information on core product, process and functional knowledge. The Mentoring Wave III initiative was launched, wherein senior colleagues help in competency development of young colleagues through their guidance and support.

The Quality at Root initiative was embarked upon by the business to reduce the cycle time of manufacturing by eliminating duplicate activities. This initiative requires high levels of sensitivity towards quality, and casts responsibility for quality on the same set of employees who are responsible for manufacturing – ensuring 'First time right'.

Digitalisation has become way of life. The business was named the 'Most Digitally Enabled Manufacturing Plant



Forged Hydro Shaft, weighing 36 MT, for BHEL

in L&T' amongst non-construction businesses. Notable digitalisation initiatives include IOT-enabled smart welding stations in welding and overlay operations. Digitalisation in office areas includes automation of design & procurement, supply chain management and estimation system. Many other digital initiatives have been taken, such as virtual 3D layout simulation and Digi-Eye – for real-time project progress monitoring.

In the MRU area, the digital initiatives include coke drum life cycle management using IOT stations, remote safety surveillance using IOT cameras, remote welding monitoring, manpower tracking in confined spaces, detection of hazardous gases in confined spaces, VR based execution and safety training. All these initiatives have helped in reducing costs, improving productivity and enhancing competitiveness.

Environment, Health and Safety

The business has developed and implemented SOPs complying with Covid-19 protocols for social distancing, PPEs and hygiene.

As a part of the energy conservation drive, installation of magnetic resonators in all furnaces was carried out. Magnetic resonators maximise the specific contact area between fuel molecules and inlet air for complete combustion, which results in less consumption of input gas.

Safety is monitored with both 'proactive' indicators – Reported Safety Concerns (RSCs), Near Miss reporting – and

'reactive' indicators – dangerous occurrences, lost-time injuries and fatalities. The business launched a major initiative, the Behavior Based Safety programme (BBS) to internalise the concept of a safe workplace as a core value.

The business team achieved 0.32 million safe man hours in last year. During the year, 49 webinars on various safety modules were organised by the Safety Innovation School, Hazira.

Human Resources

The business was quick in adopting digital platforms for use during the lockdown period to upskill the talent pool. It effectively utilised Facebook at Workplace to keep employees engaged during lockdowns and reduce pandemic fatigue. 'Baatcheet' sessions were organised to strengthen connect and communication with female employees. The topics discussed included women's development, work from home experiences, retaining women employees, etc. Digitalisation of the entire talent acquisition processes – from sourcing to hiring and onboarding to placement – was implemented, resulting in process efficiencies, and realising virtual hiring. Cultural transformation programmes, designed with the help of internal and external experts, focus on driving the culture of Seven Core Values, i.e. Safety, Quality, Customer-centricity, Trust, Transparency, Action Orientation and Boundaryless Team. The 'Abhiviyakti' platform is used for regular interaction with young engineers.



End Shield for the 700 MWe Nuclear Power Plant – GHAVP



HMEI Bhatinda Multi-unit Turnaround by Modification Revamp and Upgrade

Risks and Concerns

The significant demand destruction arising from the pandemic has weakened the financial performance of the global refining industry. Deferment of projects / holds on current projects / customers' facing financial difficulties are some of the key challenges faced by the business. However, the business was quick to identify new opportunities in renewable diesel projects and expand the product offering.

The resurgence of Covid-19 and its impact remains a challenge. The business is closely monitoring this development and is geared to take appropriate steps, in case needed.

The business continues to face foreign competition in domestic projects. To have a level playing field, it is proactively working through industry associates with the ministries to mitigate the gaps. The anomalies in the implementation of public procurement and 'Atmanirbhar Bharat', Bureau of Indian Standards (BIS) and GST by Public Sector Unit (PSU) procurement are being addressed.

Further, the business has launched many improvement initiatives, viz. optimisation of plant layouts, cycle time reduction, implementation of 'Quality at root', upgradation of facilities at Hazira (West) to international standards and extensive use of digital technology. These initiatives have helped the business to meet customer expectations

on shorter delivery commitments and retain its leadership position in the market.

Outlook

FY 2021-22 is expected to provide higher growth in view of global economy recovery and lower base effect. It is expected that the investment in renewables / biofuels may increase further due to the legislations. A good number of petrochemical and refinery projects are expected in China, the USA, Europe, South East Asia and Middle East. LNG Projects in the USA, Qatar, Australia, Nigeria and Canada are expected to move forward in FY22.

Domestically, the business expects new projects in the coal gasification, petrochemical and specialty chemicals industries. The MRU business is expected to have an increased demand due to deferred investment which is driving revamp and modifications of existing projects.

Nuclear projects ordering is likely to pick up in FY22 on account of the fleet programme of NPCIL and the foreign technology programme with technology providers such as EDF, Westinghouse and Rosatom. However, Government needs to expedite the pace of tendering process for timely procurement action.

Digital and organisational excellence initiatives have accelerated the journey to be the best global Heavy Engineering company.