

Hydrocarbon Business

Overview

L&T Hydrocarbon Engineering Ltd. (LTHE) delivers integrated design-to-build world-class solutions for the global oil & gas industry, including oil & gas extraction and processing, petroleum refining, chemicals & petrochemicals, fertilisers and cross-country pipelines and terminals. The Company's in-house capabilities, synergized through strategic partnerships, enable it to deliver a single-point solution for every phase of a project – from front-end design through detailed engineering, procurement, fabrication, project management, construction and installation up to commissioning services.

The key aspects of LTHE's business philosophy are on-time delivery, cost competitiveness, high quality standards, with a focus on best-in-class HSE and IT security practices. Integrated strengths, coupled with an experienced and highly-skilled work force, are the key enablers in delivering critical and complex projects. Over the years, we have garnered a reputation for simultaneously executing multiple projects. We believe in an attitude and approach that allows for flexibility of operation and agility in response.

The business has repeatedly delivered, large, critical and complex projects, globally, by virtue of its

customer focus and responsiveness, experienced and highly skilled human resources, excellent Quality and HSE practices and culture of excellence. The business has a fully-integrated capability chain, including in-house engineering and R&D centres, modular fabrication facilities with waterfront, as well as onshore construction and offshore installation capabilities. The principles of the Company's business philosophy are striving for excellence in corporate governance, HSE and quality standards, extensive IT-enabled processes, digitalization, state-of-the-art IT security practices, on-time delivery and cost-competitiveness.

The Company's major facilities in India include Engineering & Project Management Centres at Mumbai, Vadodara, Chennai and Bengaluru and Fabrication Yards at Hazira (near Surat) and Kattupalli (near Chennai). Its overseas presence is primarily in the Middle East in UAE (Sharjah), Saudi Arabia (Al-Khobar), Kuwait and Oman (Muscat). The business also has a major Modular Fabrication Facility at Sohar in Oman, held through a subsidiary.

The Company caters to clients across the hydrocarbon value-chain through the following business verticals:

- Offshore
- Onshore
- Construction Services
- Modular Fabrication Services
- Engineering Services

Bassein Development Project for ONGC including platforms (Living Quarters & BH Wellhead), pipelines, bridges and modifications



Offshore

The business offers turnkey EPCIC solutions to the global offshore Oil & Gas industry encompassing wellhead platforms, large integrated process platforms and modules, subsea pipelines, brown field developments, offshore drilling rigs (upgrade and new-builds), floating production storage & off-loading (FPSO) modules, deepwater subsea systems, offshore windfarm projects and decommissioning projects. For nearly three decades, the business has repeatedly demonstrated its ability to offer custom-designed, cost-competitive solutions to the industry, with an impeccable on-time delivery record meeting international quality and HSE standards. It has successfully executed large offshore platforms and pipeline projects on the east and west coasts of India, the Middle East, South East Asia and Africa, for global companies such as ONGC, GSPC, British Gas, Saudi Aramco, ADNOC Offshore, Bunuq, Qatar Petroleum, Maersk Oil Qatar, PTTEP, Petronas Carigali and Songas.

Its Offshore Engineering Centre has comprehensive engineering capabilities covering the complete project life cycle from feasibility studies, concept, FEED, 3-D model based detailed engineering and special studies to commissioning for offshore projects. Value engineering is one of the core elements in the Company's project execution, and operational excellence is a key value driver in the Offshore Engineering Centre's global delivery model. The Company's business processes are oriented towards creating value and improving the quality of deliverables on a continual basis. Its engineering expertise is backed by an institutionalized system of route maps, standard operating procedures and knowledge management.

The business owns and operates a self-propelled heavy-lift-cum- pipe-lay vessel – LTS 3000 – through its joint venture, L&T Sapura Shipping Private Limited.

The business secured an EPCI contract, in consortium, for three gas production platforms with associated subsea lines and umbilical's tie-ins and hook-up under a Long Term Agreement (LTA) with Saudi Aramco.

On the domestic front, the business secured an EPCIC contract for Bassein Development of ONGC involving 3 well platforms, a 23-km subsea pipeline, composite subsea power cable, clamp-on works on an existing platform and modification work on nine existing platforms in the western offshore basin in India. Two other major contracts are T&I (Transportation & Installation) contracts of ONGC, one for replacement of well fluid, gas lift and water injection pipelines along with brownfield modification works on existing platforms in the western offshore field and the other for extracting gas from Daman field situated in the south-western part of the Tapti-Daman block at Mumbai Offshore. During the year, the Company successfully completed the Bassein development and S1 Vashista deepwater projects for ONGC.

Onshore:

The vertical provides engineering, procurement, construction and commissioning solutions for a wide range of hydrocarbon projects covering upstream oil & gas processing, refining, petrochemicals, fertilisers (ammonia & urea complexes), cryogenic storage tanks & regasification terminals including LNG and cross-country pipelines. It has a record of successful simultaneous execution of

Sailing out of Wellhead Platform Topside from Kattupalli Facility



Additional development of Vasai East Project on India's West Coast for ONGC



multiple mega projects with diverse technologies from process licensors like UOP, Axens, Technip, Haldor Topsøe, CB&I Lummus, Black & Veatch, Ortloff, ExxonMobil, BOC Parsons, Invista and Davy Process Technology. The Company has built capability and resources to execute multiple large-value complex projects simultaneously, meeting stringent delivery schedules.

Its Design Engineering Centres – L&T-Chiyoda for onshore engineering and L&T-GULF for pipeline engineering – enable the Company to offer the complete spectrum of FEED, process and detailed engineering to clients. The Company's subsidiary, Larsen Toubro Arabia, is registered as In-Kingdom EPC ('IK-EPC') company in Saudi Arabia, and addresses onshore IK-EPC opportunities.

The business has executed Lump-Sum Turnkey (LSTK) projects for various Indian oil majors like IOCL, MRPL, ONGC, OMPL, BPCL, HPCL, Reliance Industries, etc., as well as fertilizer companies like NFL, GNFC, RCF, GSFC and others.

Internationally, the business group is prequalified by major international oil & gas producers, and has a successful track record of project execution with international bellwethers such as Saudi Aramco, ADNOC Gas Processing, Petroleum Development Oman (PDO), Kuwait Oil Company (KOC), Kuwait National Petroleum Company (KNPC), Petronas, Dolphin Energy and Chemanol.

During the year, the business received orders from Hindustan Petroleum Corporation Limited for carrying out Full Conversion of a Hydrocracker Unit as well as for a Crude Distillation Unit (CDU) & Vacuum Distillation unit

(VDU), both for Visakhapatnam Refinery Modernisation project at Andhra Pradesh, and from the Adani Group, involving two LNG Storage Tanks for an LNG Terminal at Dhamra port, Odisha.

On the international front, the business received EPC contracts for the Haliba Development Project in the UAE from Al Dhafra Petroleum Company Limited and from Kuwait Oil Company for building 48" Crude Transit Line (TL-5) from North Kuwait to Ahmadi.

During the year, the business successfully achieved mechanical completion of a Coke Drum System Package for Aishwarya project at Haldia Refinery for Indian Oil Corporation Limited, and a New Gathering Centre, GC-30 in North Kuwait for Kuwait Oil Company.

Construction Services:

The business undertakes turnkey construction of process plants for refineries, petrochemicals, chemical plants, fertilizers, gas-gathering stations, crude oil & gas terminals and strategic storage facilities including underground caverns and above-ground facilities covering civil works, structural, piping, equipment, electrical & instrumentation erection, heavy lift and execution of cross-country oil & gas pipelines.

The vertical's major capabilities include heavy lift competency, advanced welding technologies, high levels of automation, management of manpower and material in large volumes at construction sites and Quality / HSE systems conforming to international practices. The business has also invested in strategic construction equipment, a range of pipeline spread equipment, automatic welding

900 TPD ammonia plant of National Fertilizers Limited, Panipat.



Coke Drum System Package for IOCL, Haldia



machines and other plant and machinery for electro-mechanical construction works.

The business has executed projects for major private sector customers like Cairn Energy, Reliance Industries, HPCL Mittal Energy (HMEL) as well as major oil PSUs like BPCL, HPCL, IOCL, ONGC and international customers like ADNOC Gas Processing, ADNOC Refining, ADNOC Onshore, Saudi Aramco, Sadara, Dolphin Energy, etc.

The Company's country-specific entities render construction support to international onshore projects – Larsen & Toubro Electromech LLC in Oman, Larsen & Toubro ATCO Saudia LLC in Saudi Arabia, Larsen & Toubro Kuwait Construction General Contracting WLL in Kuwait.

During the year, the business received an additional order for a new coal bed methane facility being developed in central India.

The business successfully completed composite work of the low-cost expansion project at GGSR Bathinda (Punjab) for HPCL Mittal Energy Limited and laying of a pipeline (12' /8" x 176 km) and associated facilities from Dahej to Navsari and a spur-line from Dahej to Hazira for the Dahej Nagothane Ethane Pipeline Project of Reliance Gas Pipeline Limited.

Modular Fabrication Services:

The business offers comprehensive modular Engineering, Procurement and Fabrication (EPF) solutions for setting up projects, primarily in the offshore and onshore oil & gas segments. World-class modular fabrication facilities

at Hazira (India's west coast), Kattupalli (India's east coast) and Sohar (Oman) have a combined annual capacity in excess of 160,000 MT, depending on the product mix, and are equipped to undertake mechanical design of modules including structure, piping, pressure vessels, fabrication and construction engineering. Fabricated modules are tested and pre-commissioned at site for trouble-free and rapid hook-up. The facilities have state-of-the-art equipment to deliver complex modules and structures, duly tested at the facilities, and offer competitive and year-round delivery capability with robust QHSE practices.

These facilities are situated on the waterfront, with easy access to clients across the globe, and have load-out jetties for dispatch of large and heavy modules via ocean-going vessels and barges. These facilities are accredited with global certifications including API, ASME and NB and pre-qualifications from major oil & gas customers.

The business executed a total of 21 challenging projects across the offshore and onshore landscape for various prestigious domestic as well as international majors in the oil & gas sector in FY 2017-18. A significant milestone was, successful on-time delivery of the offshore Production Deck Modules (PDMs) Project for Saudi Aramco. These PDMs will be installed at Safaniya oil field – which is the world's largest offshore oil field.

During the year, Company strategically entered into a new product line – and won its first Electrical House (E-House/ Power house) project. The business has also received several orders for the supply of static equipment for ongoing refinery projects in the Middle East and India.

HMEL Bhatinda Refinery, India. Scope included EPC of 2 x 44,000 MTPA Hydrogen Generation Units and mechanical construction of 7 processing units



Engineering Services:

The vertical offers end-to-end engineering solutions covering the entire spectrum of engineering across the oil & gas value chain, covering services from concept to commissioning, troubleshooting, EPCM, PMC, Field Engineering, Asset Integrity Management and Operations & Maintenance.

The business has a large resource pool of over 4 million engineering hours. A large portfolio of industry-standard software tools, robust IT infrastructure and in-house R&D facility augment its capabilities. Benchmarked through leading certification and accreditation systems, the engineering work processes ensure consistent product quality and on-time delivery.

During the year, the business has signed a Memorandum of Agreement with Institute of Chemical Technology (ICT), to build ethanol plants based on fully indigenous technology developed by ICT for producing 2G ethanol.

The business secured various engineering contracts from GCPT, KCCEC, HPCL, ISCO, Al Ghanim, IOCL, etc. and EPCM contracts from GACL.

Business Environment:

After a prolonged depressed market, signs of recovery are now visible, with upward movement in crude oil prices due to production cuts by OPEC countries and Russia. However, uncertainty with respect to crude oil prices still exists over the medium to long-term, leading to continued diligence by the oil & gas industry in making strategic investment decisions.

This year has also witnessed several consolidations, partnerships and co-investments among EPCI players. Companies are adjusting their business models to a period of recovery. Oil majors are adjusting their portfolios by adding renewables to their energy slate. IOCs and NOCs are looking to diversify risk through co-investment outside their home countries such as Kuwait in Oman, Saudi Arabia in India and China in UAE. Service providers are hedging risks through consolidation.

Localization is increasingly becoming a key differentiator. ADNOC has started implementation of the In-Country Value (ICV) program while Saudi Aramco is implementing its In-Kingdom Total Value Add (IKTVA) program with the objective of growing and diversifying the economy and creating opportunities for their nationals in the private sector. The South East Asian region continues to protect local players under the 'Bumiputra' concept.

Competition remained stiff, with some of the competitors exercising subsidized prices for limited market potential and with new entrants achieving pre-qualifications. Regional players are bidding for Indian projects with an intent to load their assets and new competitors have also started bidding for domestic prospects. Commodity prices are firming up and forex rates continue to be volatile.

Significant Initiatives:

The business has set a vision to 'Revolutionize the Hydrocarbon Industry' and mission of 'Execution Par Excellence'.

During the year, the business announced the relaunch of LAKSHYA 2021, in which strategic imperatives have

Major role in construction of world's largest Pet Coke Gasification Complex and Ethylene cracker for Reliance Industries at Jamnagar, India



been identified for each of its verticals. The Company lays continued emphasis on sharper bidding to enhance its market share and execute its projects well to protect bid margins. The business embarked upon an Operation Excellence initiative, which is aimed at achieving refined cost structures, alignment for timely project deliveries, and optimizing fund deployment. This initiative has started yielding results for the Company, as reflected in enhanced cost-competitiveness in its bids and further improvement in its bottom-line for projects under execution.

The Company's capability-building initiative has made significant progress in terms of building its portfolio and project leadership as well as functional group development. This initiative is aimed at building globally-benchmarked project leadership teams for executing large international projects, and developing and institutionalizing an international project capability development engine.

Innovation will be a key differentiator for disrupting set norms and the way business is conducted in the hydrocarbon sector. An Innovation Think Tank has been formed to channelize the efforts of the organization towards enhancing its capability and capacity to enable sustainable growth and achieve execution par excellence in every sphere of the enterprise.

The business has continued creating strong central functions to maximize synergy and to build a platform for easy transition from vertical to project-centric regional structure. The Centralized Supply Chain concept was rolled out and operational improvements institutionalized.

The Company is enhancing its current practices through digital / new-age technological advances. The business has

also launched a digital transformation initiative towards further improving productivity across its functions.

Risk Management: Pro-active Risk Management has been identified as a key strategic initiative to ensure sustainable growth. Risk Management is an integral part of the overall governance process to identify, segregate, mitigate, control and monitor various risks at business, prospect and operational levels.

The Company's risk management policy and guidelines have helped it to create a consistent set of standard risk tracking templates and measure the risk levels. This enables it to develop the ability to anticipate and respond to emerging challenges in a timely manner. Each project goes through a structured pre-bid risk review and periodic execution risk reviews, enabling effective monitoring and raising timely alerts. The Company promotes a culture of transparency in flagging emerging issues as early warning signals to management for timely attention.

Internal Controls: The management has established internal control systems commensurate with the size and complexity of the business. The internal control manual provides a structured approach to identify, rectify, monitor and report gaps in the internal control systems and processes. The Group follows well-documented Standard Operating Procedures (SOPs). The operating effectiveness of various controls is periodically tested, and deficiencies (if any) are promptly rectified.

Human Resource Development: The business has implemented several initiatives focused on acquiring and nurturing talent. It firmly believes that people are its greatest asset, and has adopted various policies and

Group Gathering Station-11 for RIL's Coal Bed Methane Field Development Project at Shahdol, Madhya Pradesh, India



initiatives in order to sustain healthy employee relations, growth and development as well as work satisfaction. The Company's commitment to creating a highly engaged work force is demonstrated through deployment of the GENIE: Engagement survey, business specific and managerial level interventions, communication with Senior Management through forums like 'Town Hall', webcast and video conferencing. The 'I-Too' recognition framework, initiatives like ICONS, long-service awards, team building workshops, non-monetary recognition events, etc. are periodically undertaken to enhance employee motivation.

Health, Safety, Environment (HSE) & Sustainability:

The business considers safety a core value, and is committed to achieving HSE excellence at the workplace by ensuring the health and safety of people and the protection of the environment. Through its 'Zero Incident Credo', the Company strives for continuous improvement in the protection and development of the health, safety, and environmental assets of its employees and stakeholders. HSE Assurance Audits were conducted to ensure the effective implementation of the HSE management system across the Company.

The Company released its Sustainability Report – 'Sustainability Par Excellence' – in January 2018, in line with Company's Mission 'Execution Par Excellence'. It covers the sustainability-focused initiatives taken across the Company, and highlights the need to enhance performance across all sustainability parameters – safety, energy, water conservation and productivity.

During the year, the Company achieved its best-ever safety performance through a 71% reduction in Total Recordable

Incident Rate (TRIR) and 50 % reduction in Lost Time Injury rate (LTIR), which are comparable to the best global industry standards.

The Company received many accolades in FY 2017-18. The KOC - GC30 project received the ASSE GCC HSE Excellence Gold Award 2017 from ASSE Kuwait Chapter. MFF Kattupalli received safety awards from the British Safety Council, RoSPA and the Golden Peacock award. The Offshore business vertical received an award from National Safety Council, Maharashtra Chapter, for achieving 'zero accident frequency rate' consecutively for 3 years.

As a responsible Corporate Citizen, the Company is committed to implementing projects that will contribute to the quality of life, including schools, hospitals, skill training institutes, water supply and distribution and sanitation facilities.

Outlook:

Gradual firming up of the crude oil price is expected to lead to increased project budgeting by IOCs and NOCs. A major section of this investment is expected to come from North America and the Middle East.

Despite lack of appetite by Korean competitors, competition intensity is expected to remain high until 2019 at least, due to the resurgence of European and the emergence of the Chinese competition. Clients are expecting EPC contractors to share the benefit of Value Addition over the tenure of the project. Project schedules are also becoming increasingly tighter.

In the domestic offshore sector, ONGC has reported significant oil & gas discovery in its Mumbai High fields,

Production Deck Modules (PDMs) for Saudi Aramco ready for despatch from Modular Fabrication Facility, Hazira



with potential reserves of 29.74 MTOE. Under the Open Acreage Licensing Policy (OALP), EOs have been received by the Government of India from private players for the shallow water basins. These developments will translate into EPC tendering by 2020-2022. ONGC is progressing on its investment for development of deepwater field KG/98-2 on the east coast of India. This will provide significant opportunities to the Company's offshore and fabrication verticals over the medium term, given its strategically located Kattupalli yard on the east coast and its tie-up with McDermott and GE to develop cost-effective subsea solutions. A number of brownfield and decommissioning projects are expected to come up in the near future. Saudi Aramco is expected to spend USD 3 billion each year on offshore capital projects to maintain production.

India has an ambitious plan to nearly double its refining capacity to about 438 MMTPA by 2030. The gas energy mix is also expected to shift from the current level of 6.5% to about 15% by 2022. The demand for petrochemicals is expected to go up by 10 MMTPA by 2020. Over 11,800 km of PNGRD-authorized pipeline projects are pending implementation.

The Indian Public Sector refineries have embarked on capacity expansion plans. Some of these refineries also have investment plans for integrating petrochemical projects along with refinery upgrade. This will offer opportunities to the Onshore and Construction Services verticals.

The roll-out of a comprehensive Urea Policy by the Government has led to the revival of public sector urea

plants at Gorakhpur, Sindri and Barauni. Energy-efficiency improvement projects are being actively pursued by fertilizer units.

The Government is focusing on setting up LNG infrastructure and investments in LNG receiving plants. Both land-based terminals as well as Floating Storage Regasification Units (FSRU) are on the anvil.

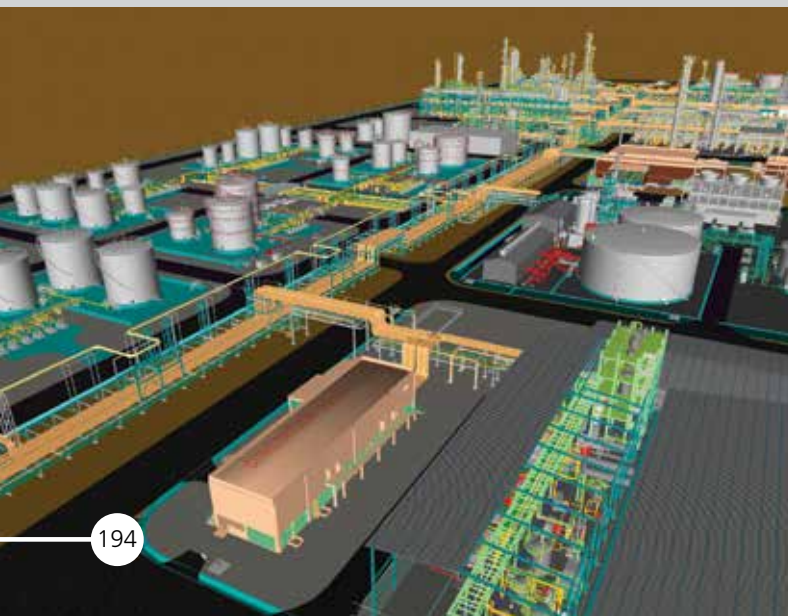
The GCC will see higher outlays for downstream and petrochemical projects, particularly in Saudi Arabia, the UAE and Kuwait. Saudi Aramco plans to spend over USD 300 billion over the next 10 years, while UAE and Kuwait are planning to spend USD 109 billion and USD 112 billion respectively over next 5 years. The integrated refinery and petrochemical complex model continues to gain momentum.

Towards providing geographical risk diversification, the Company is looking to explore newer markets which offer good long-term business potential, and has undertaken intense pre-qualification efforts. Algeria, Iraq and Indonesia will see increased levels of activity, and will potentially offer differentiated margins.

Shale gas / oil will drive petrochemical and fertilizer investment in the US, offering opportunities for high-value engineering and modular fabrication services.

With strong capabilities and capacities built over the years, the business is well-positioned to leverage these opportunities.

3-D model of Normal Paraffin & Derivative Complex under execution



One of our 'high-end' engineering design centres

