

# INTEGRATED SOLUTIONS

for the Hydrocarbon Industry



**L&T Hydrocarbon Engineering**

## About Us

L&T Hydrocarbon Engineering is an engineering, procurement, fabrication, construction and project management company providing integrated 'design to build' solutions to large and complex Offshore and Onshore hydrocarbon projects worldwide.

The Company is a wholly-owned subsidiary of Larsen & Toubro Limited (L&T), a USD 20+ billion technology, engineering, construction, projects, manufacturing and financial services conglomerate catering to critical needs in key sectors including infrastructure, construction, hydrocarbon, defence and power.

L&T Hydrocarbon Engineering is positioned to sharpen its focus on service to its customer base and enhance responsiveness in all its engagements.

More than three decades of proven experience and extensive capabilities are backed by digitalization. The Company adheres to global quality norms and HSE standards, ensuring reliability and on-time delivery. Its comprehensive range of offerings ensures demonstrable innovation and technologically superior solutions at every phase of project execution.

Conscious of its larger responsibilities as a corporate citizen, L&T Hydrocarbon Engineering is committed to the development of the communities around its facilities and project sites.

### MISSION

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#### Execution Par Excellence

We are committed to evolving into a major Indian multinational, occupying leadership position in the hydrocarbon industry.

Our people are our prime movers. We practise collaborative team-working with zeal, responsiveness and a sense of urgency. We encourage our personnel to demonstrate an entrepreneurial spirit and assume ownership for their actions.

We believe in an ethical work culture, with emphasis on governance in all business dealings. Our endeavour is to practise the highest levels of Quality, Health, Safety, Environmental and Information Security in all our operations.

Our focus is on sustainable value creation for all our stakeholders. We are passionate about our performance culture and committed to delivering excellence at every phase of our operations.

*Subramanian Sarma*  
Subramanian Sarma  
CEO & Managing Director

Date: 1<sup>st</sup> February, 2019



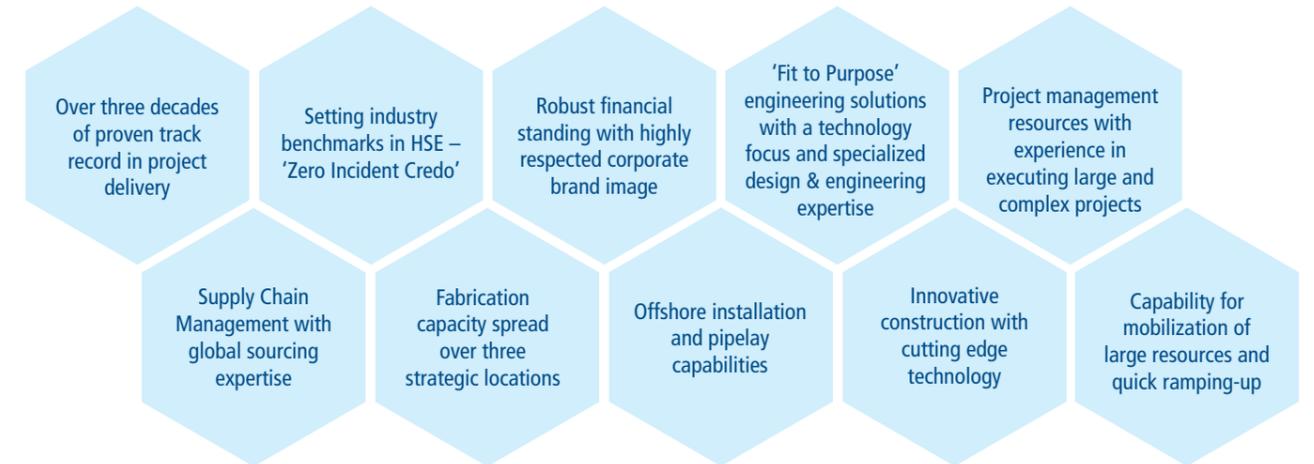
**L&T Hydrocarbon Engineering**

## L&T Hydrocarbon Engineering – Business Verticals

Offshore	Onshore	Construction Services	Modular Fabrication	AdVENT
<ul style="list-style-type: none"> <li>Integrated Process Complex and Wellhead Platforms</li> <li>Subsea Pipelines &amp; Systems</li> <li>Brownfield Projects</li> <li>Living Quarters</li> <li>FPSO Modules &amp; Jack-up Rigs</li> <li>Wind Farms</li> <li>Decommissioning</li> <li>Transportation &amp; Installation Services</li> </ul>	<ul style="list-style-type: none"> <li>Upstream Oil &amp; Gas Processing &amp; Treatment Facilities</li> <li>Petroleum Refining</li> <li>Fertiliser</li> <li>Petrochemicals</li> <li>Cross-country Pipelines &amp; Terminals</li> <li>Cryogenic Storage Tanks &amp; Terminals</li> </ul>	<ul style="list-style-type: none"> <li>Site Development &amp; Pile Foundation</li> <li>Complete Civil &amp; Structural Work</li> <li>Plant &amp; Non-plant Buildings</li> <li>Piping &amp; Mechanical Erection</li> <li>Electrical &amp; Instrumentation</li> <li>Tankages including Firefighting System</li> <li>Laying of Cross-country &amp; In-field Pipelines</li> </ul>	<ul style="list-style-type: none"> <li>Offshore Structures and Modules for Oil &amp; Gas and Offshore Wind Farm Projects</li> <li>Onshore Structures &amp; Modules</li> <li>Deepwater Subsea Structures</li> <li>LNG modules</li> <li>Modular Speciality Furnaces</li> <li>Refinery &amp; Petrochemical Plant Equipment</li> <li>Jack-up rigs</li> <li>E-Houses</li> </ul>	<ul style="list-style-type: none"> <li>Design &amp; Engineering Services - Basic, FEED &amp; Detailed Engg</li> <li>Project Management Services - EPCM / E&amp;P / PMC</li> <li>Modular Engineering &amp; Technology Solutions</li> <li>Strategic EPC Projects</li> <li>Asset Integrity Solutions</li> <li>Smart Solutions for Asset Management</li> <li>Shutdown &amp; Turnaround</li> <li>Emerging Technology Driven Solutions &amp; Innovative Business Models</li> </ul>
				

## Integrated Capabilities

As an Integrated solutions provider, the Company offers concept-to-commissioning solutions across the hydrocarbon value chain



**In-house Capabilities:** Engineering • Procurement • Fabrication • Construction • Installation • Commissioning • Start-Up

## Operating Centres





Fully integrated, heaviest gas platform in Saudi Aramco's history, installed by float-over method at Hasbah Field in Saudi Arabia



Bassein Development Project for ONGC. The scope included BCPA3 process platform, BLQ3 Living Quarters platform, BH wellhead platform, 12 km pipelines, bridges and modifications at BPA complex



Mumbai High North Complex of ONGC, executed by L&T on an EPCIC basis. The massive complex comprises a 26,500 MT process platform, a living quarters platform and control room, three process gas compression platforms, two flare platforms and two jackets – including one weighing 13,500 tonnes



Umm Lulu & Nasr Field Development Phase 1 Project for ADMA-OPCO, UAE



DDW1 Wellhead Platform & Process-cum-living Quarters Platform for GSPC, installed off India's east coast

## Offshore

The Company offers lump-sum turnkey EPCIC services encompassing the entire value chain – from oil and gas production to processing.

The range includes well-head platforms, process platforms and modules, subsea pipelines, brownfield developments, FPSO modules, decommissioning projects, offshore drilling rigs (upgrade and new build of jack-up rigs and conversion to EPS and MOPU), deepwater subsea systems and wind farm projects.

### Engineering

The Offshore Engineering Centre offers engineering solutions for wellhead platforms, process facilities, platforms, complexes, independent process and utility modules, FPSO topsides, riser and pipeline systems, jack-up rigs and MODU to MOPU conversions.

Engineering capabilities cover the project life cycle from Feasibility Studies, Concept, FEED, Detailed Engineering, 3D Modeling,

Special Studies including safety, risk assessment, pre-service engineering and commissioning assistance. Special analysis include Transient Flow Analysis, Dynamic Simulation, Non-linear Analysis (Wave Pushover Analysis, Time Domain Analysis for Rare Intensity Earthquakes, Boat Impact Analysis) using USFOS and On-bottom Roughness Analysis using SAGE.

### Project Management

Project Management teams deliver large and complex offshore EPCIC projects of over USD 1 billion, meeting world-class HSE, quality and schedule requirements. Procurement teams ensure certainty and cost competitiveness of supplies through world-wide network of suppliers, efficient expediting and detailed planning.

### Fabrication Facilities

The Company has three state-of-the-art fabrication facilities – with a total annual capacity in excess of 200,000 MT. Two fabrication facilities in India (one on India's west coast at Hazira

near Surat in Gujarat, and the other on east coast at Kattupalli near Chennai in Tamil Nadu) and a yard at Sohar in Oman offer round-the-year delivery of process platforms, wellhead platforms, modular structures, heavy jackets and oil rigs.

### Transportation & Installation Services

Our heavy-lift-cum-pipelay vessel - LTS 3000 - undertakes in-house installation of offshore platforms and pipelines. LTS 3000 has successfully installed over 120 offshore structures (jackets, topsides, etc.) and has laid more than 320 km of sub-sea pipelines (including piggyback pipelines) at various oil fields in India, Malaysia, Indonesia, Myanmar, Vietnam and the Middle East.

The Company also owns and operates LTB 300, a state-of-the-art pipelay-cum-work barge built to suit Middle East, Indian and South East Asian conditions. The vessel has extensive experience of laying subsea pipelines in water depths ranging from 60 m to 90 m.

### Clients

The Company is pre-qualified with and has executed projects for oil & gas majors including ONGC, Saudi Aramco, ADNOC Offshore, British Gas, Bunduq, Dragon Oil, GSPC, KJO, Maersk Oil Qatar, PETRONAS Carigali, PTTEP, QP, Songas, BHGE, Shell, Chevron, ExxonMobil, Total and Eni.

It is also included under Achilles JQS and FPAL as an EPC contractor in the North Sea.

The Company is in the final stages of completion and hand-over of the USD 1.7 Billion Hasbah II Gas Increment project for Saudi Aramco. The scope involved six gas production deck modules, pipelines, composite cables and 2 tie-in platforms (~7000 MT each) installed using the float-over method. Orders for four additional projects were secured from Saudi Aramco, affirming continuing customer confidence.



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



One of the 3 wellhead platforms of Bassein Development 3 Project for ONGC



Booster compressor platform with an interconnecting bridge executed for ONGC



One of the 4 Decks of SFNY-4D project installed in Safania Field for Saudi Aramco



Yetagun 'D' Platform installed offshore for PETRONAS Carigali



One of the 3 wellhead platforms of Zawtika Phase-1A Project, installed in Gulf of Mottama in Myanmar for PTTEPI



Marine services cover the entire spectrum of offshore installations - LTS 3000 (left), a heavy-lift-cum-pipelay vessel and LTB 300 (right), a pipelay-cum-work barge



ONGC's jack-up rig 'Sagar Uday' (BMC Class 300) involving major lay-up and repair

## Track Record – Offshore



**10** New Process Platforms



**80** Wellhead Platforms



**1210+** km Subsea Pipelines



**2** Deepwater Projects



**8** FPSO Topsides (Engineering)



**4** Jack-up Rigs Refurbished



**15** Gas Compression Modules



**27** Turbine Generator Modules



**9** Living Quarters Modules



**214** Platform Modifications



40,000 MTPA Melamine Plant for Gujarat State Fertilizers & Chemicals, Vadodara



900 TPD Ammonia plant for National Fertilizers Limited, Panipat – executed on a licence-plus-EPC basis



48" x 118 km-long Crude Transit Line from North Kuwait to Central Mixing Manifold for KOC, on EPC basis



Mangalore Aromatic Complex for ONGC-Mangalore Petrochemicals Limited, India



Gathering Centre (GC 30) for Kuwait Oil Company (KOC)



Normal Paraffin & Derivative Complex under execution for Farabi Petrochemicals at Yanbu, Saudi Arabia

## Onshore

The Company has end-to-end capabilities in EPC solutions for oil & gas and offers turnkey solutions across the hydrocarbon value chain covering refining, petrochemicals, fertiliser, oil & gas processing, cryogenic storage including LNG, and pipeline sectors.

The track record includes plants for upstream oil & gas processing, diesel hydrotreating, motor spirit quality upgradation, sulphur recovery, hydrogen generation, lube base oil, fluidised catalytic cracking, delayed coking, naphtha cracking and associated units, purified terephthalic acid, paraxylene, methanol, melamine, paraffin and linear alkyl benzene, synthesis gas generation, cryogenic storage terminals and cross-country pipelines.

The projects executed cover technologies from multiple process licensors, including UOP, Axens, Haldor Topsøe, CB&I Lummus, Black & Veatch, Ortloff, ExxonMobil, Merichem, Foster Wheeler, Casale, BOC Parsons, Invista and Davy Process Technologies.

Strategic alliances with internationally renowned companies complement capabilities in the fertiliser and cryogenic sector.

### Engineering

Detailed engineering centres integrate in-house strengths in engineering, fabrication, modularisation and construction to provide efficient designs and engineered solutions for hydrocarbon process plants meeting the highest safety and quality requirements.

L&T Chiyoda – a joint venture with Chiyoda Corporation of Japan – offers design and engineering services for onshore hydrocarbon plants. L&T-GULF – a joint venture with GULF Interstate Engineering, Houston – offers engineering and consultancy services for onshore hydrocarbon pipeline projects and onshore oil & gas field development projects covering design and engineering services. Capabilities include feasibility studies, basic engineering, FEED, detailed engineering, project management

services, procurement assistance and related services. Our experienced professional engineers work on state-of-the-art tools and software like HYSIS, PDS, PDMS, SPPID, STAADPRO and TEKLA structures to address the complete spectrum of process and detailed engineering.

### Project Management

From initial design, procurement, construction to final commissioning, our highly experienced and responsive teams are geared to respond to the requirements of customers in focused geographies.

### Clients

The Company is pre-qualified with and has executed projects for major oil & gas companies including Petroleum Development Oman (PDO), Saudi Aramco, Kuwait Oil Company (KOC), ADNOC, SABIC, BAPCO, Banagas, CHEMANOL, KNPC, PETRONAS, Pertamina, Sonatrach, SOCAR, etc.

Within India, the Company's client base includes major national as well as private oil & gas, fertilizer and petrochemical producers, including IOCL, MRPL, OMPL, HPCL, BPCL, RIL, HMEL, CPCL, NFL, GSFC, GNFC, HURL and RCF.

The Company consolidated its international presence with a major order in Algeria from Sonatrach. The project involves setting up three Central Processing Facilities of a total capacity of 14 MMSCMD, on EPC basis. The project focuses on maximizing modularization through our in-house modular fabrication facilities.



4.17 MMTPA FCC Reactor Regenerator for Indian Oil Corporation Limited at Paradip Refinery, India



700 TPD Methanol & 100 TPD Carbon Monoxide Plant for Methanol Chemicals Company (Chemanol) at Al Jubail in Saudi Arabia.

## Track Record – Onshore

### Petroleum Refining



**50+ Refining Units**  
 CDU/VDU, Hydrocracker, Diesel HDT, Hydrogen, Sulphur Recovery, MSQ Upgradation, Catalytic Reforming, Lube Base Oil, Coke Drum System, FCC, Vacuum Distillation, Solvent Dewaxing, etc.

### Oil & Gas Processing



**21 Oil & Gas Processing Facilities**  
 Gas Field Development / Processing / Compression, Condensate Fractionation & Cryogenic Air Separation



Laying of 125 km onshore pipeline from Land Fall Point to Fadhilli Gas Plant through Sabkha (Salt Pan) as part of onshore-offshore integrated Hasbah II Project, Saudi Aramco



Cryogenic Ethane / LNG Dual Service Storage Tank (165,000 m<sup>3</sup>) for Reliance Industries Limited, Dahej, India



Export Gas Compression Facilities Upgrade Project for Dolphin Energy Limited, Qatar

### Petrochemicals



**2 Petrochemical Complexes**  
**11 Petrochemical Units**

### Fertiliser



**9 Ammonia and Syngas Projects**

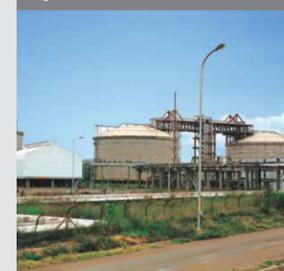


Panoramic view of Saih Nihaydah Gas Compression Project (SNDC2) for Petroleum Development Oman (PDO). The Company has also built PDO's gas processing facilities at Lekhwair, Saih Rawal, Yibal and Kauther in Oman



Naphtha Cracker & Associated Units for IOCL's Panipat Refinery, India

### Cryogenic Storage Systems & Thermal Systems



**9 Cryogenic Storage Systems**  
**83 Cracking Furnaces & Reformers**

### Cross-country Pipelines & Terminals



**6,500+ km Cross-country Pipelines**  
**10 Oil & Gas Terminals**



The world's largest ethylene cracker (1.4 MMTPA) – one of multiple systems supplied, installed and pre-commissioned for Reliance's J3 Program, Jamnagar, India. This ethylene cracker is part of the ROGC (Refinery Off Gas Cracker), the heart of C2 Complex



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

Laying of the world's longest heated and insulated waxy crude oil pipeline in India from Barmer to Bhogat 24" x 619 km crude oil pipeline and 8" x 527 km natural gas pipeline

## Construction Services

The Company undertakes turnkey construction of refinery, petrochemical, chemical and fertiliser projects, gas-gathering stations, oil & gas terminals, including storage tanks and underground cavern storage systems for LPG. It also undertakes construction of cross-country pipelines. Capabilities cover design, engineering, procurement and construction of civil, mechanical, electrical and instrumentation for composite station works and cathodic protection systems for pipelines and stations.

### Technology & Capacity Building

The Company offers innovative construction solutions with cutting-edge technology. Piping automation shops are equipped with pipe fit-up, CNC and orbital welding machines. Auto re-bar shops enhance efficiencies at project sites. Automatic welding and FCAW semi-automatic welding enhance efficiency, CPD facilitates 24x7 radiography and PAUT speed up delivery. It carries out GPS-aided surveys for pipeline projects with fully automated welding.

### Expertise in Heavy Lifts

The Company has an impressive track record in providing customized solutions in heavy lifting. Engineers, rigging foremen and skilled riggers, with experience in heavy lifting, at various project sites are supported by a centralised Construction Methods Cell.

### Equipment Fleet

A large asset-base of construction equipment includes heavy cranes up to 750 T capacity, skidding systems and strand jack systems, pipe layers up to 100 T capacity, pipe-bending machines, major concreting equipment and related machinery.

### Track Record and Client Base

In addition to providing construction for our EPC projects, we have also provided stand-alone construction services to external clients.

Most projects executed by us are in excess of 10 million construction man-hours, with two projects in excess of 100 million construction man-hours.

A landmark project includes construction of the world's largest refinery for RIL at Jamnagar, India, including its Phase-III petrochemical complex expansion. The Company is the single largest contributor in building the world's largest ethylene cracker (ROGC- Refinery Off Gas Cracker) and other units such as pX-4 (para-Xylene), MEG (Mono Ethylene Glycol), LDPE (Low Density Polyethylene), ECS (Ethylene Cryogenic Storage) and PCG (Pet Coke Gasification) units. The ECS Project set a world record for the fastest completion (29 months). The track record includes a mega onshore gas terminal at Kakinada for RIL and all major processing units of the Bathinda refinery for HEMEL. For Cairn India, L&T Hydrocarbon built the world's longest heated and insulated waxy crude oil pipeline and India's largest onshore oil processing terminal at Barmer, Rajasthan.

Our international track record includes an HRS gas pipeline project for ADNOC Gas Processing, Gas compression projects at different locations for PDO (viz. Lekhwair, Saih Rawl, Yibal, Saih Nihaydah and Kauther); Dolphin Energy-Qatar; Gas Processing Facility for Saudi ARAMCO and polyethylene trains for SADARA Chemical Company. Major projects under execution include a Gathering Centre for KOC and Haliba Onshore Field Development project for Al Dhafra Petroleum (an ADNOC Subsidiary).

Our client base comprises several industry majors:

**India:** RIL, HEMEL, IOCL, BPCL, HPCL, ONGC, Cairn Energy, MRPL, NFL, RCF, GNFC, GSFC, GAIL, GSPL, GIGL, HURL, etc.

**International:** Saudi Aramco, Sadara, SATORP, Farabi Petrochemicals, ADNOC Gas Processing, ADNOC Onshore, ADNOC Refining, ADNOC LNG, ADNOC Sour Gas, BOROUGE, ENOC, KNPC, KOC, KAFCO, QP, Dolphin Energy, PDO, OGC, Oiltanking Odfjell Terminals & Co. LLC, etc.



Mangala Process Terminal for Cairn Energy India Limited at Barmer in Rajasthan, India



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



L&T has constructed most of India's major fertilizer plants. Seen in picture is an Ammonia Syn Gas Generation Plant built on an EPC basis for Gujarat Narmada Valley Fertilizer Company, Vadodara, India



Onshore Gas Terminal for Reliance Industries Limited at Kakinada, Andhra Pradesh, India



Aerial view of PTA Plant for JBF Industries, Mangalore, India



Laying of 36" x 67 km-long natural gas pipeline from Anjar to Mundra in Gujarat for Gujarat State Petronet Limited on EPC basis



Solution Polyethylene and Specialty Elastomers package for Sadara Chemical Company (JV of Saudi Aramco and Dow Chemicals) at Al Jubail, Saudi Arabia



Trestle piping at LNG Terminal for Petronet LNG at Dahej, India



Mechanical construction works for the world's largest integrated polyolefins plant for Tecnimont-Samsung JV (TSJ) at Borouge-3, Ruwais, Abu Dhabi



Modular Fabrication Facility at Hazira, India



Modular Fabrication Yard at Sohar, Oman



Two mega tie-in platforms (7000 MT each) for Saudi Aramco under fabrication at Oman Facility



Modular Fabrication Facility at Kattupalli, India



Equipment Fabrication Shop at Sohar, Oman

## Modular Fabrication

The Company offers comprehensive Modular Engineering, Procurement & Fabrication solutions for offshore and onshore projects, primarily in the oil & gas sector, including fabrication and supply of modules and static equipment for the offshore oil & gas fields, refineries, petrochemical plants and fertilizer complexes. We are equipped to supply foundations and substation modules for Offshore Wind Farm projects.

The Company's world-class Modular Fabrication Facilities, with an annual fabrication capacity exceeding 200,000 MT, are strategically located at Hazira (Surat) on India's west coast, Kattupalli (Chennai) on India's east coast, and Sohar in Oman. Additionally, an Integrated Manufacturing Facility is being setup in Saudi Arabia.

Each of these locations was selected for its proximity to major oil and gas fields and allied maritime infrastructure. These Modular Fabrication Facilities offer year-round and on-time delivery with robust QHSE performance and zero punch list. They are

equipped with state-of-the-art infrastructure and machinery for operational and logistical flexibility, project management and cost competitiveness, and are backed by automation & digitalisation in the manufacturing process.

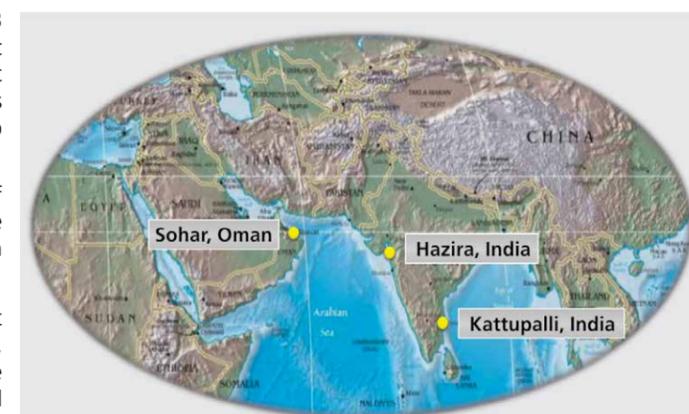
All the three Modular Fabrication Facilities are situated on the waterfront with easy access to clients across the globe and have load-out jetties suitable for dispatch of large and heavy modules via ocean-going vessels and barges. The Company's modular solutions are a unique combination of Modular Fabrication Facilities backed by rich and extensive experience of project Engineering, Procurement and Installation / Construction, Testing and Commissioning (EPIC/EPCC) in both Offshore and Onshore domains.

These Modular Fabrication Facilities are accredited with global certifications and pre-qualifications from all major oil & gas customers. They are equipped to deliver complex modules, duly tested / pre-commissioned prior to delivery.

With ASME S, U, U2, R and NB Stamps as well as API 2B approvals under their belt, these facilities also deliver static equipment like reactors, pressure vessels, columns and heat exchangers for refineries, petrochemicals, fertilizer projects and other process industries. They function as a one-stop solution for module fabrication requirements.

The modular solutions harness the extensive experience of the Company's Engineering Services, covering the entire spectrum engineering from concept to commissioning in oil & gas as well as load-out and transportation analysis.

In addition to clients from Offshore and Onshore EPC, direct clients and end-users include Petrofac, ADNOC Offshore, PDO, KOC, RIL, Fluor, KNPC, SASOL, Hyundai Saipem JV, Linde Engineering, JNK Heaters, B&V, TechnipFMC, Air Products and UOP, etc. The Company was awarded a breakthrough contract for Process Modules (PAU) and Piperack Modules (PAR) for a process plant for an international project and is set to be executed at the Modular Fabrication Facility at Kattupalli.



Total Annual Fabrication Capacity: 200,000+ MT



PAR modules for Al-Zour New Refinery Project of Kuwait Integrated Petroleum Industries Company (KIPIC). The scope includes 60 modules with a total weight of 7,500 MT



Loadout of subsea structure for ONGC's S1 Vashishta Deepwater Project from Kattupalli Facility



Modular Penex Unit and associated Off-Modules under fabrication for UOP / Bharat Oman Refineries Limited for Penex Revamp Project at Bina, India



Loadout of Topside (7,000 MT) from Modular Fabrication Yard, Oman, for Saudi Aramco's Hasbah II Gas Increment Project

## Capability Spectrum – Modular Fabrication Solutions

### Onshore



Piperack Modules (PAR)



Manifold Modules (PAM)



Process Modules (PAU)



Modular Reformers, Cracking Furnaces & Heaters



Modular CCR Projects



Equipment and Skids

### Offshore



Platforms



Living Quarter Modules & E-Houses



Compressor Modules



Jack-up Rigs



Jackets



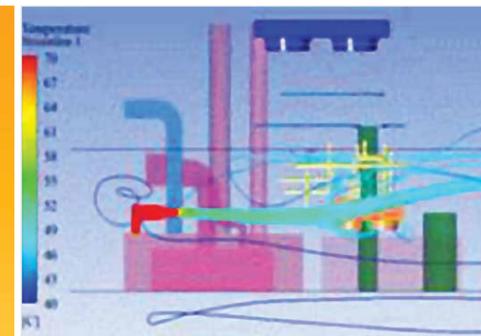
Bridges



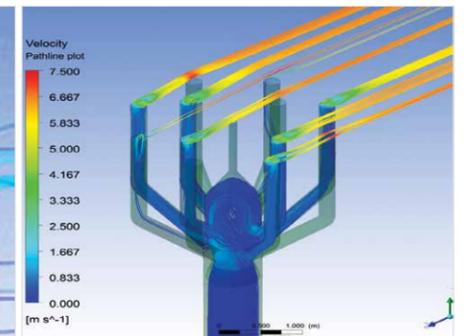
Comprehensive detailed engineering solutions for process plants



3D model of CCR for OMPL, Mangalore



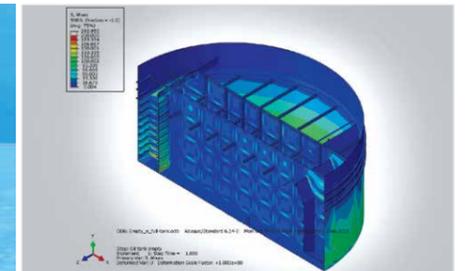
Flare radiation and dispersion analysis



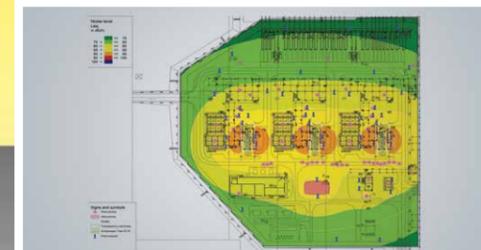
Advanced CFD analysis



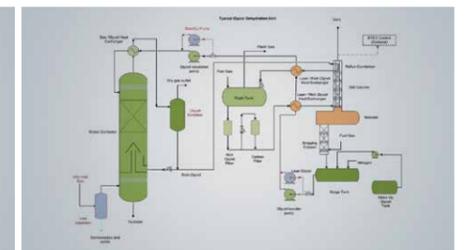
Hydrodynamic analysis during offshore transportation



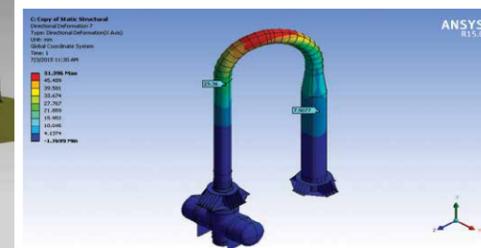
Advanced stress analysis for tank structure



Plant noise mapping study



Advanced Gas Processing Simulation



Stress Analysis of Critical Process Equipment



Engineering for complex process plants

## AdVENT (Advanced Value Engineering & Technology)

L&T Hydrocarbon Engineering's erstwhile Engineering Services vertical has been restructured into a specialized Business Vertical, 'AdVENT', to offer customer-centric solutions for the entire value chain of Hydrocarbon industry and for emerging industries in energy sector.

Leveraging the expertise in high-end engineering and execution of large-scale technologically complex EPC projects over several decades, AdVENT delivers comprehensive solutions encompassing Design & Engineering, end-to-end Project Management, Strategic Project Delivery, Modularization, Asset Management and Turnaround Services to its clients in the Hydrocarbon industry worldwide.

AdVENT's technical capabilities and agility enable it to offer tailored solutions through appropriate business models, meeting specific needs in the changing energy sector.

### Engineering Solutions

The Company addresses end-to-end, multi-disciplinary engineering requirements of projects, from Concept, Basic and FEED to Detailed Engineering. LTHE's experience in various hydrocarbon process technologies makes it a preferred partner for leading process licensors. Benchmarked through leading certification and accreditation systems, the engineering work processes offer consistent quality with on-time delivery. The vertical also offers state-of-the-art multi-D modelling solutions.

### Modular Solutions

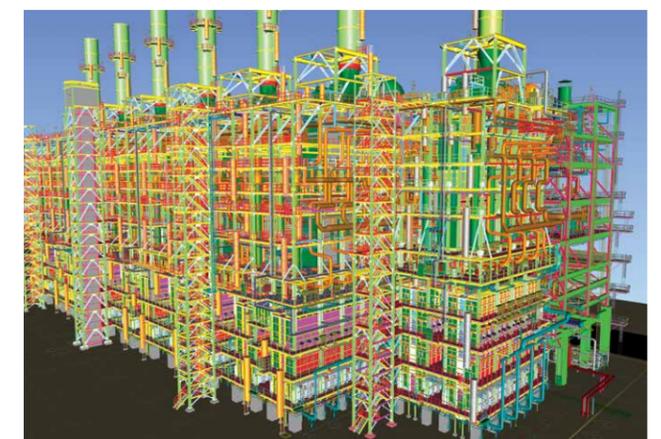
To deliver cost and time-efficient projects to its clients, the Company has developed expertise in modular engineering of process units for Hydrocarbon applications. The Company offers solutions with flexibility in schedule to align with construction and concurrent fabrication and provides customized solutions especially for revamp projects.

By pooling in the strengths and facilities of other business verticals within LTHE, including three world-class strategically located modular fabrication yards, the Company offers integrated solutions covering plant modularization, engineering / fabrication of process skids, and design, engineering and fabrication of niche products such as reformers, heaters and cracking furnaces.

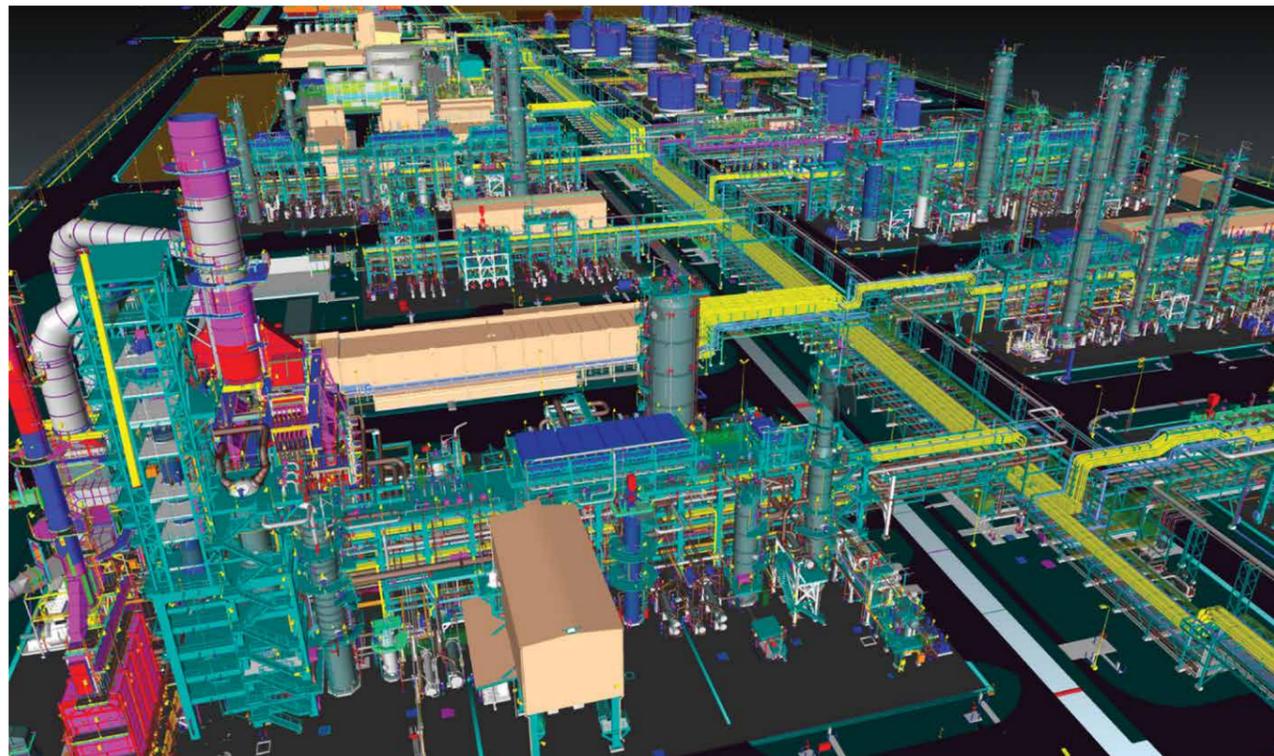
### Asset Management Solutions

The Company focuses on holistic solutions to maximize Operational efficiency, reliability and availability of critical assets through end-to-end Asset Management Services including Asset Integrity Studies (RAM, RBI, RLA, FFS, etc.), Asset Performance, Reliability and Availability enhancement solutions and cost/benefit analysis using appropriate digital platforms.

The Company also offers pipeline health assessment services (CP system, ECDA/ICDA studies, condition assessment, etc.),



3-D model for Cracking Furnace Project of Guru Gobind Singh Polymer (HPCL-Mittal Energy Limited), Bhatinda, India



3-D model of Normal Paraffin & Derivative Complex under execution for Farabi Petrochemicals at Yanbu, Saudi Arabia



One of our 'high-end' engineering design centres



Clients review design at our engineering centres

plant debottlenecking and troubleshooting services, energy optimization studies and root-cause analysis of failures based on specialized studies.

Efficient management of Revamp, Upgradation and Plant Turnaround programs is crucial for any Hydrocarbon facility. Through a dedicated and experienced team, the Company offers plant turnaround services to enable clients to effectively implement shutdown / turnaround programs for complex process plants within the targeted cost, schedule and safety performance.

#### Emerging Industries

The Company plays a pivotal role in realizing India's aspirations under the National Biofuel Policy. Partnering with a premier institute, the Company is engaged in commercialization of indigenous 2G Ethanol technology.

In response to the growing demand for deriving value from waste, the Company positions itself as a key player in the entire Waste-to-Value sector, offering solutions based on multiple technology pathways in collaboration with technology partners.

As an early mover, the Company intends to be a significant player in emerging industries such as Biofuels, Biochemicals, Waste-to-Energy and CO<sub>2</sub> Capture and Utilization.

Team AdVENT comprises a large resource pool of multi-faceted expertise, augmented by a rich portfolio of industry-standard software, robust IT infrastructure and in-house R&D facility. With its depth of expertise, rich experience in EPC Projects and network of collaborations, AdVENT is uniquely positioned to serve as a value-added solution provider to the Hydrocarbon industry.

## Management Systems

L&T Hydrocarbon Engineering is committed to continual improvement of its business processes by using internationally accepted standards. Its Corporate Policy is a reflection of an Integrated Management System for Quality, IT Security, Environment, Energy, Occupational Health & Safety, Social Accountability and Human Rights whilst implementing globally recognised standards such as ISO 9001 / ISO TS 29001, ISO / IEC 27001, ISO 14001, ISO 50001, OHSAS 18001 and SA 8000.

A centralised Management Systems Cell, with qualified personnel, administers these functions. Periodic internal audits and corrective actions with management reviews at various levels ensure compliance throughout the business processes and lead to continual improvements.

**Occupational Health & Safety – OHSAS 18001**  
Modular Fabrication Facilities / Yards and all project construction and commissioning of Onshore & Offshore activities are certified to OHSAS 18001.

**Energy – ISO 50001**  
Modular Fabrication Facilities / Yards are in compliance with Energy Management System and are certified to ISO 50001.

**IT Security – ISO / IEC 27001**  
Along with the Ministry of Communications and Information Technology, Government of India, L&T pioneered the IT Security Management System movement in India.



#### Quality – ISO 9001, ISO TS 29001, NBBI, ASME and API Accreditations

The Company's Quality Management System is certified to ISO 9001 and ISO TS 29001. This certification affirms its capabilities in the execution of turnkey projects covering marketing, design, engineering, project management, procurement, manufacturing, erection, construction and commissioning of various plants and systems.

Modular Fabrication Facilities are accredited by NBBI, ASME and API. The authorisation to use their 'U', 'S', 'R', 'NB' & 'API' symbols and monograms reflect the capabilities of our facilities to manufacture, repair and assemble pressure vessels and boilers in accordance with ASME Boiler & Pressure Vessel Codes, and to manufacture pipes in accordance with API 2B and 5L specifications.

#### Environment – ISO 14001

Engineering Services are certified to ISO 14001 for their capability to design and engineer environmentally friendly plants. Modular Fabrication Facilities / Yards and all project construction and commissioning of Onshore & Offshore activities are in compliance with Environment Management System and are certified to ISO 14001.

L&T's R&D efforts in this field resulted in a National Standard for ISMS and this project of national significance created a new benchmark for Indian industries and strategic sectors. L&T is the world's first company to be certified to ISO/IEC 27001 on the very first day of its publication. The certification was granted by BVC.

**Human Rights / Social Accountability – SA 8000**  
Modular Fabrication Facilities / Yards are in compliance with SA 8000 and certified by DNV.

#### National / International Benchmarking

With active participation in the National Committee and in the International Organization for Standardisation ISO/TC 176 and ISO / IEC / JTC1 / SC 27 development activities, L&T also assists ISO in validating the revisions of ISO 9000 series as well as ISO / IEC 27001 series. To keep abreast of the latest developments in Management Systems, links are established with various international bodies such as the Institute of Quality Assurance (UK), American Society for Quality (USA), European Organisation for Quality (Switzerland), IT Security – International User Group (IUG, UK), Information Systems Security Engineering Association (ISSEA, USA) and United Nations Economic Commission.

## Health, Safety & Environment (HSE)

HSE has always been an area of focus at L&T Hydrocarbon Engineering. This is reflected in the consistent world-class HSE performance of the Company. We believe that accidents are preventable, and arduously aim to achieve a 'zero incident' workplace. By successfully implementing a robust HSE Management System, we ensure that our operations are undertaken by managing HSE risks diligently, with continual improvement and compliance with the legal and regulatory requirements. Our HSE Management system is certified to ISO 14001:2015 EMS and OHSAS 18001: 2007 standards.

Using high-risk activities as the yardstick, we have in place 15 Golden Safety Rules which are followed by all the employees and contractors. Numerous awards and accolades from national and international agencies affirm our excellence in HSE.

- RoSPA Gold Award-2018 for Modular Fabrication Facility, Kattupalli
- Certificate of Merit-2018 from Frost & Sullivan for Modular Fabrication Facility, Hazira, for the improvement in Contractor Safety Management under the Safety Leadership Category
- Golden Peacock Environment Management Award 2018 for Offshore Business
- 4-star rating in CII-SR EHS Excellence Awards-2018 for Modular Fabrication Facility, Kattupalli
- ASSE GCC HSE Excellence Platinum Award and Management of Driving Safety Gold Award-2018 for SNDC 2 and KDC 2 projects of PDO-Oman
- RoSPA Gold Award-2018 for SNDC 2 & KDC 2 projects of PDO-Oman
- BSC International Safety Award – 2017 for Modular Fabrication Facility at Kattupalli
- RoSPA Gold Award – 2017 for Gathering Center-30 project of Kuwait Oil Company, Kuwait
- Golden Peacock Occupational Health and Safety Award – 2017 for Modular Fabrication Facility at Kattupalli
- American Society of Safety Engineers (ASSE) – GCC HSE Excellence Gold Award – 2017



No Personal Injuries

No work related ill-health

**ZERO INCIDENT CREDO**

No occupational accidents & material damage

No harm to environment

**Safety as a Core value** We believe that every incident is preventable. Our "Zero Incident Credo" implies that we are committed to providing a safe and healthy workplace without adversely affecting the environment.

### Golden Safety Rules

- Work with a valid permit where required
- Conduct gas test when required
- Obtain authorization before entering a confined space
- Obtain authorization before overriding or disabling safety critical equipment. Do not override or interfere with any safety equipment, nor let anyone else override or interfere
- Protect yourself against a fall when working at height
- Use adequate PFD (Personal Flotation Devices- Life Jacket, Work Vest etc.) while working over water.
- Do not walk under a suspended load
- Do not smoke in prohibited areas
- Wear your seat belt while driving
- Adhere to applicable PPE rules
- Positive isolation and lockout must always be followed
- No alcohol or drugs while working or driving
- Do not exceed notified speed limit
- Do not operate without authority or interfere with equipment
- All injuries and incidents must be reported

### Corporate Health, Safety & Environment Policy

As an integral part of our business philosophy, we are committed to protecting the environment and providing a safe and healthy workplace for our employees and stakeholders. To achieve this, we shall:

- Incorporate HSE considerations into all business processes
- Ensure compliance with statutory and other applicable requirements
- Prevent adverse environmental impact and avoid occupational health and safety risks
- Conserve natural resources, minimise waste generation and environmental emissions
- Impart structured training and augment resources for HSE performance
- Encourage communication, consultation and collaboration with all stakeholders

Date: 1<sup>st</sup> February, 2019

Subramanian Sarma  
CEO & Managing Director

**L&T Hydrocarbon Engineering**

## Digitalisation Revolutionizes Project Performance and Delivery

L&T Hydrocarbon Engineering has implemented an Integrated, IT-enabled Project Management suite of applications in synch with several other digitalization initiatives. This enhances its ability to deliver projects on time and within budget, while conforming to international safety standards.

The Integrated Project Management System (IPMS) is a comprehensive data management system that compiles information from various databases and provides a visually rich planning and reporting environment to enable stakeholders to make informed, decisions, backed by data-analytics.

Built on a robust SAP backbone, IPMS is aligned with a Microsoft SharePoint-based Document Management and Progress Reporting systems and other suites of functional applications, developed in-house. An enterprise-wide knowledge management portal (KnowNet captures lessons learned and best practices across our projects and disseminates them to project teams.

Integrated EPCC / EPCIC planning is carried out on Primavera Enterprise / Microsoft Project software, which, integrated with engineering technical documents, registers and controls indices for procurement and construction. The client and PMC participate in the relevant workflows.

Engineering teams use the latest CAD / CAE software suites to generate an integrated plant model (PDS / PDMS / E3D / SP3D, as per the client's preference). A highly evolved material codification system bridges the 3D system with a SAP-based ERP system. Project material take-offs from the 3D system are thus converted into error-free purchase orders and integrated into material tracking systems.

e-Procurement automates purchasing systems and effectively controls delivery schedules, cost and quality of procurement. It includes SAP ARIBA and other MOSS-based programmes

developed in-house for Vendor Documentation Management (VDMS). SAP ARIBA allows shortlisted vendors to participate in virtual negotiation over the Internet, which facilitate securing the best terms and deliveries. SAP Business Warehouse (BW), a business-intelligence online analytical processing software, increases flexibility in response to client requirements.

Other IT-enabled processes include an advanced Vendor Delivery Management (VDM) that permits tracking of the physical progress of items at various stages of manufacture, and a GPS-based system for online tracking from source to final destination. A custom-built spool-detailing software automates the process of weld-mark-up and fabrication isometric preparation. It forecasts the fabrication work-front based on material receipt and inventory at the project's stores.

A digitalized material tracking application allows for QR/RFID-based physical tracking of piping spools, reducing loss of time and material. Structural, E&I and loose-shipped material with packages follow similar systems and processes.

Construction management is enhanced with eALPS+, a proprietary Web-enabled software, which micro-plans, tracks, controls and integrates activities across project sites, providing 'real time' status. Site supervisors update daily progress using mobile devices at individual-item level. This rolls up into the daily, weekly and monthly progress reports in a transparent, auditable manner.

A Completion Management application manages project activity turnover and certification, monitors and closes out punch lists, generates certificates for completion, monitors real-time progress and generates system-wise completion dossiers.

Other digital 'edge' applications help supervisors to track the productivity of workers, plant and machinery using biometrics, GPS, BLE/RFID and IIOT sensors, etc.



Combination of Multiple or Integrated Digital Tools provide an effective solution for Automated Work-flow, Integrated Communication and a strong Decision Making Process

## Corporate Social Responsibility

The Company's CSR interventions – fuelled by commitment, mobilisation of employee volunteerism, innovative approaches, appropriate technology and key partnerships – have been making a lasting difference on the lives of underprivileged. Synergy between corporate actions and the Government and NGOs makes CSR interventions more effective in facilitating inclusive development. The Company's CSR policy has built-in, self-regulating mechanisms to monitor and ensure adherence to law, ethical standards, and international norms. The Company accepts responsibility for the impact of its activities on the environment, consumers, employees, communities, stakeholders and all other entities and individuals in the public sphere.

**'Building India's Social Infrastructure'** – Our Goals: Water and Sanitation: The Company focuses on providing access to safe drinking water. Initiatives include installation of hand-pumps and bore wells, as well as the construction of check dams and ponds to improve the water table. To eliminate open defecation, toilets have been constructed in households, schools and in the community. Street plays and focused group discussions help generate awareness about the harm caused by open defecation. In the last three years, 750 toilets were constructed in rural Maharashtra, Tamil Nadu and Gujarat.

**Education:** The Company's initiatives include supporting education programmes at all levels in rural and slum areas, ensuring quality education for primary school children, infrastructure support, teachers' training and scholarships to meritorious students. Utilising technology to enhance the quality

of education, the Company helps improve teaching using audio-visuals, animation and other technology.

**Health:** The underprivileged are helped to access quality healthcare through the Company's partnerships with Primary Health Centers (PHC), Community Health Centers and District Hospitals. Its areas of focus are medical camps, awareness programmes on maternal and child health care, and immunization.

**Skill Building:** The employability of youth is enhanced through various skill-building programmes, teaching various trades like welding and automation through Govt. ITIs and NGOs. State-of-the-art Community Centres have been constructed in Gujarat to impart training to rural youth.



Education support programme



Health check-up



## Corporate Social Responsibility Policy

L&T Hydrocarbon Engineering fosters a culture of caring, trust and continuous learning while meeting the expectations of all stakeholders and society at large. As a responsible Corporate Citizen, the Company contributes towards inclusive growth by empowering communities and accelerating development.

We shall leverage our inherent strengths and capabilities to build India's social infrastructure.

Towards this, we shall:

- Implement sustainable CSR programmes towards building India's social infrastructure
- Partner with communities, NGOs and institutions to make a positive impact by identifying the needs and providing solutions in the areas of water & sanitation, education, health and skill development
- Harness innovation and technology-driven solutions to address social needs
- Strengthen systems and processes to achieve measurable results

Our aim is to contribute to a better quality of life, mitigate social inequalities and help individuals in identified communities to achieve their true potential.

Subramanian Sarma  
CEO & Managing Director



L&T Hydrocarbon Engineering

Date: 1<sup>st</sup> February, 2019

## Corporate Sustainability

As a responsible corporate citizen, the Company strives for sustainable growth in harmony with the environment and society. Our Sustainability journey encourages sustainable practices, ushering excellence in triple-bottom-line performance. Sustainable practices ensure the use of resources in ways that generate economic growth, create social benefits and minimize the negative impact on the environment.

In the varied geographies in which we operate, we develop business practices in an inclusive and holistic manner, amplifying our outreach. We endeavour to capitalize on local talent, creating avenues for community development and spurring growth of local businesses. We are mindful of our environmental performance, specifically our energy consumption, not just within our operations, but also of the products and services we offer.



## Corporate Sustainability Policy

As an integral part of our business philosophy, we are committed to fulfilling our social, environmental and economic responsibilities for sustainable development.

Towards this, we shall:

- Continue to abide by ethical practices, maintain transparency in our engagements with stakeholders and advocate responsible business practices
- Incorporate social and environmental considerations in our business operations
- Foster a culture of trust and caring to enhance the well-being of employees and communities
- Promote social equity and partner with communities in health care, education and skill building
- Conserve natural resources, reduce the adverse impact of climate change and enhance energy efficiency
- Adopt sustainable and resource efficient processes and provide value-added products and services

Date: 1<sup>st</sup> February, 2019

Subramanian Sarma  
CEO & Managing Director



L&T Hydrocarbon Engineering

## Commitment To Continuous Learning

L&T has set up a number of institutes around the country to impart technical and managerial training.



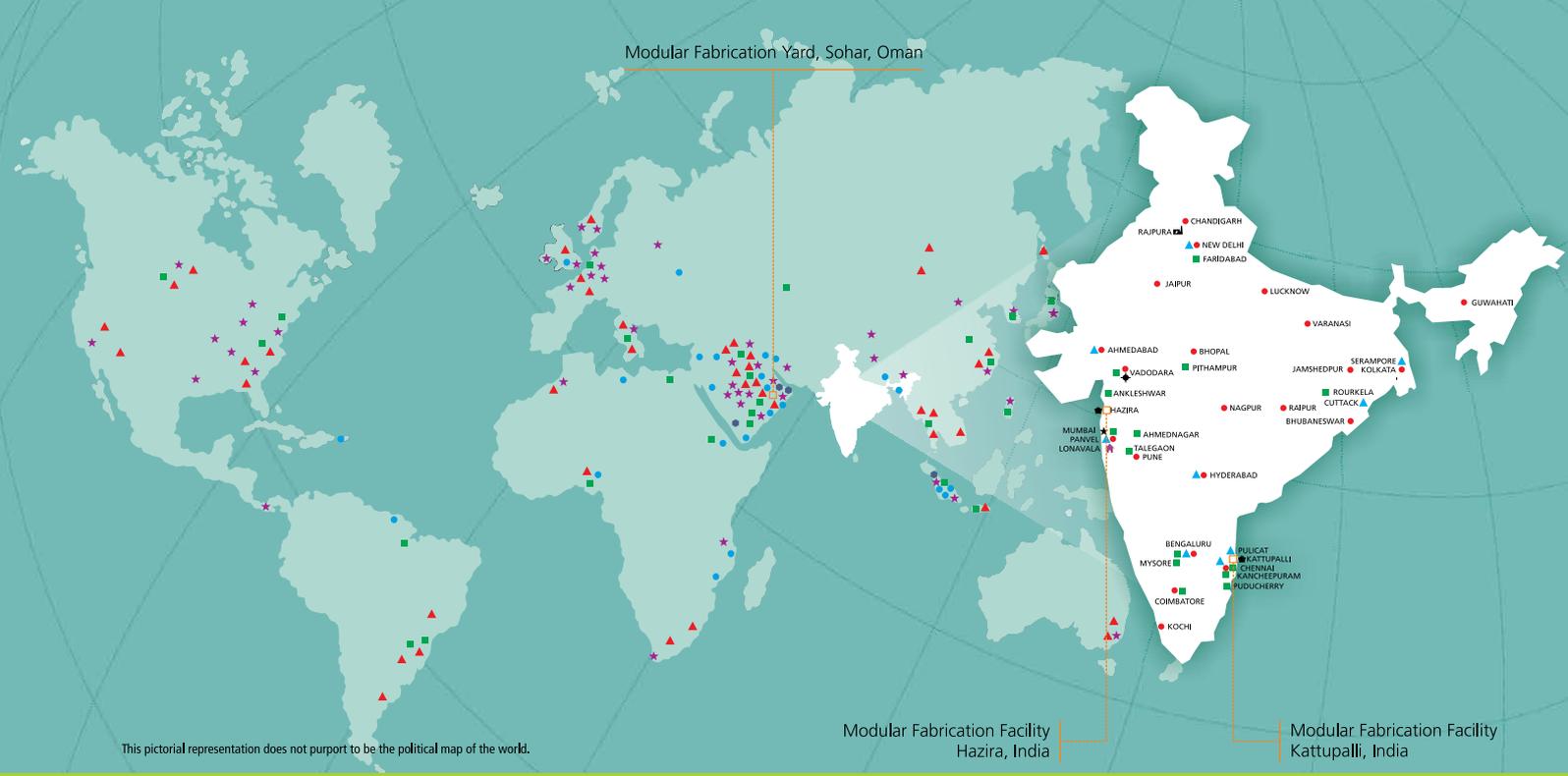
L&T Institute of Project Management (IPM) at Vadodra – a registered educational provider of PMI, USA – develops project managers across EPC domains



L&T's Leadership Development Academy has world-class facilities to deliver learning and development programmes.



Safety Innovation School at Hazira, Gujarat – part of multiple initiatives for the propagation of a safety culture company-wide



This pictorial representation does not purport to be the political map of the world.

## Global Presence

- ★ Offices
- Engineering & Construction Projects
- ▲ Product & Equipment Supply
- Manufacturing / Fabrication Facilities
- Agents
- Modular Fabrication Facilities

Note: Map is broadly representative of L&T's presence in markets worldwide. For details of establishments within India, please refer to 'National Network'.

## National Network

- ★ Registered Office
- Campus\*
- ⚡ Power Plant
- 🚢 Shipyards
- Offices
- ♣ Knowledge City
- 🌟 Leadership Development Academy
- ▲ Construction Skills Training Institutes\*

\* 'Campus' denotes facilities for design and manufacture  
 \* Part of L&T's Corporate Social Initiatives

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A wholly owned subsidiary of Larsen & Toubro Limited

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