

**GLOBALLY
BENCHMARKED
PROUDLY BUILT
IN INDIA**



THE COMPANY

Larsen & Toubro is an Indian multinational engaged in EPC Projects, Hi-Tech Manufacturing and Services. It operates in over 50 countries worldwide. A strong, customer focused approach and the constant quest for top class quality have enabled L&T to attain and sustain leadership in its major lines of business for eight decades.

Headquartered in Mumbai, Larsen & Toubro Limited is one of the largest and most respected companies in India's private sector. L&T has unmatched capabilities across Technology, Engineering, Construction, Manufacturing and maintains a Leadership Position.

L&T's businesses include Buildings & Factories, Infrastructure, Heavy Engineering, Water & Effluent Treatment, Power, Minerals and Metals, Smart World & Communication, Defence, Shipbuilding, Hydrocarbon, Machinery & Industrial Products, Realty, Financial Services and IT & Technology Services. Team L&T comprises over 50,000 people worldwide.

VISION

L&T shall be a professionally-managed Indian multinational, committed to total customer satisfaction and enhancing shareholder value.

L&T-ites shall be an innovative, entrepreneurial and empowered team constantly creating value and attaining global benchmarks.

L&T shall foster a culture of caring, trust and continuous learning while meeting expectations of employees, stakeholders and society.



LARSEN & TOUBRO

HEAVY ENGINEERING

L&T Heavy Engineering business is global leader in supply of the Engineered to order hi-tech equipment needs of Refinery, Oil & Gas, Fertilizer, Petrochemicals and Nuclear power plants. The business has been at the forefront of introducing digital Industry 4.0 techniques, products and materials into manufacturing sector for over eight decades. Dedicated engineering, procurement, project management and construction teams of our Modification, Revamp and Upgrade (MRU) business offer technology-driven, quick turnaround solutions for process plants.

A.M. Naik Heavy Engineering complex at Hazira is globally benchmarked state-of-the-art fully integrated , digitally enabled manufacturing complex.

Our capability spectrum not only covers in-house engineering, R&D centres, and world class fabrication facilities, but also includes a highly talented team, committed to a safe and sustainable work culture. The business achieved international recognition through an impeccable track record of executing large complex projects and constantly creating new international benchmarks.

Our state-of-the-art manufacturing facilities are located at:

- Hazira (Surat) - A. M. Naik Heavy Engineering complex with its own waterfront 'Load on' and 'Ro-Ro' jetties
- Ranoli (Vadodara) - Vadodara Heavy Engineering Works, a facility that handles stainless steels, non-ferrous, exotic materials, and process plant internals
- Powai (Mumbai) - Supports Modification, Revamp and Upgrade Business

HE Mission Statement

We shall strive to become the world's best organization to engineer, manufacture, integrate, upgrade, revamp and provide value added services for technology intensive, custom-built equipment and systems, harnessing digitally enabled processes.

We are committed to create significant value for customers, other stakeholders and society through relationship, trust and transparency.



LARSEN & TOUBRO LIMITED
Heavy Engineering



L&T Heavy Engineering

PRODUCT BUS

- Reactors & Pressure Vessels
- Heat Transfer Equipment
- Nuclear Power Plant Equipment
- Modification, Revamp & Up grade Services
- Process Plant Internals
- Critical Piping



INT'L OFFICES

- Houston, USA
- Shanghai, China
- Sharjah, U.A.E.
- Jakarta, Indonesia
- Paris, France



- L&T Special Steels and Heavy Forgings

JVs

ENGG & MFG CENTERS

- Hazira, Surat
- Ranoli, Vadodara
- Powai, Mumbai



- Refineries & Cracker
- Oil & Gas
- Fertilizers
- Petrochemicals
- Coal Gasification

INDUSTRY SECTORS

Global Benchmarks

121 m

World's Longest Column for Reliance Industries, India

USD 421 Mn

World's Single Largest Order of 22 Reactors for KNPC, Kuwait

2313 MT

World's Heaviest LC-Max Reactors for HPCL Vizag Refinery

1500 MT

World's Largest Tubular Reactor for Equate, Kuwait

658 MT

World's Heaviest Coke Drums - 6 Nos. PEMEX, MEXICO

33 Months

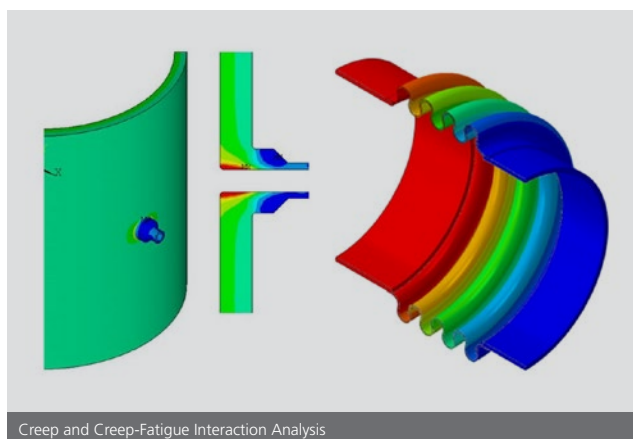
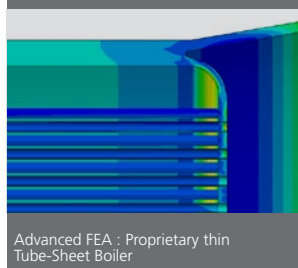
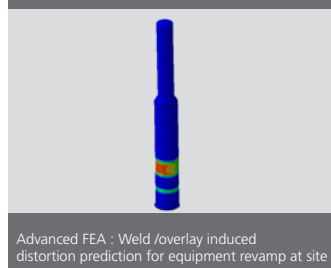
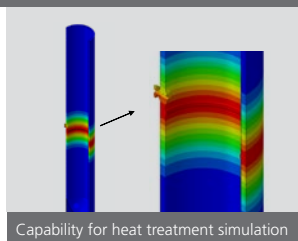
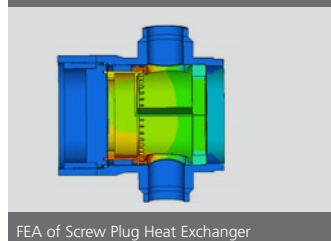
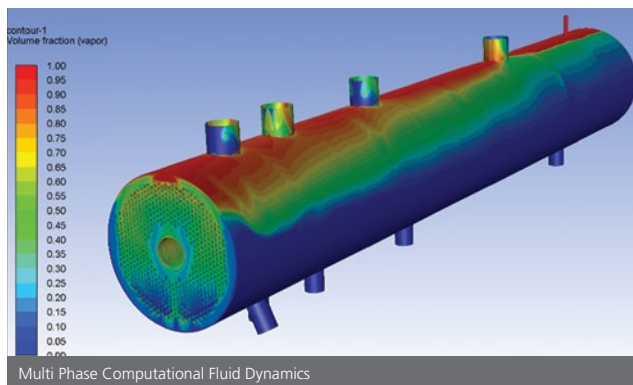
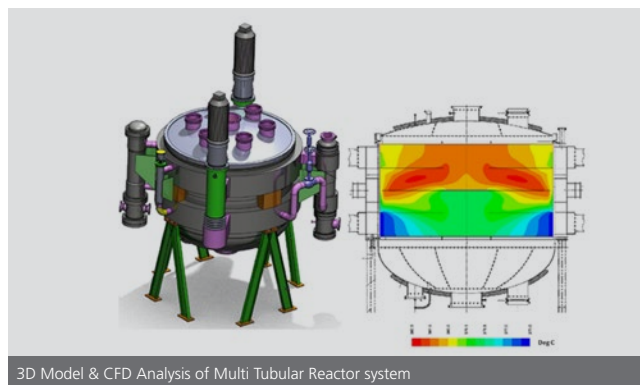
Manufactured Nuclear Steam Generator for NPCIL

16.3 m Diamter

Largest RFCC Package for Reliance Industries, India

29.4 m Diamter

The Cryostat - world's largest stainless steel, high vacuum pressure chamber weighing 3,850 MT for ITER, France



DESIGN & ENGINEERING: TECHNOLOGICAL EXCELLENCE

L&T's engineering capabilities are geared to design equipment as per customer specific requirements, and international codes and standards. Fabrication drawings for critical equipment are generated through 3D automation which have been developed in house. The perpetual endeavour of design engineers is to generate optimum solutions leading to lowest capital and operating costs.

TECHNOLOGY SOLUTIONS UNDER ONE ROOF

MECHANICAL	THERMAL	ANALYSIS	SPECIAL
Design to International-Codes & Standards <ul style="list-style-type: none"> ASME Sec. I, III & VIII EN 13445 PD5500 - British IBR AS1210 - Australian ADM - German KTA - German JIS - Japanese Stoomwezen - The Netherlands TEMA Standards EJMA Standards GB 150 - Chinese 	Members of HTFS & HTRI Design of Equipment <ul style="list-style-type: none"> All types of Shell & Tube Exchangers Screwplug Closure (Breech lock) HP Heat Exchangers Helixchanger/Helitower Transfer Line Exchangers Nuclear Steam Generators Multi Tubular Reactors Shell & Tube LNG Vaporisers 	Finite Element Analysis <ul style="list-style-type: none"> Static & Dynamic Linear & Non-linear Response Spectra Analysis Thermo-structural Steady state & transient Buckling Fatigue & Fracture Creep & Creep-Fatigue Interaction 	Fluid Structure Interaction Analysis (FSI)
			Simulation of weld induced distortion and stress pattern
			Analysis for metal
			Chemical Process Simulation
			Collaborative Research & Process Developmen
			Failure Analysis
			Analysis and engineering for Site Fabrication and Revamps
			Experimental Stress Analysis
			Destructive / Non-destructive Testing
Wind & Seismic Analysis	Heat Transfer Systems Design & Analysis <ul style="list-style-type: none"> Waste Heat Boiler Systems Molten Salt Bath Reactor (MSBR) Systems Vaporiser Systems 	Computational Fluid Dynamics <ul style="list-style-type: none"> Conjugate Heat Transfer Single & two-phase flows Reactor Chemical Kinetics Particle Dynamics 	
Automated Modelling - 2D/3D		Piping Flexibility	
		Flow Induced Vibration (FIV)	
		Integrated System Analysis	
		Lifting & Transportation	



UNCOMPROMISING STANDARDS: QUALITY ASSURANCE

The Total Quality Management approach ensures that deliveries are made as per customer specifications. The quality procedures guarantee that safety and reliability of operations are built into the equipment and systems delivered.

The quality systems are backed by the latest facilities for radiography, including 12 MeV linear accelerator, ultrasonic, ToFD & PAUT, magnetic particle & liquid penetrant examination, high pressure and high vacuum testing, helium and freon leak testing.

Advanced NDE - ToFD & PAUT Station

- Compliant to ASME requirements to replace Radiography by Ultrasound (UT).
- Weld Thickness range inspected: 6mm to 430mm
- Fast Inspection due to no Radiation hazard
- No Job handling at assembly stage
- Recordable UT data of weld as base line data to refer in future
- Automatic twin engine Scanner used to straddle the probes along weld length



Plate-rolling machine for hot rolling of plates 300mm max. and 4500mm wide max.



IOT Enabled Shell Overlay Station

WORLD CLASS CAPABILITIES: FABRICATION

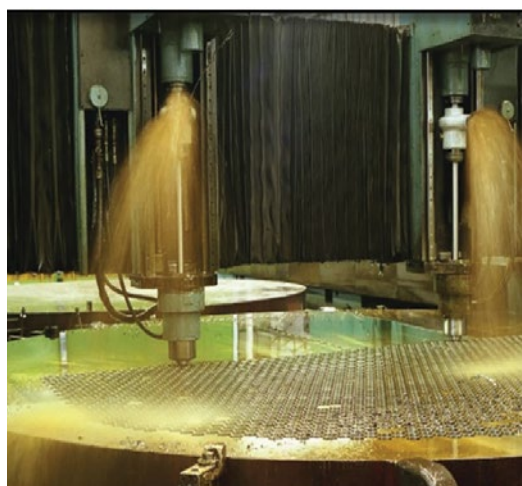
L&T's world class fabrication capabilities have been achieved through the perfect integration of efficient material handling and preparation, precision machining and welding processes for a range of materials in varying thickness, backed by technological excellence in design and engineering and responsive quality as well as IT systems.



Three CNC floor-mounted horizontal boring machines. Spindle diameter: 200 mm & Travel: 5m x 17m



CNC Vertical boring machine Max.
Diameter: 12m, Max. Job Weight: 130 MT



CNC Horizontal multi-spindle deep-hole drilling machine
Drilling Depth: 1100mm Number of Spindles: 2



CNC Vertical multi-spindle deep-hole drilling machine.
Drilling Depth: 900mm Number of Spindles: 2

The capabilities of CNC Floor Mounted and Special Purpose machines are supported by a battery of general purpose machines, all geared to the precision machining needs of a world class fabricator.

HEAT TREATMENT

One of the crucial activities in manufacturing of any pressure vessel is Post Weld Heat Treatment. Our workshops are equipped with several large automatic control gas-fired modular furnaces, with dimensions up to 51 m length & 24 m height capable of performing Heat Treatment & stress relieving of sections and equipment of large size. Systematic configuration of gas burners and regulated air flow ensure uniform heat treatment.

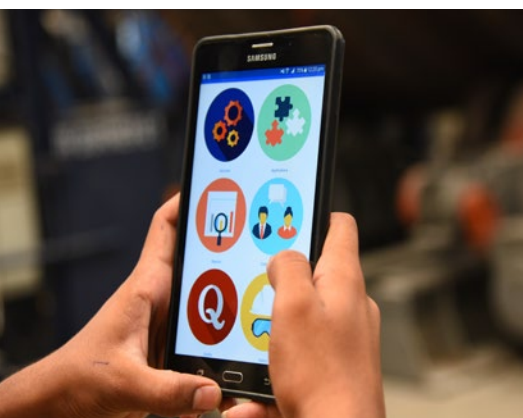


Natural gas-fired bogie hearth furnace and modular furnace for heat treatment of equipment

COMPREHENSIVE WELDING CAPABILITIES

WELDING PROCESSES	MATERIALS WELDED	SPECIALISED WELDING TECHNIQUES
<ul style="list-style-type: none"> • SMAW • SAW (Semi-Auto/Machine) <ul style="list-style-type: none"> • NG SAW • Tandem/Twin-Head SAW • LSO SAW • GTAW (Manual/Semi-Auto/Machine) <ul style="list-style-type: none"> • Hot Wire GTAW • Activated TIG • Keyhole TIG • Automatic Tube # Tubesheet • Inner Bore welding • Orbital TIG • GMAW (Semi-Auto/ Machine) <ul style="list-style-type: none"> • Pulse GMAW • CMT • Robotic welding • FCAW (Semi-Auto/Machine) <ul style="list-style-type: none"> • Self-Shielded/Gas Shielded • ESW <ul style="list-style-type: none"> • Conventional/High speed cladding • PAW • Laser Beam Welding • Arc Stud Welding 	<ul style="list-style-type: none"> • Carbon steel • Low alloy steel (C-Mo, Mn-Mo-Ni, 3.5 Ni, Cr-Mo, CrMoV) • Quenched & Tempered Steel • Stainless Steel • Austenitic stainless steel • Super austenitic stainless steel • Duplex stainless steel, Super & Hyper duplex stainless steel • Ferritic stainless steel • Maraging Steel • Nickel based alloys (Inconel, Incolloy, Monel, Hastelloy) • Copper based alloys (Cupronickel, Aluminum Bronze, Brass) • Titanium & titanium alloys 	<ul style="list-style-type: none"> • Tandem / Twin SAW • Semi-Automatic GTAW/SAW • Robotic • Hot Wire GTAW • Activated - TIG • Narrow/ Ultra-Narrow Gap SAW / GTAW • Pulsed GTAW/GMAW • Internal BoreTube to Tubesheet • Cold Metal Transfer (CMT) • Self - Shielded FCAW • Strip Cladding • High Speed ESW

Continuous improvement in Welding Technology has enabled the development of over 8000 welding procedures qualified as per international codes and standards - ASME, BS, EN/BS, AS/NZ - for a variety of materials in a range of thickness (0.5 to 800 mm) covering the complete spectrum of welding processes. Specialised fabrication facilities include 100,000 class of dust-free enclosures with areas of 1000 sq. m. and 400 sq.m.



DELIVERING ENHANCED VALUE THROUGH DIGITALISATION!

L&T Heavy Engineering embraces digital solutions to enhance its operational excellence and offer your business value - added benefits

WE CONSTANTLY STRIVE TO INCREASE VALUE FOR YOU THROUGH:



On-Time Delivery



First Time Right



Significant Productivity Improvement

OUR DIGITALISATION INITIATIVES INCLUDE:



Smart Machines

- Smart Stations
- Asset Tracking & Utilization
- Remote Monitoring by Smart AR Glass



Smart Processes

- Advanced Metrology & NDT
- Integrated Engineering Manufacturing Quality System
- Live Project Tracking



Data Analytics

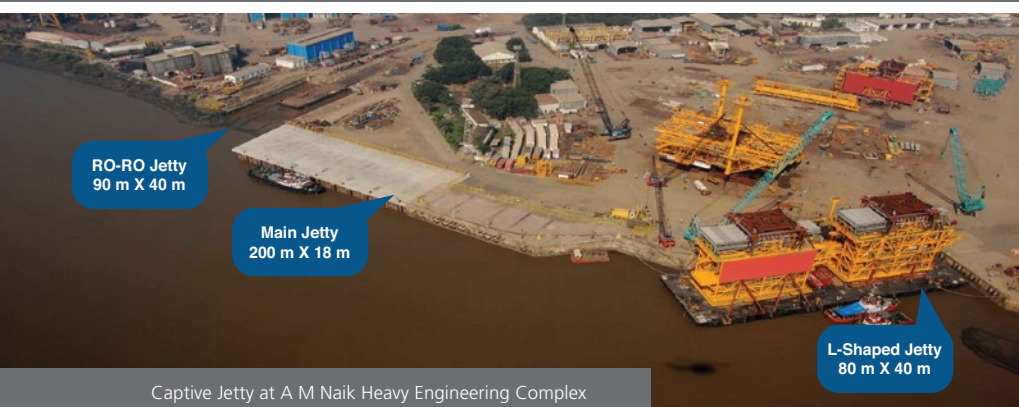
- Real Time Monitoring of Machines
- Smart Procurement
- Online Dashboards



Reactor Regenerator Package for Pertamina, Indonesia



LC MAX Reactors on Barge for HPCL Vizag



Captive Jetty at A M Naik Heavy Engineering Complex



Ethylene Oxide Reactor for LPCL, China

TIMELY DELIVERIES: LOGISTICS

TRAFFIC & LOGISTICS

Specialists provide traffic and logistics services for domestic and international customers. All arrangements are made for safe, low-cost and timely deliveries.

Traffic and logistics regularly carry out comprehensive route surveys from point of origin to final destination; plan and

arrange the right mode of transport; obtain statutory clearances and organise inter-agency co-ordination as per the specific needs of customers.



Reactors (260+)



EO Reactors (55+)



FCC & Columns (280+)



Coke Drums (80+)



HP Heat Exchangers (450+)



Ammonia Equipment (200+)



Urea Equipment (160+)



Steam Generators (40+)



Modification, Revamp Site work (100+)



Coal Gasifiers (30+)



LNG Vessels (135+)



Process Plant Internals (500+)

GLOBAL BENCHMARK: KEY PRODUCTS



Products exported to more than 50+ Countries spread over all five continents.



World's largest tubular reactor being supplied to the Middle East weighing 1500 MT



Methanol Converter for Yanchang, China weighing 392 MT



Molten Salt Bath Reactor System for Phthalic Anhydride & Maleic Anhydride Plants



PO Reactors



Titanium Clad Dehydration Towers

PETROCHEMICAL PROJECTS

EQUIPMENT SUPPLIED

- Ethylene Oxide Reactors
- ACN Reactors
- Dissolver Reactors
- Methanol Convertors
- Convection Section modules for Cracker Furnace
- RG Boiler for Methanol Plant
- Molten Salt Bath Reactor
- Ti clad Dehydration Towers
- TLX & USX Heat Exchangers
- Oleflex Reactors
- Catofin Reactors & Products Splitters
- PO Reactor
- AM Reactor
- PTA Equipment
- Rod Baffle Exchangers
- Zirconium & Titanium Heat Exchangers



290mm thick CrMoV forged ARDS reactor for KNPC. Total 22 nos. weighing 19000 MT



5 critical renewable diesel reactors to one of North America's largest renewable diesel producer Diamond Green Diesel (DGD)



RAPID FCC Reactor-Regenerator Package, total 2 nos. weighing 8750 MT

REFINERY PROJECTS

EQUIPMENT SUPPLIED

- Hydrocracker & ARDS / VRDS reactors
- HDS/Hydrotreater reactors
- Fluid Catalytic Crackers including Reactors, Regenerators and Accessories
- High pressure heat exchangers with threaded lock closures
- Heat exchangers in various materials of construction including 1-1/4 Cr - 0.5 Mo, 2-1/4 Cr - 1 Mo, Nickel Alloys, Duplex SS



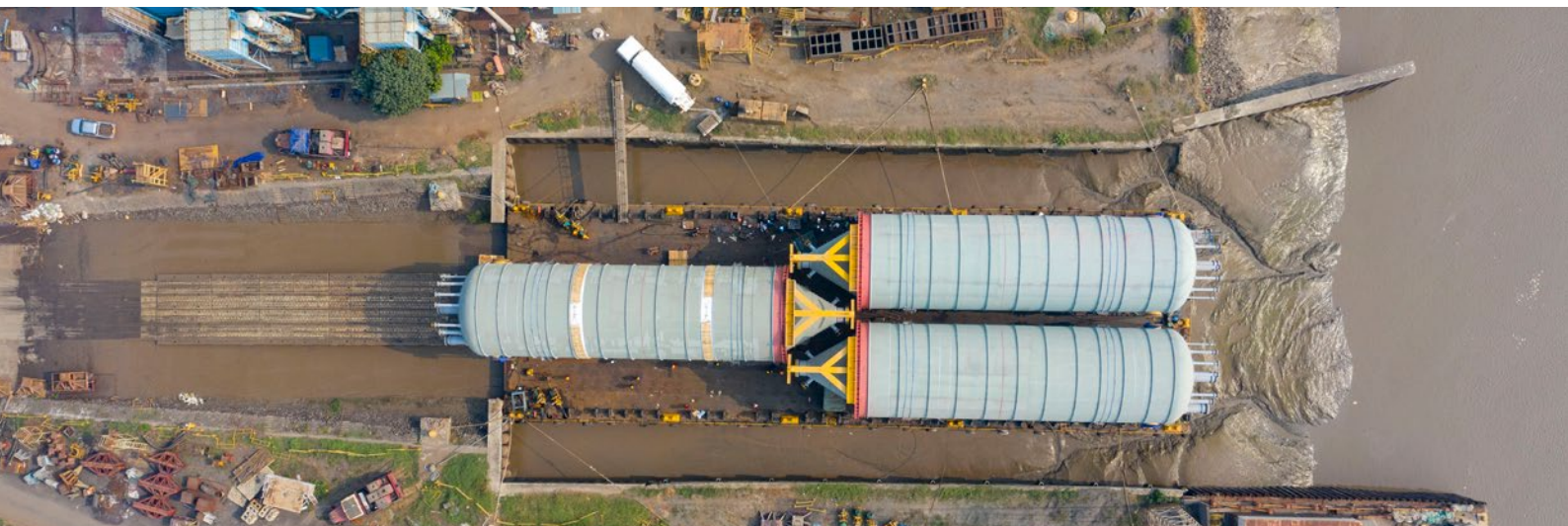
Worlds Heaviest LC-MAX Reactors (2313 MT) for HPCL Visakh Refinery



Heaviest Vacuum Column weighing 964 MT



High Pressure Screw Plug Heat Exchangers 66 nos. supplied to KNPC, Kuwait

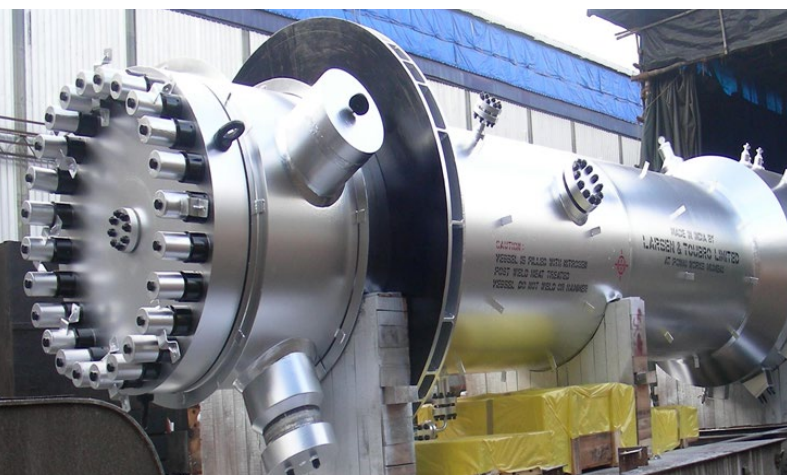


Worlds largest Coke Drums for PEMEX, Mexico

- Reactors for Renewable Diesel
- Coke Drums
- Helixchangers/Helitowers
- High-pressure vessels (separators for hydrocracker, merox vessels, etc.)
- Columns including Vacuum columns, Crude columns, fractionators



Ammonia converter



Synloop Boiler



Unitized Chiller weighing 380 MT for a project in Indonesia



Urea Reactor supplied to RFCL India

FERTILIZER PROJECTS

EQUIPMENT SUPPLIED

- Ammonia Converters
- Ammonia Converter Basket
- Waste Heat Recovery Boiler package including RG, CG Boiler, Steam Super heaters, Synthesis Loop Boiler, Steam Drums, and R&D Piping
- High Pressure Exchangers for Synthesis Loop



Urea Stripper Supplied to Petronas, SAMUR, Malaysia



Carbamate Condenser Supplied to SAFCO V, Saudi Arabia



Waste Heat Boiler Package including RG/CG boiler, steam drum, risers & downcomers at Sohar Fertilizer plant

- Secondary Reformer Waste Heat Boiler & Steam Super heaters
- Ammonia Unitized Chillers
- KRES Exchanger
- Urea Reactors
- Urea Strippers
- Carbamate Condensers & Separators



Amine Absorber for Saipem(Marjan, KSA)



Heavy Thick Vessels for KNPC Al-Zour

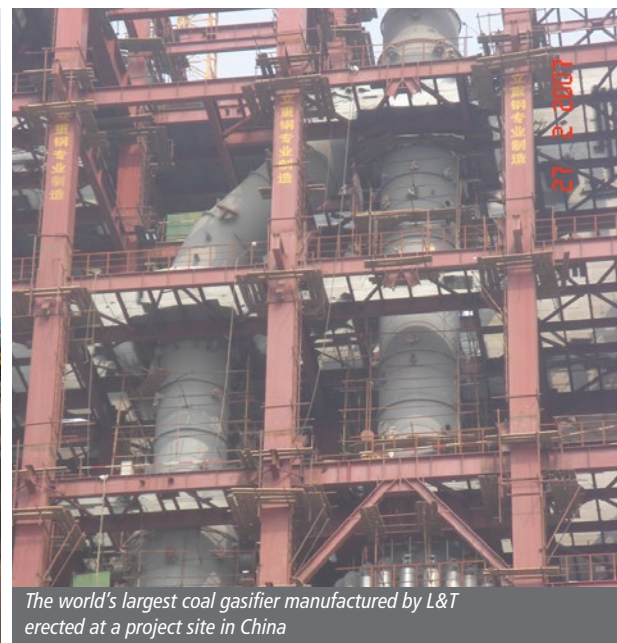
OIL & GAS PROJECTS

EQUIPMENT SUPPLIED

- LNG Vessels
- Gas Processing Equipment



A section of a coal gasifier being exported to Vietnam



The world's largest coal gasifier manufactured by L&T erected at a project site in China

COAL GASIFICATION PROJECTS

L&T is the leading manufacturer of key gasification equipment with supplies to projects in China, Vietnam and India. L&T has supplied

- Nine gasifiers to various projects in China
- Two gasifiers to Vietnam of Shell Technology.
- Nineteen gasifiers in India of Air Products, Lurgi & CB&I Technologies

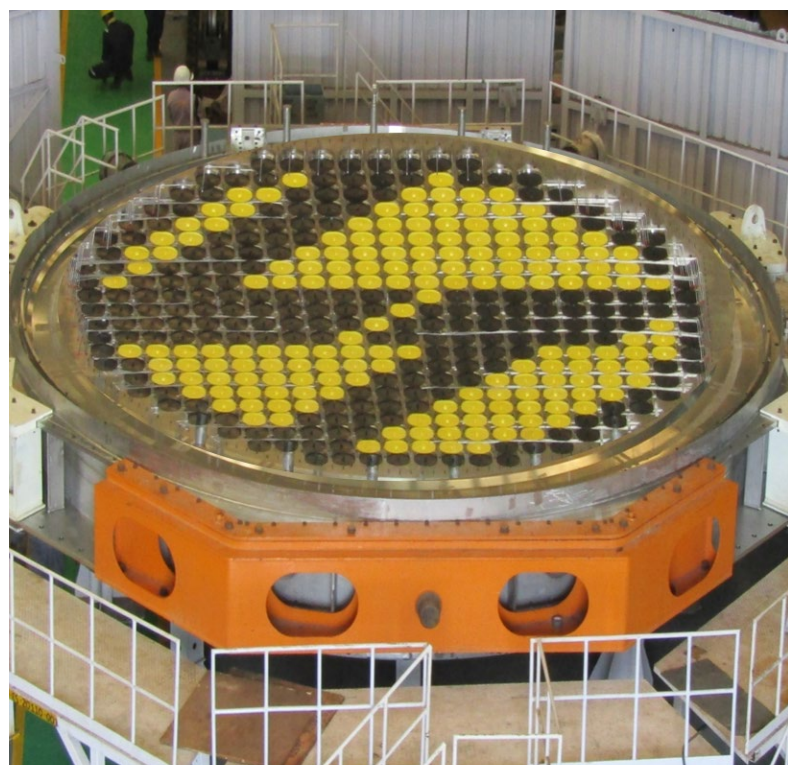
L&T is also qualified for supplying gasifiers as per GE, KBR, Siemens among other gasification technology providers.



Global Benchmark in Manufacturing : Steam Generator for 700 MWe (PHWR) Nuclear Power Plant



ITER Cryostat for Nuclear Fusion Reactor, France. MOC: SS 304L, Diameter: 29 m, Height: 29 m, Thickness: 50 – 200 mm Total Weight: 3200 MT



End-shields for 700 MWe (PHWR)

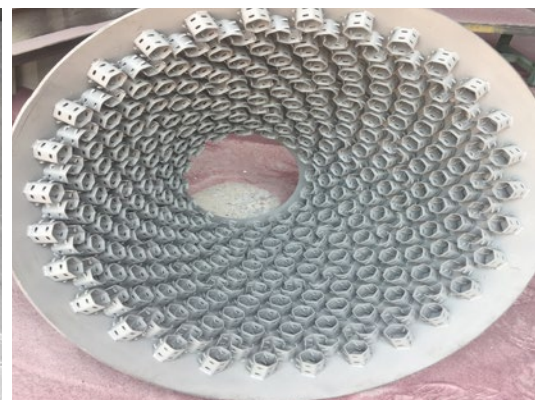
NUCLEAR POWER PLANT PROJECTS

EQUIPMENT SUPPLIED

- Steam Generators (220 MWe, 2. 540 MWe & 700 MWe)
- End Shields (220 MWe, 540 MWe & 700 MWe)
- Pressurizer (700 MWe)
- Cryostat for Fusion Reactor (ITER France)
- Spent Fuel Canisters & Casks (for US market under US NRC)
- Reactor Headers
- Calandria
- End Fittings
- Safety Heat Exchangers



Internals for Hydroprocessing Reactors, Gasification and Urea Equipment



Internals for FCC - Cyclones and Air Rings



Exotic Metal Exchangers and Equipment for Specialty Chemical Industry

PROCESS PLANT INTERALS

L&T owns dedicated facility to manufacture specialized equipment -internals of exotic metallurgies. Approved by all leading process licensors, this inhouse facility compliments the supply chain.

INTERALS SUPPLIED

- Hydro processing Reactors Internals
- Gasification Internals
- Urea Internals
- Cyclones
- Air Rings
- Swirl Assemblies

EXOTIC MATERIAL EQUIPMENT

Our state of the art facility also expands our capability to supply complete equipment of exotic metallurgies like SS, DSS, Urea grade Steel, Inconel, Titanium, Zirconium etc. as a one stop solution provider. Our offerings also includes Oxygen mixing spargers / Nozzles.



Heat Train Exchanger Replacement at Kuwait



FCCU Revamp, Nayara



Replacement of FCCU Reactor with Internals for OQ at Oman

MODIFICATION REVAMP AND UPGRADE SERVICES

Dedicated Engineering, Procurement, Project Management and Construction teams offer complete solutions for Process Plants.

Site Services:

- Critical Turnaround & Revamps
- Debottlenecking & Expansion
- Site Fabrication & assembly
- Repair & Maintenance

Speciality Services:

- Failure Analysis and Troubleshooting
- Thermal Performance and Enhancements
- Specialized Welding
- Health Check-up
- Residual Life Assessment

We offer complete solutions from concept to commissioning of static equipment including piping, structural, electrical & instrumentation engineering.

GREEN INITIATIVES

At L&T, we believe that a holistic approach and responsible informed choices can lead to sustainable solutions. Our programmes are aligned to help combat climate change, drive energy efficiency, and encourage renewable energy usage.

Green initiatives at A M Naik Heavy Engineering Complex:

- Green Hydrogen Plant for captive usage
- Ecosystem restoration by converting Lawn area to Urban Forest
- Water efficiency and conservation measures



- Green product usage – Eco friendly Construction Material
- Energy Efficient Manufacturing Processes
- Upgradation of Indian Green Building Council (IGBC) certification

We foster a culture of responsibility through periodic awareness and trainings for our workforce and thereby embed environmental stewardship within our business.

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