

### METALLURGICAL & MATERIAL HANDLING SOLUTIONS



# Seventy five years of **UNDISPUTED LEADERSHIP**





Larsen & Toubro is a major Indian multinational in technology, engineering, construction, manufacturing and financial services, with global operations. Its products and systems are marketed in over 30 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 over seventy five years.

- Construction
- Heavy Engineering
- Hydrocarbon Engineering
- Power
- Metallurgical & Material Handling
- Ship Building
- Infrastructure Concession
- Realty
- Electrical & Automation
- Construction & Mining Machinery
- Valves
- Infotech
- Technology Services
- Financial Services



Top : Blast furnace re-constructed for Durgapur Steel Plant. Middle : India's first Monorail Transit System at Mumbai. Bottom : Terminal 3 at Indira Gandhi International Airport in New Delhi.

### The Indian CONSTRUCTION GIANT

L&T Construction, India's largest construction organization and ranked among the world's top 30 contractors, has been over the past seven decades transforming cityscapes and landscapes with structures of immense size and grandeur. The company's capabilities span the entire gamut of construction - civil, mechanical, electrical and instrumentation engineering - and its services extend to all core sector industries and infrastructure projects.

Several of the country's prized landmarks - edifices, structures, airports, industrial projects, flyovers, viaducts, water and power infrastructure projects carry L&T's signature of excellence in construction. Today, more and more structures beyond India's boundaries are standing tall, thanks to L&T Construction.

L&T Construction straddles eight related businesses:

- Buildings & Factories
- Transportation Infrastructure
- Heavy Civil Infrastructure
- Power Transmission & Distribution
- Water & Effluent Treatment
- Smart World & Communication
- Renewable Energy
- Metallurgical & Material Handling







Top : Stacker Reclaimer at Koderma Thermal Power Plant in Jharkhand. Middle : 400kV Fujairah-Ras Al Khaimah Transmission Line project in the Gulf. Bottom : World's longest single flight long belt cross country conveyor (17 km) from Meghalaya in India to Chatak in Bangladesh.

### Metallurgical and Material Handling (MMH) Expanding the Sinews of the Nation







Metallurgical industry is one of the most essential industries enabling a multitude of modern engineering marvels. It has played an important role in the advancement of civilisation. Iron and steel have by far been the most important of metals with infinite functional applications touching every aspect of life.

L&T has played a major role in the development, modernisation and expansion of all metallurgical plants including the construction of Greenfield plants in India.

The Metallurgical and Material Handling (MMH) business of L&T Construction - is India's market leader in Engineering, Procurement & Construction of metallurgical projects. MMH has the capability and expertise to undertake detailed engineering, procurement, manufacture, supply, construction, erection and commissioning of projects through its dedicated business units:

- L&T's Minerals and Metals (M&M) business offers onestop-solution for the ferrous and non-ferrous sectors covering iron and steel industries, aluminium, copper, zinc, lead and mineral beneficiation plants.
- L&T's Bulk Material Handling (BMH) business provides comprehensive Engineering, Procurement and Construction (EPC) solutions for material handling to core sector industries covering power, steel, mines, ports & speciality conveyors.
- **L&T's Product Business** based in Odisha and Kanchipuram serves as a world-class precision manufacturing facility for a wide spectrum of fabrication, machining and assembly of products for core industries such as chemical, cement, steel, paper, power, mineral and railways.

### Minerals & Metals Single-point Solutions Provider

L&T has played a significant role in the development of steel, aluminium and zinc sectors in India, with its involvement in almost all major Greenfield and Brownfield projects. L&T has established long-standing customer relationships with industry majors such as Tata Steel, SAIL, Jindal, Bhushan, Vedanta and Hindalco, and has been a key partner in their ambitious plans and modernisation programmes. A high degree of operational efficiency and consistent performance has enabled L&T to constantly meet customer demands and sustain its growth trajectory.

L&T undertakes metallurgical projects on turnkey EPC and construction contract basis involving civil, structural, mechanical, electrical & instrumentation works and commissioning for the following sectors:

Ferrous Metals	Non Ferrous Metals
Iron making	Alumina
Steel making	Aluminium
Rolling and Finishing Lines	Zinc and Copper
Mineral Beneficiation	Mineral Beneficiation

The industry has benefitted from L&T's integrated strengths in basic and detailed engineering, equipment fabrication, procurement, project management, erection, construction and commissioning. L&T's wide spectrum of capabilities enables it to offer single-point responsibility and successfully meet stringent quality standards and delivery schedules with focus on best-inclass Environment Health Safety and Information Technology.







Top : Exterior View of Blast Furnace-3 for Vizag Steel Plant. Middle : Blast Furnace 'F' under operation at Tata Steel, Jamshedpur. Bottom : Blast Furnace 'I' for Tata Steel at Jamshedpur.

### Ferrous Metallurgical Plants Delivering Ahead Through Integrated Process Capabilities





The challenges in delivering integrated processes for the metallurgical industry calls for niche expertise. To every such critical requirement, L&T leverages on its seven decades of domain expertise and meets the specific needs of a large customer base. The Company's technology prowess is constantly upgraded through engineering and technology tie-ups with global leaders. L&T has pioneered new concepts in dismantling and rebuilding blast furnaces and direct reduction plants in India.

L&T's capability spectrum in ferrous metallurgical plants include:

- Blast furnaces on turnkey basis
- Sinter plants on turnkey basis
- Coke-oven and by-product
- Corex plants
- Continuous casting plants slab casters and billet caster, hot strip mills, cold rolling mills - pickling line and tandem, cold mill, bar and rod mills, lime calcining plants, reheating furnaces
- Steel melting shop (BOF, EAF)
- Colour coating lines and galvanizing lines
- Secondary metallurgical installations
- Power distribution system design
- Load flow and short circuit analysis
- Equipment sizing and layout
- Cable interconnecting schedules
- Raceway layout



Top : Conarc furnace for Bhushan Steel at Angul. Middle : Corex plant for Jindal Steel at Vijaynagar. Bottom : Coke oven battery for Tata Steel at Jamshedpur.



Top Left : Integrated Steel Plant, Kalinganagar, Odisha. Top Right : Slab Caster at Oman. Bottom : Panoramic view of Sinter Plants at Tata Steel, Jamshedpur.

## Ferrous Metallurgical Plants Delivering Ahead Through Integrated Process Capabilities



Top Left : Sinter machine commissioned for IISCO at Burnpur. Top Right : Sinter Plant 2 for Bhushan Steel at Angul. Middle Left : Coke Dry Quenching Plant and CDQ Boilers for Jindal Steel at Bellary. Middle Right : Ladle turret installed at Bokaro Steel Plant. Bottom : India's largest Pellet Plant (6 MTPA) for Tata Steel at Jamshedpur.

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Top Left : Cold Rolling Mill for Tata Steel, Jamshedpur. Top Right : Control Panels of Blast Furnace for Tata Steel at Jamshedpur. Middle Left : Aerial view of Water Cooling System for Vizag Steel Plant. Middle Right : Inside view of the main pump house of Vizag Blast Furnace. Bottom : Exterior view of 'l' Blast Furnace for Tata Steel at Jamshedpur.

## Non-Ferrous Metallurgical Plants Enabling Industrial Growth

Non-ferrous metals cater to a large spectrum of engineering requirements and contribute significantly towards industrial growth. Being a complex domain, this sector caters to widely differing needs across a large customer base. A long-standing association with the leading industry players and the expertise of having delivered a wide range of customized solutions across the industry gives L&T the advantage to devise, develop and deliver critical construction projects with quality for the non-ferrous industries.



L&T's comprehensive offerings in the non-ferrous metallurgical plants and minerals include:

- Pot room for aluminium smelter
- Pot shell and pot superstructure
- Carbon area in aluminium smelter anode rodding and handling shop; baking furnace construction and refractory works
- Alumina storage silos
- Alumina refinery structural works, tankages, piping, equipment installation and construction
- Zinc smelter, melting and casting plant
- Copper smelter and refinery
- Lead smelter structure installation, equipment installation, refractory works and construction
- Sulphuric acid and phosphoric acid plants
- Oxygen plant including cold box installation
- Beneficiation Plants rock phosphate / lead-zinc / graphite / chrome ore



Top : Utkal Alumina Refinery at Odisha. Bottom: Illuminated view of Hindustan Zinc's Smelter Plant at Chanderiya in Rajasthan.





Top Left : Tank house commissioned for Hindustan Zinc Phase II at Chanderiya. Top Right : Bath Cleaning Machine in operation at Rodding Shop in NALCO Angul. Middle Left : Air Separation and Oxygen Plant for Birla Copper at Dahej. Middle Right : Pot room for Hindalco Aluminium Smelter Plant at Mahan. Bottom : Sulphuric Acid Plant for Sterlite Copper Smelter at Tuticorin

# Benchmark Projects A Saga of Continuous Excellence





L&T augments its capabilities by employing innovative construction techniques and productivity boosters that accelerate the pace of construction. Today, by virtue of its rich experience, expertise and speed of construction, L&T has set world-class standards and new benchmarks in the metallurgical industry.

- L&T completed India's largest pellet plant (6 MTPA), LD-3 and thin slab caster rolling mill at Jamshedpur, bedding and blending system for iron ore mines at Noamundi for Tata Steel, Blast Furnace - 4 at Bellary for JSW Steel.
- A slew of significant projects executed by L&T include iron-making and steel-making facilities for Tata Steel at Kalinganagar, for Steel Authority of India at Bhilai, for Bhushan Steel at Angul, for JSW at Bellary, an alumina refinery for Utkal Alumina at Rayagada concurrently.
- L&T is also involved in the fabrication of coke oven battery equipment including primary gas cooler for Tata Steel and Bhushan Steel; blast furnace shell, lower tower structures and hot stove shell including dome for SAIL's Bhilai Plant; Nitrogen vessels for the steel plants of SAIL and Tata Steel; and pot shell and pot superstructure for Hindalco Mahan Aluminium Smelter.



L&T's project milestones in the metallurgical industry include:

- India's largest pellet plant
- India's largest hot strip mill complex
- Three zinc smelters in a span of seven years
- 2.5 MTPA blast furnace commissioned in 25 months
- Concept to commissioning of 204 Sq.m sinter plant in 19 months
- Rebuilding of blast furnace with a shutdown period of 105 days
- 1.2 MTPA cold rolling mill in a world record time of 27 months
- India's first integrated pig iron plant
- First gas based sponge iron plant
- First sponge iron plant
- India's first corex plant
- Largest Sinter Plant of 496 Sqm. At Kalinganagar









Top : 204 Sq.m Sinter machine at Tata Steel, Jamshedpur. Middle Left: Hot Strip Mill at Jindal Steel, Bellary. Middle Right : Hot metal at cast house for Tata Steel. Bottom : Lead Smelter Plant for Hindustan Zinc Limited at Dariba.

### Engineering Design & Research Centre (EDRC) Powerhouse in Engineering Design

EDRC - the Engineering Design and Research Centre (EDRC) of L&T's Minerals & Metals business, located in Kolkata has a multidisciplinary team of engineers, sophisticated software and hardware facilities that provides value-added integrated engineering services for clients across all M&M projects with detailed design and engineering support as part of the comprehensive EPC services.



EDRC's comprehensive engineering capabilities cover:

#### **Support in Process**

- Piping and instrumentation diagrams
- Sizing and selection of equipment
- Plant operational philosophy
- Site based design verifications

#### **Mechanical and Utilities**

- Plant and equipment layout
- Detailed engineering drawings for equipment
- Pipe stress analysis and isometrics
- Design of utility and HVAC systems

#### **Controls and Information Systems**

- Instrument list and specifications
- Control and safety logic development
- Instrument installation drawings
- Loop schematics



Top: 3D model of Blast Furnace. Bottom: Design engineers at EDRC

#### Electrical

- Power distribution system design
- Load flow and short circuit analysis
- Equipment sizing and layout
- Cable interconnecting schedules
- Raceway layout
- Earthing & lightning protection design and layout

#### **Civil, Structural and Architectural**

- Site layout and geo-technical recommendations
- Design drawings
- Structural analysis
- Foundation drawings
- Architectural drawings

EDRC is certified for ISO: 9001-2008 for its operations. EDRC integrates L&T's in-house strength in design and engineering to provide engineering solutions that ensure the safety of the plant, are construction friendly and meet the highest quality norms of international standard. EDRC's advanced engineering resources provide computer aided engineering and simulation facilities. Its in-house innovative packages are backed by the expertise of on-board professionals with varied experience and in-depth knowledge in delivering critical and complex engineering solutions to projects in India as well as in the international arena. This unique capability facilitates M&M to undertake projects with a comprehensive responsibility of Engineering, Procurement, Supply and Construction.





Top : Finite Element Analysis of Sinter Cooler. Bottom : Sinter Plant-3 for Rourkela Steel Plant.

### Bulk Material Handling (BMH) Custom-engineered solutions from Concept to Commissioning





Customized material handling systems are critical for maximising delivery and improving plant efficiency. The large volume of material handling transaction in the core sector augments the need for giant machinery and state-of-the-art material handling systems.

L&T's Bulk Material Handling business (BMH) is a pioneer in the field of dry bulk handling with more than three decades of expertise. BMH provides comprehensive Engineering, Procurement and Construction (EPC) solutions for material handling in core sector industries covering power, steel, mines, ports & speciality conveyors..

L&T's capabilities in this sphere encompass the entire gamut of material handling needs: system design and engineering, civil and structure construction, manufacture, procurement and supply, erection, testing, commissioning and performance test, operation and maintenance, spares and after sales service.

L&T's equipment offerings in the material handling sector include:

- Wagon Tippler (up to 30 tips per hr)
- Stacker Reclaimer (up to 6800 TPH)
- Barrel Reclaimer (up to 2000 TPH)
- Bucket Wheel Excavator (up to 7531 TPH)
- Mobile Transfer Conveyor (up to 11000 TPH)
- Crusher (up to 2000 TPH)
- Apron Feeder (up to capacity of 2500 TPH)
- Travelling Tripper (up to 3600 TPH)
- Spreader (up to 4420 cu.m/hr)
- Wagon Loader, Ship Loader and Unloaders
- Pusher Car and allied equipment



BMH provides EPC solutions for design, manufacture, supply, erection, testing & commissioning of Coal Handling Plant (CHP) and Ash Handling Plant (AHP) for thermal power plants. BMH's track record includes more than 50 CHPs and 5 AHPs.

#### Comprehensive EPC solutions for systems include:

- Coal unloading systems
- Coal conveying systems
- Coal stockyard and blending
- Bottom ash handling
- Fly ash handling
- Ash slurry disposal system
- High Concentration Slurry Disposal (HCSD) System

### PROJECT MILESTONES IN THE MATERIAL HANDLING SECTOR INCLUDE:

- NTPC Kahalgaon (3X500MW) : CHP 3000 TPH
- NTPL Tuticorin (2X500MW) : CHP 2000TPH
- Rajpura Power Plant (2X660MW) : CHP 2500 TPH
- Adani Tiroda (5X660MW) : CHP 3600 TPH
- DVC Koderma (2X500MW) : CHP 1600 TPH
- Hindalco Mahan (6X150MW) : CHP 1700 TPH







Top : Stacker reclaimer for Damodar Valley Corporation's Coal Handling Plant in Koderma. Middle : Crescent Wagon Tippler for a power plant. Bottom : Bird's eye view of the jetty with its conveyors at India's deepest all weather private sea port at Dhamra near Odisha.

### Benchmark Projects Giant Machinery for Critical Industrial Needs





### Bulk Material Handling for Steel, Mines, Ports and Specialty Conveyors

BMHs provides comprehensive EPC solutions covering design, manufacture, supply, erection, testing and commissioning of dry bulk material handling for Steel, Mines, Ports and Specialty Conveyor segments.

Major offerings for key sectors include:

#### Steel

- Material unloading system
- Raw material and sinter crushing and screening system
- Raw material and sinter conveying systems

#### Mines

- Mining equipment (overburden removal and lignite extraction)
- Raw material conveying systems
- Raw material crushing and screening system
- Material loading system
- Stacking and reclaiming, specialty conveyors



Top : 1000 TPH capacity Barrel Reclaimer at Bhilai Steel Plant. Middle : Raw Material Handling System for Tata Steel at Jamshedpur. Bottom : 5460 cu.m/hr capacity bucket wheel excavator (1400 l) for Neyveli Lignite Corporation.

- Raw material unloading system
- Raw material conveying systems (pipe / belt conveyor)
- Rapid loading systems (up to 5500 TPH)
- Stockyard equipment

#### SIGNIFICANT MILESTONES EXECUTED FOR THE MATERIAL HANDLING SECTOR INCLUDE:

- World's longest single belt conveyor (17 Km) for Lafarge LBC
- 5500 TPH conveyor for Dhamra Port
- Rail Material Handling System for IISCO at Burnpur
- Material Handling System at Joda Mines 4 MTPA
- RMHS for Tata Steel (Double Decker Conveyor)
- Noamundi Mine 2.7 MTPA expansion
- Special Mining Equipment for NLC







### Established Expertise in Engineering Design Unmatched Design Capability

BMH's engineering, design and research centres in Kolkata is ISO certified (BS EN ISO 9001- 2008) and offer comprehensive engineering solutions from concept to commissioning for a wide variety of disciplines covering mechanical (system and equipment), civil & structural and electrical & instrumentation for mining, coal handling for thermal power plants, raw material handling in steel plants and export and import of raw material in ports and harbours.

BMH provides the client with unmatched design and engineering solutions for the manufacture and supply of critical equipment like the stacker reclaimers and other stockyard machines, wagon tippler, marshalling equipment, paddle feeder, crusher, grizzly feeders and bin extracting system including rapid/wagon loading systems.

BMH has strategic alliances with leading global technologists to avail of new concepts and technologies and provides end-to-end solutions for critical applications:

- Ashton Bulk (UK) for Wagon Tippler and Ducking Tripper
- UCC (USA) for Ash Handling System

BMH has a successful track record of having executed more than 53 coal handling plants, 115 stockyard equipment, 12 material handling plants, 24 RMHS plants, 92 wagon tipplers, 8 ship unloaders, 13 wagon shifters and about 250 Km of conveying systems.

#### **Basic Engineering and Design Layouts**

BMH's Engineering Design and Research Centre (EDRC) - BMH provides basic engineering and detail engineering from concept to commissioning to suit the specific requirements of clients. BMH offers cost effective proposals with various alternatives meeting the delivery schedules.

#### **Equipment Design and Development**

BMH has a dedicated team for developing state-of-the-art equipment with environment-friendly design to meet the requirement of the entire spectrum of raw material handling sector, including:

- Wagon shifters
- Pusher cars
- Tandem tipplers
- Barrel reclaimers
- Stacker reclaimers

The team has designed material handling equipment up to 6800 TPH and is capable of designing and developing higher capacities of equipment as per requirement.

#### System Design and Engineering

EDRC-BMH has the capability to design core conveying systems and other allied systems like, dust extraction, ACVS and MEP services. It has comprehensive capabilities to design electrical and instrumentation systems including SCADA and DCS system thus offering complete EPC solutions for material handling projects involving coal, coke, iron ore, limestone, bauxite base mix and alumina.

#### **Comprehensive Civil, Mechanical & Electrical Engineering**

BMH has an all-round ability to provide complete detail engineering solutions in all disciplines to meet stringent delivery conditions including mitigation of any interface issues. Capabilities comprise handling of Greenfield and Brownfield EPC jobs including plant revamp.



Bottom Left : Isometric view of Crescent Wagon Tippler. Bottom Right : 3D model of Rapid Loading Silo including foundation.



BMH provides optimal engineering solutions by using high-end software such as:

- NASTRAN
- STAAD-PRO
- BELTSTAT
- FE-MAP
- TEKLA
- Plant Design Suite (Inventor)
- Solid Edge
- WALLAP

BMH has also the capability to deliver CNC inputs through TEKLA-3D for fabricating structures in CNC equipment.

#### **Geotechnical Engineering**

BMH's specialised geotechnical team offers solutions for foundation related issues, deep excavation schemes including sheet piling, soldier piles, Berlin wall and diaphragm wall as well as advanced solutions like stone columns, deep foundations, Gabion wall, soil nailing etc., using latest software like TALREN, PLAXIS-2D and MODFLOW.

For critical projects activities, engineering reviews are conducted regularly and optimal construction methodologies are worked out in consultation with L&T's Construction Methodology and Planning Cell.



Top : Design engineers at work in the state-of-art Engineering Design Research Centre. Bottom : Shotcreting and slope protection at Joda Mining Project.

### Product Business Unit A Range of Product offerings and Service Support

L&T's Product Busines Unit is a world-class one-stop-shop for a wide spectrum of fabrication, machining and assembly of products for core industries such as chemical, cement, steel, paper, power, mineral, and railways.

L&T's Kansbahal Works (an ISO 9001 accredited unit) in Odisha undertakes design, manufacture and supply of complete range of crushing systems and equipment, blast-free surface miner solutions, apron feeders & critical machinery and parts for steel and paper industry. The comprehensive product offerings are complemented with excellent design, engineering, quality control and logistic expertise.

### **Product portfolio:**

#### **Crushing Systems and Equipment**

L&T offers complete crushing solutions from conceptualization to layout design to manufacturing, supply and servicing of all equipment and accessories for various applications in limestone, coal, lignite, granite, basalt, bauxite, iron ore, etc.

The product range offered extends from unit equipment to complete crushing plants, both stationary and mobile, of up to 2000 TPH capacity, covering all types of size reduction technology, single/double toggle jaw crushers, cone crushers, feeder breakers, roll crushers and sizers, impact crushers, ring granulators and hammer mills. This also includes wobblers and vibratory screens, grizzly/apron feeders, and dryers, etc.

L&T is India's largest supplier of limestone crushing plants with a market share in excess of 80% for major cement plants. L&T crushers are also exported to several countries, including Nepal, Bangladesh, Bhutan, Dubai, Saudi Arabia, Myanmar, Indonesia, Nigeria, Kenya, Tanzania, Ethiopia, Congo, Mali, Malawi and Australia.

#### **Blast-Free Surface Mining Solutions**

L&T is India's first designer and manufacturer of eco-friendly surface miners. Since launching of its first machine in the year 2004, L&T has established a dominant market position in the Indian surface mining industry by delivering rugged, cost effective and environmental friendly mining solutions. L&T's surface miners cater to diverse rock cutting applications for varied deposits of limestone, coal, bauxite, gypsum, iron ore, etc. The surface mining options provided by L&T in medium-hard/ medium abrasive rocks have won the appreciation of users in India and in the overseas market. Major countries where L&T's surface miners are in operation include Dubai, Qatar, Tanzania and Togo (Africa) for limestone and hard rock mining applications.







Top : Limestone Crusher. Bottom Left : Rotary Breaker supplied to Rio Tinto. Bottom Right : Ring Granulator.





#### **Metallurgical Equipment**

The Product Business Unit also manufactures customised equipment for Metallurgical Industry (steel, aluminium, zinc, copper, etc.) meeting international standards/specifications. This includes the complete range of equipment for the steel sector covering the following:

**Coke Oven :** Pusher car, charging cars, guide cars, quenching cars and quenching car locomotives, wagon pushers, reversing winch etc.

**Iron Making :** Top charging equipment, tuyere stocks, probes, hot metal handling system including torpedo ladle cars, transfer cars, ladles, etc., slag handling system including transfer cars, slag pots, etc.

**Steel Making :** Basic oxygen furnace, electric arc furnace, vaccum degassing system, ladle transfer system including transfer cars, ladles, ingot strippers, etc.

**Continuous Casters :** Equipment of billet/slab caster including ladle turret, tundish car, strand guide segments, dummy bar system, roller tables, etc.

**Rolling Mills :** Equipment for hot / cold rolling mills, Steckel mills, wire rod mills etc. such as walking beam conveyor, coiler

mandrel, coil transfer cars, pinch roll assembly, flattener, bridle roll assembly, descaler, adjustable guides, shears, belt wrappers, etc.

In addition, L&T manufactures customised equipment for the non-ferrous segment (e.g., aluminium, copper, zinc, etc.) as per specific requirements of the customer.





Top Left : Mobile Jaw Crusher. Top Right : Skid Mounted Gypsum Crushing Plant at Oman. Skid Mounted Coal Crushing Plant Middle : Quenching Car loco unit. Bottom : L&T's surface miner in operation.

### Product Business Unit A Range of Product offerings and Service Support



#### **Apron Feeders**

L&T offers a complete range of heavy duty apron feeders and provides customised designs and tailored solutions for a variety of mineral applications and undercarriage components in the following size ranges:

- Pan Width: 900 mm 2800 mm
- Centre Distance: 2000 mm 76400 mm
- Capacity: 10 TPH 2860 TPH

L&T has a track record of having delivered more than 500 machines. Backed by experienced in-house engineering professionals, L&T adapts to the specific requirements of the client and provides specialized solutions for hot clinker handling, anode butt handling and totally enclosed conveyors.

#### **Torpedo Ladle Cars (TLCs)**

L&T offers torpedo ladle cars ranging from 175t to 400t to meet the transport requirements of hot metal in steel plants. With three decades of experience in this field, L&T is in a unique position to offer concept-to-commissioning solutions (including refractory) for hot metal handling with TLCs meeting specific customer requirements. The TLCs can be offered with advanced features like automated positioning system, on-board weighing system, online tracking system, etc. The torpedo ladle cars offered by L&T are designed and manufactured with stringent QC measures at L&T's integrated manufacturing facility in Odisha.

#### Eco friendly sand manufacturing solutions

In association with Kemco, Japan – the world leaders in sand manufacturing solutions, L&T has been manufacturing and supplying advanced automated sand manufacturing plants that can produce high quality sand with precise fineness modulus. L&T also caters to a range of simpler sand manufacturing plants such as sand air classification plants used extensively across the industry for filtering the ultra-fines from the crusher dust.

#### **Design and Engineering**

A well-equipped design and engineering facility at Kolkata provides a wide spectrum of design and engineering services ranging from concept to commissioning for all types of industrial machinery requirements.

Comprehensive engineering services include:

- Basic/Detailed Engineering
- Proposal Engineering
- Crushing Plant Layout Design
- Product Development and Optimization



## Manufacturing Capabilities Hi-Tech Machine Building Centre

L&T's Kansbahal Works (which started as an Indo-German venture in 1960), has evolved into a world-class integrated manufacturing centre with facilities for fabrication, machining, assembly and under carriage works. The works is an ISO certified unit accredited with ISO: 9001-2008, ISO: 14001-2004 & OHSAS 18001-2007 certifications by DNV.

#### Comprehensive production capabilities include:

- 12800 Sq.m fabrication shop
- 16050 Sq.m covered area for machine and assembly shop
- Testing and inspection facilities









### Frontline Fabrication Unit One-stop-shop Solutions

L&T's Engineering Workshop (LTEW) at Kanchipuram (Tamil Nadu) is an ISO 9001-2008 certified Workshop that undertakes fabrication and supply of plant and equipment including sophisticated as well as custom designed equipment components for core industries like steel, power, refinery, etc. It sprawls over 75 acres, with fabrication being carried out in the covered shops as well as in open gantry fabrication / assembly yards. The total working area of the covered sheds is 12000 Sq.m and open yards is 24000 Sq.m with handling of EOT and gantry cranes respectively.

LTEW has been meeting the challenges of quality, delivery and safety with the help of experienced engineers, skilled artisans and sophisticated tools and tackle aided by specialized fabrication techniques. Computerized programmes and planning are carried down from the macro to the micro scale to fully analyse individual elements and install them in the correct sequence so as to complete the job in the time allotted by the client.

#### Major offerings include:

- Surface condensers/de-aerators for power plant
- Primary gas cooler for coke oven battery of steel plant
- Sinter machine/sinter cooler equipments of steel plant
- Pressure vessels for steel plants
- Blast furnace equipments of steel plant
- Stacker and reclaimer for coal handling projects
- Paddle feeder/flow dividers
- Mobile transfer cars/bucket wheel excavator
- Pot shells
- Pelletising disc







Top : Bucket wheel and surface condenser fabricated at Engineering Workshop (LTEW) in Kanchipuram. Bottom : Fabrication Shop.

### Project Management Competency Enhancing Operational Efficiency

L&T's integrated Project Management approach contributes significantly to achieve project operation efficiency and sustain overall business growth trajectory. L&T is one of the first companies to implement the Enterprise Resource Planning (ERP) software in its business operations. ERP integrates all the execution processes of the projects and provides the project teams with up to date information at all stages of execution.

#### Planning

L&T has standardised on Primavera Enterprise software for prioritizing, planning and managing projects by clearly identifying role-specific functionality to satisfy each team member's needs, responsibilities, and skills for managing projects of various levels of complexities and size.

#### **Project Team**

L&T adopts a dedicated task force approach for execution of the projects by identifying the project team by due evaluation of the skill sets of resource vis-a-vis requirement of the project from its vast pool of resources available at its various capability centres. Backed by long-standing experienced team leaders, the balanced matrix of project team efficiently negotiates the project complexities to emerge in the forefront with great success.

#### Engineering

L&T's project task force comprises of multi-disciplinary and highly skilled engineers who review the engineering inputs and co-ordinate with EDRC for the design basis for subsequent engineering. It facilitates smooth interaction and interfaces between the customer and EDRC. This ensures that collaborative design, engineering and project management bring measurable benefits in terms of reduced cycle time and better service levels.

#### Procurement

L&T undertakes procurement activities including vendor identification and development, global sourcing, logistics and quality. Continuous widening of vendor base is ensured through structured and comprehensive vendor evaluation, qualification and continuous monitoring. The procurement team works towards fast track order placement in strict compliance with contract specifications and in line with the planning and scheduling of the project team.

#### **Logistics Management**

All arrangements for safe, low cost and timely deliveries are made for the domestic and international customers. The procurement team along with the logistics specialists undertake the shipping arrangements by employing professional forwarders to ensure safe and timely deliveries.



Effective and efficient management of resources for handling project encompassing Conceptualization, Development & Delivery involves:



and timely closure

### Strategic Alliances Partners in Technology with Global Leaders

L&T nurtures strategic alliances with world leaders to expand its capabilities and to remain at the cutting edge of change. L&T's project specific strategic alliances with the leading global technologists is a part of its business-line enhancement and diversification in the core sectors.

- Paul Wurth for Blast furnace, Coke Oven and By-product plant
- Outotec for Sinter Plant and Pellet Plant
- Ashton Bulk, UK in High-end Material Handling equipment
- UCC, USA for Ash Handling System
- KEMCO, Japan in advanced Sand Plant technology
- ARD Crushing Ltd., UK in Cone Crusher technology
- Doppelmayr for Ropecon
- Kopex, Poland for Shiftable conveyor
- Primetals In Steel making Caster and rolling
- Brass In slurry pipeline
- DRA / NORWEST In Ferrous ores, Non-ferrous ores and Coal washeries



Top Left : Pipe Conveyor for IISCO Burnpur Steel Plant. Top Right : L&T's G33 wagon tippler, a state-of-the-art wagon unloading system. Bottom : Exterior view of Blast Furnace-2 for SAIL Bokaro Steel Plant.





Top : Hot stoves under operation at Blast Furnace 'H' for Tata Steel, Jamshedpur. Bottom : Ropecon transporting bauxite for Jamalco / Alcoa, Jamaica.

### Men and Machine Robust Resources

L&T's robust engineering set-up with a unique blend of experienced and young engineers in all disciplines for project management combine with its huge fleet of sophisticated plant and machinery to execute projects to the highest standards.

L&T has India's largest fleet of construction equipment comprising of a wide range of sophisticated and specialised equipment for speedy, high-quality and cost-effective construction. The asset base includes heavy duty cranes, crawler/tyre mounted hydraulic cranes, heavy earthmovers, batching plants, concrete pumps, boom placers, hydraulic drilling rigs, winches, gantry, compressors, D.G. sets and various types of welding plants. L&T's Plant & Machinery Cell offers the "Total Equipment Management Services" which includes identification, evaluation, selection, mobilisation, commissioning, operation and maintenance of plant and machinery across all project sites.





Top : L&T's robust engineering set-up with a unique blend of experienced and young engineers. Bottom : Blast Furnace 'I' for Tata Steel.

### Competency Cells Value-added Support Services





L&T's Specialized Construction Methods and Planning Cell (SCMPC) complements the operation of projects by providing value added solutions for critical and complex civil construction and heavy lift erection and related works.

SCMPC focuses on implementation of cost effective construction methods and aims at systemising, automating and mechanising on elaborate processes by incorporating the latest trends in construction technology. Major areas of innovation and initiative implemented include modularisation of erection, mobile formwork for continuous casting and mechanised construction methods.

With a prime focus on safety, this cell develops flawless and construction friendly approach for handling critical facilities by maximising yard works and minimising the field works. With a strong fleet of heavy lift cranes ranging from 150 tonnes to 750 tonnes, this cell has executed many jobs through proper schemes and methods. Super-heavy elements (up to 3000 t) are lifted through specially built towers and strand jack systems together with heavy skidding facility.



Top : Erection of Down Comer Module with Refractory completed on ground level for Blast Furnace at Vizag Steel Plant. Middle : Erection of Lower Tower Module for Blast Furnace at Tata Steel, Jamshedpur. Bottom : Cable gallery of RMHS at Tata Steel.

### Quality Management Committed to Excellence



Quality management at L&T begins with a company-wide drive to support business goals. Effective processes are developed for everything from research and development and product implementation, to sales and customer support. At L&T, we constantly strive to create high-quality products and services and implement on-going improvements that will meet or exceed customer's needs.

L&T is committed to continual improvement of its business processes by implementing globally accepted standards such as ISO 9001:2008, ISO 14000: 2004 and OHSAS 18001:2007. L&T's operating sites, implement the appropriate quality policies depending upon their locations, types of products or services provided, and prevailing regulatory requirements.

CERTIFICATE	CERTIF CATE OF APPROVAL This is to certify that the Quality Management System of	
Contents into         Mark confidence data         Viete.           Mark 2018 - 100, April 2018 - 101, Apri	Larsen & Toubro Limited Metallurgical & Material Handling IC Godrej Water Side, Tower 2, Sector V, Salt Lake, Kolkata – 700091, INIDIA	
(Construction) Metallurgical & Material Handling Strategic Business Group 11th & 12th Floor, Godrej Waterside, Plot No. 5, DP Block, Sector V, P.S.: Bidhannagar (E), Salt Lake City, Kolkata - 700 091, Dist.: 24 Parganas,	has been approved by Lloyd's Register Quality Assurance to the following Quality Management System Standard:	
West Bengal, India	ISO 9001:2008	
has been found to conform to the Occupational Health and Safety Management	The Quality Management System is applicable to:	
System standard: OHSAS 1800:1:2007 This certificate is valid for the following scope: Management of environmental, occupational health and safety requirements at project sites and offices	Engineering, Procurement, Manufacturing, Project Management, C and Commissioning of EPCSemi EPC Projects In domestic an international markets including all operating support services in the business vertical of Metallurgical & Material Handling comprising of business units: Busik Material Handling Data Material Handling	nstruc wel compa follov
	Approval Original Approval: 18 July 2003 Certificate No: MUM0060918	
Pace and door. Cheered, 15, April, 2016 Cheered, 15, April, 2016	Current Certificate 201 April 201 Certificate Expiny: 28 February 2 Issued by: Lloyd's Register Quality Assurance	:018 : Limite
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Passion & Excellence... That's our world

...Aligned to your world

# Quality Assurance

### Environment Health and Safety (EHS) Enhancing Effectiveness

L&T is committed to protecting the environment, the health and safety of its employees, customers, and the public by adhering to stringent regulatory and industrial standards across all its facilities, encouraging pollution prevention, and striving towards continual improvement.

L&T seeks to go beyond compliance with regulatory standards in pursuit of excellence in environmental, health and safety management practices, as an integral part of its total quality management system. L&T's corporate management has enunciated policies that emphasize on EHS through its structured and well-defined procedures at every stage of construction that protect the environment. L&T's global operational policies and standards support its commitment to continuous improvement. They serve as a sound foundation for EHS management processes. L&T's business units build upon this foundation with programs tailored to their culture and work environment to strive toward L&T's ultimate vision of zero injuries and zero adverse environmental impact.



#### Corporate Environment, Health & Safety (EHS) Policy

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

- Incorporate EHS considerations in all business processes
   Ensure compliance with statutory and other applicable
- requirements • Prevent adverse environmental impacts and
- occupational health and safety risks \* Conserve natural resources, minimise waste generation
- and environmental emissions Impart structured training and augment resources for effective EHS performance
- Encourage communication, consultation and collaboration with all stakeholders





### Corporate Sustainability Initiatives for a better world

L&T acknowledges its responsibility to safeguard the interests of the future generations by implementing initiatives to conserve natural resources and protect the environment and create awareness among all levels in the organisation. Through its Social Responsibility Cell, L&T invests among communities residing in the vicinity of its facilities and projects, taking sustainable initiatives in the areas of health, education, environment conservation, infrastructure and community development. Recognising the need for skilled workmen, L&T established construction skills training institutes across various locations in India. These institutes have been highly successful in training and providing employment in the construction sector to youth from the rural sectors. The organisation strives to maintain the highest standards of corporate ethics with a transparent governance structure while undertaking such initiatives.





### Recognition and Awards Emblems of Excellence

L&T's signatures of excellence are acknowledged across industrial domains. Over the last seven decades the Company has made outstanding contributions in the field of technology, engineering and manufacturing.

The Company has bagged several prestigious national and international awards for its record of achievements.

- Forbes ranked L&T the 9<sup>th</sup> Most Innovative Company in a global study, 2012. L&T was rated highest amongst Indian companies that made it to the list, and was the only Indian Company to feature among the top ten.
- L&T featured five times on the Forbes Fabulous 50 list of the best public companies in the Asia-Pacific region.
- Economic Times adjudged L&T as the Company of the Year in 2010.
- L&T has been wining top honours at the coveted Construction World, NDTV Business Infrastructure awards.
- L&T is adjudged as the 4<sup>th</sup> Greenest Company in the World (Industrial Goods Category) by Newsweek in its 'Green Rankings' publication.
- Fortune India survey ranked L&T as India's most admired company in Engineering and Construction sector.







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