
Larsen & Toubro Limited Hazira Works

(i) Unit Profile

Larsen & Toubro was founded by two Danish engineers, late H Holck Larsen and late Soren Toubro in 1938. It was converted to a private limited company in 1946 and has been a public limited company since 1950. Since then it has grown in to a professionally managed, large engineering conglomerate and has acquired leadership position in all the areas of its activities. With yearly sales of over Rs 11,000 crores and its presence in country's core sectors, L&T foresees itself as a key player in engineering sector. It has a vision to become a professionally managed Indian Multi national. Its tag line – “We make the things that makes India proud” is quite popular with media and public.



L & T – Heavy Engineering Division

Company has set up world-class heavy engineering facilities at Hazira, near Surat, on the coastal belt of western India. The unit is engaged in design and manufacture of hi tech fabricated equipment for core sectors such as Oil & Gas, Refineries, Petrochemicals, Fertilizers, Nuclear and Aerospace for our customers in India and abroad. Facilities set up on 200 acres of land on the bank of river Tapi, houses several well equipped shops, open yards for fabrication of large equipment and off shore platforms and private jetties for marine transportation of large and heavy equipment.

Hazira works has established numerous Benchmarks and has several firsts to its credit. E.g., largest FCC (Fluidized Catalyst Cracking) Regenerator in the world, first hydro cracker, first CrMoV reactor, established global benchmark in early delivery for 500 MWe End Shields, critical equipment for nuclear power plants etc.

Heavy Engineering Division at Hazira works has following quality certifications

Product Quality certifications:

ASME – U, U2, S Stamp by ASME – USA
Permission to manufacture equipment under
IBR act by CIB
AD-Merkblatter by RWTUV

Safety & Quality License for importing
Boilers & pressure vessels in China by
China State Bureau of Quality & Technical
Supervision

Systems & Business Excellence accreditations:

ISO 9000 – 2000 by DNV India
ISO 14000 & OHSAS 18000 by
DNV India
IQRS – Level – 7 by DNV –
Netherlands



While pursuing excellence in its chosen fields, Hazira Works have won following awards in recent past

- Energy Conservation Award for years 1998 – 99 & 2003 –04 instituted by Southern Gujarat Chamber of Commerce and Industries.
- “Excellence for Innovations in HRD” for year 1998 –99 by CII Western Region
- National Safety Award for years 2000 & 2002 by British Safety Council.
- Award for Social welfare for year 2000 –01 by Southern Gujarat Chamber of Commerce and Industries.
- “Strong Commitment to TQM “ by CII as part of CII Exim Bank awards for Business Excellence.
- “Best Supplier” certificate from Fluor Daniel – USA , global EPC players.

(ii) Energy Consumption

At L&T Hazira, primarily following sources of energy are used.

Conventional:

- (a) Electric Power
- (b) High Speed Diesel / LDO
- (c) Natural Gas
- (d) LPG

Non – Conventional:

- (a) Solar
- (b) Bio-Gas

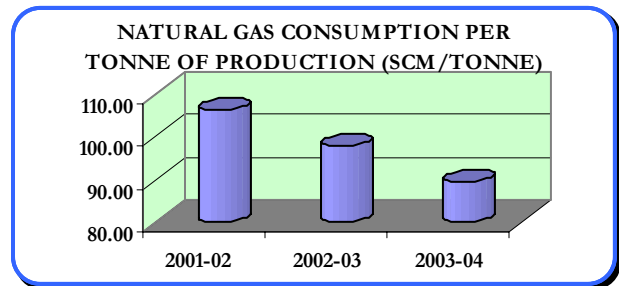
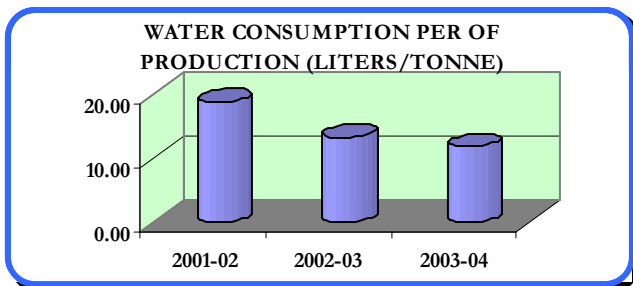
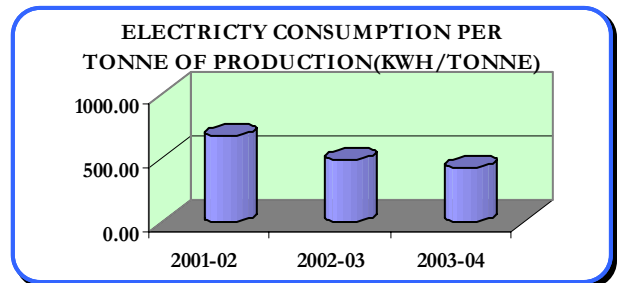
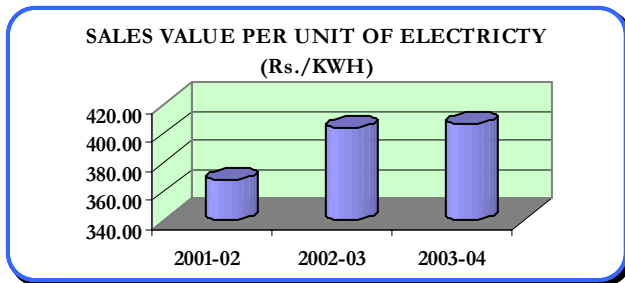
Among the above sources, major source of energy is Electric Power. See chart for consumption of each of them below during the past three years

Unit manufactures extremely diverse range of product. Consumption of energy varies depending upon type of product being manufactured in the industry. E.g. for normal structural welding, energy consumed per tonne of production is less. However, the same is high when pressure vessels and reactors are manufactured. The energy consumption increases considerably if there is a large amount of strip cladding done for providing a different base metal inside reactors/vessels. Now, considerable strip cladding work is carried out for manufacture of Reactors.

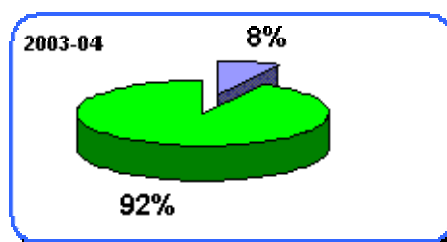
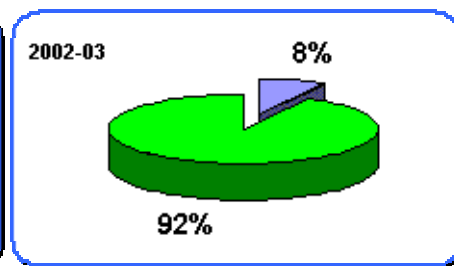
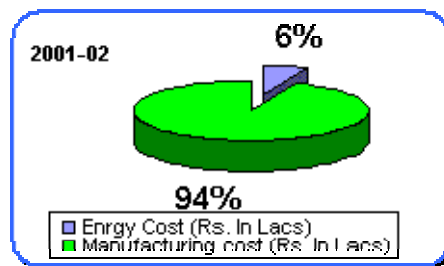
Under such diverse product range, there is no Benchmark for units of energy consumption per tonne of production or output in value per unit of energy in our kind of diverse products industry. However, the trends are as given below where every product may be different and designed as per customer requirement.

| YEAR | TOTAL CONSUMPTION {Purchased + Generated} (KWH in Lacs) | OUTPUT IN SALES VALUE (Rs. in Lacs.) | SALES VALUE PER UNIT OF ELECTRICITY (Rs./KWH) | PRODUCTION OUTPUT IN TONNES | ELECTRICITY CONSUMPTION PER TONNE OF PRODUCTION (KWH/TONNE) |
|---------|---|--------------------------------------|---|-----------------------------|---|
| 2001-02 | 63.28 | 23287 | 368.00 | 9455 | 669.28 |
| 2002-03 | 82.76 | 33435 | 404.00 | 17049 | 485.42 |
| 2003-04 | 98.83 | 40194 | 406.70 | 23414 | 422.10 |





Energy Cost as percentage of Manufacturing Cost



(iii) Energy Conservation Commitment, Policy and Organizational Setup

At L&T's – Hazira Works very focused attention is given to energy conservation measures since inception of Hazira Plant (1986-87). Unit has undergone four independent energy audits so far by various external agencies. All the recommendations by these auditors are implemented.

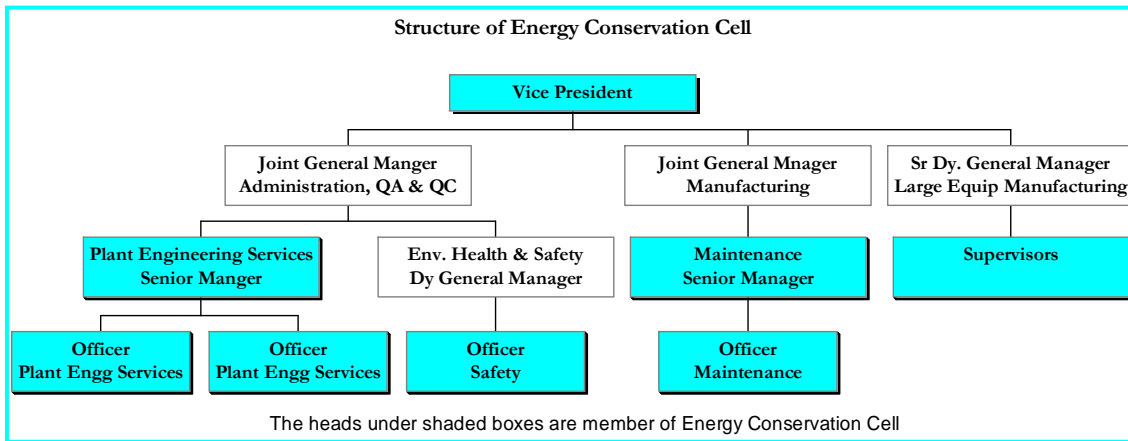
In the past, a cross functional improvement team was set up, which was given a class room training to work on the project of energy conservation in a very structured and data driven Japanese method known as “Juran on Quality Improvements”(JQI). This team identified the operations/processes responsible for energy wastage and implemented the remedies to eliminate or reduce this wastage. This systematic approach has resulted in to substantial savings and improvements in many areas of operations.

Policy

L&T Hazira Works has integrated system of ISO – 14001 for Environment and OHSAS – 18001 for Occupational health and Safety where Energy Conservation is one of the integral parts of the policy. To monitor the activities, performance and results on energy conservation, a Management Programme (MP) is in place under the EHS system, which is periodically audited by internal and external auditors.

Energy Conservation Cell

After completion of the Project given to the team, a permanent “Energy Conservation Cell” comprising members from production, planning, purchase and maintenance department was formed in 1998-99. The cell is responsible for holding the gains obtained from earlier improvement projects and explores new areas and technologies for energy conservation on continuous basis. To ensure availability of resources and timely implementation of energy conservation measures identified by this cell, the unit head [Vice President – Mr. V C Bedi] himself monitors and guides the activities of this cell.



(iv) Energy Conservation Achievements

L&T has been conscious regarding savings of energy since the last 14 years. Some of the implemented measures are as under:

- ◆ Use of Energy efficient equipments like, high frequency tools in place of pneumatic tools.
- ◆ In the area of Illumination: Use of HPSV and CFL light fittings, Electronic ballasts with triphosphorous tube lights, Introduction of separate transformer for Office and shop lighting load, Use of natural light in buildings,
- ◆ In the area of Compressed air: Disposing off Centralised air compressors by introduction of portable compressors
- ◆ In Electrical system: Use of P.F. improvement capacitors and demand side management.
- ◆ Conversion of all main motors from delta connection to star connections, Conversion of Half wave to Full wave welding rectifier and prevented idle running of equipments in all possible areas
- ◆ Thermal Energy: Introduction of VAM air conditioning system working on Natural Gas, Conversion of LPG to natural gas fuel for Stress Relieving furnace & shop use, Introduction of PID controllers for air/fuel ratio in furnace, Installation of 125 KVA Natural Gas based Generator instead of Diesel Based Generator
- ◆ In-house R&D: Auto stop of H.F.Generators, welding machines.
- ◆ Non-Conventional source of energy: Installation of solar water heaters in various possible areas and use of Biomass.

In the 2003-04, the projects implemented are as below: **The details of major projects with photographs are given in Annexure – C.**

- [A] CNG Based power generator
- [B] VVVF drives for Electrical Operated Travel [EOT] Cranes
- [C] New Generation welding sets
- [D] Automatic Temperature controls and recording system
- [E] Water Conservation
- [F] Modified air conditioning system in SKODA horizontal borer panel.
- [G] Implementation of SON-T Plus lamps for outdoors lighting.
- [H] Installation of chopper drives for Battery operated truck.
- [I] Vacuum Packaging System for electrodes eliminated baking activity.
- [J] Modular partition for our heat treatment furnace saves energy during heat treatment of smaller jobs.
- [K] Conversion of Diesel operated buses to CNG

(v) Energy Conservation Plans and Targets




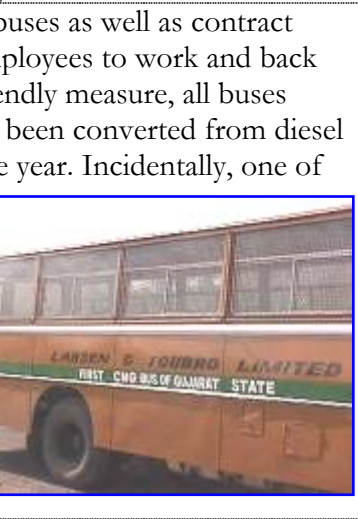

| Energy Conservation Measures (Planned) | Anticipated savings in | | Approx. investment (Rs.lakhs) | Project Commence ment & Completion year |
|--|---------------------------------|-----------|-------------------------------|---|
| | Energy Value (specify units) | Rs. Lakhs | | |
| Conversion of 1100 KVA DG Set to work on Dual-Fuel | Saving of Rs. 1 per KWH | 26.88 | 30 | 2004 |
| Conversion of 200 KVA DG Set to work on Dual-Fuel | Saving of Rs. 1 per KWH | 2.88 | 7 | 2004 |
| Modification of S.R. Furnace in LEMF | To be calculated | | 30 | 2004 |
| Solar Lighting in AFY | 255.5 KWH | 0.014 | 1 | 2005 |
| Introduction of soft starters in Asquith Deep hole drilling m/c and edge planner | 3000 KWH | 0.17 | 1 | 2004 |
| Introduction of micro gas turbine to run Furnace auxiliaries | 28800 KWH | 1.61 | 4 | 2005-06 |
| Introduction of Gas based oven for flux and welding electrode | 14600 KWH | 0.82 | 3 | 2005-06 |
| Introduction of Solar based room heating for welding electrode | 39420 KWH | 2.21 | 3 | 2005-06 |
| Introduction of natural turbine ventilator | 10220 KWH | 0.57 | 1.6 | 2005-06 |
| Introduction of T5 lamp for offices | 57600 KWH | 3.23 | 4 | 2005-06 |

(vi) Environment and Safety

L&T Hazira works is the first organization in India for receiving the certification for ISO 14001 for Environment management system and OHSAS 18001 for Occupational Health and Safety management **together** in the year 2000. Re-certification of this integrated EHS System was done in the year 2003 by DNV.

The system guided us to make continual improvements to protect environment and to conserve natural resources water, oil and power in particular.



| | | |
|---|--|---|
| <p>Treated water from Septic tank is used for gardening. This resulted in improving greenery with monetary saving Rs 4.14 Lacs per annum.</p> |  | <p>Waste coolant oil is disposed in form of cakes to 'Common waste disposal site' after water is evaporated in Solar evaporation pit.</p> |
|  | <p>Canteen waste is recycled to generate biogas, which is used for cooking.</p> |  |
| <p>Preference for use of recyclable material for stationary like folders, visiting cards, season greetings etc.</p> | <p>L&T Hazira Works has own buses as well as contract buses for transporting our employees to work and back home. As an environment friendly measure, all buses including contract buses have been converted from diesel to CNG operations during the year. Incidentally, one of these buses was the FIRST BUS IN THE STATE OF GUJARAT TO BE CONVERTED IN TO A CNG BUS. This will reduce the cost of fuel as well as help in cleaner environment.</p> |  |
|  | <p>Furnace and D.G. sets emissions are monitored strictly as per GPCB norms.</p> | <p>L&T Hazira Works is the member of Common waste disposal site for disposal of hazardous waste as well as for biomedical waste.</p> |
| <p>All our manufacturing processes are clean and do not generate any effluent.</p> | <p>Furnace and D.G. sets emissions are monitored strictly as per GPCB norms.</p> | <p>L&T Hazira Works is the member of Common waste disposal site for disposal of hazardous waste as well as for biomedical waste.</p> |

L&T Hazira works has strong commitment towards industrial health and safety. There are management programmes and operational control procedures in existence to eliminate or reduce the risk to the acceptable level. L&T Hazira Works received prestigious international award from British Safety Council London for the year 2000 and 2002.

There are several initiatives taken in recent past to elevate the level of safety:

- ◆ Safety & 5S (Work Place Management System) committees are formed in each manufacturing shops. The members of the committee take round for half an hour in the beginning of each shift.
- ◆ Near-miss reporting system is launched to enable the workers to directly report unsafe condition and incidents to safety department.
- ◆ Induction training is made compulsory for all the contract workers. A dedicated training room is made near entrance.
- ◆ Special emphasize is given for safe working at height by introducing standardized working stands of various heights, special fixtures, standardization of ladders, hiring of specialized scaffolding contractor etc.
- ◆ Safety team enforce the compliance of the legal requirements, safety rules, work permit system, use of PPEs, investigation of dangerous occurrence & accidents, training and awareness etc.



Larsen & Toubro Limited Hazira Works

Energy Conservation measures implemented in 2003 - 04

[A] CNG Based power generator:

A 250 KVA natural Gas Base Based generator has been installed to replace conventional Diesel generator.

Previous situation:

Diesel generators are used for power generation.

Investment: Rs. 16 Lacs

Savings of Rs 7.5 lacs per annum due to lower cost of natural gas.

Other benefits: In line with unit's EHS (Environment Health & Safety) policy of cleaner fuels



[B] VVVF drives for Electrical Operated Travel [EOT] Cranes:

EOT cranes in our shops consume more power. To reduce this power consumption, Variable Voltage Variable Frequency [VVVF] drives were installed in these cranes.



Previous Situation: Rotor resistance type arrangement for start up and speed reduction of motor.

Investment: Rs. 3.6 Lacs

Saving: Rs. 0.91 Lacs per annum

Other advantages:

1- Very low starting currents are required for

these drives

- 2- Elimination of rotor resistance hence elimination of wastage of power.
- 3- Smoother operations of the cranes
- 4- Reduction in the component failures, hence lower maintenance costs.



[C] New Generation welding sets:

Instead of conventional MMAW welding machines, 25 numbers of microprocessor based Inverter welding machines were procured.

Previous Situation: MMAW thyristered welding machines consumes more power during welding as well as during no load.

Investment: Rs. 17 Lacs

Saving: Rs. 7.94 Lacs per annum



Other advantages:

- 1- Lower operating costs and no load currents
- 2- Compact design with lighter weights
- 3- Better welding quality to eliminate rework and repairs resulting in to savings of energy

[D] Automatic Temperature controls and recording system:

An automatic temperature controls and recording system was designed in house and installed for pre and post heat treatment processes

Previous Situation: Undue increases in the temperatures resulting in high consumption of natural gas. Uneven temp. control of shell being heated.

Investment: Rs. 2.9 Lacs

Saving: Rs. 1 Lac per annum

Other advantages:

Since designed in-house, the import of such equipment could be avoided which saved one time investment of Rs. 20 Lacs.



[E] Water Conservation:

To conserve water and to avoid pumping to save energy, following steps are taken:



- ◆ Use of treated water from Septic tank for gardening. This resulted in saving of fresh water and its pumping of worth Rs 4.14 Lacs per annum.
- ◆ Reuse of backwash water coming from water treatment plant resulted in saving of Rs. 3.2



Lacs per annum The water is stored in water tank and due to its high-pressure head; the flow of water was very high whenever one opens the tap. Introduced orifice in all the tapes to reduce the pressure and flow resulted into saving of Rs.3.3 Lacs per annum

- ◆ Subsoil drip irrigation for lawns also resulted saving in water.

[F] Modified air conditioning system in SKODA horizontal borer panel.

The air conditioning system in our CNC SKODA Boring machine was modified to reduce power consumption. This very large machine has a separate cabinet housing critical electronic components. This cabinet was attached to the machine and hence needed more power to maintain its temperatures through the air conditioning system. This cabinet has been provided AC fixed directly on it without ducting pipe hence it is consuming less power now.

[G] Implementation of SON-T Plus lamps for outdoors lighting.

These lamps are having more lumens out put for same power consumption. No. of light fittings were reduced while compared to SON-T lamp.

[H] Installation of chopper drives for Battery operated truck.

Battery operated trucks were having resistive control for speed control operation. This was giving lot of maintenance problem as well as energy was lost due to heat up. Chopper drive is installed in all the trucks, which gives smooth control of speed and saves energy.

[I] Vacuum Packaging System for electrodes eliminated baking activity.

A high tech vacuum packaging system is installed for electrodes consumed in our yards. This system has eliminated the need to store these electrodes in baking ovens. Elimination of these baking ovens has resulted in to substantial savings of electrical power.

[J] Modular partition for our heat treatment furnace saves energy during heat treatment of smaller jobs.

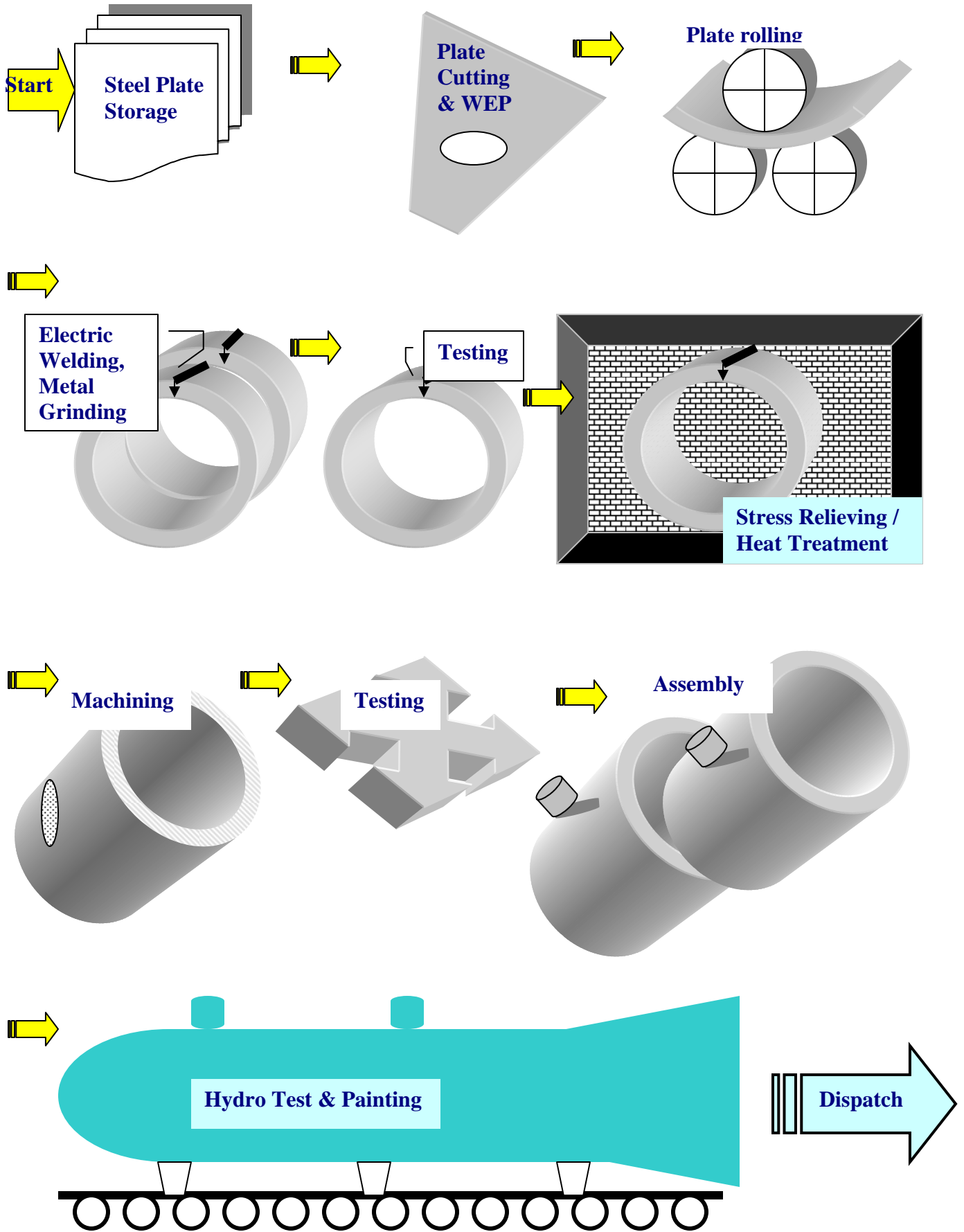
A large size gas fired heat treatment furnace was installed to accommodate largest possible jobs that are manufactured. Same furnace is used for the smaller jobs also thus resulting in to loss of fuels as the entire furnace is sealed and heated for uniform heating even for a small job. To eliminate this waste, the furnace was designed and developed with a modular partition. This partition enables the furnace operators to utilize only the minimum required area for heat treatment for a specific job.

[K] Conversion of Diesel operated buses to CNG

L&T Hazira Works has own buses as well as contract buses for transporting our employees to work and back home. As an environment friendly measure, all buses including contract buses have been converted from diesel to CNG operations during the year. Incidentally, one of these buses was the FIRST BUS IN THE STATE OF GUJARAT TO BE CONVERTED IN TO A CNG BUS. This will reduce the cost of fuel as well as help in cleaner environment.



Flow of Production Process

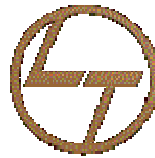




First ever Reactor built in India with Cr-Mo-V Steel.
Ready for despatch to IOCL Digboi

India's first Hydrocracker Reactor
Dim: Ø 3.35 m x 21 m LG x 232 mm Thk:
Weight: 430 T, Year: 1991,

First ever DHDT Reactor built in India
Weight: 130 T, Year: 2000



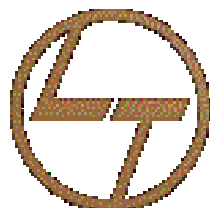
I-MNTW Deck for ONGC
Size : 29Mx22Mx21M, Weight.: 3060MT
(4 Nos), Year: 1993/94

Product Splitter for Saudi Polyolefins,
Saudi Arabia
Dim: Ø 8 m x 103 m LG x 28 mm Thk
Weight: 720 T, Year: 2002



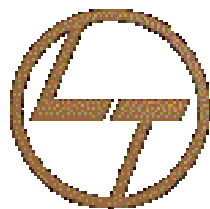
Largest FCC Regenerator in the world for RPL

Dim: Ø 16.3 m x 42 m LG x 48 mm Thk
Weight: 1200 T, Year: 1998, Process: UOP





L&T in Aerospace



We make the things that make India Proud



World's largest FCC Regenerator made by HZW for RIL, Jamnagar (98-99)

