Port Solutions
Customer Case Study

iVision$_{max}$ - Ship Lift™

Control System for L&T Kattupalli Shipyard

Overview

Country or Region: India
Industry: Shipbuilding

Customer Profile

The Kattupalli Shipyard cum Captive Port Complex is a large shipyard at Kattupalli village near Ennore of Chennai built by L&T Shipbuilding Ltd . The Shipbuilding facility recently set up for construction of high tech vessels and the facilities at the shipyard include prefabrication facilities such as shot blasting and priming , CNC cutting machine, semi panel line fabrication, unit assembly bay, block assembly and a slipway to launch the vessels along with a jetty for outfitting jobs for the ships under construction. It offers total solutions in shipbuilding – from concept and design for 'new-builds' as well as repair and retrofit. The shipyard is geared up to take up construction of niche vessels such as specialized Heavy lift Cargo Vessels, CNG carriers, Chemical tankers, defense & para military vessels and other role specific vessels.

L&T has set up a large world class shipyard at Kattupalli, near Chennai,India for construction of new ships/vessels and repair & maintenance of old ships/vessels. This is a ` 4,300-crore Shipyard-cum-Captive Port Container Terminal project implemented by L&T Shipbuilding Ltd.

The shipyard will build commercial ships, specialised cargo ships, defence ships, including submarines, offshore platforms, floating platform-cum storage facilities and heavy engineering fabrication and component production for ship-building. Housed in a spacious 1,225 acres area, the shipyard will, in the current phase, handle ships of up to 210 m long and 18500 T launch weight.

The shipyard's world-class assembly line includes 20 state-of-the-art production shops. The total area of the production shops is 54,765 sq.m with shops of various heights that exceed 120 feet.

State-of-the-art Ship Lift System

- The shipyard has a state-of-the-art Ship Lift system for transfer of ships/ vessels from sea to shore berths and vice versa and the ship lift platform itself always remains available for emergency ship repair demands.
- The shiplift can lift ships/vessels weighing around 18,000 tonnes at its present capacity. With a 60 m lengthwise extension, it will lift a total of 23,000 tonnes. It consists of two 200-metre-long outfitting jetties supported by two piled platforms, one cross-transfer area, two defence repair berths, one wash-down berth, two commercial repair berths and two defence 'new-build' berths. The self weight of ship lifting platform is about 8200 tonnes. 68 winches of 590-tonne capacity each lift the platform along with the vessels.

"We are satisfied and proud to have a best in class system delivered by C&A for our Ship yard facility."

P R Prabhu
Director - L&T Shipbuilding Ltd

A ship docked using the new shiplift at the Kattupalli yard.

System Details:

Hoists:
590 T, 68 Nos, expandable to 92 nos.

Platform Speed:
0.18M/Min

Ship Weight:
18500 T, expandable to 23000 T.

Platform Length:
200 M x 46 M,
expandable to 260 M x 46 M.

Maximum skew allowed:
15 MM (Achieved max 5 MM)

Control System Software:
iVision$_{max}$-Ship Lift™

Drive:
30 kW Closed Loop Vector Control

Power System:
11kV/4 x 415, 50 Hz, 24 Pulse, 2 MVA

The critical factors considered in the design:

1. Platform stability under all normal and fault conditions
2. Robust Power System
3. Ease of Operation

- To dock a vessel, the platform along with a cradle are lowered into the water, and the vessel is moved into place over the platform. When in position, the platform is raised to the shore level and vessel is removed from the platform using transfer system to shore berth. Ship Lift platform, thus, is available for next operation. On completion, the process is reversed. The Ship Lift system minimizes space required for launching ships at the waterside and the transfer system ensures maximum use of the shore work area away from the water front, without polluting the waterway.

Why L&T Shipbuilding chooses C&A

Control & Automation Business Unit (CA) of L&T supplied the Electrical & Control System for the ship lift system. The scope included design, engineering, manufacturing, testing (FAT & SAT) of the entire system and documentation, followed by Lloyds Certification. The system is operational since January 2012.

The entire system development was done indigenously by pooling expert engineers from Electrical, Drives and Controls Departments of CA having 15 to 25 years of experience. The development task involved clear understanding of mechanical system behavior consisting of hoists, ropes, platform and the load distribution.

Platform stability under all conditions:

Platform stability under all conditions was of primary importance. The team performed Design Failure Mode Effect

Analysis (DFMEA) for electrical, control & mechanical system listing all possible faults that might occur while carrying out the operation. Based on the probability of fault occurrence, ease of detection of fault and likely consequence, the system architecture including protection system was reviewed. As an outcome of this exercise, redundant control system (Servers & Controllers), redundant communication, redundant position sensors and redundant load sensors (Load Cell + Motor Current) were incorporated.

The software ***iVision$_{max}$-Ship Lift™*** is developed by L&T Control & Automation keeping in mind the criticalities involved in the operation. The important features provided are as follows:

1. Speed synchronization of all hoists
2. Position skew monitoring between hoist pairs as well as adjacent hoist pairs.
3. Maximum position skew monitoring between any two hoists.
4. Load sharing between hoist pairs
5. Expected load Vs. actual load on all hoists.
6. Safe halting under all conditions
7. Centre of gravity calculation
8. Run / inch control with auto slow down.
9. Individual/pair/group/platform control
10. Initial position calibration facility.
11. Maintenance mode operation.
12. Storage of ship loading data for future use.
13. Monitoring of various other parameters through condition monitoring.
14. Elaborate event, alarm and fault logging system.
15. Multilevel password access for operators and administrators.
16. Redundant servers and controllers.

Power System Design:

CA decided to use standard squirrel cage induction motors driven by closed loop vector control drives in place of synchronous motors. The advantages were obvious.

1. Servo like performance. Position accuracy better than 2 mm over entire vertical travel length.

About Us

L&T Control & Automation (C&A) is a Strategic Business Unit of L&T Electrical & Automation. It is a part of Larsen & Toubro – the multi-billion India-based conglomerate. L&T's C&A business is market leader in delivering integrated electrical & automation solutions in India and overseas. With over three decades of experience in diverse industry segments, C&A delivers value through comprehensive solutions based on varied technology platforms and incorporates the benefits of its wide-ranging experience. L&T's state-of-the-art Automation Campus at Navi Mumbai in India has the latest testing and manufacturing equipment. It incorporates a modular manufacturing unit, an application software laboratory and a fully networked office for engineering and project management.

LARSEN & TOUBRO
Control & Automation
Automation Campus,
Shil Mahape Road,
Navi Mumbai, India.
Tel : 91-22-67226300

E-Mail:
Rahul.Rane@LnTEBG.com
CNA-marcomm@LnTEBG.com

Web Site:
www.LnTEBG.com

Our Integrated Electrical & Automation Solutions:

Cement

- Material Handling
- Cement Plant E&I
- Automation Solution for Steel Making

Energy Solutions

- LV/690/MV Drive Systems
- Solar PV Products and solutions
- Power Management System
- Availability Based Tariff System

Infrastructure

- Airport Baggage Handling Systems
- PMS for Airports & Metro
- ECS & TVM for Metro
- AFC for Metro

Oil & Gas

- Integrated Process Control System
- Pipeline SCADA
- Emergency Shut Down System and Fire and Gas
- Terminal Automation

Power

- Integrated Controls for Boilers and Turbines
- Station C&I for Power Plants
- E&I for main plant & BOP Systems

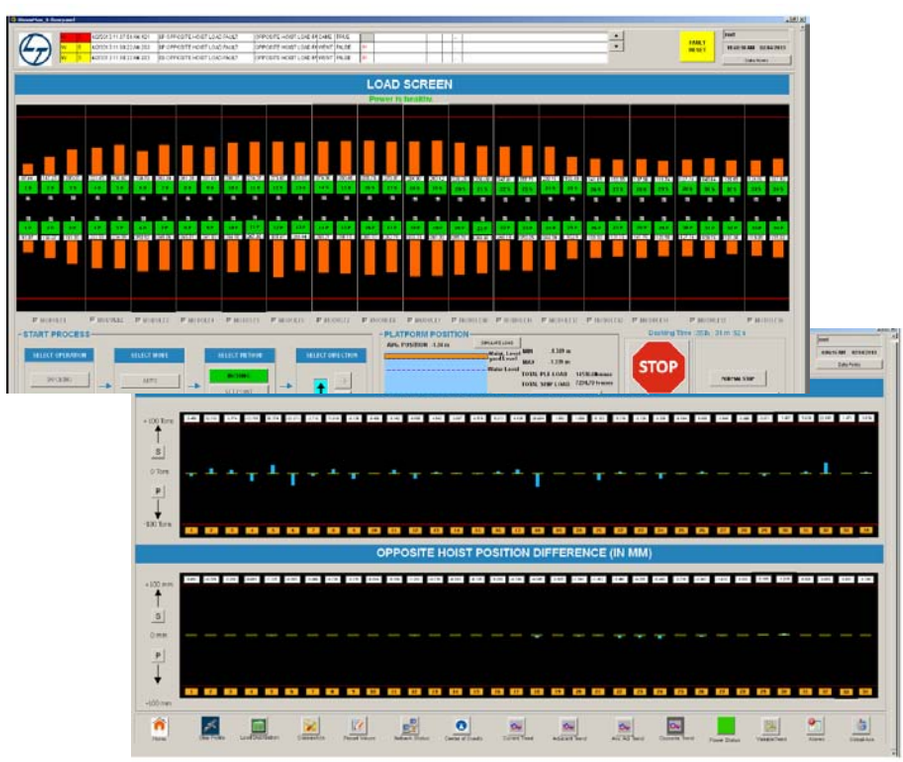
2. All hoists could be started at the same time without the problem of inrush current. So, no need to stagger starting of hoists.
3. System has built-in feature to run at higher speeds in the field weakening mode for lighter loads.
4. Power factor is better than 0.95
5. Lesser maintenance for motors.

All the drives are fed from a 24-pulse power system and the problem of harmonics has also been eliminated. The entire ship lift system can be run on a diesel generator and hence does not face downtime when mains power is not available.

Ease of Operation:

User-friendly GUI on operator stations with elaborate diagnostic system, ease of navigation between the GUI screens, extensive fault diagnostic screen for quick identification of problem are some of the features responsible for ease of operation of the platform. Condition monitoring provides early alerts for preventive maintenance avoiding costly breakdowns.

A screen grab showing load distribution in the shiplift system



The solution has been in use since mid-2012 and has successfully met user's expectation of smooth operation. With this proven track record, L&T is fully geared up to provide similar integrated solution to global ship yards.