L&T AUTOMATION

Port Automation

LARSEN & TOUBRO LIMITED

Port Automation

Larsen & Toubro (L&T) has built a two stream 6500 tpd per stream cement plant along with a captive jetty (port) at Kovaya on the Gujarat coast. A 3.6 kms long steel-cord-belt conveyor system connects the port to the plant for servicing two purposes:

One - cement and clinker produced, for export or for coastal packing plants, need to be moved from the plant to the port for loading into ships and barges.

Second - imported coal, which is discharged on the port needs to be moved into the storage areas in the plant.

The long distance conveyor handles cement or clinker being moved-out simultaneously with coal coming-in on the return side.

The conveyor runs at different preset speeds depending on the combinations of material being transported on the outgoing & incoming sides.

Long Conveyor

System configuration

The port automation configuration shows the various components of the automation system used for this facility.

Hot standby process controllers at the plant and port terminals and a dedicated speed & synchronizing controller integrate with high-speed communications through 3 levels of fibre-optic networks. The 3 separate networks ensure maximum data throughput under all operating conditions. Use of fibre-optic ensures data reliability unaffected by noise and lightning or other electrical surges, which are all too common in a plant with a large geographical spread. Network bridges are used to interface with the existing plant control system.

The chosen configuration combines the latest of technology into a fast, reliable, user friendly and cost-effective solution.
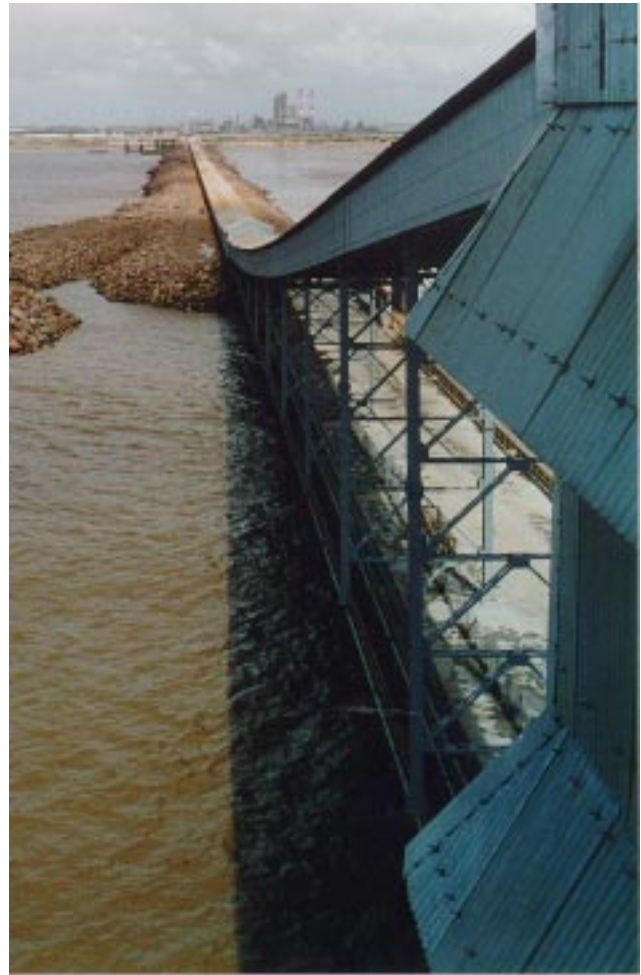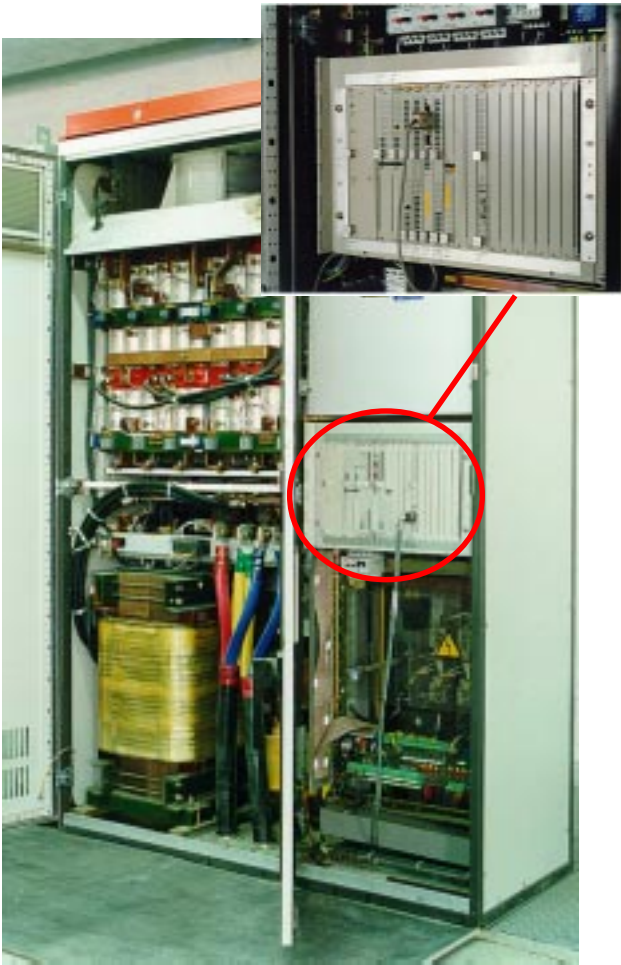
System features

Four high rating AC motors drive the long distance conveyor. Two at the head (port) end and two at the tail (plant) end. There is another variable speed conveyor to receive the material fed by long distance conveyor and feed it to the shiploader. The high rating AC drives used for driving the four motors are of compact design with digital information processing and improved control response. The motors are equipped with digital speed encoders with highest speed accuracy & regulation.

Field mounted temperature scanners display the temperatures of motor winding and bearings, while also transmitting these to the control system.

access from the HMI many parameters like trends of motor currents, motor temperatures, drive parameters, belt tension etc. along with alarms

Speed and Synchronising Controller

minimum power consumption, a very important criterion considering the large drive ratings and varying load patterns. The slightest mismatch while starting, stopping or running can cause belt fatigue and failure - a disastrous proposition where the conveyor is the only effective means of dispatching the produced output of the plant. Protections in the speed synchronizing system include execution of predefined action on communication failures, tripping of any of the drives, belt slippage, load/speed unbalances, overloads, power failures at port/plant side and tacho failures.

Obviously ease of operation and maintenance, minimum downtime and fail safe operation are pre-conditions for this system.

There are also various subsystems associated with the long distance conveying system which are controlled like other conveyors, elevators, compressors, air slides, fans, pumps, brakes, bag counters, gates, metal detectors, belt weighers, dust extraction / suppression system and belt cleaning system.
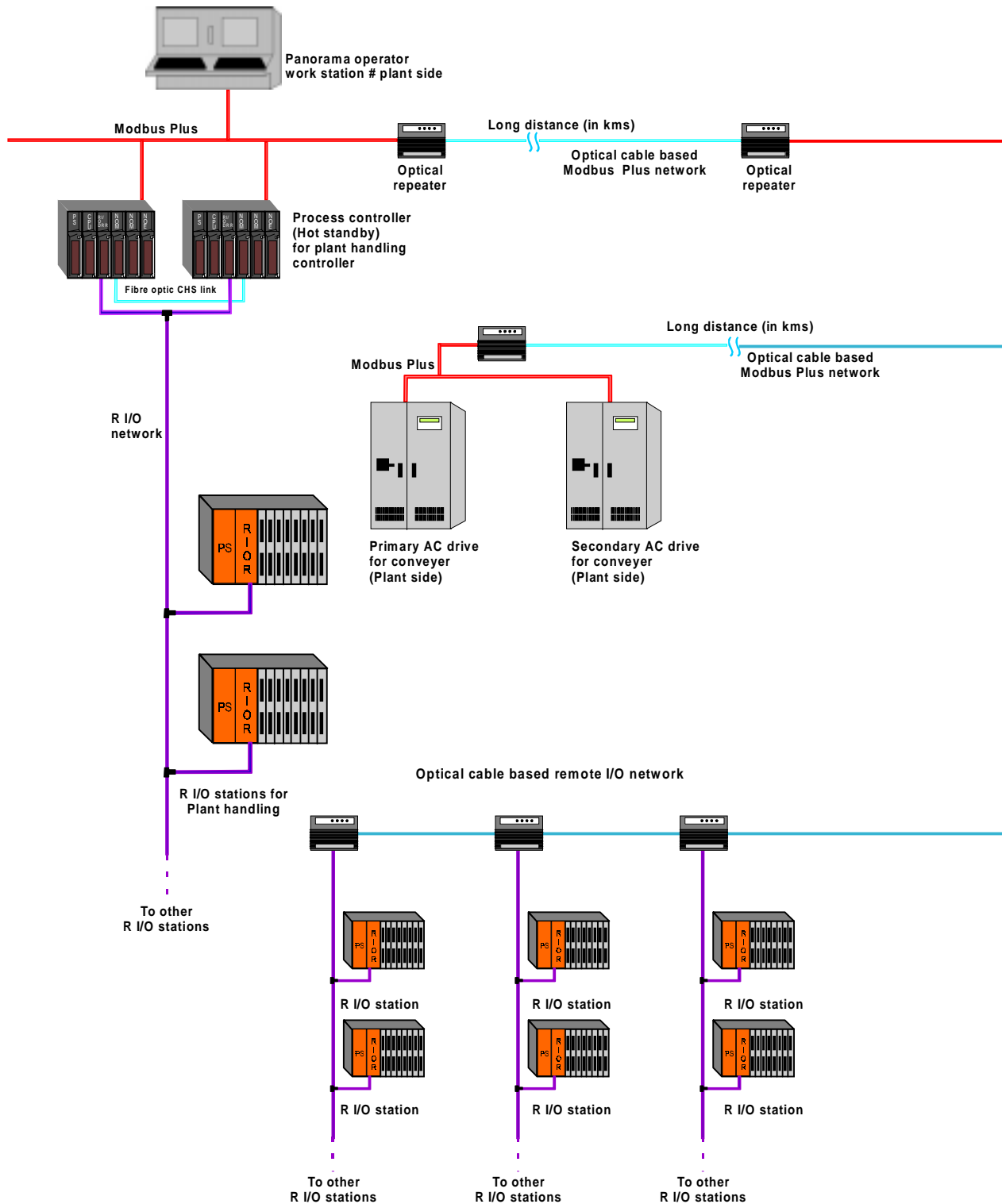

AC drive panel

The system fully integrates with an automated ship loader. The system incorporates a fixed winch at the head end and a motorized winch at the tail end. The system controls the tail end motor by closed loop action to vary the belt tension depending on loading of different materials. Operators can set the desired belt tension and the system ensures operation within safe limits. A specialized object oriented software (OOS) runs in the speed & synchronizing controller, to synchronize four motors located at the two ends of the conveyor. This separation of the synchronizing, load-balancing and protection functions into a dedicated OSS ensures that the core functions required for the long conveyor operation are always solved at the highest priority and unaffected by other routine functions like alarm handling, interlocks, reporting etc. which might slow down the system under certain critical conditions. This also ensures smooth starting/stopping of the four motors with an adaptive load balancing/sharing algorithm, which ensures

Human machine interface

Panorama -2000 a Windows'98/NT based HMI system provides plant operation in a graphical format that is easily understood by the plant operators. All screens and operator commands are menu /icon based and do not call for specialized training or programming knowledge from the operators or engineers. Operators can
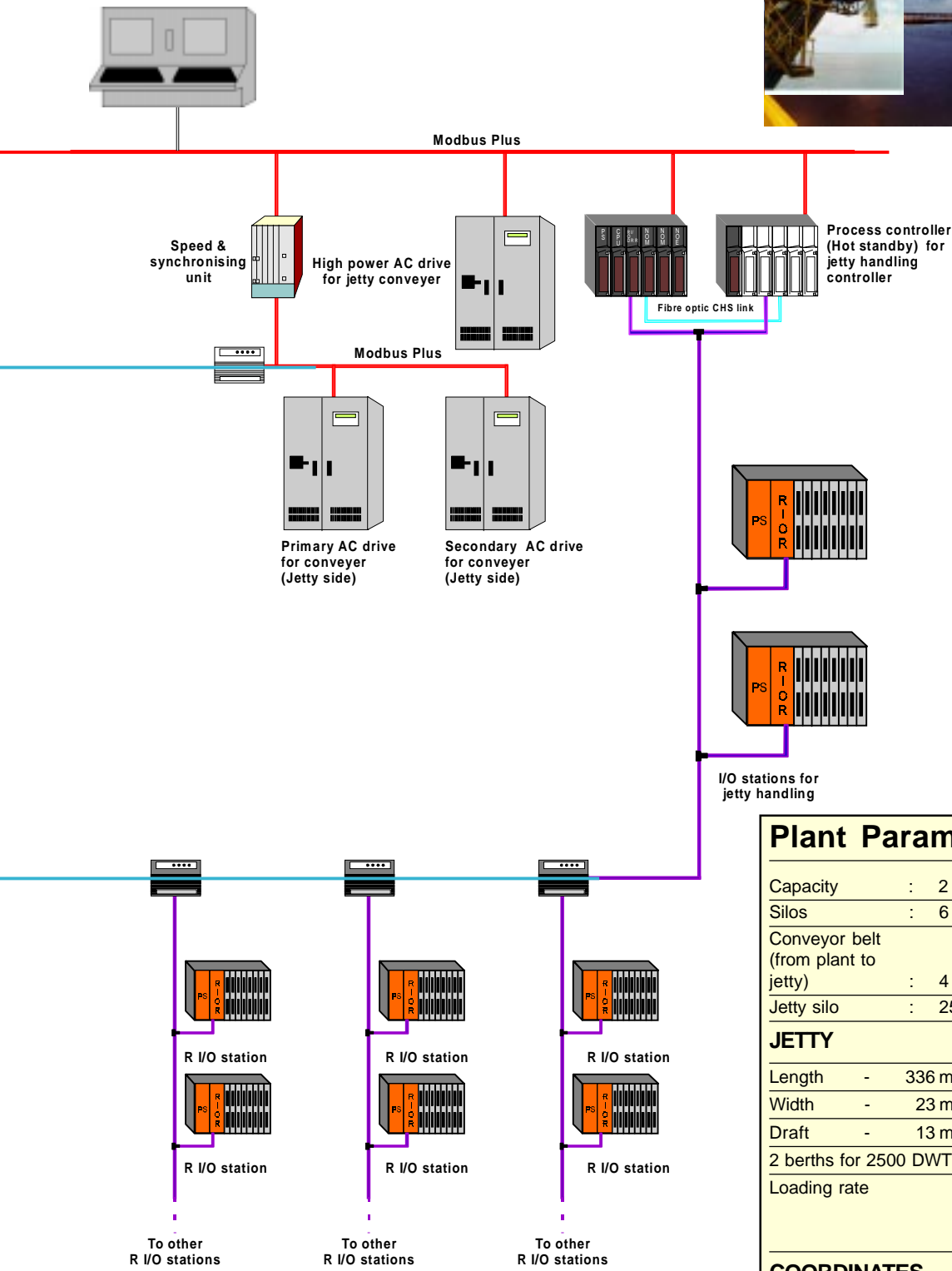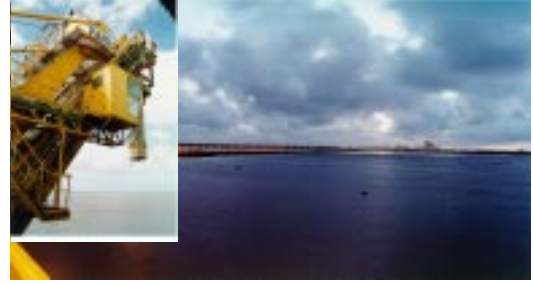
Port Automation at

Panorama operator work station # plant side

Modbus Plus

Optical repeater

Long distance (in kms)

Optical cable based Modbus Plus network

Optical repeater

Process controller (Hot standby) for plant handling controller

Fibre optic CHS link

Modbus Plus

Long distance (in kms)

Optical cable based Modbus Plus network

R I/O network

PS **R I O R**

Primary AC drive for conveyer (Plant side)

Secondary AC drive for conveyer (Plant side)

PS **R I O R**

Optical cable based remote I/O network

R I/O stations for Plant handling

To other R I/O stations

PS **R I O R**

R I/O station

PS **R I O R**

R I/O station

PS **R I O R**

R I/O station

PS **R I O R**

R I/O station

PS **R I O R**

R I/O station

PS **R I O R**

R I/O station

To other R I/O stations

To other R I/O stations

To other R I/O stations

Modbus Plus - Registered trademark of Schneider Automation

Gujarat Cement Works

Modbus Plus

Speed & synchronising unit

High power AC drive for jetty conveyer

Process controller (Hot standby) for jetty handling controller

Fibre optic CHS link

Modbus Plus

Primary AC drive for conveyer (Jetty side)

Secondary AC drive for conveyer (Jetty side)

I/O stations for jetty handling

R I/O station

R I/O station

R I/O station

R I/O station

R I/O station

R I/O station

To other R I/O stations

To other R I/O stations

To other R I/O stations

R I/O = Remote Input/Output ;   PS = Power supply;   RIOR = Remote input output receiver

Plant Parameters

Capacity	:	2 x 1.5 million tonnes per year
Silos	:	6 x 5000 mt
Conveyor belt (from plant to jetty)	:	4 km long
Jetty silo	:	2500 mt

JETTY

Length	-	336 m
Width	-	23 m
Draft	-	13 m
2 berths for 2500 DWT	-	45000 DWT vessels
Loading rate	-	Clinker 1650 TPH
	-	Bulk cement 600 TPH
	-	Bagged cement 120 TPH

COORDINATES

*Latitude : 22° 55*
Longitude : 71° 30' 30"

superimposed on the plant mimic. All group start/stop operations are available at a keystroke. A maintenance log function keeps track of numbers of alarms for critical equipment, to notify when maintenance is due.

Operation

Inputs to the system are spread over the 4 kms distance and come through 19 remote stations spread over the length of the conveyor.

There are five possible paths for the operator to select from:

- imported coal handling

- cement bag loading

- bulk cement loading

- clinker loading

- cement bulk loading with imported coal handling
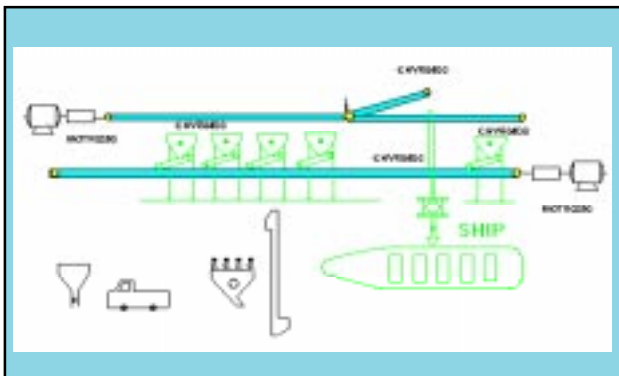
Graphic Mimic page

The complete automation project was executed on a turnkey basis and commissioned in very short time and handed over to the customer by the engineers of Control & Automation of L&T. Loss measurement and certification of the fibre-optic cable was done at site after its laying, jointing and connectorisation. Complete staging of the automation system and fibre-optic system was done at site, prior to beginning of the commissioning, to ensure minimum time spent on rectifying problems during the actual trials and ship loading phases. Extensive documentation in the form of drawings, catalogues, test certificates, operation and maintenance manuals etc. various purchased and manufactured subsystems as well as on the application and system software was furnished for effective maintenance by the client. Various features incorporated in the system ensure minimum operator interaction for operating the system while ensuring safe and reliable operation. There are only four such long distance conveyors with high capacity variable speed drives implemented anywhere in the world.

Today such proven expertise is available as a solutions package for other customers within country.

L&T AUTOMATION

LARSEN & TOUBRO LIMITED

P.O. Box 8119
Mumbai 400 051
Tel : 6401232
Fax : 6401312

Post Bag 5247
Chennai 600 002
Tel. : 8522141
Fax : 8520769

P.O. Box 7025
New Delhi 110 002
Tel. : 3721830
Fax : 3713802

P.O. Box 619
Calcutta 700 071
Tel. : 2822301
Fax : 2821025