ENGINEERING APPLICATIONS – PROJECT DESCRIPTION

Queensland Bulk Terminals – Replacement Shiploader

Client: Queensland Bulk Terminals (QBT), Murrarie

Project: Design, Fabrication & Installation of Replacement Shiploader

Duration: May 2014 to April 2015

Man Hours: Engineering Design & Detailing – 3000 Hours

Fabrication – 8600 Hours

On-site Construction – 6700 Hours

Description of ENAP's Scope:

Engineering Applications (ENAP) has a strong working relationship with Queensland Bulk Terminals (QBT), commencing in 2010 with a facility upgrade project to convert the plant from a sugar export facility to grain handling. Due to a failure of existing shiploader in February 2014, a new shiploader was required for the facility.

The project started with concept engineering design in April 2014 with the project objective to provide a shiploader with increased capacity, whilst being more efficient in the vessel loading process. The design of the previous shiploader was a wire rope luffing system allowing for vertically movement of the boom and relying on the long travel motion in the horizontal plane, which had loading capacity constraints for QBT. The concept design stage was completed in eight weeks with the selected concept design having a fixed pivot point boom with slew, luffing and extension capability.

The design specification of the selected concept for the replacement shiploader was:

- Design Loading Rate of 1800tph Grain of Density 825kg/m^3
- 1200mm wide belt conveyors at 4.2m/s
- Capable of Loading Supermax Ships
- Long travel the entire length of the wharf – 110m
- Loading Slew Range of 90 degrees
- Maintenance Slew Range of 180 degrees
- Luffing Range from +30 degrees to -15 degrees
- Boom reach length - 22m retracted, 38m extended
- Telescoping loading chute –2m retracted, extended 10m
- Spoon chute attached to the loading spout with a 360 degree range
- New Shiploader MCC from existing HV power supply
- Control System PLC based with HF Radio Controller

The design of mechanical and structural components was completed by ENAP's in-house engineering and design team, with design completed in accordance with AS4324.1. The entire project was 3D modelled in AutoCAD Inventor, which lead to preparation of assembly and shop fabrication drawings. The electrical and controls design was sub-contracted to Arnolds Electrical also based in Brisbane, who ENAP and QBT had previous working relationship.

The fabrication was completed in ENAP's Workshop located at Hemmant, Queensland, with approximately 160T of steel over a four month period. Due to the fast-tracked nature of the project, fabrication was progressed while design of other components was being completed. The excellent design output is demonstrated by minimal fabrication rework as the design on the entire shiploader was completed.

The main fabrication components included:

- Box Beams and Base Frame
- Yoke / Slewing Frame
- Retractable Conveyor Trusses
- Retractable Loading Chute
- Ancillary Access Platforms and Stairs
- MCC Frame

ENAP was engaged as Principal Contractor for the wharf activity to manage and control the worksite and ensure safe working between all contractors. The site installation process commenced with deconstruction of existing shiploader frame, with only items reused being the four vertical portal legs and long-travel bogies. The new base frame was site welded to remaining vertical legs consisting of 1200mm deep welded beams and box sections. Following welding, the existing structure and site welded areas were on-site blast and painted.

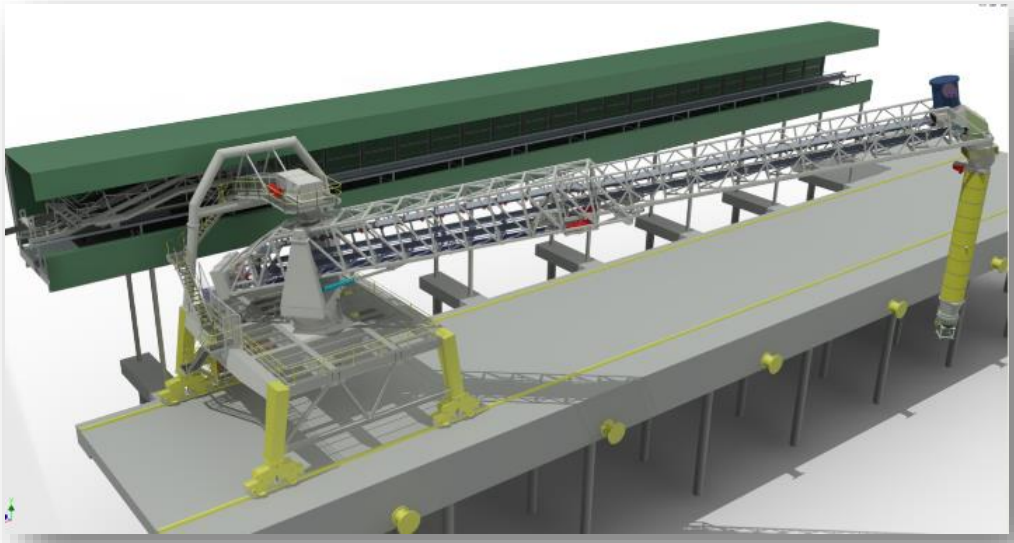
The installation process continued with installation of 2.9m diameter slew ring and yoke frame. This included a 75kW hydraulic powerpack for operation of two Brevini slew drives and the two 10" luffing cylinders.

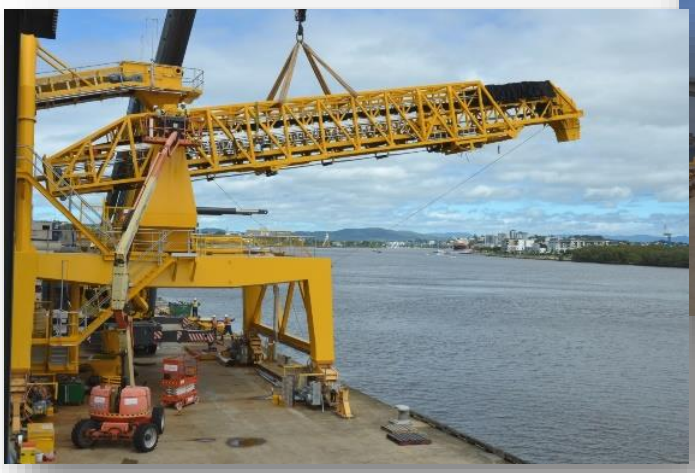
The retractable conveyor frame was assembled on the wharf following fabrication and workshop blast and painting. The assembly of the conveyor frames included retractable wheel system including chains, and conveyor components, including pulleys, gearmotors, idlers and conveyor belt. The conveyor trusses were also completely electrically assembled including cable tray, cables and drive and instrument terminations. The installation of the 46T conveyor assembly was completed with 450T Slew Crane with the installation from lifting to self-supporting completed in five hours. This short installation window for significant structural assembly is a credit to the quality of the design and fabrication with components fitting perfectly.

The shiploader is controlled with a new PLC system that is incorporated into the site's existing SCADA program. The shiploader is controlled by one operator using a HF Radio controller like an oversized Playstation controller, allowing the operator to move freely into any position on the ship or shiploader to monitor loading operations and adjust as necessary.

The commissioning process, while not without challenges, was extremely quick and seamless. There was a three week dry commissioning process with wet commissioning into test ship on 7th April 2015. The first production ship was loaded on 27th April 2015, and there have been a subsequent four ships loaded during May 2015.

This project was completed from commencement of detailed design to commissioning in 10 months, which is an incredible achievement. The resulting product is a novel, unique and innovative shiploader design that provides QBT with enhanced flexibility and capacity for grain loading. This project is highly visible being on Brisbane River and is an impressive engineering design for function and aesthetics for a piece of mechanical equipment.





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