



The Grimsby Corporation Road Bridge, was built by Sir William Arrol & Company in 1928 to replace an existing swing span bridge allowing water-borne traffic access to the dock from inland waters. After nearly 20 years out of commission, North East Lincolnshire Council in association with Mason Clark Associates started to accept tenders for the reinstatement of electrical control and main motor drives to the bridge.

For the 10 years prior to the re-instatement of electrical power, the bridge had to be hand-wound whenever it was required to be lifted. This would generally take up to half a day to complete, using a team of eight workers in shifts of two to complete the lift. This meant that the road over the bridge would be closed for most of the day when any lift was required. Due to lack of use, the bridge began to seize up, meaning that each bridge lift became harder to achieve and longer to complete.

As the area is now set for major investment, it is hoped that the waterway will be used for both pleasure and business use. It is also a legal requirement to be able to open the waterway to allow traffic through.



In this project Fairfield Control systems implemented a design engineered by Mason Clark Associates, who acted as Engineering Consultants for the project.

The bridge, which weighs a counterbalanced 741 tonnes, is lifted by means of two DC motors with in-line integral gearboxes. These are controlled by two Eurotherm Series 590 digital drives in a load sharing configuration.



Eurotherm 590 Digital Drives

This allows the operator to choose between either of the two drives as master, with the slave drive following using current demand feedback. Both motors are connected to the bridge lifting mechanism by means of a single drive shaft. This means that both motor units have to run at a synchronised rate: up to 450rpm with an output torque of 750 Newton metres each.

The lifting power is supplied by two 460V DC motors, each with a power rating of 35.5 kilowatts. The Series 590 Eurotherm 4 Quadrant Drives control each of the motors independently, essentially the two units are separate in their control up to the main shaft. The power sharing function is achieved by



Thurlby Electric DC Motors with In-Line Gearbox

using the current demand and the current feedback functions of the drives. When the bridge is lowered the energy that is generated would normally be dissipated as heat through the braking system. In this design a dynamic braking system is used which directs the energy generated back into the electricity supply. The benefits of doing this are mechanical wear is reduced and the generated energy is sold back to the supply company off-setting the electricity charges incurred in the operation of the bridge.

The configuration and setup of the drives was solely managed by Fairfield Control Systems. The bridge's nose bolt stability system also required an overhaul, with the inclusion of two new nose bolt motors and specific engineered adaptor mechanisms which insert and retract.



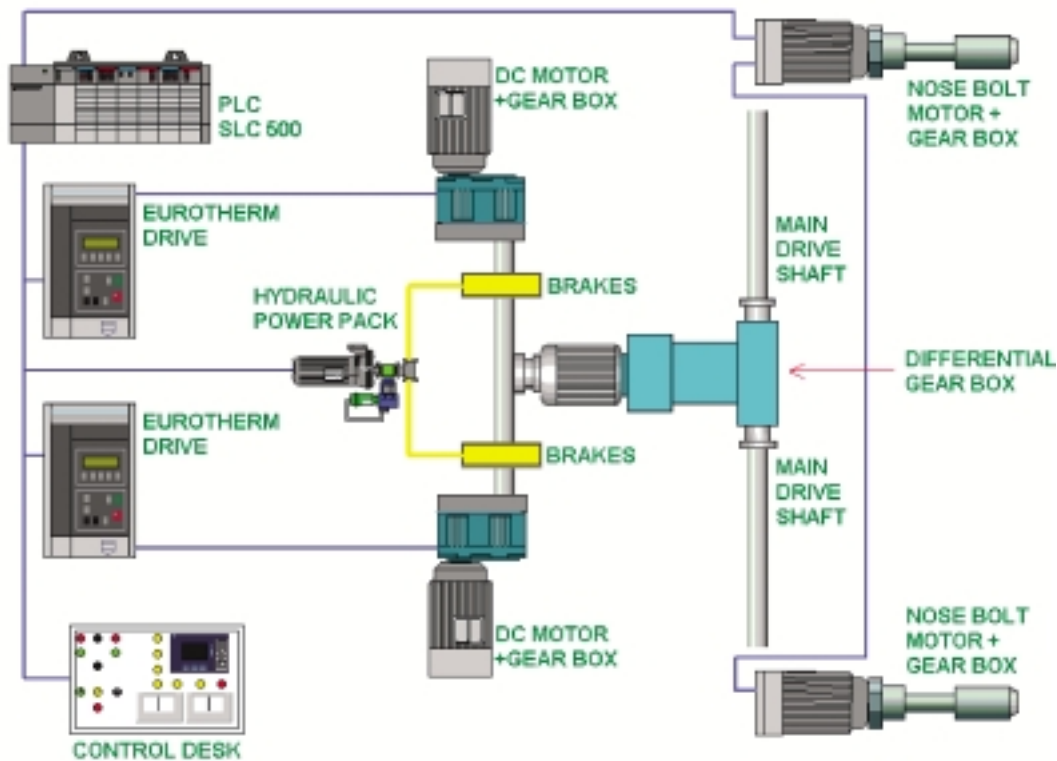
Nose Bolt Drive Mechanism

The control and interlocking system is provided by an Allen-Bradley SLC PLC system, using standard Digital I/O, with the outputs switched through Fairfield Control System's Automation Products Relay Cards and 4 Channel Splitter Cards. The control system was also configured to control road batteries and traffic beacons at a future date.

The PLC software code was produced entirely by Fairfield Control's own Engineering Team.



Allen-Bradley SLC 500



System Configuration

System Specification

PLC	Allen-Bradley SLC 500
Drive System:	Eurotherm Series 590 Digital Drive: 110 amp, 4 quadrant active regenerative control unit, 110V AC Control Circuit
Main Motor System:	2 x Thurlby Electric DC motors with in-line gearbox 0-450 rpm 0-36 kW 0-73 kW peak 750Nm Torque
Nose Bolt Motors:	2 x Squirrel Cage Motors 0-1kW 16Nm Torque

Business Activities Include:

- SPECIFICATION
- CONSULTANCY
- HARDWARE DESIGN & BUILD
- SOFTWARE DESIGN
- INSTALLATION
- COMMISSIONING
- TRAINING

- SERVICE SUPPORT

Service support is your insurance against prolonged plant outages, which could cost you vast sums of money. Because we understand control systems and work with them daily we have been able to build up a vast expertise, which enable us to quickly diagnose and fix faults, sometimes without even attending the site. Our service Support Contracts are flexible and designed to meet our client's particular requirements up to and including immediate callout responses available twenty four hours a day, seven days a week.

NOTES

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