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Case Study: Dock Crane Refurbishment

Associated British Ports - Cardiff

15 tonne Dockside Crane

Features and Benefits

- **Smooth Load Control**
- **Automatic field weakening for fast speed with lighter loads**
- **Ward Leonard MG set becomes redundant**
- **DC motor replaced by AC squirrel cage motor**
- **Increased reliability**
- **Improved safety**

The Challenge

The dockside crane hoist motion was operated by a DC machine that received the DC supply from a motor/generator set. The hoist motor speed was controlled using a Ward Leonard system. Both the DC machine and the motor/generator set were failing regularly, resulting in very high repair costs and extended crane outage periods. Although the crane was in excess of 30 years old, the mechanical structure and moving parts were still in good order. Because this was the largest crane on the dock, it was critical that it should be available to carry out specific tasks.

The Solution

MH Automation International performed the design of a new control system including an AC squirrel cage motor. The existing 3 phase, 415 V AC supply to the crane (which was used for driving the M/G set) was retained and applied directly to the new control system. The control system consisted of a purpose built panel to be accommodated in the available space on the crane.

The inverter control system was specifically developed for hoist applications and included the necessary safety interlocks and protections required for lifting applications. Field weakening is performed by the drive to ensure similar operation to that provided by the previous DC motor control.

Key Project Elements

Motor and Drive Technology

- New 8 Pole, 90 kW, 3 -AC WEG squirrel cage motor
- Force ventilated with integral encoder, anti-condensation heaters and thermistors
- Insulated NDE bearing and inverter related insulation
- 90kW Vacon inverter drive
- Integral Brake chopper for lowering
- Hoist control software (closed loop)
- Tropicalised cards for protection from humidity and corrosion
- Keypad and display for operating information, parameters and fault reporting
- Stainless steel grid resistors complete with enclosures for power lowering

Benefits

- Smooth accurate control of both motor speed and torque
- Automatic field weakening allows faster speed for lighter loads
- Safer and more predictable load control and placement
- Hoisting software ensures effective control of motor and brakes to eliminate load sag or the motor driving against the brake
- Brake shoe wear eliminated
- DC motor brush maintenance eliminated
- Excellent reliability of solid state inverter drive and squirrel cage motor
- Control system maintenance reduce significantly



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