

Charging crane upgrade at POSCO saves US\$4M annually – (and does it sooner than expected)

At POSCO, the world's largest steel mill, located at Kwangyang, Korea, Rockwell Automation modernizes a charging crane control system 17% sooner than the expected shutdown period. The upgrade provides an ongoing availability improvement of 24 hours per annum, which equates to an additional US\$4 million in raw material throughput.

Background

POSCO's Kwangyang Steel Works is acknowledged as the largest steel mill in the world. A set of four 400 tons per hour capacity charging cranes form the heart of its operations. These cranes provide the essential link between POSCO's blast furnace, hot mills and cold mill processes.

Challenge

As the majority of POSCO's cranes are in excess of 12 years old, the availability of spare electrical components had become a major problem. In addition, POSCO's maintenance team struggled with poor crane documentation and operational information. Electrical failure at charging crane No.1, caused by vibration and the harsh environment of the mill house, motivated POSCO to embark on a complete refurbishment of the crane's electrical systems. As the charging crane has a daily material throughput valued at US\$4 million, ensuring a minimal shutdown period was essential.

Solution

POSCO turned to Rockwell Automation and its Field



Modernization Engineered Drive Systems business to perform the retrofit.

Rockwell Automation has a strong design and implementation capability, particularly with regard to realizing a seamless interface between the customer's existing equipment and Rockwell Automation products. Its approach to crane control systems is highly modular and scalable. Solutions can range from 'digital control-to-the-motor' (retaining existing power system and motors) to 'power-to-the-motor' (complete retrofit).

The decision is based on optimization of price versus performance of the retrofit. In the case of the POSCO charging crane No.1 retrofit, only the existing motors were retained.

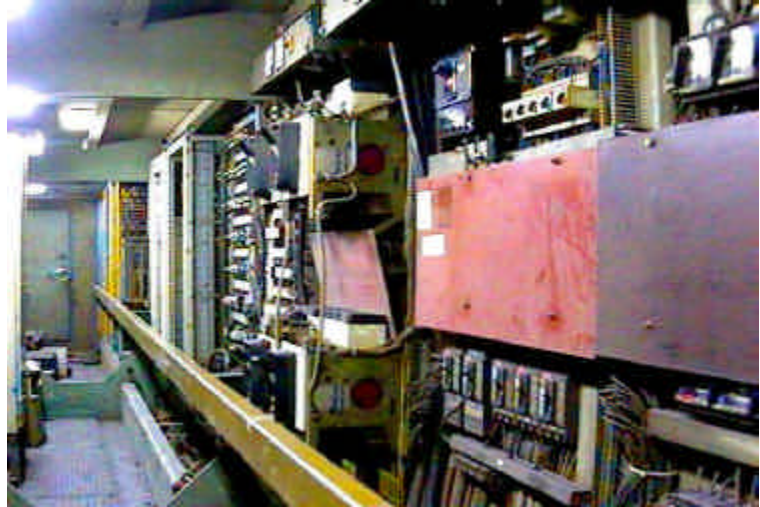
To ensure the entire project was completed within the 12 and a half-day shut down period, Rockwell Automation adopted a total turnkey approach to the retrofit, assuming the entire responsibility from construction through start up.

The Rockwell Automation retrofit covered three main areas: the 6.6kV main power controls, drives control and drives monitoring. In the main power controls area, the Vacuum Circuit Breakers (VCBs) were replaced and the master control relay logic upgraded to Rockwell Automation's 'Crane Master Controller' system. In the drives control area, the existing analogue DC drives were replaced with Rockwell Automation DPS (Distributed Power System): SD3000 digital drives. New Rockwell Automation 'CraneView' Human Machine Interface (HMI) software was installed to provide all drives monitoring and trending facilities.

Although Rockwell Automation's products exceeded POSCO's requirements for 'vibration withstand', Rockwell Automation incorporated anti-vibration springs, which absorb up to 80 per cent of the vibration occurring at the No. 1 Charging Crane. To meet POSCO's dust contamination concerns, Rockwell Automation used IP52 enclosure-rated panels throughout this installation.

In all, a total of 12 drive panels were upgraded. The scope included:

- The Drive Power Modules (Main Hoist No. 1, Main Hoist No. 2 and Auxiliary Hoist). A standard power module rating of 525 kW, 575 VAC—was adopted across the entire project to ensure minimal spare parts inventory.
- The Crane Master Controller control rack and backup rack.
- The CraneView HMI, providing system monitoring via the Crane Master Controller Network module.
- The Allen-Bradley Remote I/O-powered relay panels for interfacing to control devices.



- The Air Circuit Breaker panels for the main input power.
- The Uninterruptible Power Supplies (UPS), providing backup for all the control power.

Fibre optic communication between the Crane Master Controller and SD3000 digital drives was made possible by the Rockwell Automation, Power Module Interface (PMI), a flexible interface module that may be adapted to suit a wide range of third-party power units.

Results

The entire retrofit was completed in a 12 and a half-day shutdown—around 83% of the shutdown period POSCO initially estimated for. This time reduction was the result of Rockwell Automation's total turnkey

responsibility, along with its meticulous approach to total system testing and simulation in the Rockwell Automation systems laboratory prior to installation.

Prior to modernization, POSCO reported charging crane No. 1's operational delays of around two hours per month due to crane control and automation system failures. After modernization there have been no recorded failures due to the Control & Automation System resulting in 100% Crane availability. An annual net savings of US\$4M is expected to be appreciated from this effort without increasing the typical 80 charges in a 24 hour period.

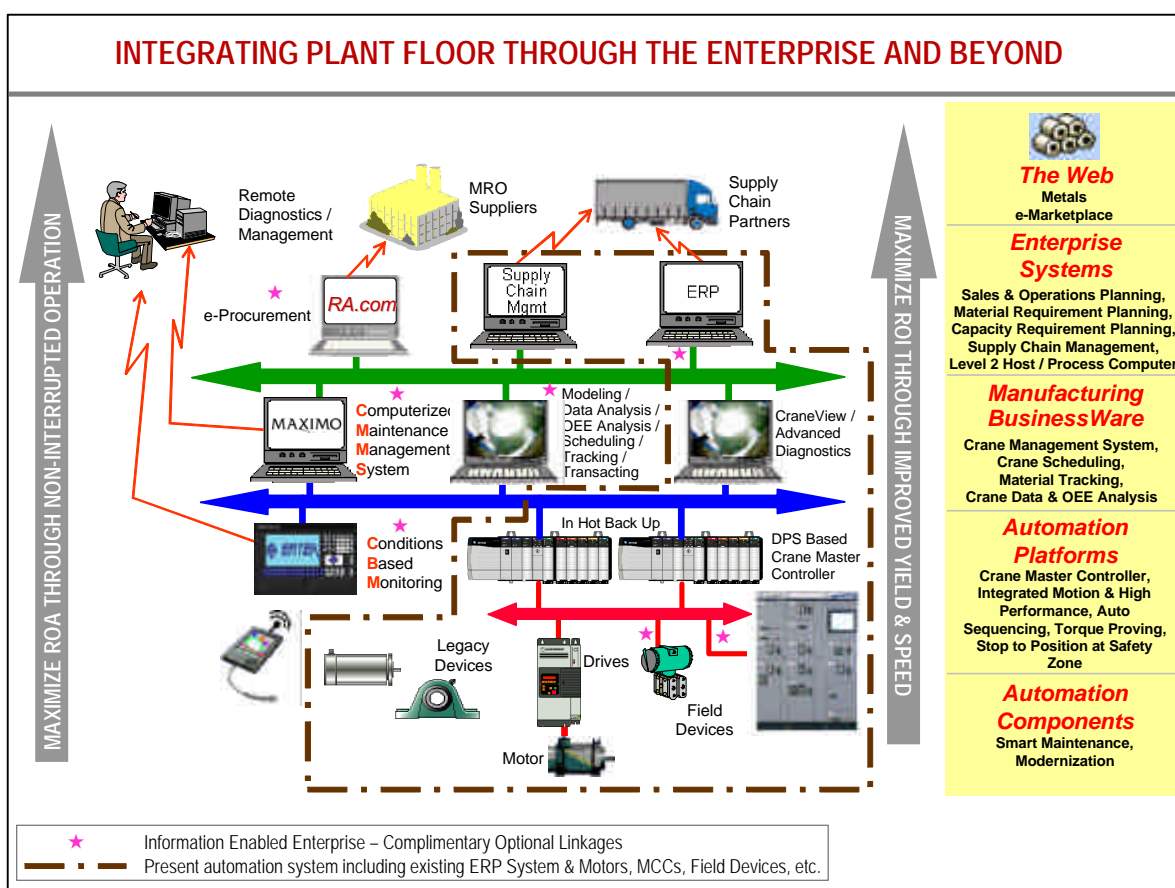


In addition to the remarkable improvement in throughput and efficiency, the crane electrical system is now easier to maintain as the system is fully documented, with all programs based on Microsoft's Distributed Internet Architecture technology. The use of digital DC drives greatly reduces the number of analog interface signals between the drive and Crane Master Controller.

Finally, the HMI greatly enhances serviceability and operations, as all diagnostic and operations data is displayed in the electrical control room.

Due to the success of the POSCO charging crane No.1 retrofit, the company plans a similar retrofit of its charging crane No. 2 during 2001.

The architecture below depicts Rockwell Automation's concept of an Information Enabled Enterprise. The area outlined with a brown dash line shows the present automation level in the plant under discussion. The other portion shows the whole host of solutions that Rockwell Automation can provide today to integrate the plant floor through the enterprise and beyond.



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