Twin strand caster upgrade with improved DC drive system

A new DC drive digital control system for a 20 year old caster has been installed while the caster was still in production use. It provides much improved load sharing, more consistent speed control and significant improvements in reliability and increased productivity through shorter re-thread times and a 30% increase in strand speed.

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As part of the Corus Port Talbot No.1 continuous caster upgrade project, the original twin strand DC drive systems (essential for reliability and superior speed control), were replaced with two new DC drive Motor Control Centres (MCCs) from Control Techniques. Control Techniques has successfully automated many continuous casters and has developed an in-depth application knowledge and understanding of the metals industry. Corus has considerable experience with Control Techniques’ Mentor digital DC drives at its Ravenscraig, Llanwern, Redcar and Port Talbot works, including caster No.2, and the use of these drives is regarded as a means of providing the plant with many years of high reliability, accurate control and low maintenance. The implications of a total system failure on a continuous caster are extremely serious, therefore back-up redundancy in all areas was a design pre-requisite.

BACKGROUND
The twin strand caster at Port Talbot, commissioned more than 20 years ago, was built mainly for the very demanding tinplate and automotive markets; producing slabs with good surface and internal quality. Since then the machine has cast more than 50 million slabs, and to maintain the reliability and quality demands placed upon it, it was decided to renew or replace important parts of the plant, including the drives, as well as making significant environmental improvements.

The challenge of replacing obsolete process control equipment, while still being used for production, was undertaken by a joint team of personnel from Corus Port Talbot and Corus Process Engineering Workington (CPE), working closely with project engineers from Control Techniques.

PROJECT AND EQUIPMENT
The project team successfully integrated the new plant in phases, using opportunities offered by normal sequence stops, and concluded in the successful commissioning of new strand drives, PLC and SCADA hardware and software for the control monitoring of both the casting plant and water treatment plant.

Many of the key benefits have arisen by changing from analogue to digital control. In conjunction with Corus and Modicon (Schneider Group) engineers, a dual redundant communications system was implemented. The plant interface is direct to two Modicon Quantum PLCs, one operating in full-time production with the other acting as a hot standby. Furthermore, two communications links are provided between the PLCs and the Control Techniques’ drive system, and any failure to communicate via one of the routes automatically initiates a communications link via the second route.

New tachogenerators were also installed on each of the existing DC motors, and a standby armature voltage feedback feature was engineered into the drive set-up software, enabling the motors to remain running if a particular tachogenerator failed and the signal is lost.

Key to the successful operation of the plant is the proportional integral derivative (PID)-based load sharing system, pre-programmed into each of the Mentor DC digital drives, using the on-board facility of the MD29AN co-processor modules.

The success of this new load sharing software, with its benefits of reduced wear and tear and more consistent casting speed, is very evident in the motor armature current trends which are consistently balanced. Re-thread times are now much quicker, with any limitations being factors other than the drives/electrics on the strands. The end result is a much more stable drive control system which reflects in improved product quality.

The new drive systems were manufactured and tested in-house at Control Techniques’ UK headquarters in Telford, and afterwards additional in-house trials were conducted using the Corus system PLCs and motors to replicate plant operation and fault modes. These verification trials proved invaluable, as the time spent on in-depth testing at Control Techniques, significantly reduced the on-site commissioning period.

The whole system is now more modular, with the intelligence in the system distributed rather than being...
and diagnostic tracking can easily be incorporated into drive system motor control centres. This will provide valuable production and quality data as well as preventative maintenance data, thus identifying problems before they result in actual breakdowns.

OUTCOME
Corus is very pleased with the results of this major project for, in many ways, the control approach has been simplified thanks to new technology, and much greater plant utilisation is anticipated because of the inherent reliability of modern electronics and the ongoing after sales support provided by Control Techniques. The new drive system provides much improved load sharing, more consistent speed control and significant improvements in reliability and increased productivity through shorter re-thread times and a 30% increase in strand speed.

Following the success of the No.1 caster project and the earlier No.2 caster project, Control Techniques has been awarded a contract for providing the automation system for caster No.3 through the principal contractor VAI UK Ltd. This is a greenfield site project using an AC drive system technology with on-board intelligence. Figures 1 and 2 show the AC Unidrive SP package, being installed on this project.

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