Robotics

Teeside Beam Mill
Case study: Marking

Two ABB IRB 6400 ‘FoundryPlus’ six-axis robots, operated by Corus Group’s Construction & Industrial Division at its Teesside Beam Mill to carry out marking operations on structural steel products, are proving to be a blueprint for safety and efficiency in one of industry’s harshest environments.

Mark of quality

The manufacturing process is totally automated, with no manual intervention at any stage. Steel feedstock, supplied by Corus Group’s Teesside and Scunthorpe plants, is heated in a reheating furnace to a temperature of 1300 degrees C, and then directed to a ‘cogging’ mill where it is fashioned into ‘dog bone’ shape. The ‘dog bone’ is sheared, front and back, to give it straight edges, before being directed to one of Corus’ biggest investments at the plant, an £86 million, three stand, close-coupled reversing mill, which carries out roughing, edging and finishing to give the product its familiar I-beam section. The product, now in run-out lengths of up to 200m, is cut by a hot saw installation (a £16 million investment by Corus in 1997) to customer order, in lengths anywhere between 6 and 25.1m. The product then goes through a series of cooling banks and straightening processes, before being despatched from the works.

Each product carries a unique, primary identifier code that details all its technical and manufacturing information. This information is used for internal tracking and traceability throughout the life of the product. Character marking of any kind presents a significant problem due to the harsh environment of the beam manufacturing process. Thus, finding an effective method of marking the product with the requisite information has, until the robot-based solution, proved fraught with problems.

Corus has previously used (in chronological order): manual chalk marking, manual hard stamping, automated labelling, and automated aluminium paint stencilling. Reviewing its requirements, Corus drew up a specification for the new marking system. The specification required that the system had to have: an extremely short cycle time; a compact footprint; entirely automated operation; reliability; robustness, and an easy-to-apply marking medium. Notwithstanding this, the Corus mantra is ‘keeping people away from the process’ and safety has to underpin every aspect of every installation.

The key production requirement is a very short cycle time - as any delay in the automated process has serious knock-on effects in terms of productivity. Additionally, heat is slow to dissipate from the product, which makes the application of paint difficult - while the scaly surface of the product is also not conducive to marking.

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Manufacturing manager – development, Chris Hamlett, enlisted the expertise of Hartlepool-based marking and tracking technology company Numtec Magnemag, in devising a more efficient method of product identification, as Numtec had previous experience in various labelling and paint spraying solutions within the mill.

Numtec Magnemag suggested an ABB robot-based solution following its application experience in steel plants in South Wales and in mainland Europe, incorporating a high temperature spray marking system capable of operating in temperatures of 800 degrees C.
Hot paint spraying was recommended over etching and other systems because of the minimal cycle time required to apply the medium, thus preventing the production holdups feared by Corus - while ABB robots were recommended due their excellent reliability in harsh environments, their speed, accuracy, and compact footprint.

The robot-based systems, installed during the mill's planned summer shutdown of 2003, are located at an optimum point in the product manufacture – within each of the two cooling banks, after the hot saw process. Control interlocks are incorporated to signal a halt to each product on its journey to the cooling banks, and while the product is stationary, the independently operated robots are signalled to power-up, carry out the marking operation, and return to their respective stowages. Robot cycle time is just six seconds.
To ensure maximum availability, Corus has agreed an annual service contract with ABB Manufacturing Automation UK, which includes calibration and maintenance servicing as well as emergency call-out.

Steve Bowman, manufacturing engineer – finishing, the engineer with responsibility for the serviceability of the installation, has been impressed both with the IRB 6400's themselves and with the back up from ABB.
Mr Bowman comments: "Though there is no requirement for any intervention with the robots' routine operation, me and four other mill engineers carried out the ABB programmer's course so that we have the ability to manual operate the robot in exceptional or emergency situations. Fortunately no such situation has arisen, or is likely to, as serviceability is excellent. In addition, all of the Corus
Group attendees at ABB's Customer Service Centre, Milton Keynes, were impressed by the facilities and rated the course one of the best in the business."
Summing up the performance of the installation over the past two years, Chris Hamlett comments: "Many people were sceptical about how effective a robot-based system was likely to be in such a harsh environment as the Teesside Beam Mill. I can categorically say that we have been impressed with the safety of the Numtec Magnemag/ABB system; its availability - currently running at above 99.9 per cent; and its productivity."

He adds: "Due to the success of the IRB 6400 systems, during the planned summer shutdown in 2005 two more ABB robot-based systems will be installed, in this case IRB 6600's, which will be located downstream of the current machines. These will fulfil automatic labelling operations, to add commercial information and customer logos to the relevant products."

FACTS

- Teeside Beam Mill, Lackenby UK.
- Efficent structural rolling mill, throughput of 750.000 tons per annum.
- Manufacturing a vaste range of products for the global construction industry.

ABB Robotics
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