

Embedded PC CX5000 controls rail-guided vehicle

Huaheng Welding Co., Ltd., based in Kunshan, Jiangsu, China, specializes in the development, production and sales of welding equipment. The company's product range extends from mechanized to intelligent robot welding solutions and automated welding plants. With the development of a new production line on the basis of a rail-guided vehicle, Huaheng has made an important contribution to automated production in the Chinese mechanical engineering industry.



The fully automated production line essentially consists of five elements: the rail, the rail-guided vehicle as the means of transport, a robot station, a decentralized control system and the higher level controller.

Bridge cranes are still widely used for in-plant transport in the Chinese mechanical engineering industry; however, the growing production requirements create an increasing demand for automation in production. Kunshan Huaheng recognized this trend and in April 2010 introduced an RGV (rail-guided vehicle) with automatic points changer to the market which, when combined with a robot station, forms a flexible production line. The structural welding shop at the Sany Lingang Factory manufactures among other things excavator shovels and booms using this production line. Currently there are more than 20 RGV-enabled production lines in operation at Sany.

Where control is concerned, Huaheng's architecture is based throughout on automation components from Beckhoff: the plant is well-equipped using Panel PCs and Embedded PCs with TwinCAT automation software for control, I/O components for system communications as well as highly dynamic servo drives and motors. The fully automated production line essentially consists of the rails, the RGV as the means of transport, a robot station, a decentralized control system and the higher level control system.

The compact RGV offers high speed (up to 20 meters/min), excellent stability while driving as well as a high positioning accuracy (< 1 mm) and can be loaded and unloaded fully automatically. The control level connects itself to the MES system and transfers information about the workpiece during the manufacturing process.



The rail-guided vehicles are used among other things for the automatic production of excavator shovels and booms in the structural welding shop at the Sany Lingang Factory, a manufacturer of construction vehicles and machines.

CX5010 Embedded PC: high performance, numerous interfaces

The CX5010 Embedded PC with TwinCAT NC PTP handles all control functions of the rail-guided vehicle. "We chose the CX5010 on the one hand due to its performance and on the other due to its range of interfaces and compact design. Another advantage is that the Bus Terminal system from Beckhoff supports different fieldbuses such as CANopen and PROFIBUS and is thus compatible with our device periphery," explains Wang Wei, head of the electrical welding automation group at Kunshan Huaheng. In addition to that, the development engineers from Huaheng value the software libraries and function blocks in TwinCAT. "Since many requirements cannot be covered by a standard controller, which makes additional programming work necessary, we save a great deal of time during project development by using the TwinCAT software modules," emphasizes Li Fang, electrical engineer at Kunshan Huaheng.

Drive Technology: high dynamics and positioning accuracy

Kunshan Huaheng uses AX5000 servo drives and AM3000 servo motors from Beckhoff for motion control. This solution ensures the fast travel and exact positioning of the RGV on the main and branch rails as well as rotation on the Z-axis while replacing traditional positioning modules and NC controllers. "The stations that the vehicle drives to are freely selectable. They are configured in the RGV without having to modify the program," explains Wang Wei. In addition the RGV is equipped with the

EL6731 PROFIBUS master/slave terminal to which two barcode scanners are connected. They read the barcodes on the main and branch rails and enable fast changing of the points if slippage should develop between the vehicle wheels and the rails.

Embedded PC and EtherCAT are at the "heart" of the control platform

The production line is also controlled via an Embedded PC. Via the local I/Os, the control system detects the requirement signals of the robot welding positions, the execution signals of the hydraulic clamping fixtures and the "ready" signals of workpieces on the feeding platform; in addition it controls the loading and unloading of the vehicles. The CX5020 Embedded PC forms the "heart" of the control platform. The position and feeding platform signals are captured by an EtherCAT terminal. For each position, an EK1100 EtherCAT coupler is used which is connected to the CX5020 over EtherCAT. "The use of EtherCAT as the communication system has many advantages for us: Apart from faster signal detection we also have shorter cycle times. In addition wiring is simplified because we can use CAT5 cables, significantly reducing our installation costs as a result," says Liu Xiaolan, electrical engineer at Kunshan Huaheng. "What's more, thanks to wireless communication between the RGV controller and the CX5020 via the Beckhoff CU8890 WLAN controller, the individual production lines can communicate with one another easily."

Further Information:

www.huahengweld.com

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