Flexible, PC-controlled punching and bending system produces busbars

The company Jiangsu Jinfangyuan CNC Machine Co. Ltd., which is located in the high-tech area of Yangzhou City, China, manufactures and exports a wide range of hydraulic or servomotor-driven CNC machines for punching, bending and cutting sheet metal. Jiangsu Jinfangyuan developed a modular CNC punching and bending machine for producing busbars that can be operated individually or in tandem. The control system uses a PC-based automation solution from Beckhoff Automation.

With the utilization of new energy sources in China, particularly wind and solar energy, the optimization of transmission and distribution grid systems is becoming increasingly important. This applies to the conductance of busbars as well as their production conditions. Busbars are used to carry large currents in switchboards, substations and in other electrical equipment.

The fully automated plant developed by Jiangsu Jinfangyuan consists of two machine modules: a punching unit and a bending unit. As the name implies, the punching machine deals with punching, corrugating, shearing, embossing and stamping of the copper sheets, the bending press naturally deals with horizontal, vertical and U-bending. The two machines are controlled by separate hydraulic CNC systems, so that they can be used in tandem or as individual machines. With this high degree of flexibility the plant is able to meet a wide range of different customer requirements. Jiangsu Jinfangyuan chose a CP62xx "Economy" built-in Panel PC from Beckhoff as the control system for the punching machine and the bending press, EtherCAT as the bus system and EtherCAT Terminals for the I/O. The Servo Drive is integrated into the EtherCAT Terminal system via a CANopen master terminal.

Software replaces conventional positioning modules and NC controllers

The bending press uses TwinCAT NC PTP automation software. "TwinCAT NC PTP handles the axis movement and the position control of the bending unit. In addition, we utilize the functionalities of the NC PTP library by including two encoder axes in the system for indicating the movement positions of the hydraulic components," said Jingchun Ye, director of the electric control department at Jinfangyuan.

The punching machine uses TwinCAT NC I. For Jingchun Ye, the openness of TwinCAT automation software yields another advantage: "TwinCAT offers us maximum independence when it comes to I/O and drive systems. This was an important selection criterion in our decision to use the software-based control platform."

Openness of the software platform offers users a high degree of freedom

"The simple manageability of TwinCAT, based on the IEC-6113-3 programming standard, suits us very well and offers a high degree of flexibility for modifications," said Shen Xiaoyuan, software engineer at Jinfangyuan: "We redesigned the PLC code structure to optimize the production flow of the busbar processing unit and we increased production capacity by 20% as a result."

TwinCAT-ADS is also used for integrating the user interface. "Based on the Beckhoff .NET control library, our customers obtain extremely helpful references and functionality for developing their unique HMI. In conventional CNC systems, where only the existing functions and interfaces supported by the system are available, this is not possible. If a function doesn't exist, there is nothing you can do about it," said Chen Lin, also a software developer at Jinfangyuan.

"The advantages of the software-based control solution were the convincing factors for us and that it formed an excellent basis for subsequent CNC projects," said Jingchun Ye. "We are currently in discussions with Beckhoff Shanghai regarding the use of Beckhoff NCI/CNC solutions for other machines."

Jiangsu Jinfangyuan CNC Machine Co. Ltd **www.jinfangyuan.com**
Beckhoff China   **www.beckhoff.com.cn**

The fully automatic punching machine MC-40 handles the punching, corrugating, shearing, embossing and stamping of the copper sheets from which the busbars are produced.

The CP62xx "Economy" built-in Panel PC from Beckhoff offers a compact unit for control and visualization on the punching unit MC-40.