Chinese CANopen devices in Chinese design

CIA member Kinco developed with its customer a CANopen-based control system for a glass 4-edge grinding procedure. The used products are made by the Chinese supplier.

The class edge-grinding machine is controlled by the IEC 61131-3 compliant F1 controller (Photo: Kinco)

Human beings produce glass for a long time. Naturally occurring glass, especially the volcanic glass obsidian, has been used by many Stone Age societies for sharp cutting tools. But the first true glass was made in coastal north Syria, Mesopotamia, or ancient Egypt. Nowadays, new types of glass such as laminated glass, reinforced glass, and glass bricks have increased the use of glass as a building material and resulted in new applications of glass.

Glass has been widely applied in automobile windshield window, building curtain wall, store showcase, bathroom door and window and so on. The glass has to go through the tempering process to make sure the strength and toughness suitable for the application before put into use. The glass has to go through the edge-grinding process before the tempering process, otherwise glass edge breakage and burst may occur in the glass tempering furnace. So the edge-grinding process is very important. Based on the products advantages, Kinco has provided a solution based on CANopen for the glass 4-edge grinding procedure.

The CANopen-based control system comprises multiple motion controllers, some I/O modules, and the F1 host controller (Photo: Kinco)

The control system is based on the Codesys runtime system and is programmed with the software development environment by 3S (Germany). The program modules are independent as well as correlated with each other. Key points of the system control were the self-adaption of the length of the glass instead of inputting length and width manually. The left and right edges are grinded during glass moving. When glass spans two different conveyors, the speed of two conveyors should be synchronous. When the switch installed on the grinding head detects rising edges, the current position of the servo should be caught immediately. At the same time, the servomotor moves a fixed distance. The glass is moved at a speed of 20 m/s, which requires motor speed up to 2000 rotations per minute. Under this condition, actual position should be caught by rising edge and servo moves a very short distance, which requires response speed of the system should be fast enough. The servo should switch among speed/position/synchronous modes freely with no stop and vibration.

Concerning the above-mentioned requirements, Kinco developed a CANopen-based control system. Combining the fast pulse position catch function of Kinco’s servo, the controller sends commands via CANopen to each axis to realize dynamic mode switching. The motion controllers support the CiA 402 CANopen profile. The system configuration structure is shown in the figure. The advantages of the developed solution include controlling the servo instead of sending pulses from the PLC. The wirings are simplified, as well as inaccurate positioning caused by disturbed pulse signal can be avoided. Fast pulse position catch function is embedded in servo firmware. PLCs do not participate in position signal catch. So there is no need to configure high-speed counter or high-speed counter interrupt in the PLC program. The PLC only concerns on logical control. Therefore the PLC program is simplified. The system can be expanded due to the flexibility of CANopen. Users just need to add axis to the bus directly. The F1 controller is integrated with an Ethernet port to connect with enterprise ERP system.

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