Digitally networked servos drive two NEW MACHINES

BOTH ARE BASED ON 'FIREWIRE'

Digitally networked servos that allow cost-effective, high-speed communications among the electronic components of shop floor machinery are becoming increasingly common. They not only enable the design of more effective equipment, but they enable that equipment to link more effectively with overall plant operations. This communications capability is at the heart of two new machines, very different in function, but based on the same standard digital servo technology.

The screen machine motion controller provides interfaces to users, programmers, and upper-level management systems.

One machine automates the process of making window screens; the other manages the design and production of steel-piping systems. Both feature a digital drive system (ServoWire from Ormec) that replaces the conventional ±10V analog interface with an all-digital control network. The system eliminates hundreds of interconnections and can be plugged together in minutes using standard cables. It allows programmers full access to drive parameters to ease the development of diagnostic logic and fault codes. Thus operator interfaces can provide real-time diagnostic data.

The drive system is based on an industry communications standard, IEEE 1394, also known as "Firewire." IEEE 1394 was originally designed for PC and multimedia applications—so chips are available in high-volumes at low cost—but is also directly applicable to factory control and networking. It provides high-speed data transfer (200 Mbps or higher) and guaranteed communications.

Machines making screens. Making a window screen can be tricky business. A technician has to square up the edges, cut the screen material to just the right size, and keep the tension within tolerance as the screen is secured to the frame. A tough challenge for automation, but a challenge that has been met by the Screen Express from Lockformer Corp. The system was designed by Robert E. Welty of Concepts to Reality Inc. (CTR; Gadsden, AL) and features a digital motion control system from Ormec.

Guiding the operation is a five-axis motion controller. Three servos control motions in the X, Y, and Z directions to properly position the frame. The X and Y servos adjust a cam to maintain proper tension on the screen. The other two servos adjust the size of the fixture that holds the window frame.

Thanks to the communications capabilities of the machine, instructions for each job can be downloaded over a factory network from a shop floor control computer. An optional bar code reader also allows an operator to scan the next job and automatically set up the machine. The system can also be linked to a manufacturing database for inventory management.

An important design requirement was a user-friendly interface that would not intimidate the

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operator. The solution is a six-inch color touchscreen that allows the operator to select the product that he is working on from a series of pre-configured options. The system stores information on screen material dimensions, and the location and width of the frame. Bob Ford, technical designer for one user of the machine, North Star Manufacturing Ltd., reports that the training on the system required one full day.

About 40 of the machines have been sold so far, and one is helping North Star Manufacturing Ltd. improve its operations. "We're putting out just as many screens as we used to, while freeing up two previously used screening stations," says North Star's Ford. He also notes that the screens are tensioned more consistently, with fewer rejects coming off the line. Operator fatigue has also been reduced, cutting down the risks of repetitive stress injuries.

The company concentrates on vinyl windows for renovations, which means that it must make a wide variety of sizes. To help the operator through the maze of options, the machine is linked to a management computer that provides screen dimensions to the screen machine, in a lot and bin sequence. The operator takes an assembled frame, which was produced upstream on the production line, and hits the enter button on the screen machine computer. The machine then makes the X and Y adjustments and the frame is ready for the application of screen cloth and splines.

Making the cut. Large buildings, such as skyscrapers and hospitals, contain thousands of feet of piping to connect the structure's various mechanical systems. It's essential, in terms of time and money, that the pipes be cut quickly and accurately. A new system has been developed to automate the process. The brains of the operation are in a design software package, developed by Mechanical Data Inc., that allows users to specify the length of pipe, and the precise location and size of holes. The software then lays out the pipe sections to minimize waste—a crucial capability because steel pipe is expensive.

When the design is complete, all data is sent in an ASCII file to the plasma pipe cutter, designed by CTR, and featuring a six-axis motion control system using Ormec controllers and servos. Two servos control lateral and rotational position of the pipe; two servos set the plasma torch at the proper angle for cutting; one servo controls movement of the torch along the length of the pipe; and one servo controls the height of the torch relative to the pipe. A controller coordinates motion among five of the servos to ensure precision of the cutting process.

Operation is guided from an industrial PC workstation running Windows NT. The workstation runs the design software and communicates via Modbus protocols. Software parameters defining cut data are sent to the controller using standard TCP/IP and FTP protocols. The system operates without extra measures, in the EMI environment created by the plasma cutter.

For more information

Motion control system from Ormec **Circle 764**

Software from Mechanical Data Inc. **Circle 765**