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ETHERNET

Simplifies Monitoring And Diagnostics

Internet permits remote access to high-speed press.

In terms of service headaches, the high-volume contract stamping facility had a conventional problem. A high-speed transfer press that moves sheet-metal parts through six sequential dies under one press ram, that had run reliably for months, suddenly experienced a series of mysterious faults that interrupted production. Visual inspection showed no obvious problem, such as an obstruction from stray scrap. What's more, the programmable, servodriven transfer system had a proven track record of efficiently handling sheet-metal parts.

What's different was the service call. Personnel at Atlas Technologies, a Fenton, Mich., pressroom automation specialist, diagnosed the problems without leaving the office. Through a modem and an Ethernet hub, controls engineer Scott Clement could explore the operational software and interrogate its logic.

The problem involved slight changes to press set-

A typical press work cell features a variety of automation systems, such as a stamping press, transfer system, die changers, and material loaders and unloaders. Intricate sequencing is essential for high production.

tings that affected the timing of fingers on the in-press transfer system. Coordinating the fingers is critical to lift the parts out of the dies and transfer them forward to the next station.

Maximizing uptime

Until recently, remote control and data access in a stamping application was impractical due to cost and complexity. But Atlas, working with Ormec Controls, Rochester, N.Y., has implemented a viable system.

The typical press work cell features a variety of different automation systems and devices. In this Atlas design, for example, each cell contains a stamping press, in-press transfer, automated die changer, and handling systems for coils, blanks, and finished parts. Intricate sequencing is essential to high production. The destacker and blank-feeders must coordinate with press actuation, as does the three-axis in-press transfer. On the exit side, conveyors, part stackers, and scrap-management equipment remove material from the press.

A reliable motion controller is critical to keeping material flowing smoothly through the cell, as well as fully integrate communications between controller, PLCs, and operator interface (HMI). Alarms alert the operator to a machine fault. However, if the solution is more than removing a piece of scrap material, the operator may be out of his league.

"Errors in programming or electronics can not be identified by physical investigation," explains Peter Stollberger, director of sales at Ormec. What's more, given the number of interconnected devices and controls, troubleshooting may require painstaking, methodological evaluation by an expert, he says.

Manufacturing engineers monitor production operations from an office within the plant. If problems arise beyond the scope of the manufacturing engineer, Atlas and Ormec engineers offer remote support. Via modem, personnel can access machine and control information, analyze software programs, and make programming modifications to correct the problem without an on-site service call.

A number of networks support these types of functions, says Dave Hense, director of R&D at Atlas. However, many are proprietary, which limits the ability of the OEM to modify the application software without assistance from the supplier. Proprietary networks can also be expensive.

Instead, Atlas and Ormec turned to Ethernet. Ethernet is an established standard with a firm foothold in office environments. Hardware, available at the neighborhood computer store, ensures component choices and low prices. Recent technological advances include Fast and Gigabit Ethernet that respectively provide 10× and 100× the bandwidth of traditional Ethernet. Used far more than Profibus and other

The Flex 5000 in-press transfer system has an Ethernet hub that communicates through PLCs to monitor sequence control of destackers, transfer mechanisms, and other equipment.

Automation elements can be networked beyond the work cell through the Ethernet hub. This permits remote monitoring and diagnostics, as well as easy software upgrades.

communication protocols, Ethernet offers a reliable and easily maintained industrial network.

Modularity delivers connectivity

Connectivity of the machine network relies on the motion controller, in this application the Ormec Orion. The Orion is an industrial PC-based platform for multiaxis motion control that is compatible with open-communication standards such as IEEE-1394 and TCP/IP. When using industry-standard Ethernet hardware, such as ISA buses or PC Card adapters, and Allen-Bradley A-B Ethernet, the result is an inexpensive, reliable, and fast solution.

Orion's motion-control software, MotionBASIC, supports high-speed, line-oriented, repetitive manufacturing operations. The language processes complex motion contours, simulates complicated mechanical-cam action, and is capable of time-based profiling.

An Ormec add-on is MotionBASIC Extension (MBX). MBX for A-B Ethernet opens the network to different PLCs and enables modularity. "The extensions provide communication from the MotionBASIC software to other devices that use the A-B Ethernet protocol," explains Al Presher, vice president of marketing at Ormec. The A-B Ethernet is a fast, low-cost method to send and receive application data between controllers in the network. MBX facilitates Ethernet communication between Orion controllers, Allen-Bradley PLCs and PCs, and HMIs, providing a machine-control network that ties together the various subsystems.

Network elements

Internally, Atlas's FLEX 5000 in-press transfer system has an Ethernet hub hardwired to the PLCs, operator interface, and motion controller. The hub communicates through Allen-Bradley, Siemens, or other PLCs to monitor sequence control of I/Os from the blank destacker, transfer automation, and other equipment. An industrial PC with Windows NT 4.0 operating system, touchscreen, and Wonderware HMI package creates a centralized, easy to use operator interface. From here the operator can create, store, verify, and run part-stamping programs.

According to Dave Hense of Atlas, the only problem historically with Ethernet is that it is an indeterminate network. "You can't say exactly for sure how fast a piece of information can be transferred. Data acquisition can be supported at speeds of 4 to 8 msec, which works fine with Ethernet's nondeterministic characteristics. However, there are bona fide times when milliseconds can make or break the application. We worked around this by addressing coordinated motion at the controller," says Hense.

Ethernet hubs can be made more determinate with message-switching capability and full-duplex wiring. High-speed switching allows traffic between two ports on an Ethernet hub to travel at near the rated wire speed and switches handle data transfer without collision delays.

Remote access capability

Information shared between the press and automation elements can network beyond the cell through the Ethernet hub, allowing remote access. This enables the user to monitor the transfer-press from the office.

Remote access also allows the OEM to keep firmware and application software up to date and easily download enhancements. For example, Ormec engineers can access the Orion controller via the Ethernet hub to upgrade its firmware, tune servoloops, update software, or change machine setups. They can view and monitor the process in real time and even browse through the Orion controller using Netscape Navigator or Microsoft Internet Explorer.

Remote diagnostics offers savings in time and money to both the OEM and end user. According to Stollberger at Ormec, "The connection to an Ethernet hub provides the capability for a skilled individual to plug into the machine and its control and remotely perform an evaluation. Both the OEM and end user benefit by saving time. The end result is greater machine uptime."

"Atlas is applying standard tools, such as Windows Dial-Up Networking, modems, and off-the-shelf devices to dial up the machine," explains Ormec's Presher. "Where once people had to jump on a plane to go to troubleshoot a system, they can now perform a detailed investigation at their home facility." More uptime and lower service costs means such networks often pay for themselves in short order. ■

Information for this article was provided by Atlas Technologies, Fenton, Mich., and Ormec Controls, Rochester, N.Y.