

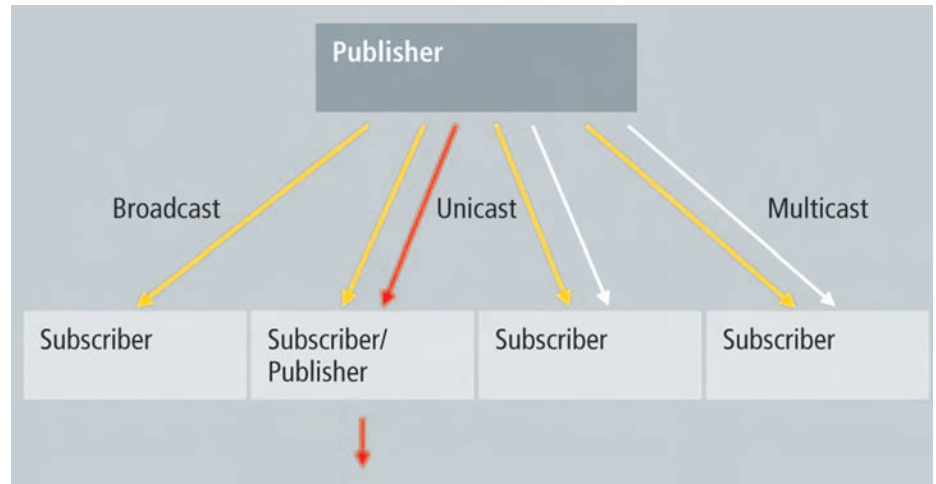
EtherCAT: Realtime data syncs presses



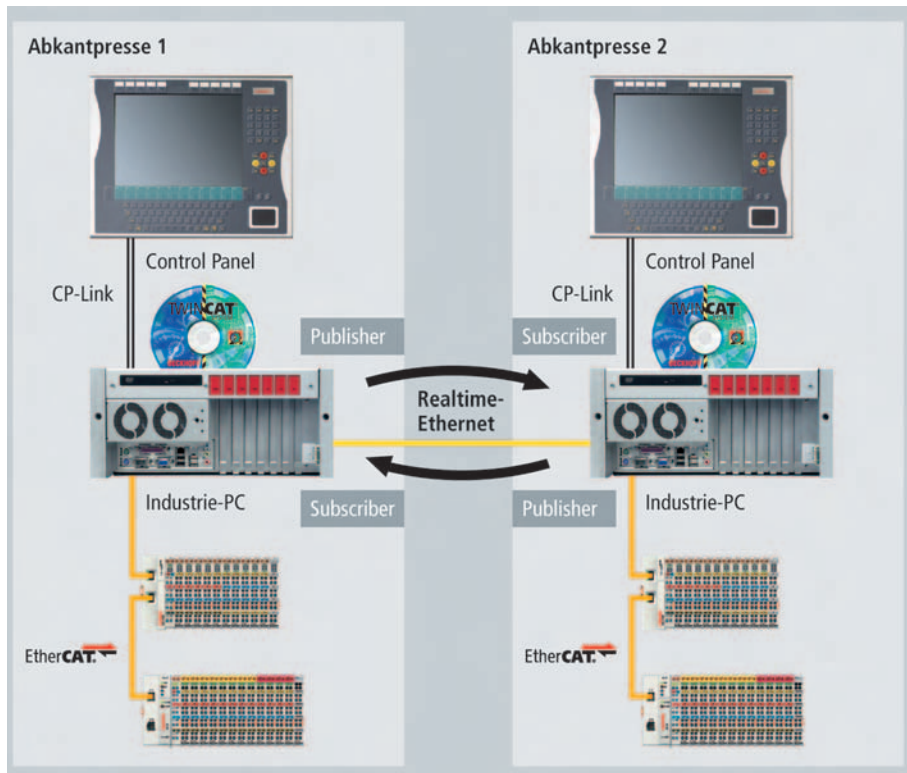
Accel tandem presses from Canadian manufacturer Accurpress can bend sheet metal components with a length of up to 14 metres. The company achieves this by coupling two standard high-end Accel press brakes via real-time Ethernet. Beckhoff control technology is used to synchronise the machines and control the entire bending process, including the associated material handling equipment.

AS THE NAME IMPLIES, the Accel tandem press can operate in tandem or simplex mode. In tandem mode, the presses are synchronised such that they operate like a single press with high precision. If the full capacity is not required, the presses can bend shorter components in simplex mode. This renders unnecessary expensive special machines for bending longer parts that rarely operate at full capacity. Depending on the size of the sheet metal components and the batch size, the coupled press brakes operate in simplex or tandem mode with a speed of 20mm/s and a parallel accuracy of $\pm 0.01\text{mm}$.

'We created the first tandem press following a request by a customer,' said Alex Kvyatkovski, R&D Team Leader at Accurpress. 'It was clear to us that the coupling should be implemented via the control system. Together with Beckhoff, our control equipment supplier, we achieved the coupling via real-time Ethernet.'



Based on the publisher/subscriber model, the publisher makes variables available to one subscriber (unicast), several subscribers (multicast) or all subscribers (broadcast)



The press brakes exchange information on set and actual position, velocity, recipe step, job and machine status and special key positions based on the publisher/subscriber model

PC control enhances precision

At the core of each press is a Beckhoff C6240 control cabinet Industrial PC using Windows as the operating system and TwinCAT for the automation platform. In addition to PLC functions and Motion Control, the PC also deals with HMI integration. EtherCAT links the I/O level with the control system; low cycle times lead to high precision and repeat accuracy. The EtherCAT terminals integrate both the sensor and actuator level with the control system. Serial interfaces are available via the IPC.

The relatively simple hardware architecture, in conjunction with the open TwinCAT automation platform, makes for flexibility. Accurpress can adapt the press specification to customer requirements without great effort. Functions can be modified and complemented through programming without the need for special hardware.

Similarly, two presses can be coupled to form a tandem press via real-time Ethernet communication. On the hardware side, the C6240 IPCs are complemented with a standard Ethernet fieldbus card and networked with standard Ethernet cables, further reducing cost. The devices are addressed directly via the hardware addresses of the network cards.

The press brakes operate on a master/slave principle. Depending on the application, one press acts as the master while the other press acts as the slave. For switching from simplex to tandem operation, the machine operator selects tandem mode on both machines, specifies the master and slave, and uploads the recipe to be processed to both control computers. From then on, the machine operator uses only the operating panel of the master. The slave follows the mode of the master.

The controllers of the coupled presses communicate using the publisher/subscriber model (TwinCAT network variables). Each controller acts as publisher and subscriber, creating a permanent bidirectional data link. In general, the publisher sends information without concern for proper configuration. Communication monitoring takes place in the subscriber. The publisher makes its current machine data (actual and set positions, velocities, recipe steps, job and machine status) available to the subscriber of the other machine with a cycle time update of two milliseconds.

In simplex mode, the receiver deletes the data. In tandem mode, the subscriber receives the data intended for it, while the machine control system processes the data and controls the press according to the current process data. While running in tandem mode, the presses are synchronised through continuous bidirectional data exchange and adaptation of the machine control parameters.

The machines also monitor their respective states in parallel and main bending parameters such as mute, pinch and retrack point. Real-time Ethernet coupling based on the publisher/subscriber model offers a cost-effective and convenient way of implementing precise tandem presses with high repeat accuracy and process reliability.

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Omron goes EtherCAT for motion control apps

A PARTICULAR STORY of significance – at least to this writer – coming out of SPS/IPC/Drives last November was the announcement by Omron that the company will support EtherCAT for its next generation Motion Control systems. Omron is geographically agnostic! It recently launched a Profinet system par excellence for Europe, with built in media and system redundancy, but clearly the company has now decided against supporting Profinet IRT for Motion. By contrast, it supports EtherNet/IP for North America (and maybe at home too). However, the company's Motion division is largely independent of mainline automation. Its current Trajexia solution is proprietary and

Omron clearly feels that EtherCAT is more in line with its needs.

This raises the question once again: Is Motion part of automation, or a separate discipline as up until now? It's possible to argue on both sides of this proposition. EtherCAT is very fast in the line structures typical of Motion, and with the smaller telegrams that Drives usually need. Profinet, and probably others like Ethernet/IP, keep Motion on the same network as the primary automation system. This is much better in the complex tree structures typical of modern automation. EtherCAT does not like opening itself up to other Ethernet systems, whereas the rest have deliberately kept everything integrated. From the user's point of view one would think that a single network would be preferable.

The final answer is personal of course but

EtherCAT seems to be tickling the fancy of quite a few vendors at the moment. To compete, Profinet is already fine-tuning its protocol to respond in the raw Motion space described above, so maybe EtherCAT won't have everything its own way for ever.

Geoff Hodgkinson

- The EtherCAT Technology Group (ETG) developing its own take on PoE: Power over EtherCAT. The proposed specification makes use of IEEE802.3af PoE functionality, and can be implemented with commercially available chips. Stub lines and star topology together with line, tree and redundant ring have always been among the EtherCAT topology options. Devices such as encoders or linear position sensors will be able to connect using a single, standard Ethernet cable. ■