

Beckhoff implement an integrated automation design at Hörmann KG Werne

From Barcode to Individual Door Frames

An integrated automation solution from Beckhoff is ensuring optimised production on a line for special doorframes in the Hörmann KG Werne factory. The open controller scheme, consisting of Beckhoff Industrial PCs, the TwinCAT automation software, Bus Terminals and the Lightbus offers cost advantages and flexibility, in spite of the growing range of variations.

Paul Buschmann makes the point clearly: "The ever-rising demand for special frames makes investment in modern automation equipment a necessity for us." Hörmann KG Werne's technical manager continues "This sector of the market is demanding shorter fabrication times along with increasing variety". The component manufacturers, based in Westphalia, invested in the concept of PC automated production in order to achieve an increase in production throughput. The challenge that this user made to the automation engineers was easy to express: The technology had to be integrated as easily as possible into both the existing bending, sawing and stamping machines and into the new machinery. It should also be easy to operate, and offer the possibility of flexible re-arrangement. P. Buschmann also wanted to avoid the disadvantages of the classic PLC solution used to date, which had been found to be too complex and too inflexible. For Hörmann KG

Werne it was simply a logical step to apply open and integrated concepts to the automation.

The customer decided in favour of Beckhoff automation technology. One contributory reason for this was that the performance of the individual systems could be tested in advance.

In order to adequately satisfy these demands for openness and continuity, the Beckhoff team designed an automation solution oriented towards full distribution. Industrial network PCs were applied, together with the TwinCAT automation software, and a fieldbus networking scheme utilising several hundred Bus Terminals, most of which were digital, handling sensor and actuator signals in locally situated terminal boxes over the shortest cable lengths possible.

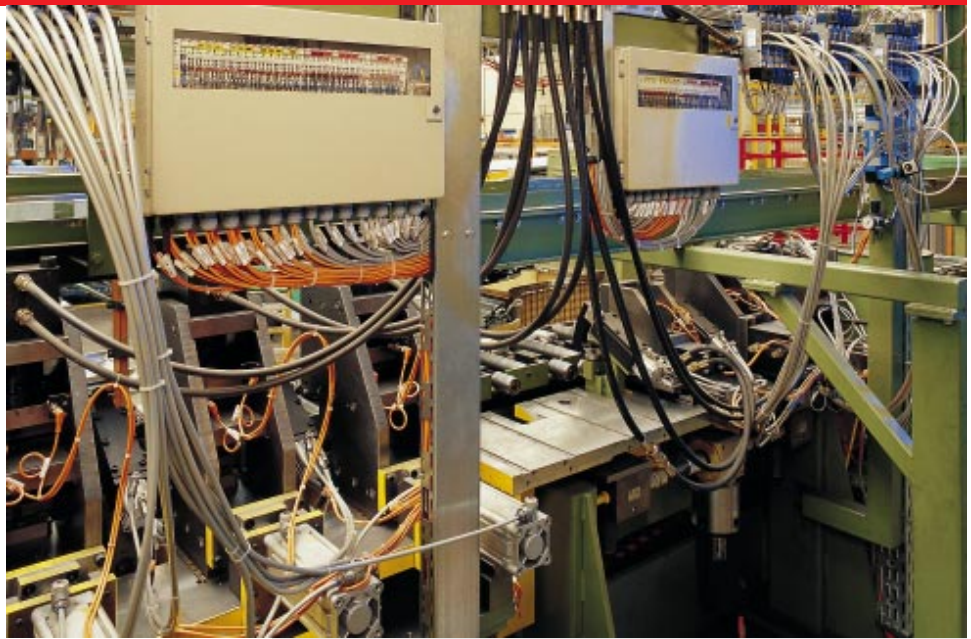
Process Optimisation by PC

An important element in the system is the integrated TwinCAT automation software. TwinCAT does more

than just convert any PC into an IEC 61131-3 PLC for automation applications. Even NC axis controls with cycle times shorter than 1 ms run entirely on a PC platform under Windows NT. It offers a modular, scalable software product for programming, controlling and visualisation, using program modules precisely tailored to one another and functioning under a Windows visualisation and the open interfaces. For example, with TwinCAT ADS a unified data interface is used in order to implement linking to Windows programs such as Visual Basic.

In this application TwinCAT not only handles the full range of functions associated with the control of sawing, bending, stamping and material flow, but also links them with the data processing associated with business management. The Oracle databank represents both the interface and the joint pool of data. This is where incoming orders are used to generate processing instructions. Hörmann

In the Hörmann KG in Werne the highly modular and variable-bus Beckhoff Bus Terminals ensure that individual manufacturers' system components grow together into a unified decentralised automation solution.



KG Werne take advantage of the high level of continuity right at the beginning of the automation chain. An automatic mechanism examines the order from the builder or architect – only if intervention is necessary is this altered by the work planning department – and converts it into item numbers stored in the databank. The production computer accesses these in accordance with the urgency of the order or the sequence. Right at the beginning of production, the system specifies a location for the barcode label that is visible until the item is completed but is later unseen, and where it will not be affected by machining or by other processes. At the central operating station the user selects the processing program, together with the various frame parameters such as material thickness and rebate depth, length and width, specifications of the bending and stamping, or parameters for special versions. The days of rigid process programs belong to the past of customised frame production.

The automation scheme gave each processing area its own PC for control, visualisation and communication tasks. Control is implemented by means of an IEC 61131 PLC, while the NC functionality in the PC performs the axis control for the feeding and positioning of the

The User: Hörmann Constructional Components

Gates, doors, frames, drives

With its ten production works, Hörmann takes a leading position in the European market for construction parts. More Hörmann Berry doors are sold in Europe than any other up-and-over door, while Hörmann sectional doors - whether as garage or industrial doors – are also best-sellers. Garage door drives provide a maximum of comfort and security.

A wide range of industrial doors, including all important constructions as well as door drives and controllers, offers tailored solutions for every application, from sliding courtyard gates, through external hall doors up to quick-opening doors as exterior or interior closers.

Fire and smoke doors as well as elements with large-area glazing offer plenty of creative scope to the architect, providing a successful synthesis of form and function. And when the emphasis is on protection from noise or from break-ins, Hörmann again have plenty of solutions ready.

Hörmann use aluminium as well as steel – for example, in multi-purpose and fire doors, smoke protection closers, sectional doors, roller doors and house doors. The wide range of Hörmann frames includes both a large number of standard types and special solutions in the form of Roundstyle frames and high-value stainless steel versions.

Central operator station for the bending, sawing and stamping machines. Each processing area utilises an individual IPC for its control, visualisation and communication tasks.



frame parts. "One particular feature at Hörmann was the integration of the relatively new Dreistern bending machine with a Siemens S 5 PLC," commented Beckhoff project leader Ehl. These machines are linked via a communication PC to the rest of the production system, and are thus connected to the central data bank. "This scheme of computer networking displays the progress of production clearly and transparently on every screen", reports technical manager Buschmann.

Cost advantages from electronic Bus Terminals

Turning to details, the bending and sawing machines – quite apart from

digital or analogue input and output modules – are fitted with encoders. These transducers have the task of detecting the bending angle or the length of the saw cut, so adjusting the position. Sebastian Ehl describes a good example of this, as a narrow frame is cut to length: "The saw, with its low advance speed, is only drawn back just far enough for the trimming to be completed in the minimum time. The complexity of such a quadruple saw and distribution machine is also underlined by the figures: the Beckhoff IPC controls nine servo-axes, and continuously interrogates more than 500 inputs and outputs for the precise positioning. Here again the finely modular Bus Termi-

nals receive all the signals locally and transmit them via bus couplers, the link between Bus Terminals and the fieldbus.

The Bus Couplers, which are available for all common fieldbus systems, transfer the data over the Beckhoff Lightbus to the PC controller. Using Lightbus, the signals can be transmitted even over long distances without risk of electromagnetic interference. At several places on the machine small terminal boxes are located, which, thanks to the individual terminal technology, are customised and therefore use little space. In this way the modern switching cabinet only requires half the space of earlier types.

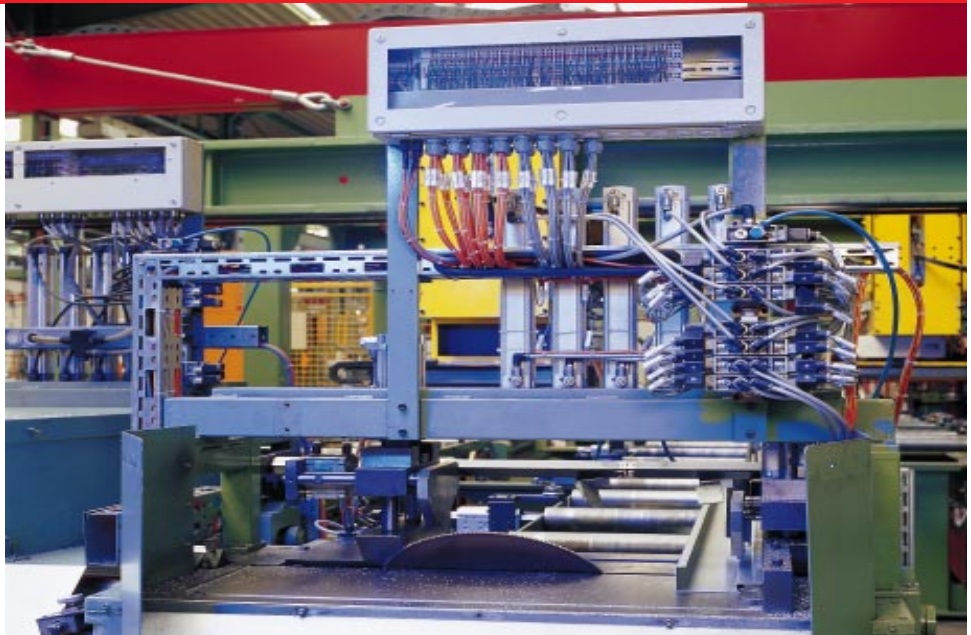
Fitting Times are Significantly Reduced

The principle of this distributed approach ensures control that is oriented very closely to the actual progress of the production, and also guarantees operation co-ordinated over the machines. The Beckhoff engineers also rigorously implemented this approach in the stamping plant. The Industrial PC here controls 13 axes, and manages about 650 inputs and outputs for optimal feed positioning and stamping control. The interlinked operation makes it possible here to process up to four different frame

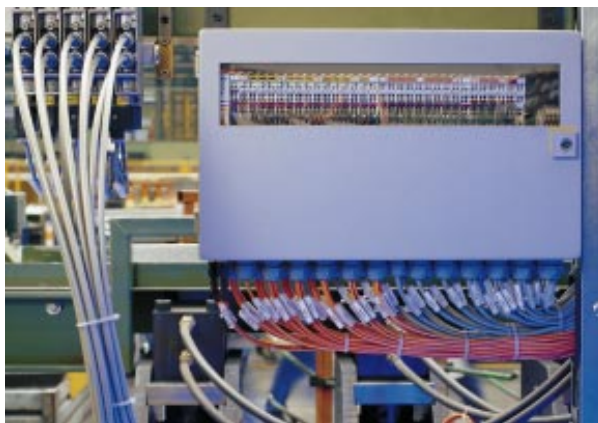


The current status of special frames production is displayed directly in the plant on a screen. Beckhoff technology is also used here in the Control Panel that is connected to the Industrial PC via coaxial leads. Using CP-Link technology the Control Panel and the IPC can be up to 65 m apart.

On the saw and distribution machine the PLC/NC TwinCAT software controls 9 servo axes. The location regulator is calculated on the PC processor and cyclically exchanges data via the fieldbus with drives and measurement systems.



In the decentralised terminal boxes sensors and actuators are connected directly to the Beckhoff Bus Terminals. Data transfer to the central computer is achieved via the Beckhoff Lightbus using optical fibres.



parts in one work cycle. This significantly reduces the necessary fitting times.

Only the spot welder is "merely" connected in a logistical sense to the interconnection. Human effort ensures the correct mechanical connections here at the interface to the unmanned production. Beckhoff power however is again called for in the final inspection. Four PC stations, fitted with extremely flat Beckhoff control panels, process the barcode, ensuring that the completed frame is properly inspected, booked out, and ready for subsequent delivery to the customer.

This application at Hörmann illustrates the fact that PC-based automation schemes are quite capable of being applied in pressing and stamping works. In spite of the tough environmental conditions and strong vibrations found there, the computers and monitors at Hörmann stand in the middle of the production area.

At the end of the production line four PC stations, together with the Control Panel, provide a proper control and check out of the frames.

