

EtherCAT replaces proprietary measuring cards and digital signal processors

→ The company Dr. Ecklebe GmbH, based in Wernigerode, Germany, has been offering specialty automation solutions since 1990. One of the main areas of activity for the company is the development of test facilities for generating and measuring operating data and maximum ratings for a wide variety of industrial applications. Dr. Ecklebe used EtherCAT, the high-speed, real-time Ethernet system for the first time in conjunction with a project to upgrade a test bench for analyzing dynamic, hydraulic and thermal loads on components.



“The upgrade of an existing test bench for hose clips at Hans Oetiker Metallwaren- und Apparatefabrik GmbH, based in Endingen, Germany, aimed to achieve a comprehensive controls modernization and increased performance,” said Dipl.-Ing. Michael Paetzel, managing director of Dr. Ecklebe GmbH. One of the requirements was to replace the existing analog control technology with software-based controllers. Each test piece requires different controller settings, which in the past could only be realized through hardware intervention.

With TwinCAT PLC software and EtherCAT as a fast fieldbus system, a solution is now available that enables all control tasks to be created in the IEC 61131-3 programming language. “The physical data transfer of the new control system is based on standard Ethernet, with EtherCAT used as the protocol. The system features cycle times in the 50 μ s range. Since the hydraulic pressure values have to be kept constant during the test procedure, fast readjustment is required,” automation expert Michael Paetzel explained.

“Via a suitable periphery, EtherCAT offers an automation system with data acquisition speeds that in the past could only be achieved with special measuring cards and digital signal processors (DSPs),” Michael Paetzel continued. “In conjunction with TwinCAT, we now have a modular, high-performance control system based on cost-effective, standard components.”

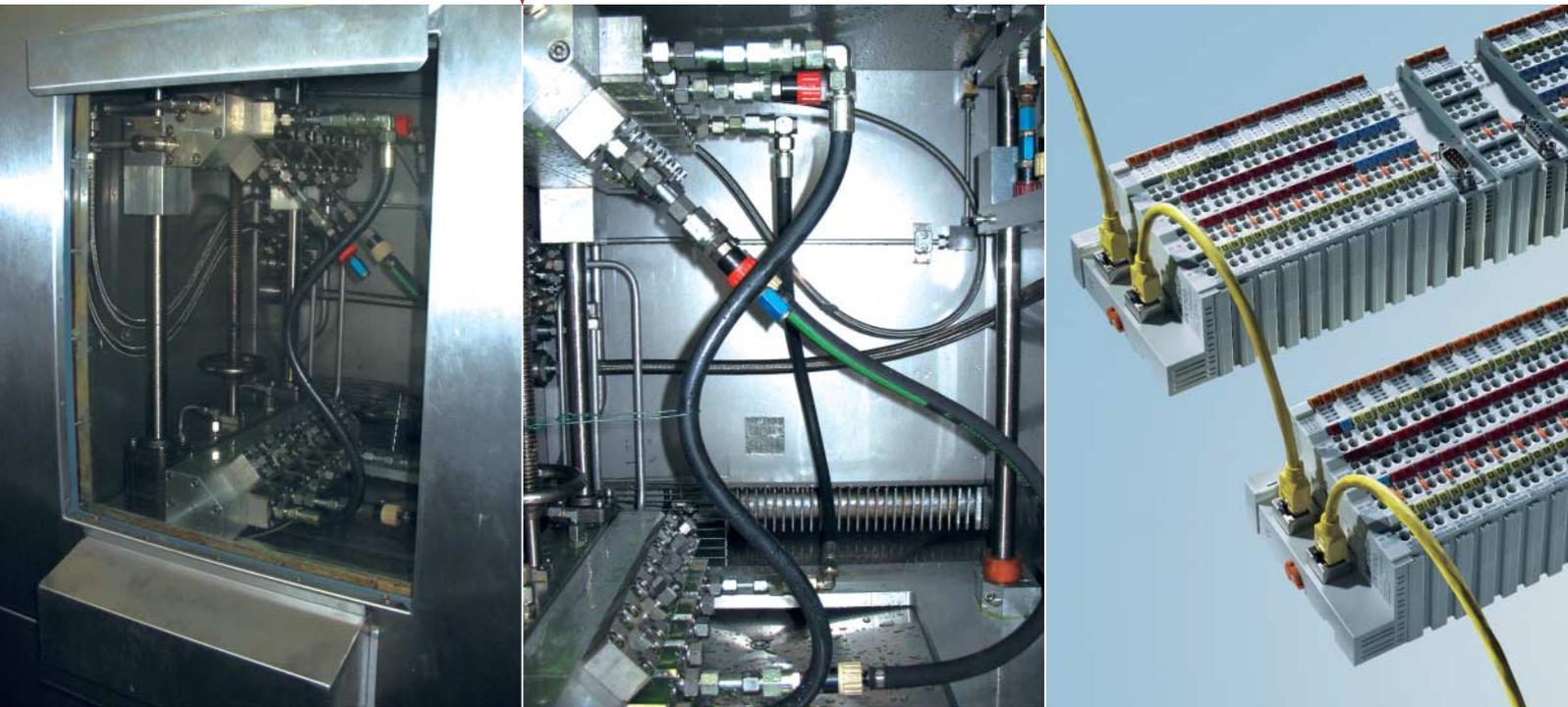
The adaptive control algorithms developed by Dr. Ecklebe GmbH run within a dedicated task (500 μ s) in the software PLC. All other tasks are handled via a second task (1 ms).

The following tasks have to be dealt with:

- | calculation of the set value curve (sine, trapezium, rectangle, etc.)
- | position control of the pressure generator
- | regulation and monitoring of the test pressure
- | adaptation of the controller parameters
- | logging and preprocessing of all measured values

TwinCAT integrates the regulation process into the control program. Via TwinCAT ADS, it also provides all process parameters for the visualization program, which is written in Delphi.

Hardware PLCs and DSPs are no longer required. This not only leads to substantial cost savings for components, but also reduces the project design, switchgear engineering and programming effort.



"For fast control tasks we use EtherCAT I/O terminals. For normal system control signals, standard Bus Terminal I/O are used with the BK1120 EtherCAT Bus Coupler. Since performance depends on the PC, control system scalability is practically unlimited as PCs become ever faster and more powerful," said Dipl.-Ing. Paetzel.

Another significant advantage is simplified programming and commissioning. All control software is written under a single development environment. Complex hardware coupling between PLC and DSP, such as multiplexed 5 V DC signals, is no longer required. Signal coupling is dealt with entirely within the software. This makes signal exchange less prone to faults and I/O tests during commissioning are no longer required. Overall, the decentralized configuration leads to further improvements with regard to EMC issues. The control signals are handled with short cable lengths. Full remote system maintenance capability is another advantage: Remote access to the PC enables full access to all relevant system data. "The first implementation of a test bench facility with EtherCAT convinced us and

our customer, with whom we cooperate closely, of its performance capability," said Michael Paetzel. "Commissioning was straightforward, since the system offers convenient engineering tools such as integrated trace functions." This application demonstrates that EtherCAT technology is not only suitable for new systems, but also enables existing systems to be modernized and upgraded. "EtherCAT can not only be used for test bench automation, but for any other control task, such as the positioning of electric or hydraulic axes." For Dr. Ecklebe, the fast fieldbus system offers significant room for technological advancement well into the future.

- Hans Oetiker
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