



Güdel uses Beckhoff technology for transfer and handling systems

PC as control platform

The exacting demands of transfer and handling systems are realized via a modular mechanical system and a powerful PC controller. The technology applied can be summarized as follows: The basic mechanical modules are sheet loader, loading and unloading devices, inter-press shuttle devices, 2- and 3-dimensional transfer devices as well as suction bar transfer devices. The movements of a large number of servo axes, synchronized with the press via two master encoders, is realized through the SERCOS interface drive bus via a motion law (5th degree polynomial). Nearly jerk-free motion of the handling equipment and transfer devices is ensured at any time. An electronic shaft connects all axes, so that they are synchronized with the respective press angle and the variables "velocity" and "position". The interfacing of the I/O layer is done via Profibus DP through the Beckhoff Bus Terminals.

→ Latest control and servo technology, combined into a mechatronic system using an innovative mechanical concept, allows extremely flexible, optimally designed solutions for the automation of movement sequence. Güdel proves how software PLC/NCs can achieve maximum productivity of a production process with the transfer and handling systems for presses, large-scale presses and press application.



Transfer and handling systems for presses, large-scale presses and press lines at Güdel.

A satisfactory result for the end customer requires customer understanding of a new technology. This understanding can only be achieved through close co-operation between machine manufacturer and control developer. In the current example, the team made up of representatives from the companies Güdel (Langenthal/Switzerland), TAS (Rechterswil/Switzerland) and Beckhoff, already experienced in such demanding tasks, proved once again successful.

Lower costs, yet more security

In too many cases, the control experts have to struggle with the evaluation of a variety of hardware components (visualization PC, PLC, NC/CNC modules etc.), have to balance operating systems and programming languages and worry about hardware and software interface problems. Compared with traditional control technology via PLC, PC-based control with software PLC reduces the complexity of the controller by at least 40 percent and the cost by at least 60 percent. An additional benefit are increased reliability and availability because far fewer individual components are used. Due to the predominant use of standard modules, the exchangeability of faulty modules is improved significantly. Due to the reduced engineering effort, more time is available for what really matters - process optimization. The "time to market" is clearly improved.

Axis coupling with tables

In many applications it is necessary to synchronize two or more axes. This also applies to the Güdel example. A hardware solution failed to deliver the desired result, but the software version was able to fully satisfy the demands of the customer. Axes can be software-coupled via TwinCAT NC PTP. A master axis is ac-

tively controlled, and one or more coupled slave axes are synchronously positioned via TwinCAT.

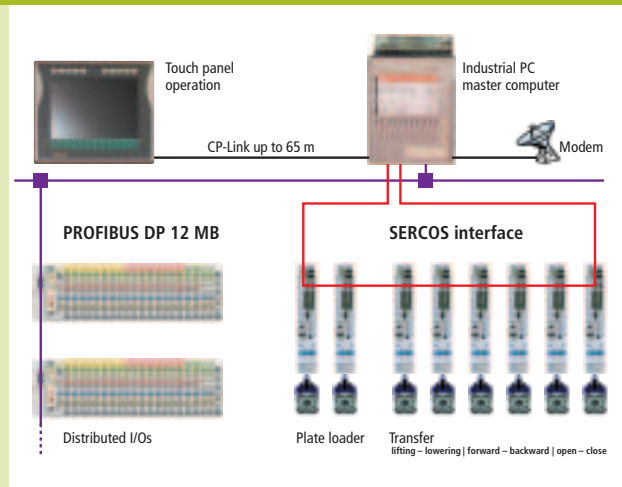
The simplest type of coupling is linear coupling with a fixed transmission ratio (electronic gearbox). More complex applications, such as the example described, require more complex coupling of master and slave, which cannot be described by a simple mathematical formula. Such a relationship can be described by means of a table that specifies an associated slave position for every master position. TwinCAT now offers the option of coupling a slave axis with a master axis (electronic cam plate) via a (cam plate) table. The table contains a certain number of prescribed reference points, and the NC interpolates position and velocity between them. Multi-table coupling also links a slave axis with a master axis, but different tables are used for different position regions.

Worldwide application

The question of the acceptance and the reliability of software PLC systems has been answered positively some time ago - at least at Beckhoff and some others. The reason why various industries are still reluctant to use the technology is that it is difficult to say goodbye to familiar and accustomed technologies. There is no significant technical argument that would prohibit the use of software PLC for complex applications. Moreover, the successful application examples worldwide signal a clear approval by customers from an economic viewpoint.

Key transfer figures at Güdel

NC part	
No. of SERCOS axes	14
Master axis encoder via SERCOS	2
No. of TwinCAT axes	18
Table couplings	10, of which 2 multi-tables
Coupling types	linear, tables, 2 real and 2 virtual master axes
Table entries per table	3600 rows
Motion law	5th degree polynomial, calculated in the PLC
NC cycle	2 ms
PLC part	
Instructions	approx. 45,000
Cycle time	10 ms
Real-time load	approx. 40%
Axis data	
Velocity	7.5 m/s
Acceleration	15 m/s ²



The control architecture of the electric transfer consists of Industrial PC, Profibus Bus Terminals for I/O interfacing and the drive technology with SERCOS interface.