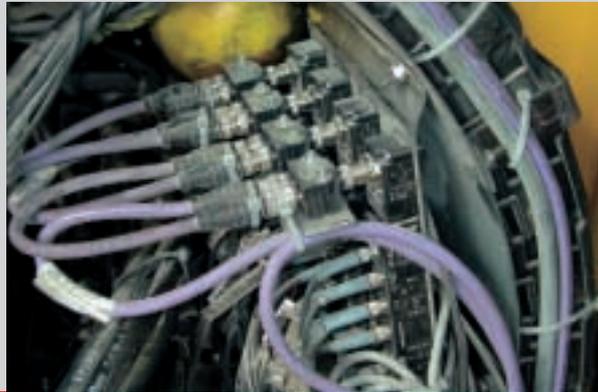
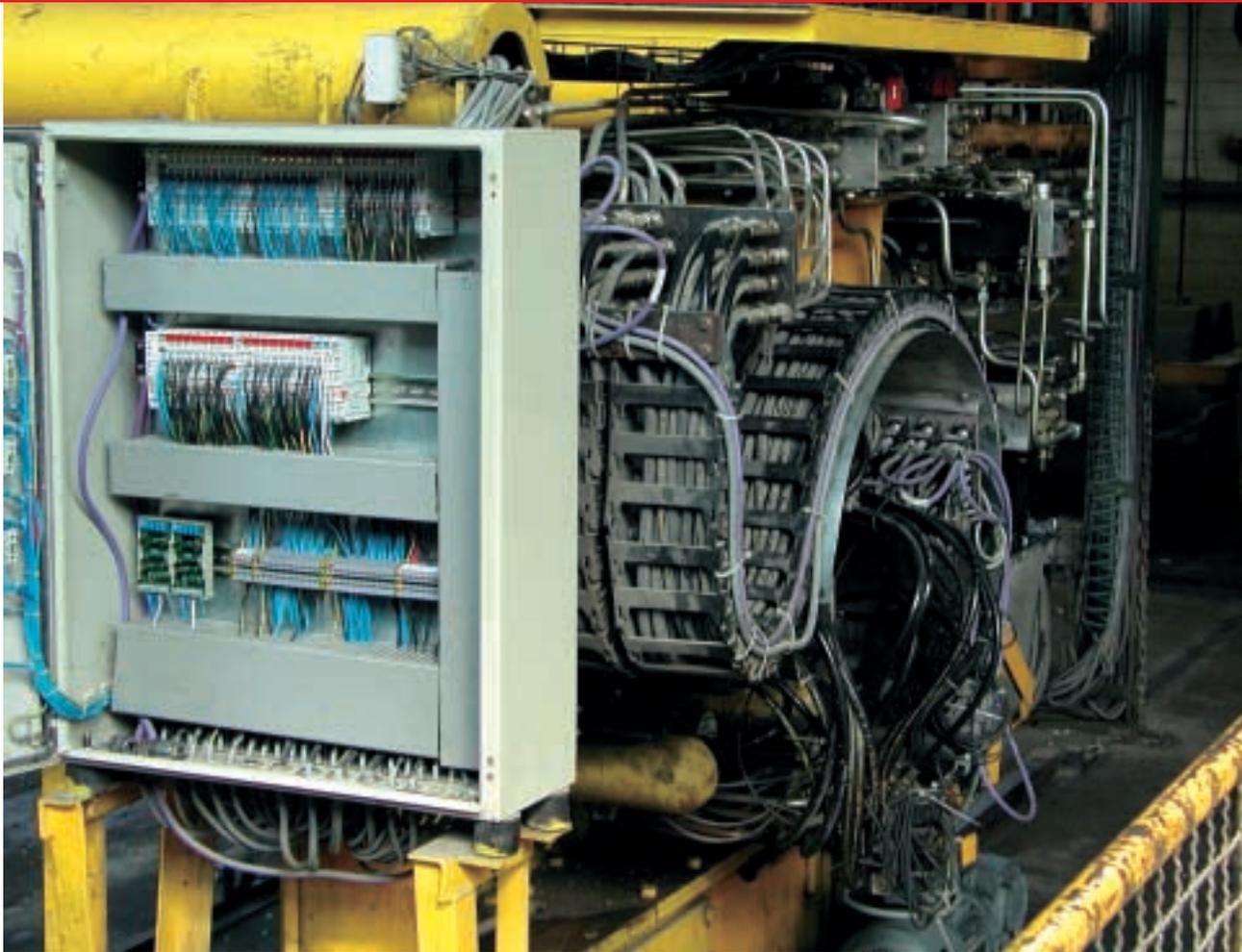


I/O modules with protection class IP 67  
for more competitive production

## Concrete ties – High-tech product?



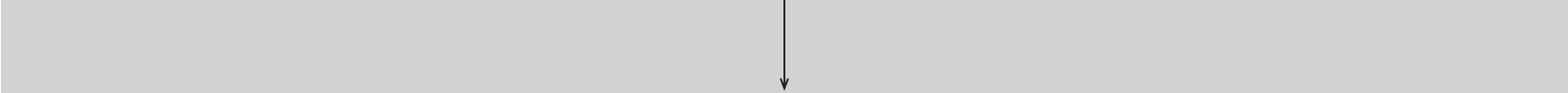
Control functions in today's automation engineering are moving closer to the sensors and actuators and away from the control cabinet. The fully potted Fieldbus Box modules, in protection classes IP 65/66/67, are ideally suited to this kind of application. The robust and compact I/O modules can be mounted directly on a machine without the need for additional terminal boxes. Leonhard Moll Betonwerke GmbH & Co. is also taking advantage of this in their production plant for concrete ties. The efficiency and the quality of the concrete ties produced could be significantly improved with the PC-based control platform TwinCAT and I/O.



In the production unit for railroad ties, the company Leonhard Moll Betonwerke GmbH & Co. relies on robust and compact fieldbus technology.

The patent for the manufacture of pre-tensioned concrete ties for railroad tracks was applied for by businessman Leonhard Moll – a pioneer in this field – back in 1937. If the railroad technology of those days is compared with that of the modern, high speed world, it is hardly a wonder that the requirements for what might seem to be such a simple product as a railroad tie have risen enormously. The portfolio of tie products includes track and points ties for German railroads, ties for transport services, longitudinal ties for lawn tracks and rail fastening systems. More than 1,000 railroad ties are produced each day at the factory in Braunschweig, Germany.

The challenge of producing concrete ties of high quality and correct dimensions for an optimum cost in a highly competitive marketplace can only be met with the help of automated machinery. Leonhard Moll GmbH's Braunschweig factory has converted completely to PC-based control technology from Beckhoff, in accordance with a decision taken by Dieter Oelmann, the man responsible for control technology. Several Beckhoff Industrial PCs, Control Panels, fieldbus components in protection class IP 20 and IP 67 and the automation software TwinCAT are being used. Leonhard Moll made the decision to use the "copper version" of Profibus DP at 12 Mbaud for the fieldbus system.



More than 1000 railroad ties are produced every day at the factory.



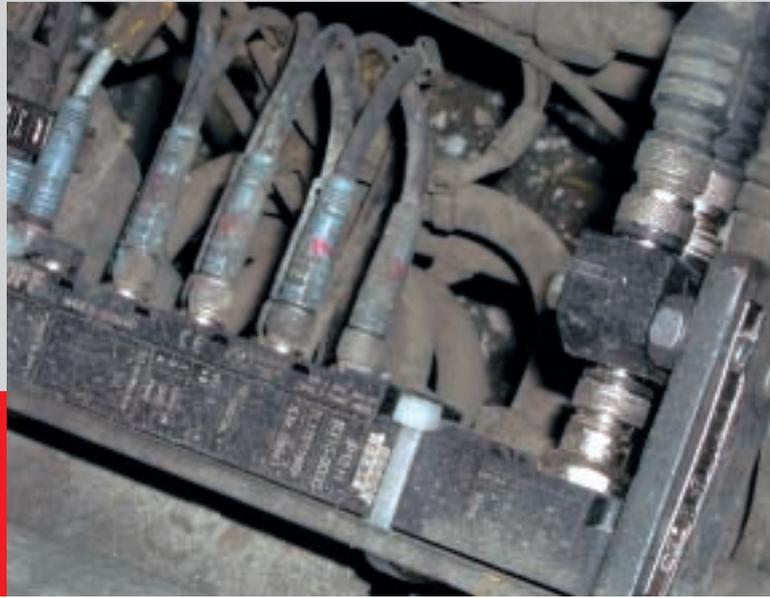
The man responsible for the control technology, Dieter Oelmann, uses Beckhoff automation components.

The facility involved is actively engaged in production, so automation is taking place continuously. This means that relatively simple modules such as material acceptance are automated and then integrated into the Profibus network.

The production of concrete ties has little connection with concrete pouring as is done, for instance, for the foundations of a single family house; we are dealing here with cost-optimized series production of the various tie types. A distinction is made between different manufacturing processes: in contrast to "late demolding", the factory in Braunschweig makes use of "immediate demolding".

As the name might suggest, in this process the concrete tie is taken out of the mold immediately for further handling, without having to wait for long drying times in the mold. This makes it possible to work with a limited number of molds, and these move cyclically through the production process. One disadvantage, however, is the effect often seen when building sandcastles: If the mixing ratios are not 100 % correct, the tie can either not be removed from the formwork, or it collapses. With an average weight of 300 kg, and a length of about 260 cm, the demands placed on the mixing process and therefore on the control technology are indeed high.

The IP 67 I/O components are particularly well suited for rough industrial environments.



### Distributed I/Os directly on the machine

Production begins with delivery of the basic materials: cement, sand, stone chips, water and diabase (broken granite). An average 450–500 ties are produced in each shift, so that 150 t of material are moved. The elevator controller and the scales, which have a BC3100 Bus Terminal Controller with a Profibus interface, transport material to the mixer. At the same time so-called matrices are drawn into the molds. These provide the necessary hollows into which the tensioning steels with their cut threads will later be located, giving the concrete tie its final strength. The molds are then passed to the formwork removal machine. A cover is placed on, and the mould is turned over.

The concrete factory's control engineer, Dieter Oelmann, decided that Fieldbus Box Modules from Beckhoff would be fitted locally. The compact, fully potted modules might almost have been designed for this application. Very tough ambient conditions and heavy exposure to dust, water and oil require particularly robust devices. Eight Fieldbus Box modules, each having eight digital 24 V DC inputs, are fitted here directly on the machine. M8 connections with pre-assembled sensor cables were selected so that the wiring could be implemented as securely as possible.

### Efficiency and quality improved

After removal from the molds, the ties are given the correct dimensions. The dimensional tolerances are  $\pm 1.5$  mm outside and  $\pm 0.5$  mm inside; hardly what one might imagine for a "simple" concrete tie. After adjustment the ties are transported by means of a high rack storage and retrieval device to the drying stores, where they will remain for 24 hours. A distributed Profibus Bus Terminal Station is used here again. It is wired through a 50 m long power supply chain, using a cable suitable for use with drag chains. In the subsequent final assembly area the tensioning steels are inserted and the final tension of 80 kN is applied. When the ties have finally been sealed, they are moved to the external stores.

The test laboratory is involved throughout the production process to ensure

consistent quality. The raw materials, finished concrete, dimensional correctness and much more are all inspected. Acceptable limits specified by the company are a great deal tighter than those required by the various official standards. In the TwinCAT system and fieldbus components from Beckhoff, the company, which is certified to DIN ISO 9001, is relying on a technology that is both innovative and yet well proven. Over recent years it has been possible to improve the efficiency and quality of the delivered products while reducing costs at the same time. Concrete ties – a high-tech product? That is a moot point. What is clear, however, is that more is involved than we might first think.

→ Leonhard Moll Betonwerke GmbH & Co.  
[www.moll-betonwerke.de](http://www.moll-betonwerke.de)

### Reinforcement for fieldbus marketing

Dipl. Ing. Dirk Bechtel studied electrical engineering at the Technical College in Bielefeld, Germany. Following his thesis on the subject of handheld computers, he worked in the area of portable operating terminals for four years. For the last 10 years, he has worked in international product management and marketing for industrial fieldbus technology. His activities

ranged from proprietary systems to the currently market-leading Profibus. Since January 2002, Dirk Bechtel looks after the fieldbus marketing and, as "IP 67 specialist", particularly the Fieldbus Box modules at the Beckhoff headquarters in Verl. With these compact units, Beckhoff opens up applications that could not be served optimally with the existing IP 20 Bus Terminal solution.

