

Triplex extruder plant at the Korbach factory of Continental AG. In the extruder head, the tread emerges from the tool (mold). It consists of the three materials provided by the triplex extruder.



→ Using PC control technology, modern communication systems and user-friendly visualization devices from Beckhoff, Continental AG transformed an existing extruder plant into an economic high-tech production facility at their Korbach factory.

PC-based control technology in the rubber processing industry

Retrofitting of an extruder plant

Continental's Korbach tire plant has a long tradition. Tires and rubber products have been produced at Korbach in northern Hesse since 1907, initially by the Frankfurt-based "Mitteldeutsche Gummiwarenfabrik Louis Peter AG", which merged with Hanover-based Continental AG in 1929. It goes without saying that the production techniques, the product range and the associated product characteristics and functional requirements have changed significantly since then. Today, the Continental Group produces tires using high-tech production machines, and the productivity of each individual plant is a crucial factor for the Group as a whole. In 2003, for example, on average the Korbach tire plant produced every day 28,000 car tires, 5,300 motorbike tires, 2,400 industrial tires and around 130 km of flexible hoses.

High-tech retrofit

In 2003, a Krupp Triplex extruder line for producing treads, which had been moved from another Continental facility, was modified for further use at Korbach. During the retrofit, the line had to be adapted to the Korbach factory standard, with assurance of the expected productivity. In order to achieve this, the complete con-



Systems visualization at the control station



Treads after the cooling section, just before the cutting unit



trol system was replaced. Continental's control engineers chose PC-based controllers from Beckhoff as their platform. Four C6130 Control Cabinet PCs were used, each with a 15 inch CP7002 or CP7032 Control Panel. Two of the four IPC/Panel combinations are used for recipe management and visualization, a further combination controls the cutting machine, and the fourth one deals with color marking.

One control cabinet PC is equipped with the TwinCAT NC PTP software and acts as a PLC for controlling the extruder. The complete periphery of the extruder plant was integrated with the IPC through Bus Terminals and via Lightbus. A total of 600 digital I/O connections and 40 analog devices are connected with the central IPC in the main operator panel via the Bus Terminals. Additionally, the Lightbus ring includes two Beckhoff servo axes. This machining station runs continuously and is used for precision cutting of the tread.

In addition, the extruder plant has 12 drives for conveyor systems, which were initially retained for cost reasons. One channel of the FC3102 Beckhoff Profibus fieldbus card is used for interfacing with the TwinCAT controller. The second channel connects the extruder controller with the tread width measurement device and with the scales that measure the weight. These are important parameters for

assuring the quality of the finished tires. The four Industrial PCs from Beckhoff are networked via Ethernet and also integrated into the factory-wide LAN. The higher-level, factory-wide production management system and the central process data archiving facility thus have access to all extruder plant data, which is a requirement in all Continental factories. The visualization interface preferred at the Korbach factory could be integrated without additional expense via a TwinCAT OPC Server.

Qualification through "training on the job"

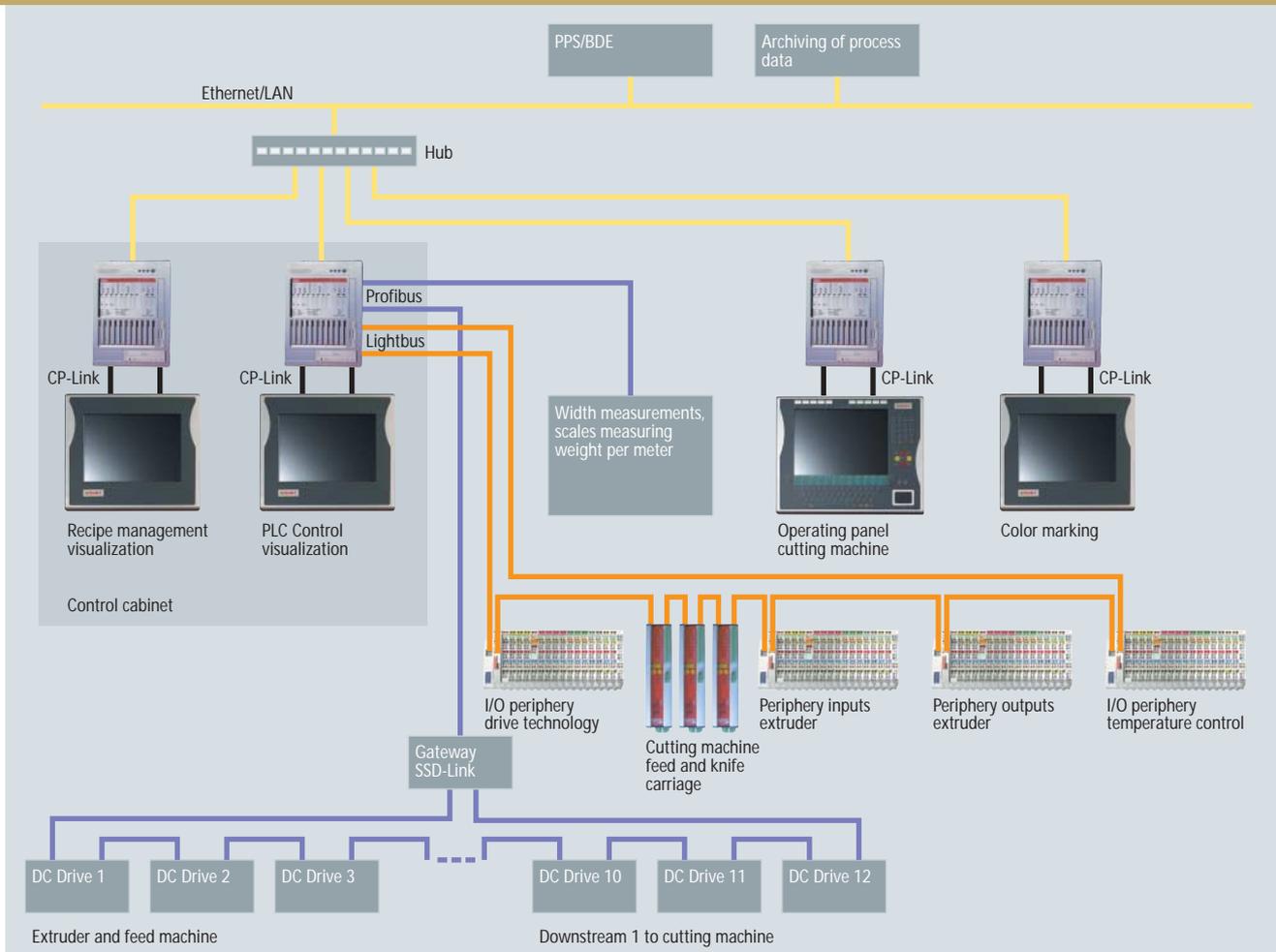
In order to make the retrofit as efficient as possible, Continental staff from Korbach were integrated into the process. While 6 months had been scheduled for the conversion, it actually only took 4.5 months. Commissioning, for which 6 weeks had been scheduled, was managed in a similar way, reducing the actual time to 5 weeks.

Since 1997, Beckhoff has been holding regular, topic-specific staff training sessions at Korbach, during which hardware know-how and programming techniques based on IEC 61131-3 and the TwinCAT software with PLC, NC PTP and OPC blocks were communicated. The results confirm that the strategy chosen at Korbach was the right one.

Globally proven PC control technology

With the commissioning of the extruder plant, the success story of the cooperation between Continental AG and Beckhoff continues. The high productivity of the works operated by the tire manufacturer speak for themselves. In April 2003, for example, the 150 millionth car tire – a 195/65 R15 ContiPremiumContact – was produced at Korbach. The Korbach location provides employment for nearly 3,000 staff.

In the global production facilities of Continental AG, more than 1,000 Beckhoff





Semi-finished material is taken to one of three extruders



Within the Continental Group, Beckhoff Industrial PCs are used for controlling the following system components:

- | Large-scale mixing room: mixing of raw material
- | Large-scale extrusion lines: duplex, triplex, mixing of 2 or 3 materials for treads or side walls
- | Calender: calendering of the inside layer, steel cord
- | Conveying equipment: transport of raw tires, finished tires
- | Individual machines:
- | Tire construction machines, carcass machines: assembly of the green tire from previously manufactured semi-finished products
- | Heating presses: vulcanization, shaping/profiling
- | Fully automated testing machines: visual inspection, checking of concentricity, bulging, imbalance
- | Core winders, core wire coating
- | Fabric cutting machine, steel cord shearing machine: cutting of material

IPCs, approximately 6,000 Bus Couplers, 150,000 Bus Terminals and 500 drive controllers are currently being used. The new CX1000 control system is already being used in various applications. The axis functionality of CX controllers can open up additional areas of application, such as mold cleaning. The manufacturing facilities controlled in this way include tire building machines, carcass machines, fabric cutting machines, cord cutting machines, heating presses, core winders, extrusion lines, testing machines and conveyor systems.

Continental has used Beckhoff IPC controls in more than 1,000 machines, particularly as part of investments in new production facilities in Portugal, the Czech Republic and Romania. Here, Beckhoff control technology makes up between 75 and 100% of the control equipment overall.

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