

A freshly-produced electromechanical gearbox, including already mounted microswitches for General Motors' automotive locking systems

Car door locking systems produced in China with PC-based automation

Precision and reliable automation unlock new global potential

→ For a few months now, newly installed production facilities built by the Austrian automotive supplier, Pollmann have been running at full speed in China. There, this specialist in electromechanical subassemblies manufactures, among other items, gearboxes used in the automotive locking systems of a well-known, global car manufacturer. The production plant was developed, designed and built by Pollmann and then, after an intensive test run that included pre-series production, shipped to China at the end of 2007. For the control system the company relied on its partner of many years, Beckhoff, developing a smart, locally arranged PC- and Ethernet-based automation architecture.



The new Pollmann production facility during the test phase at the Karlstein factory: in the foreground, the laser welding machine by Trumpf, in the background, the 4 meter high storage tower that serves for the curing of the cast parts coming from the two-component casting station. At the same time, it is used as a buffer store within the overall production process.

The production company Pollmann, based in Karlstein, Austria, has been competing successfully for almost three decades in the global, perpetually hard-fought automotive supplier industry. This innovative company has specialized mainly in the development, prototype manufacture and series production of electro-mechanical subassemblies made of plastic and metal used in insert and outsert techniques, and today manufactures components for sunroofs, door locking systems and drive units for lumbar supports in vehicle seats, among numerous other products. The customer specifies the functions to be integrated, the installation space and the interfaces and Pollmann elaborates upon the process and mounting criteria. The manufacturing process is determined and the plant is designed and built based upon this close collaboration.

In addition to its headquarters in Karlstein, Pollmann has production facilities in the United States, Czech Republic and, since the end of 2007, in China. "Our intention was to manufacture locally for the Asian market and in the immediate vicinity of one of our largest customers," says executive manager Markus Pollmann, explaining the reasons why the company has strengthened its position in the Asian market with its own factory there. The decision was underlined with a concrete order from MAGNA, a Pollmann customer of many years, for the production of electromechanical gearboxes for General Motors' automotive locking systems.

A high precision, economical solution

Pollmann's remarkable strength lies in the combination of metal and plastic materials to make electromechanical subassemblies. "We have many years of experience in plant construction and series production here," explains Markus Pollmann. "Since, as a development partner, we are usually involved very early on in new projects, it is possible for us to create solutions that are not only highly precise, but also very economical."

The production facility developed and constructed specifically for this large order has a high degree of automation. "The particular challenge was to find the optimum mix in degree of automation and use of personnel for the operation of this plant," says Reinhard Ringl, responsible for the conception and implementation of control technology at Pollmann. "The production of a total of 27 different model versions had to be made possible. At the same time, the goal was to make do with a maximum of 16 employees per shift."



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The housing, just produced in the plastics injection molding machine, is placed on a transport tray and subsequently arrives at the final assembly area of the plant via a sophisticated transfer system. Depending on the version, various microswitches are inserted here and subsequently welded by laser and completed in the two-component casting station.



A look inside the control cabinet: the technicians at Pollmann have relied for years on PC-based automation technology from Beckhoff. On the control side, the heart of the new plant is formed by the C6140 Industrial PC with TwinCAT PLC real-time software.

Reinhard Ringl, control technician at Pollmann: "The individual Beckhoff automation components simply match each other perfectly, and they can all be managed, programmed and diagnosed via a single software platform."

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Complex production strategy

A finished part reaches end storage every eight seconds. The efficient chaining of individual production steps, each representing in principle a self-contained work step, are the basis for the complex manufacturing strategy: at the start, injection molding tool inserts are fitted with the externally punched conductor tracks (pre-molded parts) in the provisioning stations. From there the pre-molded parts are placed fully automatically by a robot in the injection molding machine, which 'spits out' the actual plastic housing with up to ten molded-in conductor tracks. The housing is placed on a transport tray and subsequently arrives at the final assembly area of the plant via a sophisticated transfer system. Depending on the version, various microswitches are inserted there, welded by laser and completed in the two-component casting station. The material cures in a 4 meter high storage tower, which works on the paternoster principle and at the same time serves as a buffer store within the overall process.

Extensive quality checks follow, which are similarly integrated in the automated circuit: the parts are checked both for correct configuration and model version and their electrical functions are also checked. The test and measurement data is documented and saved in a database running on a Beckhoff Industrial PC; Pollmann is naturally certified to ISO/TS 16949 and ISO 9001:2000. Finally, laser marking is performed and the finished electromechanical housing arrives at the removal station.

Transport between the individual working stations takes place fully automatically. "The completion of the locking system, such as the installation of the motor and the wiring, then takes place at our customer's facility," says Reinhard Ringl, explaining the further procedure.

Universal PC-based automation architecture

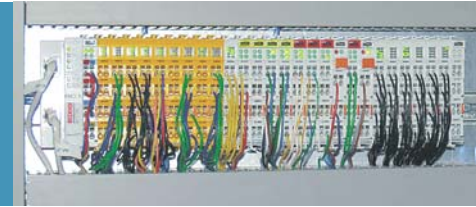
The technicians at Pollmann have relied on PC-based automation technology for years and swear by the advantages and flexibility of the software PLC. On the control side, the heart of the new plant is formed by two Beckhoff C6140 Industrial PCs, installed with TwinCAT PLC automation software. "All of the threads are tied together here: the injection molding machine, the robot and the laser welding and laser marking machines have their own controllers that communicate with our TwinCAT application as the higher-level controller. We have implemented safety equipment throughout the entire plant with

TwinSAFE, the safety solution from Beckhoff. The integration of the safety functionality into the existing control architecture simply works perfectly," reports Reinhard Ringl. Local automation architectures are similarly standard at Pollmann: In this specific case, there are 25 local Bus Terminal stations with approx. 3,000 I/Os for the plant's many sensors and actuators.

Ultra fast communication via EtherCAT

EtherCAT is used for communication. "This extremely fast communication is necessary above all for the laser welding systems. Four laser cells access a single laser source here. Switching between the cells is coordinated by the Beckhoff controller, wherein the switching time must not exceed 60 ms," explains Reinhard Ringl. However, the pneumatic valve terminals, which control various pick-and-place units in the individual workstations, also communicate with the software PLC via EtherCAT. "A great many component manufacturers now offer EtherCAT interfaces, which means that this bus system can be used very practically," says Reinhard Ringl. The Servo Drives in the system are also from Beckhoff.

"The Beckhoff components simply match each other perfectly, and they can all be managed, programmed and diagnosed via a single automation software platform," explains Reinhard Ringl, and he continues: "We implement our remote maintenance concept via the Ethernet connection. That was very important to us, especially for the plant in China. If problems occur, we can access the controller and the database on the IPC from Karlstein and quickly analyze the reasons for a malfunction. The Beckhoff system offers us extensive diagnostic options for this purpose."



Around 3,000 I/Os for the plant's many sensors and actuators are connected via Beckhoff Bus Terminals.

→ Pollmann www.pollmann.at

→ Beckhoff Austria www.beckhoff.at