



→ Eberspächer used Beckhoff automation systems for the development of a monolith press for catalytic converters in South Africa. In order to meet the strict quality requirements, Jendamark Automation designed a PC-based control system using the C5102 Industrial PC and TwinCAT NC PTP as control software.

Jendamark automates Eberspächer Monolith Press

“Clean” automation solution

The Eberspächer group of companies are specialists for exhaust engineering, vehicle heaters and glazing construction. Based in Esslingen, Germany, the group comprises 25 companies in 13 countries with more than 5,200 employees. Eberspächer is a leading exhaust engineering company, supplying advanced exhaust systems to vehicle manufacturers around the world.

For the development of a new horizontal press for inserting monoliths into stainless steel catalytic converter housings in South Africa, Eberspächer utilized the automation know-how of Jendamark Automation and control technology from Beckhoff. Jendamark is the Beckhoff partner in South Africa, specializing in automation solutions for the automotive industry.

Precise acceleration and deceleration ramps

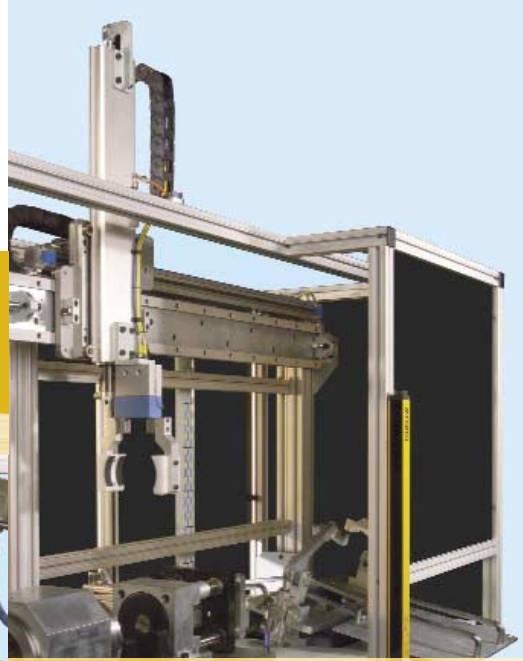
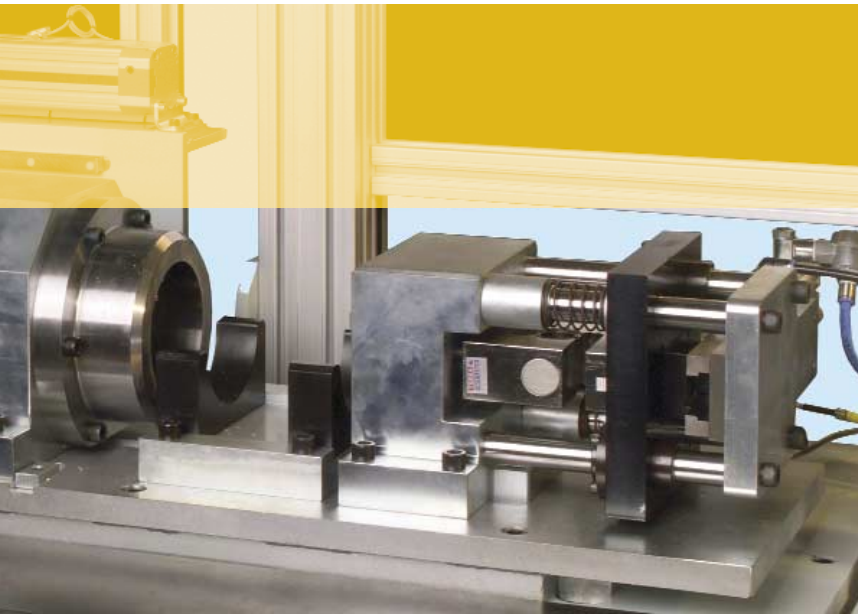
The individual channels of a catalytic converter – up to 8,000 channels per unit – are called monoliths. They convert the combustion residues into environmentally benign substances (see box: “How a catalytic converter works”). The monolith diameters vary in size, and the system has to adapt accordingly. The insertion of monoliths into the stainless steel catalytic converter housings requires a press-in speed of 12 m/s at 25 kN. This is achieved by using an AX2020-B200 Beckhoff servo-amplifier in combination with a 32 Nm AM297S Beckhoff servomotor, and

an angled gearbox that drives a ball screw pressing mechanism. The TwinCAT control precisely regulates the acceleration and deceleration ramps in order to achieve optimum pressing attributes. The Lightbus system enables high-speed communication between the Industrial PC and the drive in order to control the process to the specified requirements. A C5102 Industrial PC mounted in a 19-inch rack is used as control hardware.

Due to the level of operator interaction, the system is designed for safety category 4. Emergency stop circuits and safety light barriers are employed to ensure optimum safety. Safe emergency stop recovery sequences are programmed directly in the TwinCAT PLC, with different recovery routines depending on the last state of the machine before the emergency stop. Low and high pressure pneumatic cylinder activation sequences result in safe operator assistance and correct positioning for all critical clamping and sliding surfaces. The return force is measured by means of a load cell system that ensures precise press-in force settings.

Scalable and adaptable control

All specifications for the pressing operation can be manually adjusted for different products. The user interface is based on a Visual Basic application that allows model definition, configuration and selection. Other functions include diagnostics



Long-standing suppliers to the automotive industry

As manufacturers of vehicle heating and exhaust systems, the Eberspächer group is active on an international scale and has long been recognized as a major supplier to most European manufacturers of cars and commercial vehicles. Its core customers include DaimlerChrysler, BMW, Audi, VW, Renault, Land Rover, Saab, Skoda, Seat Iveco, MAN, SCANIA, VOLVO and RVI; and for heaters Opel, Toyota and Ford too. By concentrating on two product categories and its established markets, Eberspächer has established an outstanding position in numerous market segments and now occupies a leading position in the world market for heaters. The lion's share of the company's production of exhaust systems is used by car manufacturers. As the largest independent developer and supplier in this field, Eberspächer's share of the European market is around 20%.

and manual mode operations. All operator functions are protected via access authorization. This authorization is implemented through identification tags that are read and verified in the database. The Beckhoff CP6832 Control Panel with 15" display and touch screen simplifies system operation. The PLC software enables the implementation of user-defined values for:

- | Variable speed and positioning
- | Motion profile
- | Data capture with network capability
- | Alarms to be triggered on error conditions
- | Values for the load cell system

The system status is visualized via a Visual Basic application:

- | Production results (pass, fail, force vs. displacement graphs)
- | Job particulars
- | Manual and automatic modes

Laser beams guide the operator during component placement to ensure correct alignment. At the end of the operation, an automatic transfer mechanism removes the pressed parts and delivers them to a marking location. A pin-stamp



How a catalytic converter works

The 3-way catalytic converter converts over 90% of the toxic combustion residues from a petrol engine into environment friendly substances. Carbon monoxide, hydrocarbon and nitrogen oxide are converted into carbon dioxide, nitrogen, oxygen and water vapor. The conversion is carried out catalytically by the use of precious metals (platinum, palladium, rhodium) which coat the 8,000 or so channels of the ceramic and metallic monoliths. If the entire catalytically active surface of a car catalytic converter were spread out, it would cover the area the size of 5 football pitches.

marker now engraves the finished parts with customer-specific information and company logos, as well as the recorded pressing values. After the marking operation, the components are transferred to the correct output chute, depending on their type.

The combination of Jendemark's experience in the construction of special purpose machines with Beckhoff software and hardware components enabled Eberspächer to develop a powerful solution that provides reliable quality for a variety of component variants with a cycle time of only 30 seconds. Scalability and versatility for adaptation to other component types are further key features of the Eberspächer monolith press.

→ Eberspächer www.eberspaecher.com

→ Jendemark Automation www.jendemark.co.za