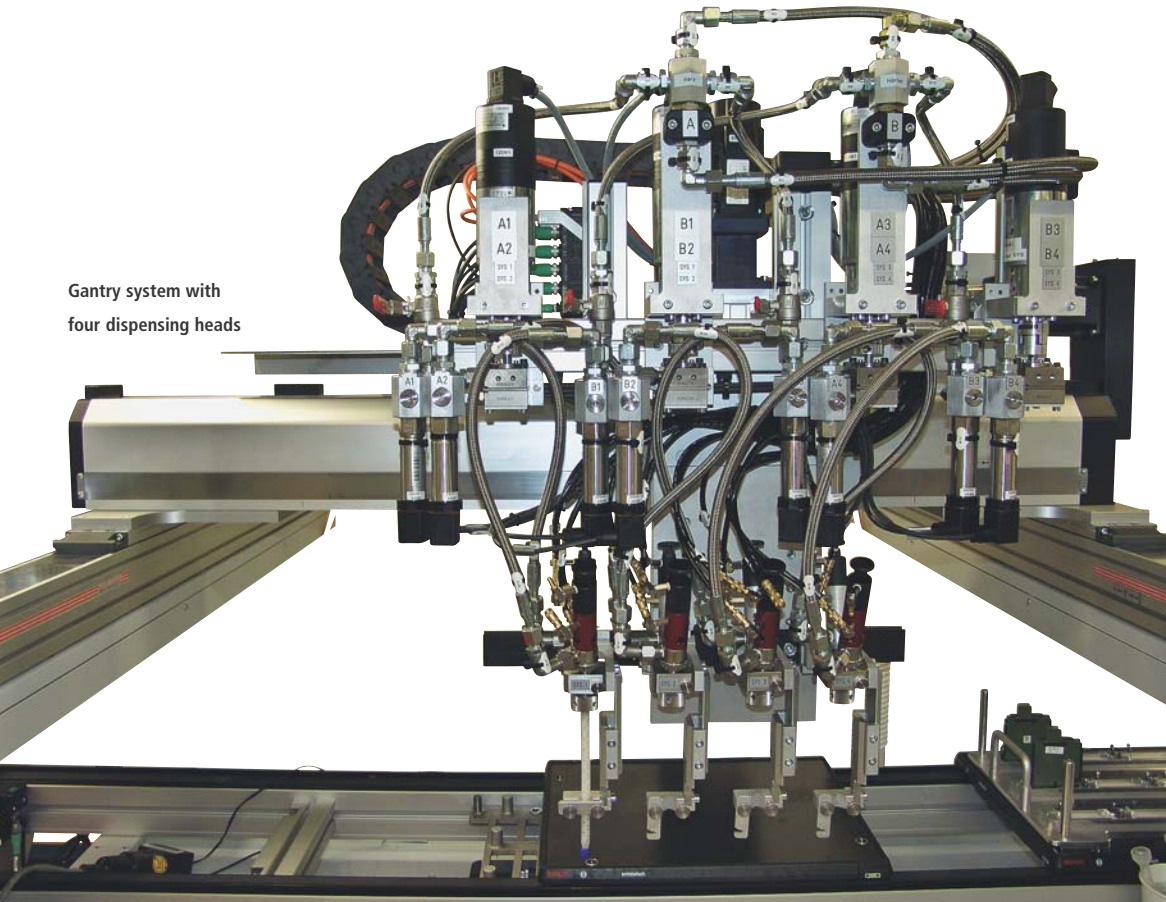


System for processing reactive casting resins features a mix of advanced technologies

PC-based control platform blends dynamics and precision into one solution

Gantry system with four dispensing heads



BARTEC Dispensing Technology GmbH is one of the world's leading suppliers of dispensing and impregnation equipment. The treatment and processing of reactive casting resins are strongly dependent on the repeatability and dispensing accuracy of the processes – a requirement which Beckhoff's PC-based control platform optimally fulfills.



Plasma pre-treatment and double single component dispensing with a screw pump for casting electrical devices.

The German-based company BARTEC Dispensing Technology, with its locations in Weikersheim and Garbsen, is specialized in customer-specific process solutions for the dispensing and processing of liquid and pasty reactive casting resins. BARTEC's clientele includes the automotive industry, the electrical and electronic industry, medical technology firms and the filter industry. There are already more than 2,000 BARTEC machines installed in plants worldwide.

High demands on dispensing accuracy and repeatability

"The treatment and processing of reactive casting resins is anything but trivial," explains Steffen Dommerich, technical manager and proxy of BARTEC Dispensing Technology. "We process different materials, single- or multi-component epoxy resins, silicones and polyurethanes, from low to

high viscosity, enriched now and again by abrasive fillers. The challenge in terms of process engineering consists of mixing the components homogeneously and then applying the mixture precisely." Depending upon the constituents, the quantities and the viscosity, this procedure makes different demands on the dispensing technology. "That is precisely the trick: to obtain a homogeneous mixture in which the mixing ratio and the discharge quantity are correct over the entire duration of production," says Steffen Dommerich.

Customer-specific solutions – made to order

The complete solutions offered by BARTEC are combinations of dispensing technology, mechanical engineering, automation and information technology. Depending on the customer's process and product requirements,



a universal solution is developed from standardized modules or standard solution concepts. Markus Schmitt, project manager in the engineering department, reports: "Before the start of the project, a detailed consultation with the customer takes place, in which the customer is advised about details of the core processes: dispensing, plasma pretreatment and the hot stamping procedure. In the subsequent step, preliminary tests are carried out in the company's own pilot plant in accordance with the customer's specific process task. Process parameters such as cycle times, type and processing of the materials etc. are determined together with the customer for this. Based on these results, a holistic concept is developed and the process solution is optimized."

Exact pumping, dispensing and mixing

The objective is the production of homogeneous, free-flowing and bubble-free streams of material. This is ensured by the preparation of the dispensing material in the MPS material preparation system specially developed by BARTEC, which unites the following process steps: evacuation, tempering, homogenization, recirculation and pumping. These complex process tasks are accomplished by a standardized, configurable software solution on a CP6709 built-in Panel PC from Beckhoff Automation. The user interface specially developed by BARTEC offers the customer an optimal overview of its process parameters. In order to ensure a continuous, infinitely controllable flow of material without pressure fluctuations, the delivery rate of the feed pump is regulated by a PID block and the dispensing pump is therefore always optimally supplied.

The material is pumped into the mixing head by high precision BARTEC dispensing pumps and precisely controlled dispensing valves. The speed of the pump thereby determines the delivery amount. Conversely, the use of the different pump sizes and technologies is decided by the material properties and the dispensing rate. A continuous dispensing process is ensured by the constant monitoring of the pump speeds and the operating pressures.

BARTEC Dispensing Technology uses two different principles for material mixing: In the dynamic variant, a rotary mixer is used in a mixing chamber. In the static process, the two streams of material are mixed in disposable mixing tubes.

High quality requirements as technology drivers

The high degree of automation of the three or four-axis, servo-driven portal or gantry systems ensures that the high expectations for productivity, dispensing accuracy and repeatability, positioning, etc. are met. In dispensing technology it is frequently the case that axle loads of more than 15 kg (33 lb) need to be moved with a positioning accuracy of the order of 0.05 mm – and with relatively high dynamics at that. Movement speeds of up to 700 mm/s are also required, for

example, when applying beads. "We use high performance drive technology from Beckhoff for this," Markus Schmitt reports. But not only are the axis systems servo controlled; servo drives are also used in the dynamic mixing systems. "These consist of a chamber in which an agitator moves at up to 5,000 revolutions per minute, driven by a speed-controlled servo motor," Steffen Dommerich remarks. "Process stability is ensured continuously by the employment of special monitoring systems," Markus Schmitt adds. The integrated Beckhoff safety system TwinSAFE helps ensure safety throughout the workplace.



The 'Material Preparation System' (MPS) creates the conditions for bubble-free casting. The modularly expandable material preparation system can be integrated easily into an existing system and is suitable for virtually all low- and medium-viscosity casting compounds. It is operated via a Beckhoff Control Panel.



Steffen Dommerich, technical manager and proxy, Bartec Dispensing Technology



Markus Schmitt, project manager, Bartec Dispensing Technology

In many cases the customer's databases must be connected to the BDT plant equipment; for example, documentation of the production chain is often called for in the automotive sector. Regarding this, Markus Schmitt explains: "We recently put a plant into operation that consisted of 10 stations. All processing stations were connected individually to the customer's database so that the data from the processing step could be queried. To this end the product code is read in via a scanner. The specified target values and process data are retrieved from the customer database and the results of the processing are fed back."

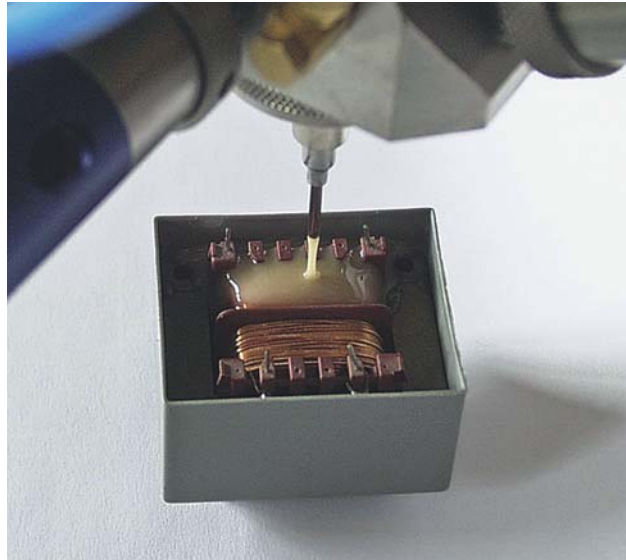
Open platform is ideal for the complexity of the application

A further technical challenge consists of the fact that the gantry systems with a 2D or 3D structure are not only path controlled, but are also driven interpolatively, fast and precisely by CNC functions. Furthermore, a great many sensor-assisted monitoring functions must be implemented. "A dispensing system with a dynamic mixing head can be considered to be a small chemical factory in itself," comments Steffen Dommerich. Additionally, the BARTEC specialists need powerful communication and data interfaces, in order, on the one hand, to connect the self-developed control technology to the plant or cell controller and, on the other, not to endanger the variety of the individual control tasks through uncontrolled growth in a physical sense and in terms of data. Ultimately BARTEC Dispensing Technology relies on a function building kit with a uniform control concept for its solutions. "We found that at Beckhoff," says Steffen Dommerich.

Several factors played a role in the decision in favor of Beckhoff's open automation platform: "The prices for hardware and software were evaluated in the benchmark, but the development time for adaptations necessary for the platform as well as the running expenditure for individual subassemblies which we would incur later represented major criterion," explains Markus Schmitt. Also of relevance to BARTEC's decision was that TwinCAT control software is based on the globally-recognized IEC 61131-3 standard. "This was one of our specifications," says Steffen Dommerich, "because if new employees are involved in the development, they should be familiar with the programming and not be confronted by obscure technology."

Simplified migration assured into the future

Despite these great successes, the automation experts at BARTEC Dispensing Technology have no time to rest on their laurels. Beckhoff Bus Terminals have been used for the I/O so far; for new plants they are switching to EtherCAT I/O Terminals and the EtherCAT-based AX5000 servo drive. BARTEC has also developed a great interest in the upcoming TwinCAT version 3. "The integration of Visual Studio and, in particular, the possibility to program with C, C++ and C# is interesting to us," explains Markus Schmitt. "There are customer requirements for which high-level



The continuous dispensing process is ensured by the monitoring of pump speeds and operating pressures.

Switching and control center of a dispensing cell with a Beckhoff Embedded PC



language programming is needed, e.g. to connect our systems to the customers' databases. In this case additional helpful interfaces will be available with the TwinCAT-3 release," comments the project manager.

BARTEC Dispensing Technology GmbH www.bartec-dispensing.com