

Integrated Automation Boosts Additive Manufacturing

From concept to successful machine automation in just a few months: SBI GmbH is a specialist in plasma welding and, based on this expertise, also develops systems for the additive manufacturing of metal parts. For machine automation, SBI relies on SIGMATEK's compact, modular system platform, including the highly compact modular DIAS-Drive MDD 2000. This enabled the Lower Austrian company to develop a new machine generation to series maturity in just four months.

By Ing. Peter Kemptner / x-technik



Operation and monitoring of the additive manufacturing systems are performed via visualization created in LASAL on a TT 1933-S multitouch operating panel from SIGMATEK with 18.5" WXGA TFT color display.

The world of industrial manufacturing is undergoing a transformation – and not only in terms of digitalization. Additive manufacturing is making a significant contribution to this shift in production processes. It enables material- and resource-efficient production of parts with complex geometries in batch sizes starting from one, directly from the 3D model. Originally used primarily as 3D printing of plastic components for rapid prototyping, various additive manufacturing processes for metal parts are now employed to produce structural components without the high costs associated with toolmaking. This is particularly beneficial when reproducing spare parts that are no longer available for durable capital goods.

Solutions for Modern Manufacturing Processes

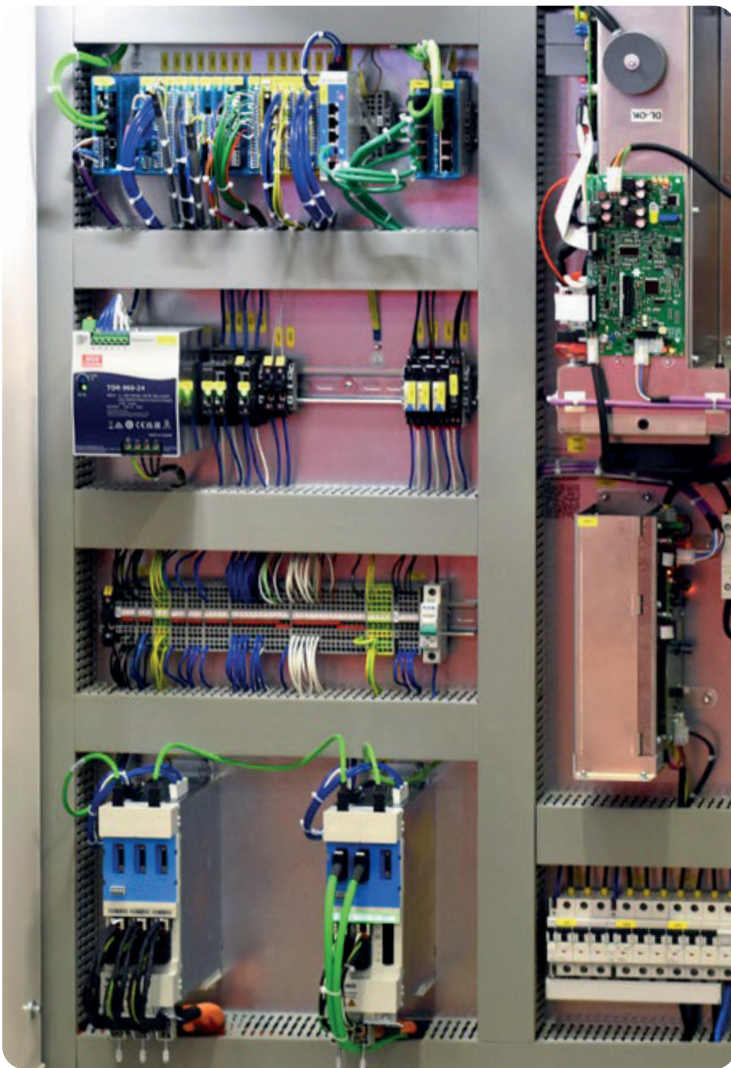
Founded in 1999, SBI GmbH specializes in the development and production of equipment and automated systems for plasma welding. The core components are plasma welding power sources developed in-house. Since 2009, these have also been used in systems for the additive manufacturing of metal parts using plasma cladding (plasma deposition welding). Since 2016, the company, headquarter-

Shortcut

Task: Development and construction of a new machine generation for additive manufacturing with six motion axes.

Solution: Compact full-system automation including sequence, safety, and motion control as well as visualization using the modular S-DIAS system, DIAS-Drive MDD 2000 multi-axis servo system, safety functions, and TT 1933-S multitouch operating panel, object-oriented programmed in LASAL.

Benefits: Space-saving, energy-efficient, and highly dynamic automation solution with reduced engineering effort.



For sequence, safety, and motion control, SBI uses compact automation components from the S-DIAS and DIAS-Drive MDD 2000 series – including safety – from SIGMATEK. In-house developed electronic assemblies for arc control are connected via CAN.

red in Ziersdorf, Lower Austria, has also been producing complete systems with a high degree of customization.

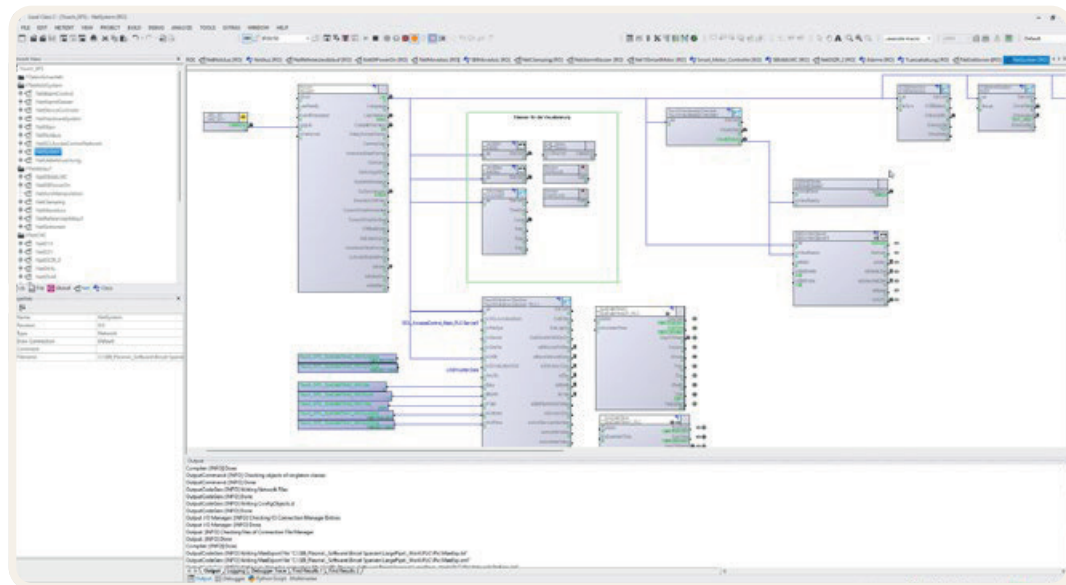
“Compared to other arc welding technologies, plasma welding stands out for its robust and clean operation – free of spatter and with low smoke generation – which facilitates the printing of metals such as titanium, stainless steels, and aluminum,” explains Johannes Niedermayer, Head of Development at SBI GmbH. “Compared to laser cladding, plasma offers significantly lower investment costs and eliminates the need for laser safety measures.”

Automation with SIGMATEK Systems

A key distinguishing feature of SBI’s equipment and systems is precise control of welding processes and agile system automation. The development of electronic assemblies for controlling the welding power sources is one of the company’s core competencies and is carried out in-house. For all other control and automation tasks, SBI has relied from the very beginning on the product portfolio of the Salzburg-based automation specialist SIGMATEK.

“The powerful yet highly compact SIGMATEK systems cover all automation requirements – from sequence and motion control including motors and safety to visualization,” explains Matthias »

»



SBI uses the SIGMATEK LASAL development environment to create its object-oriented, modular software.

Inhauser, Automation System Developer at SBI GmbH. “They offer a high degree of openness and provide every conceivable interface and bridge for integrating third-party components.” For example, the in-house developed inverter assemblies are connected to the control system via the CAN bus, which is included as standard in SIGMATEK systems.

As its central control and I/O system, SBI uses the particularly compact, modular S-DIAS family. It combines maximum packing density with high performance, mechanical stability, and ease of handling. In a space-saving form factor, it offers functional and safety-oriented CPUs, motion modules, and a wide variety of I/O modules with up to 20 channels on just 12.5 mm width, as well as TÜV-certified safety modules.

“Software development for all aspects of system automation – including sequence control, motion control, safety technology, and visualization – is carried out using modern object-oriented programming in the LASAL development environment,” adds Martin Wolfbeißer, Automation System Developer at SBI GmbH. “This ensures efficient engineering, full traceability, facilitates reusability, and minimizes effort for software maintenance and customer-specific variants.”

Complex Motion Sequences

SBI originally developed its latest additive manufacturing machine model on behalf of a university. The M3DP-CL features a working area of 1,500 x 800 x 650 mm and enables the processing – including mixed processing – of various ferrous and non-ferrous metals in powder or wire form to produce workpieces weighing up to 200 kg. With simultaneous processing in four motion axes, the M3DP-CL enables the production of components in 2.5D design. Two additional axes for a rotary-tilt table allow the production of true 3D geometries without support structures in a single production process.

System-Integrated Motor Solution

For the numerous axis movements within the machine, SBI uses brushless three-phase servo motors of the DSM5 series from SIGMATEK, equipped with PEII series planetary gearboxes. Their low moment of inertia makes them highly dynamic, and their very low cogging ensures smooth operation. This makes them ideal for demanding motion applications. In the M3DP-CL, two motors are paired for movements of the X and Z axes. “Using third-party products, this would likely have involved considerable additional effort,” says Martin Wolfbeißer. “By using SIGMATEK motors, we were able to implement this easily and very quickly.”



” By using SIGMATEK’s highly integrated system platform and modular engineering with object-oriented programming in LASAL, we were able to develop the automation for an entirely new machine to series maturity in just four months.

Martin Wolfbeißer, Automation System Developer, SBI GmbH



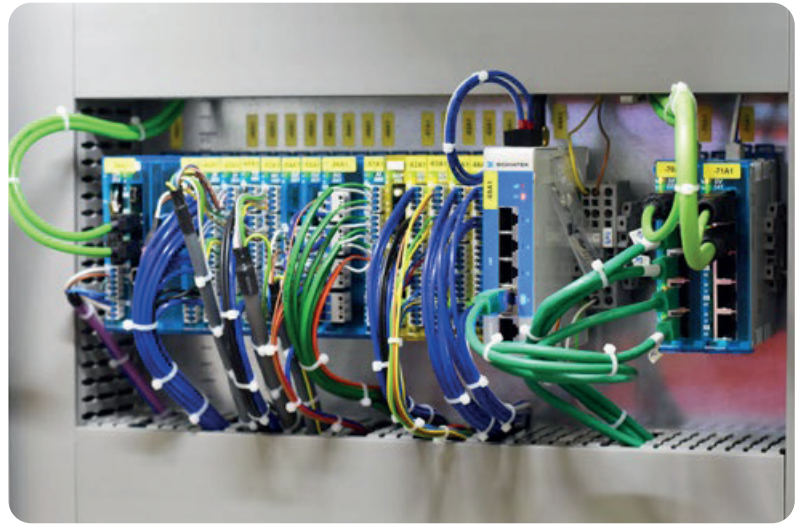
For axis movements within the machines, SBI uses highly dynamic brushless three-phase servo motors of the DSM5 series from Sigmatek.

Highly Compact Drive Technology

Drive technology is also fully integrated into the overall automation solution. For the M3DP-CL, SBI uses up to three of the highly compact, modular DIAS-Drives MDD 2000 from SIGMATEK. These fast-response multi-axis drives, with controller cycle times of just 62.5 μ s and jitter below 1 μ s, are ideal for fast and highly precise positioning tasks. They combine maximum power density with modern controller performance in a compact housing. Independently or in tight synchronization, they can control one to three motors in hard real time and can be combined with any axis expansion modules (MDD) to form a multi-axis system.

Fully Integrated, Easy to Implement

The modular devices, designed with uniform height and depth, already integrate supply, filter, brake resistor, and DC power link, as well as numerous TÜV-certified safety functions up to SIL 3, PL e, Cat. 4. Position setpoints are generated in the control system and transmitted to the drives via the VARAN real-time bus. The same applies to safety-related signals, which are tunneled via real-time Ethernet using a black channel. "The compact devices are seamlessly integrated into the SIGMATEK automation system, and their configuration is conveniently handled in the LASAL »



The pocket-sized **S-DIAS control and I/O system** combines maximum packing density with high performance, mechanical stability, and ease of handling.

engineering tool,” says Martin Wolfbeißer, highlighting the ease of implementation of the DIAS-Drives MDD 2000. “Their single-cable solution with Hiperface DSL additionally minimizes wiring effort.”

Fast Track to Full Automation

The automation system for the innovative M3DP-CL is completed by a modern operating and monitoring solution. For this purpose, SBI uses the SIGMATEK TT 1933-S multitouch operating panel with EDGE2 technology and an 18.5” WXGA TFT color display with projected capacitive touchscreen. Like all SIGMATEK HMI with processor, it supports all common standard interfaces and communication via OPC UA. The visualizations are created using the LASAL SCREEN HMI tool and are therefore an integral part of the overall automation. “By using SIGMATEK’s highly integrated system platform and modular engineering based on object-oriented programming in LASAL, we were able to develop the automation for an entirely new machine to series maturity in just four months,” confirms Johannes Niedermayer. “SIGMATEK also supported us by extending the G-code command set of the DIAS-Drives MDD 2000 for kinematic transformation.”

» www.sigmatek-automation.com

User

SBI GmbH, founded in 1999, develops welding systems and metal-based 3D printing systems for industrial applications. The company specializes in plasma welding technology. With customized, modular solutions, it enables demanding production processes with a high degree of automation – from prototype development to series production.

SBI GmbH
 Gewerbering 15, A-3710 Ziersdorf
 Tel. +43 2952-34139, www.sbi.at



» **As a full-service provider for industrial automation, SIGMATEK offers highly dynamic, modular components – including safety – with full integration and user-friendly engineering.**

Stefan Mingler, Sales Eastern Austria, SIGMATEK GmbH & Co KG