

Stiwa Fertigungstechnik: High-end assembly automation makes consistent use of PC control technology

We keep automating where others give up!

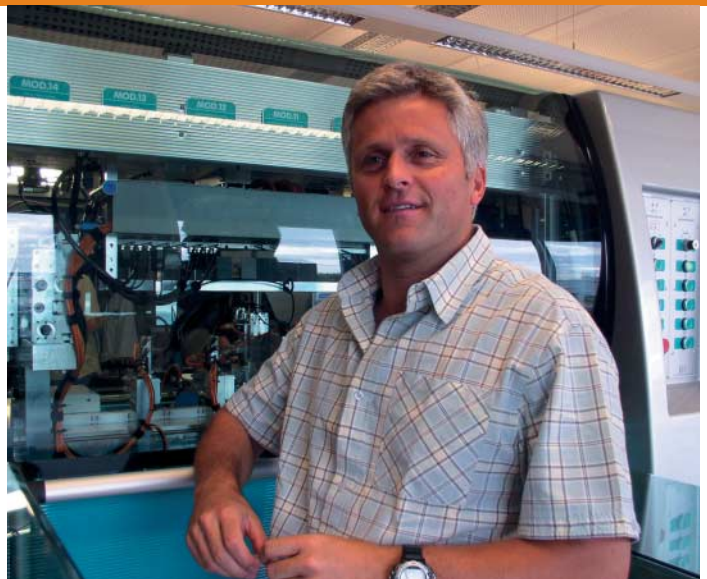


→ With high-end automatic assembly machines, crucial competitive advantages are only available to those willing to explore the frontiers of technical feasibility. Only a few machine manufacturers are able to concentrate successfully on such a market segment. One example is the Austrian specialist company Stiwa Fertigungstechnik. Stiwa utilizes PC control technology from Beckhoff as part of an unusually close partnership that enables its potential to be exploited to the full.

Stiwa Fertigungstechnik is a leading European company for product and assembly automation with around 900 staff, based in Attnang-Puchheim (Austria). Stiwa designs, produces and supplies complete automation solutions, including automation-compatible product design. The emphasis is on strong, long-term partnership with customers. Harald Strauß, at Stiwa responsible for technical system development, said: "We concentrate on a few regular customers, some of whom we have been working with for 30 years. We regard ourselves as a comprehensive service provider and development partner, offering customers "exclusive security", i.e. we guarantee protection know-how vis-à-vis competitors." Services offered by Stiwa range from product & process development and software development (dealt with by associate company AMS-Engineering based in Hagenberg/Austria) to optimization of production facilities (maintenance, operation). Stiwa-APF, based in the German spa town of Schlangenbad, produces products or assemblies with intelligent high-performance automation, thus closing the circle. Examples for applications are car safety components such as ABS or steering columns, construction hardware, window and furniture fittings, and laboratory products. According to Harald Strauß, "these are all products that offer potential for automation. A particularly important factor is that, for safety reasons or due to high quality requirements, they cannot be produced using cheaper labor, for example in the Far East. Our aim and that of our customers is to preserve Europe as a production location."

Close partnership with suppliers

Achieving top technical performance not only requires close co-operation with customers and associated user know-how. Harald Strauß: "The close partnership with our customers is also reflected in our relationship with staff and suppliers. Not all potential suppliers are too keen on this approach, because our market offers competitive advantages only to those willing to explore the frontiers of technical feasibility. We want to advance the systems offered by our suppliers for our purposes, with innovations based on standard products without the need for special solutions. For suppliers, this is not least a question of attitude, and Beckhoff



Harald Strauß, at Stiwa responsible for technical system development, said: "We decided to use PC-based control technology, in order to be able to standardize our technologies. Our aim was an integrated concept, which was not possible with hardware PLC."

was spot-on in this respect. For me, this was an important criterion in the decision to use Beckhoff technology." Armin Pehlivan, managing director of Beckhoff Austria, confirms this far-reaching co-operation: "We are proud to be a standard supplier for a top automation company such as Stiwa. Our co-operation started about six years ago and involves intense discussions for applications involving special features."

Harald Strauß explains the reasons for the change in technology and the decision to use PC control from Beckhoff: "Our origins are in the hardware PLC world. At some point, we had to make a decision between retrofitting or changing to a different system. We went for the second option, mainly in order to be able to standardize our technologies. Our aim was an integrated concept, which was not viable with a traditional hardware based PLC. Moreover, with our systems we have to be able to develop or adapt everything in-house, which is only possible

The C6240 Industrial PC from Beckhoff is the hardware platform for the PC-based controller. In the largest system built by Stiwa so far, 29 Beckhoff IPCs are used.

The Lintrans LTS-CI high-end automatic assembly machines from Stiwa are equipped with PC controls from Beckhoff throughout.



with PC-based technology. In addition, we usually deal with very complex systems involving a large number of processes, which means that large quantities of production data have to be continuously accessible and achievable. All this led to a change to PC technology back in 1998. Beckhoff was the clear market leader in this area, which even large control manufacturers told us at the time."

Modular PC control ensures high flexibility

Stiwa only produces linear transfer machines. We focus on rigidly interlinked high-performance automatic assembly machines with cycle times in the range of seconds. Our systems comprise open, modular, automatic machines that can be adapted to various application requirements. This modularity despite rigid linkage is one of the main features of Stiwa systems, not least because modern applications have to be able to respond to very short product life times, design modifications at short notice, or subsequent system extensions. Automatic assembly machines offer ideal scope for such extensions, which account for at least 30% of Stiwa projects.

August Gründl, who is responsible for systems development at Stiwa, explains that the name speaks for itself: "Lintrans LT306S is the name of our predecessor system that still used hardware control. With the conversion to the TwinCAT software PLC from Beckhoff, we changed the name to Lintrans LTS-CI, with CI short for "completely integrated". The same principle applies to the loosely interlinked LTL-CI system." LTS-CI basically consists of a rigidly interlinked basic system chain on which workpiece carriers are installed. Feed units deliver the individual parts to the chain, where they are inserted into workpiece carriers via pick & place. Fully automatic processing modules then manipulate the workpieces. Each processing step is followed by a chain cycle for transporting the workpieces to the next processing module. At the end of the chain, depending on the system the workpieces are transferred to the next chain or discharged into packaging units.

A typical control environment involves several C6240 control cabinet IPCs from Beckhoff:

- | A visualization PC for running the Stiwa visualization and order management software,
- | A terminal server serving the local visualization terminals (third-party products) that are distributed throughout the plant,
- | A database server for storing product and quality data, and
- | One or more control PCs (the largest system built by Stiwa so far involved 29 PCs) with automation software TwinCAT 2.9.

August Gründl explains the advantages of PC-based control from Beckhoff: "In a minimum configuration, i.e. for very small and therefore atypical LTS-CI systems, these PC functions can run on a single computer". However, usually several PCs are involved, which are networked via Ethernet TCP/IP for fast data exchange. Ethernet TCP/IP is also used for the connection to the higher-level customer LAN. The I/O level is integrated via the Beckhoff Bus Terminal system (Bus Coupler BK3100 and various Bus Terminals) or via the Fieldbus Box modules in protection class IP 67 with PROFIBUS DP with 12 Mbaud transfer rate. The servo drives are integrated via the SERCOS interface.

Benefits of PC control technology

For August Gründl, the conversion to PC-based control technology has brought numerous advantages: "Today, hardly any system can operate without PCs. Even if a conventional PLC is used for control purposes, most systems will feature additional PCs for measuring, data protection or image processing, etc. Using a PC as a PLC significantly simplifies and speeds up communication between the control system and the periphery. In smaller systems, the individual software packages may even run on the same PC. Communication with customary software packages, such as Excel for quick and simple data protection or analysis, or the

Automatic assembly machines from Stiwa are used worldwide, for example at Julius Blum GmbH. Blum produces hinge, drawer and slide systems and processing aids for furniture fittings.



August Gründl is responsible for systems development at Stiwa: "Complete integration of an NC in TwinCAT significantly simplifies the control of highly dynamic drives."

realization of simple PLC control tools for commissioning or constructing the system, can quickly and easily be implemented with conventional programming languages (in the simplest case Visual Basic, for example)."

According to August Gründl, the use of TwinCAT offers further significant benefits: "Complete integration of NC into the TwinCAT control system significantly simplifies the control of highly dynamic drives. Cyclic communication between the PLC program and the NC enables continuous monitoring of axis movements or real-time responses to various events during an axis movement at any time. Operators don't have to wait until positioning is complete to be told that the axis has reached its target or that a fault may have occurred. The system enables full real-time control of all set values and actual values of the drive during the complete positioning process. Even demanding tasks, such as dynamic, high-precision force-fitting processes, can usually be solved without additional external control hardware by implementing the control algorithm within the TwinCAT PLC and controlling the axes via the integrated TwinCAT NC interface. This means that system developers no longer have to rely on "black box" devices from third-party suppliers, but are able to implement the complete control and process know-how in-house. Even axis synchronization – from simple linear coupling to "flying saw" or path interpolation – can easily be realized with standard drives. The drives themselves do not require additional intelligence; everything can be configured and controlled centrally within TwinCAT. This means that the different tasks do not require different drives, but one drive with standard intelligence and real-time interface (e.g. SERCOS) is sufficient."

While the options for direct remote maintenance and diagnosis via Internet or remote control PC software and the automatic annual increase in speed of PC processors are general benefits of a PC solution, for August Gründl the Beckhoff variant offers further, specific advantages: "Overall, Beckhoff offers innovative solutions and responds very well to customer needs. Further benefits are openness

vis-à-vis different fast fieldbus systems, real-time capability, and significantly shorter PLC cycle times compared with conventional PLCs."

EtherCAT at a glance

High-performance automatic assembly machines are very demanding in terms of internal data transfer. Interfacing of the field level (I/O modules, Festo valve terminals etc.) via PROFIBUS DP with the maximum transfer rate of 12 Mbaud enables bus cycles (complete pass of all devices within the PROFIBUS ring) of 1 ms. For servo drive coupling via SERCOS interface with a cycle time of currently 2 ms, Stiwa is already reaching the limits in many cases. Some processes require significantly shorter cycles (e.g. 500 μ s) in the drive bus. August Gründl said: "In the long term, EtherCAT will be very interesting for us, because further reduction in bus cycles means additional minimization of system cycle times and savings in hardware, since the PC will only require the EtherCAT interface, from which further fieldbuses such as PROFIBUS can be accessed. However, for us it is important that a sufficient number of components from different manufacturers support EtherCAT. We therefore maintain a very close relationship with our suppliers, in order to be able to influence their products through close co-operation and continuity of the relationship. We definitely do not pursue a strategy that involves using one product today and another one tomorrow. It would be highly desirable if some of our key suppliers also started to use EtherCAT."