



Hans Beckhoff, owner
and Managing Director
of Beckhoff Automation

Optimizing machines and production processes for the long term

In an interview conducted ahead of the SPS trade show with Open Automation's editor-in-chief, Ronald Heinze, Managing Director Hans Beckhoff discusses new products the company has lined up – products that individually or as part of a complete and integrated automation system can play a valuable role in optimizing machines and entire production plants. Particularly in an economic downturn, products like these present an opportunity for the capital goods industry to make its machines and installations more competitive. And now is the time to optimize for the longer term.

There are many ways to enhance and optimize production plants and machinery – by incorporating high-end measurement components, machine vision technology or linear transport systems for new drive solutions, for instance. Given the current sharp sectoral downturn and attendant shift in focus toward optimization and new approaches, Hans Beckhoff is upbeat in anticipation of SPS: "It promises to be an exciting event – first, because customers now have more time for new projects and, second, because they're urgently on the lookout for new ideas and products. There's demand now for new, more advanced technologies, and at Beckhoff Automation we have an outstanding product lineup to meet it."

According to figures published by VDMA, the Mechanical Engineering Industry Association based in Germany, software and automation technology make up 30 % of mechanical engineering products made in Germany, so the role played by automation technology as a whole in the optimization of machinery and production systems is immense. At SPS, automation specialist Beckhoff is presenting key exhibits spanning the entire company's portfolio, from Industrial PCs, I/O and motion to automation, applications and solutions. "We're showing new products in every segment," promises Hans Beckhoff.

IPC highlights: New processors, plus an edge PC

The company is introducing a broad array of product additions, based, for the most part, on more advanced processors. "We're putting new, high-performance CPUs in our successful CX20xx series of DIN-rail-mount Embedded PCs," Hans Beckhoff explains: "We decided to use AMD Ryzen processors that combine support for 32-bit and 64-bit operating systems with excellent real-time performance. This means we can run the many new 64-bit applications yet continue to support existing 32-bit applications and give them a performance boost in the process. Our customers really appreciate this continuity." The company is also making the most of performance gains offered by advanced 9th Gen Intel® Core™ i CPUs such as the Core™ i3, Core™ i5 and Core™ i7. "At SPS we're presenting the first IPCs equipped with the new generations of processors, such as our ultra-compact C603x Industrial PC," says the managing director. The first units will start shipping the first quarter of 2020, with several more IPCs, new Panel PCs such as the C6920 and C6930, and IPCs with ATX boards (including the C6640 and C6650) due to get the new CPUs over the course of 2020. "To offer users the same familiar flexibility with our new selection of processors, we'll also offer systems running Celeron® and Pentium® CPUs at the lower end of the performance range," he adds.

To meet the important and growing trend toward fanless Industrial PCs as well as provide a complement to the highly successful C6015 (one of the most compact IPCs in automation technology), Beckhoff is introducing the C6025 series, a range of slightly larger but significantly more powerful devices. "These compact, elegant and powerful machines based on new Intel® Core™ i U processor series are designed to close the gap between Intel Atom®-based units like our C6015 and well-known Core™ i processor devices like our C6030," the company's visionary founder explains. "We're introducing a brand-new performance class designed to fit seamlessly into our C60xx family and target a large number of potential use cases."

"We'll be unveiling our new C7015 edge PC at SPS. This is a fanless device with flexible I/O options and full IP65 protection," Hans Beckhoff is pleased to report. Built around a dual-core Atom®-based mainboard, the PC has three LAN ports, multiple USB ports and a DisplayPort video interface; it also incorporates support for wireless connectivity such as Wi-Fi and LTE. When combined with standard I/O box modules, the edge controller can capture signals in the field and process and provision them for IoT applications.



The C60xx series of advanced, flexible-to-install, ultra-compact Industrial PCs now features three new generations of Intel® processors, including the brand-new fanless C6025 with Intel® Core™ i U processor (center).

Motion highlights: New strategies and enhanced motor dynamics

Beckhoff is setting new standards in drive technology with XPlanar, the planar motor-based transport system. "This is a fascinating class of drive technology that heralds both radical change and enormous optimization potential in the field of machine design," says physics graduate Hans Beckhoff. He continues: "Our linear XTS transport system has successfully found its way into a large number of applications, but XPlanar goes much further, conceptually. It uses free-floating movers that can travel across a surface in two dimensions, it works without mechanically driven parts, abrasion or mechanical wear, and is essentially maintenance-free. The surface across which the movers travel consists of planar motor tiles that can be laid out as tracks in 2D patterns in any shape. The XPlanar system supports overtaking, changes in the materials flow, track switching, and parking – all with exceptional elegance and ease."

Drive technology can play a key role in optimizing machines, and this year Beckhoff is exhibiting numerous innovations in this field at its booth for visitors to see. "We're showing new, even more dynamic motor variants at SPS," says Hans Beckhoff. The AM8054, for instance, combines a low moment of inertia with outstanding torque. The company is also exhibiting a new and improved safety-certified encoder with 24-bit resolution for its One Cable Technology (OCT) motors. "The certified 24-bit encoder is not just electrically and mechanically compatible with our prior standard motor encoder, it's also available at the same price point," the company manager explains. "It offers our users better safety functionality, plus much higher resolution."

The AX8000 multi-axis servo system with built-in safety functions and OCT has now also been certified for linear motors. In addition, the AX5000 now has cogging torque compensation, as will the AX8000 shortly. "It's extremely effective, as we've seen in tests with our AM8000 motors on customer machines," the company leader explains. Highlighting the benefits, he adds: "We've seen cases where contouring errors have been reduced by as much as a factor of ten." This is next-level drive optimization.

I/O highlights: EtherCAT is a global standard

In the I/O segment, EtherCAT continues its success story: "Today, nearly all of the world's automation vendors offer EtherCAT as an interface to their devices, and it makes us exceptionally proud to see technology designed by a mid-sized company in Westphalia being accepted and adopted globally," says Hans Beckhoff. "After Beckhoff, Omron and scores of other vendors, another major player, Bosch Rexroth, has now chosen to use EtherCAT as its system bus." This Beckhoff sees as a fine example of the technological prowess of Germany's Mittelstand: "The EtherCAT standard now ranks as one of the most – if not the most – widely adopted in the automation arena." The EtherCAT Technology Group (ETG) recently incorporated EtherCAT G and G10 into the standard as system-compliant enhancements. And, as Hans Beckhoff is happy to report: "Having 1 Gbit/s and 10 Gbit/s moves automation performance up into a whole new bracket."

XPlanar, the planar motor-based transport system, paves the way for radical advances and optimizations in machine design.



Beckhoff is also supporting initiatives surrounding OPC UA FLC over TSN. "With Stefan Hoppe, the OPC Foundation has as its president a Beckhoff employee of many years' standing," the company's MD is pleased to report. Smiling, he continues: "That means OPC UA's European headquarters is in a way also based in East Westphalia." In Beckhoff's view, OPC UA and its variants are "a sensible solution for controller-to-controller and controller-to-cloud communication." He explains: "When connecting simple peripherals, though, OPC UA FLC over TSN is complete overkill; it adds zero value. Fieldbus systems, which have been refined over many years and two generations, are the better option."

Automation highlights: TwinCAT, beating heart of the system

Beckhoff is lifting the wraps on an important innovation in the automation segment: TwinCAT will now, for the first time, also be available on an operating system other than Windows. "TwinCAT/BSD runs on FreeBSD, an established, exceptionally robust and advanced open source OS that can trace its roots all the way back to the 1980s," says the managing director. It can also run a large number of Linux programs. However, TwinCAT/BSD is not subject to Linux GPL licensing terms. From the company's perspective, BSD licensing allows the automation software to be distributed to vendors and users in the industry's usual manner because there is no requirement to release the software's source code.

TwinCAT Cloud Engineering is another major trade show highlight. Hans Beckhoff explains why: "All you need now in order to work with TwinCAT or to

program controllers is a web browser." This new cloud-based offering from the Westphalia-based automation experts targets two specific use-case scenarios: First, it is designed to provide an environment that makes it quick and easy to try TwinCAT free of charge using sample applications without installing it. As Hans Beckhoff is keen to emphasize, "This lets interested users take their first steps with TwinCAT simply by logging into the company website; there's no need to put the software on an actual PC." Second, with the professional version, available on a subscription basis, Beckhoff provides virtual machines that customers can use for any conceivable kind of TwinCAT installation. This allows them, for instance, to run separate development environments for specific machine generations; they can also manage their source code in the cloud in a Git-based repository. "The Professional Version is also available on subscription basis," Beckhoff adds.

As IoT applications gain greater momentum, user demand is growing for dashboards that output instant analytics in a clear and well-organized layout. To meet this demand, TwinCAT Analytics now includes a powerful, configurable dashboard as part of its standard feature set. In addition, TwinCAT HMI provides functions to enable users to easily configure graphical user interfaces. But, as Hans Beckhoff points out, "There has to be more to dashboards than this. Users need detailed information with real value." In his view, users must be able to "access deeper levels of data on which they can act," and to address this need, TwinCAT HMI provides an extensive range of drill-down functions.

Managing Director Hans Beckhoff on the current economic situation

"Beckhoff is a business accustomed to continuous growth," says the managing director. "We've had a compound annual growth rate of 16% since 2000." For Beckhoff, though, just as for other enterprises, the economic climate in 2019 has led to stalling growth and even a slight drop in revenue. "I think we'll end the year either marginally in the black or red." However, as Hans Beckhoff points out, "We saw this trend coming. New orders began to level off in mid-August 2018." Geographically, there are major differences in the company's sales development: "In Asia, including China, and even more so in the U.S. and Northern Europe, we're still growing, but in Germany our sales is dropping in double digits. It looks like Germany's classic mechanical engineering sector is struggling, both at home and abroad." The country's export-driven engineering industry is suffering increasingly as a result of mounting seismic pressures in international markets. Demand for complex capital goods from German machine builders has evidently hit a low, and for Hans Beckhoff, Germany is a barometer gauge for the wider global economic climate.

As a result, Beckhoff expects 2020 to be "a subdued year." He expands: "Based on past experience, it's fair to say that crises like this typically take between six and 12 months to build, then continue for around 12 months more before a recovery gradually takes hold over a period of six to 12 months. By this reckoning, we'll be in the middle of the trough next year. But from 2021 there should be a significant upturn again." This depends, of course, on how the world's economic conflicts unfold, not least the trade war between the U.S. and China.

Nevertheless, Beckhoff, according to its managing director, is in a solid position: "For many of our customers, we're a key supplier. As a family business, we take the long view, and we have sufficient reserves to weather a downcycle." Focusing on the positives, he says: "Times of crisis are also good times for Beckhoff as a business. They're an opportunity to talk to current and prospective customers about new machine concepts and designs." He continues: "It's at times like this that we win new projects, not during the boom years." Structural changes like those underway in the automotive sector, he says, always create chances for innovators. For Hans Beckhoff, the shift from classic combustion engines to electric-powered vehicles, for instance, presents plenty of opportunities, particularly for automation technology vendors, because it opens up space for new assembly systems and innovative ideas.

Hans Beckhoff remains committed to his expansion strategy: "In early April this year, we took over ADL Embedded Solutions, a tech company based in Siegen, Germany, that specializes in device automation." It has created custom embedded solutions for use in equipment such as e.g. medical systems and radar traps. Beckhoff is also expanding its sales network. In mid-2019, the company acquired Tri-TEK Corp. in Seoul, Korea, a distributor with a team of around 20 people. "We're immensely proud that our technology has managed to succeed in a country with such an affinity for high tech," says the entrepreneur. "We're also starting up a new company of our own in Mexico, with a staff of four initially," he continues. In addition, Beckhoff Automation now is represented in Colombia as well.

"TwinCAT Analytics is more than just a tool, it supports users throughout the analytics workflow – from data capture and storage to evaluation – and even includes automatic code generation for 24/7 analyses," says the MD. One of the new features being unveiled at SPS is the ability to automatically configure dashboards with an HTML5-based responsive design for TwinCAT HMI. "The dashboards can be viewed on any smartphone or tablet," he adds.

When testing real machines with their actual control software, it can be valuable to use a TwinCAT simulator environment to connect TwinCAT to the CAD solution on which the machines are designed. "There are tools in mechanical design that are not just used to produce drawings but to view them in 3D as well," Hans Beckhoff explains. "By connecting these tools with an actual machine control system, mechanical design engineers are now able to see in their CAD software how a TwinCAT program will move the machine or part of the machine they are working on." The special feature is, both software packages – the original CAD environment and the original controller – actually run on the same PC and are directly connected with one another, without the need for complex additional software. So far this has only been implemented for Autocad Inventor, but the next version will support more CAD tools, such as Solidworks, Catia 5 and NX.

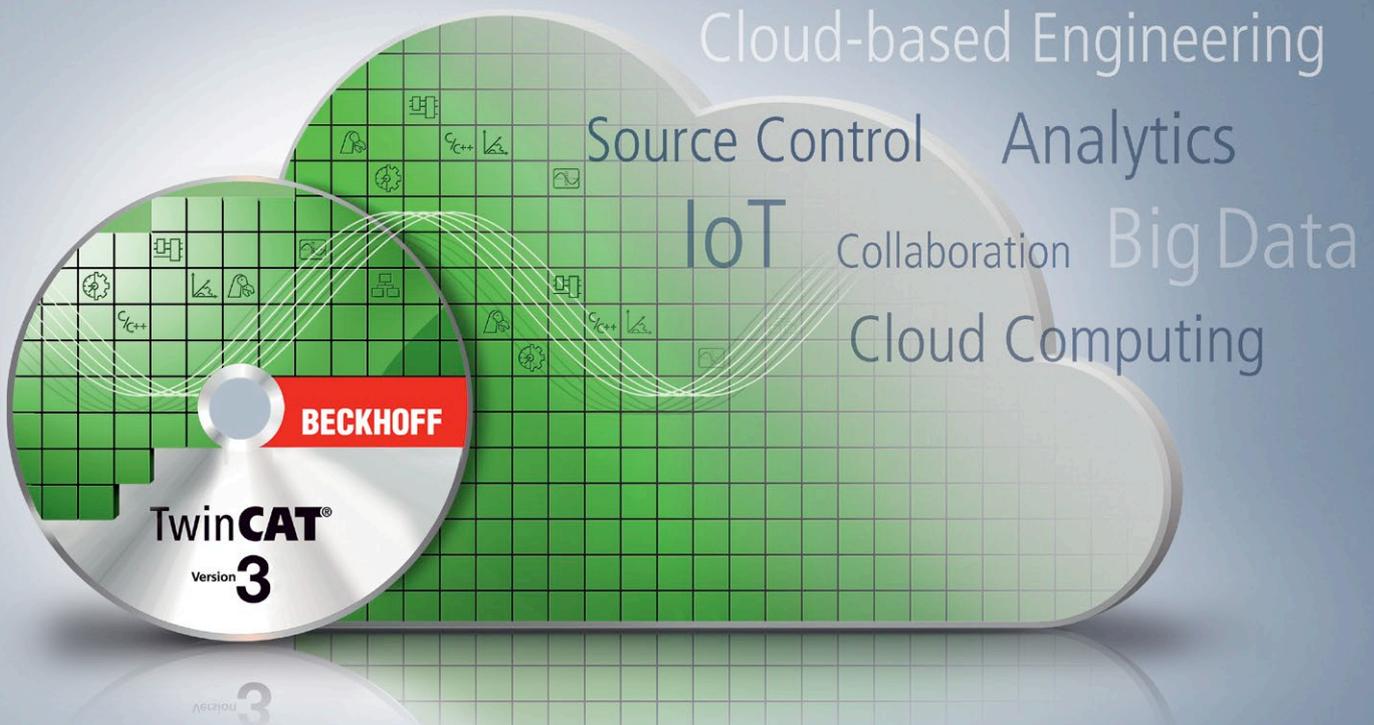
High-end measurement equipment from Beckhoff – fast, high-precision terminals for measurement tasks, combined with EtherCAT as an ultra-fast transmission medium, and special evaluation software – is also making great

strides. As Hans Beckhoff explains, "Our idea originally was to provide automation engineers with the means to incorporate measurement tasks into control systems" – the advantage being that the measurement equipment could then be synchronized to correlate exactly with machine control programs. "Being able to take precise measurements on machines as an integral part of the control process produces optimum results," he says. "It's now common practice among our customers to use integrated measurement equipment, and it's also less costly than using separate external measurement devices."

He continues: "We're also seeing greater take-up of our technology in regular test and measurement applications," which now account for 25% of company revenues from high-end measurement equipment. "We're winning quality customers in the measurement segment, and we aim to reinforce this trend by continuing to focus on dedicated measurement equipment in the future."

As for innovations in the machine vision sector, Hans Beckhoff notes that real-time vision software has been incorporated into TwinCAT successfully. "We'll also be launching our own portfolio of machine-vision hardware in 2020, which will include lighting devices as well as cameras," he adds. The integration of the TwinSAFE safety solution marks a logical continuation of the open, PC-based control philosophy pursued by Beckhoff. "It is now an inseparable part of our technology," Hans Beckhoff remarks. "EtherCAT and TwinSAFE belong together; they form the backbone of our automation architecture. We're thrilled that numerous other vendors have now incorporated

With TwinCAT Cloud Engineering, users can work with TwinCAT and write control programs using nothing more than a web browser.



Fail Safe-over-EtherCAT (otherwise known as Beckhoff TwinSAFE) into their equipment along with EtherCAT. This is what genuine open control technology is all about." He also highlights another key focus: "Security, too, is integral to our conception of automation." He continues: "We added security to Beckhoff ADS system communications last year. ADS communication is now encrypted. We've kept to our principle of open control technology but the security is substantially improved."

Applications in focus: Creating optimum solutions for customers

PC-based control technology from Beckhoff enables the creation of universal, horizontal-market control solutions – solutions that can also be tailored to vertical industries by adding market-specific features. For demanding applications in the process engineering sector, for instance, Beckhoff offers components ranging from controllers to I/O equipment designed to connect directly to intrinsically safe field devices. "We're seeing excellent market adoption of our Ex products – not just our ELX series of EtherCAT Terminals, but our CPX series of Control Panels and Panel PCs, too," says Hans Beckhoff. With these products, users can implement comprehensive solutions with barrier-free system integration through to Ex Zone 0/20. The company leader also announces: "To be closer to customers in the process engineering industry in our important North American market, we're opening an office in Houston next year."

Beckhoff Automation is a founding member of the Open Industry 4.0 Alliance. As an automation specialist and open control technology vendor, the

Verl-based company is supporting the initiative of the Alliance to define and establish an open application infrastructure for cloud technology operators in the capital goods sector. The goal behind this collaboration is to progress beyond proprietary, stand-alone solutions and deliver the crucial push needed to advance digital transformation across European industry. "We're playing an active part in ensuring that general definitions are established," says Hans Beckhoff.

With its open automation solutions, Beckhoff Automation offers the ideal toolset for optimizing machinery and production facilities for the longer term, and visitors to the company's booth at SPS will find plenty to inspire them to greater efficiency among all the innovations on show. The upshot, according to Hans Beckhoff: "Once again, the focus at the SPS 'tech Olympics' will be on the latest technology, and Beckhoff has an excellent lineup."

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Engineering 4.0: TwinCAT Analytics One-Click Dashboard eliminates an entire process step.

