Ultra compact C6015 Industrial PC: Extreme space savings and flexibility
news

4  | Beckhoff news overview

6  | 2017 Trade shows in review and preview

interview

8  | Ultra compact C6015 Industrial PC: Extreme space savings and flexibility

technology

12 | No Industrie 4.0 without OPC UA

14 | TwinCAT OPC UA: Standardized communication with information modeling – from the controller to the cloud

worldwide

18 | Koch Pac-Systeme, Germany: XTS at the core of a labeling and grouping unit in a packaging line for toothbrushes

22 | Continental Reifen, Germany: Environmentally-friendly and efficient retreading plant relies on open, highly scalable control technology
24 | PROBAT-Werke, Germany: All-in-one control platform optimizes coffee production

28 | Itron, USA: Streamlined assembly production with complete traceability

32 | Newicon, Finland: Pharmacy automation with PC-based control technology

36 | Shuangma Machinery Industry Co. Ltd., China: Open automation technology meets challenging market requirements and shortens engineering time

38 | 15 years of Beckhoff China

40 | Nardini, Italy: Art designs inspired by bubbles in distillation process

42 | Project March 1, TU Delft, Netherlands: Technology in motion: Innovative exoskeleton helps paraplegics walk

ETG

44 | News and activities of the EtherCAT Technology Group

events

46 | Trade shows and events 2017

imprint

PC Control – The New Automation Technology Magazine
Published:
Beckhoff Automation GmbH & Co. KG
Huelsbornweg 20
33415 Verl/Germany
Phone: +49 (0) 5246 963-0
info@beckhoff.com
www.beckhoff.com

Editor-in-Chief:
Frank Metzner

Project management/editor:
Martina Fallmann

Editors:
Gabriele Kerkhoff
Stefan Ziegler

Phone: +49 (0) 5246 963-140
editorial@pc-control.net
www.pc-control.net

Picture proof:
Continental Reifen Germany GmbH: p. 22–23
G. Basilico, Italy: p. 41
G. Chemello, Italy: p. 40
Itron, USA: p. 28 – 31
Nardini, Italy: p. 40 – 41
Newicon Oy, Finland: p. 32 – 35
Project March 1, TU Delft, Netherlands: p. 42 – 43
Shuangma Machinery Industry Co. Ltd., China: p. 36 – 37

Grafic Design: www.a3plus.de
Printed by: Richter Druck- und Mediencenter, Germany
Circulation: 31,500
New sales office opens in Dresden

Beckhoff opened a sales office in Dresden on 1 January 2017 to provide optimal support to customers in the eastern German state of Saxony. “The continuing economic growth in eastern Germany, in Saxony in particular, necessitated a consolidation of our sales structure there, as we have already done by opening new sales offices in other German states. Dresden is a location that is interesting for us for a number of different reasons. First of all, this is where the heart of “Silicon Saxony” beats – the largest European cluster in the microelectronics industry. And second, the region is one of the leading innovation drivers in the EU. Researchers in Saxony focus on industry-spanning production technologies and electric mobility, as well as on such other topics as automation technology and application-oriented software,” explained Andreas Schulze, head of the Beckhoff office in Berlin, with which the sales office in Dresden is affiliated.

Beckhoff was happy to sign on Bernhard Keller (left) and Martin Rau (right), two automation experts for sales and application support. “However, the office, which is located directly opposite the Church of Our Lady (Frauenkirche) in the city center of Dresden, would also be able to accommodate more personnel,” commented Andreas Schulze.

AM8074 servomotor: for increased performance requirements

The new AM8074 servomotor is a longer version of the flange size 7 model in the AM8000 series. The new windings with standstill torques of 92 or 129 Nm (in the version with external ventilation) cover the rated torque range between 19.1 and 93.3 Nm and complement the AM807x size range for fine-tuned, powerful drive solutions in the higher performance range. Due to the high currents, not all of the winding types – standard, low-speed or high-speed – are available with One Cable Technology (OCT). Above 40 A the power and encoder signals are connected separately via an IP 65 terminal box. For this purpose, pre-assembled cables are available as accessories for cost-effective and convenient wiring.

Beckhoff South Africa opens new sales office in Port Elizabeth

Beckhoff opened another new sales office in Port Elizabeth, South Africa, in the “Bloomingdales Office Park” at the beginning of March 2017. “Our new office is located right in the industrial heart of South Africa and, in combination with its training center, we are able to offer optimal support and service directly on location.”
Beckhoff USA expands with new sales office in Ohio

Beckhoff USA continues to expand its sales and support network by opening a new office in Mason, Ohio (Cincinnati area). This office commenced operations in October 2016. “With this new office, we continue the expansion of our local sales and support network, with a core focus on highly personalized, local service for customers,” stated Aurelio Banda, CEO and President of Beckhoff North America. This part of Ohio is an ideal location for Beckhoff USA to expand. The region is experiencing strong industrial growth, particularly in the fields of machine building, automotive assembly and consumer product manufacturing.

Beckhoff Drive Technology division sets up its own mechanics manufacturing

Fertig Motors, a company belonging to the Beckhoff Group, broke the ground for the construction of a new production hall for its own mechanics manufacturing on 9 March 2017. Located directly in the vicinity of company headquarters in Marktheidenfeld, a total of 2500 m² of floor space for production and another 1000 m² for office space is expected to be completed by September 2017. Managing Director Dietmar Hamberger commented: “We plan to use the new production hall to build the majority of the previously supplied motor shafts and housings for our AM8000 servomotors, which will significantly expand our in-house production depth and our own assembling competence. This makes an important contribution towards being able to further secure our high standard of quality, even with the company’s enormous growth of more than 30 % on average over the past three years. In 2017, we expect to deliver some 60,000 servomotors and, by 2020, we plan to expand our capacity to 100,000 motors.”

Approximately 7 million euros will be invested in setting up the new production facilities – a sum that is well worth it as far as Dietmar Hamberger is concerned, and not just because of the continually increasing production volume: “We are investing in powerful CNC machines whose functionality has been specifically matched to our parts range. This will enable a high degree of automation in the production process and minimize machine setup times. In addition, the production processes can be optimized by the expertise in our own company and through an intensified coordination between parts production and development. And what’s more, prototypes and special solutions can be produced both promptly and flexibly.” Plans have been made to hire eight new employees – for the most part CNC specialists – for the start of production, which is scheduled for September. In the long term, approximately 30 employees will be hired to work in mechanics manufacturing.
ISE

PC-based Control: Media and building control combined on one platform

The Integrated Systems Europe, which took place from 7 to 10 February 2017 in Amsterdam, has reached a new record high with more than 73,000 visitors from about 150 countries. “The industry is booming – and this was also reflected in the high number of visitors to the Beckhoff trade show booth. PC-based control is in fact ideal for combining media and building control applications on one central platform,” as Michel Matuschke, Vertical Market Manager Stage and Show Technology, sums up the success of the Beckhoff presence at ISE.

Interpack

Packaging takes the next step.
With XTS from Beckhoff.

At the leading global trade show for the packaging industry, which will take place between 4 and 10 May in Düsseldorf, Beckhoff will take centre stage with XTS, the eXtended Transport System, not just at one, but at several trade show booths. Various packaging machine manufacturers will demonstrate the great solution variety that XTS offers for the implementation of new packaging machine concepts: with format changeover in just a few seconds, reduced machine footprint, and opening up of new savings potential.

Düsseldorf | 4 – 10 May 2017
Hall 14 | Booth E35

Tire Technology Expo

Reduced TCO, and increased process quality

That was this year’s lead theme of the Beckhoff presence at the Tire Technology Expo trade show, which came to a successful close in Hanover on 16 February 2017. “The strong interest that visitors displayed at our booth was proof positive that we were directly addressing the needs of the tire and rubber industry with our focus on such topics as compressed performance, compact design, and minimised footprint,” comments Klaus Büttner, Business Manager Tire Industry.
Ligna
Integrated manufacturing.
With PC-based control from Beckhoff.

With its slogan of “Towards Industrie 4.0” Ligna 2017, from 22 to 26 May, is placing a main focus on intelligent, integrated manufacturing systems. Visit the Beckhoff booth to find out first-hand how to integrate Industrie 4.0 and IoT applications into the central control platform and how to generate added value with connected production facilities and cloud-based control.

Hanover | 22 – 26 May 2017
Hall 16 | Booth C05

Automotive Testing Expo
EtherCAT modules for high-end measurement in test bench automation

In the field of automotive testing, a large number of test bench manufacturers already rely on the system solution from Beckhoff, which integrates high-end measurement technology into the standard control platform. The new EtherCAT measurement modules of the ELM series are highly precise, fast and robust, and complement the existing range of measurement terminals from Beckhoff.

Stuttgart | 20 – 22 June 2017
Hall 1 | Booth 1105

Sensor + Test
High-end measurement technology in standard I/O system

At Sensor + Test 2017, Beckhoff will focus on the new devices series for high-precision and high-speed measurements. The high-performance EtherCAT analog measurement modules directly integrate measurement functionality into PC-based control technology and enable a high level of precision as regards timing, measurement, synchronisation and long-term measuring accuracy that was previously possible only with cost-intensive special equipment.

Nuremberg | 30 May – 1 June 2017
Hall 1 | Booth 350
Interview with Roland van Mark on the new universal Industrial PC that further expands the application spectrum of PC-based control

Ultra compact C6015 Industrial PC: Extreme space savings and flexibility

The new ultra compact C6015 Industrial PC (IPC) from Beckhoff is designed for universal application in automation, visualization and communication tasks. As Roland van Mark, Product & Marketing Management Industrial PC, explains in this interview, the new model is inexpensive, compact and flexible to install, opening doors to application areas that were previously closed to IPC technology.

Where is the C6015 ultra compact IPC positioned in the Beckhoff portfolio with regard to potential application areas?

Roland van Mark: With dimensions of only 82 x 82 x 40 mm, the C6015 is one-third the size of the C6905, previously the most compact cabinet-mounted IPC in our portfolio. With cost savings of roughly 25 percent, it ranks far below the former lowest-cost x86 PCs from Beckhoff. This means that engineers can now implement automation, visualization and communication tasks for small to medium-sized applications very cost-effectively, with a minimal footprint. Furthermore, it opens doors to applications where PC-based control technology was not being used until now, or where motherboards had to be customized at great expense.

What are the most important features of the C6015?

Roland van Mark: The most important feature is its extremely compact size without compromising suitability for industrial applications. This is demonstrated by the high performance of the integrated Intel® Atom™ CPU with up to four cores, and by the design as a passively cooled, long-term available device in a robust aluminum-zinc die-cast housing. It also meets other industrial requirements, such as an extended operating temperature range of up to +55 °C (131 °F) and exceptional vibration and shock resistance. I don’t believe that this level of CPU power paired with all necessary PC interfaces has ever been available for industrial applications in such a small device.

How did you manage to develop such a compact design?

Roland van Mark: Our extensive motherboard development expertise was a critical factor in designing this exceptionally compact single-board computer. We also paid close attention to user requirements and preferences. Even if it is ultra compact, an IPC must still provide all the necessary interfaces for typical automation tasks. In addition to the power supply, these devices include two independent Ethernet ports, one USB 2.0 and one USB 3.0 port, as well as a DisplayPort. These interfaces are what ultimately determined the size of the IPC, because to keep the cabling simple, they had to be located on the same side, necessitating the 82 mm housing edge length.
How does this design simplify the IPC installation in extremely confined spaces?

Roland van Mark: With the minimal size of the C6015, the six interfaces with their connectors and cables almost take up more space than the IPC itself. Therefore, it is a key benefit that the connection level of the ultra compact IPC can be precisely matched to the orientation of the cable inlet, usually predetermined by the machine layout. This is particularly true in space-constrained applications. We accommodate this with a highly flexible installation concept. Using two different installation frame types, the IPC can be vertically or horizontally mounted on a back wall or snapped onto a DIN rail. Moreover, the C6015 can be positioned anywhere within a specific mounting frame because of its symmetrical cooling fins. Rotating the IPC will not affect its heat management, because the cooling fins dissipate the heat equally in all directions. As a result, the installer can align the connector face perfectly with the incoming cables. In the past, this was often not possible and ultimately may have prevented the use of Industrial PCs in especially small installation spaces.

What are the advantages of the single-board design?

Roland van Mark: Designing the IPC as a single-board unit means that we can build a compact device in our own factory according to highest standards of efficiency and reliability. The user receives a high-quality, yet affordable industrial-grade product. Another important aspect is our quality control, which is performed entirely at the Beckhoff factory in Verl. We perform thorough tests of the boards after the assembly process, before and after installation in the housing and final tests of the finished IPC.

The C6015 was especially designed for cost-sensitive applications where space is at a premium. Can you give us some concrete examples?

Roland van Mark: With its powerful Intel® Atom™ CPU, the ultra compact IPC is especially well-suited for small and medium-sized applications in the areas of automation, visualization and communication. It works particularly well where machine designers otherwise need to integrate highly individualized electronics, usually because of lack of space or for historical design reasons. If you want to stay up-to-date in technological terms, such customized designs can become very expensive very quickly. In addition, most machine designers’ strength lies in the end process and mechanical engineering, which is often much easier to implement if they just buy the latest control electronics from a third party. The same applies to many research institutions, test-bed builders and process technology companies.
What role does the trend towards more modular and cabinet-free machines play in this context?

Roland van Mark: The trend is to do away with control cabinets as machine designs are becoming increasingly modular, which means that space requirements play a growing role in terms of the control technology. As already mentioned, the C6015 is very compact and cost-effective, making it ideal for decentralized layouts. For example, engineers can now install local intelligence in smaller machine modules where a separate control cabinet would be too costly or cumbersome. This kind of design can significantly simplify the modularization and standardization of machine modules.

To what extent does this advantage apply to Industrie 4.0 and the Internet of Things?

Roland van Mark: Decentralizing the intelligence is critical for Industrie 4.0 and IoT concepts. I foresee numerous potential applications for the C6015 where users want to collect machine and process data for transmission to cloud-based systems in very confined installation spaces. In such cases, the ultra compact IPC can function as an intelligent IoT gateway, which is also able to buffer large data volumes or to run remote diagnostics. This capability has been underlined by the confirmation of the C6015 as an Azure Certified device listed in the Microsoft Azure IoT device catalog.
The central challenge posed by Industrie 4.0 and the Industrial Internet of Things (IIoT) is the secure, standardized exchange of data and information between devices, machines and services across different industries. As early as April 2015, the Reference Architecture Model for Industrie 4.0 (RAMI 4.0) recommended only IEC standard 62541 OPC Unified Architecture (OPC UA) for implementing the communication layer. In November 2016, the Industrie 4.0 Platform published a checklist for classifying and advertising products as Industrie 4.0 “Basic”, “Ready” or “Full”. To comply with the “Industrie 4.0 communication” criterion, even the lowest category requires the product to be addressable over the network via TCP/UDP or IP and to integrate at least the OPC UA information model. As a result, any product being advertised as “Industrie 4.0-enabled” must be OPC UA-capable (either integrated or via a gateway). The checklist also stresses the information modeling property of OPC UA.

There is no Industrie 4.0 without OPC UA

OPC UA is not just protocol – it’s a whole lot more

When it comes to information modeling is often when many small and medium-sized companies tune out, because they compare OPC UA with other protocols like MQTT and assume that it has limitations. We often hear questions like, “OPC UA can’t communicate directly with the cloud, can it?”

First of all, every equipment and machine manufacturer already provides an implicit information model with data interfaces (via various protocols). Humans have learned to adapt to the computer’s way of ‘thinking’ – documenting what the bits, bytes and hex codes mean. This new world full of devices capable of a service-oriented architecture (SoA) helps humans understand the “things” more quickly and easily, because they offer “services” and describe their underlying meaning. The subject of SoA is nothing new in the world of IT. Now, however, it extends all the way to the “things” themselves. This is where OPC UA comes...
into play, providing the framework for industrial interoperability. Machine and device manufacturers describe the object-oriented information of their systems and define the access rights along with integrated security features. Germany’s BSI (Bundesamt für Sicherheit in der Informationstechnik, or Federal Office for Information Security) published the results of its security analysis of OPC UA in April 2016 in highly positive terms. This was because machine builders keep full control of the data, i.e. they can distribute it in a targeted and controlled manner, which enables them to participate monetarily in big data applications and data analytics.

To exchange the data, OPC UA combines two mechanisms to implement various scenarios:
- A client-server model, in which OPC UA clients use the dedicated services of the OPC UA server. This peer-to-peer approach provides a secure and confirmed exchange of information, but with limitations regarding the number of connections.
- A publisher-subscriber model where an OPC UA server makes configurable subsets of information available to any number of subscribers. This kind of broadcasting mechanism provides an unconfirmed “fire and forget”-style exchange of information.

OPC UA offers both mechanisms, but the more important benefit is that they are decoupled from the actual protocol. TCP and HTTPS are available for the client-server model, while UDP, AMQP and MQTT are available for the publisher-subscriber model. As a result, the question of “OPC UA or AMQP or MQTT” doesn’t matter from the OPC Foundation’s perspective. Since the smallest microcontrollers may not have enough resources to implement full-fledged OPC UA, the device can offer its data over MQTT or AMQP in an “OPC UA-compliant” manner, making it easier to integrate it on the other end. After all, agreeing on an information model and what the data means is the key to achieving the concepts of Industrie 4.0.

Trend: Information models
OPC UA provides secure transport of data via diverse and expandable protocols. But who defines the data’s meaning? Other associations like AIM for the auto ID industry (RFID readers, scanners, etc.), VDMA technical groups for injection molding machines, robotics or machine vision and 35 other VDMA industries already define their information in OPC UA servers in the form of so-called OPC UA companion specifications. For an equipment supplier, meeting this type of industry standard does not automatically mean they become exchangeable, as each manufacturer can offer their own special services on top of the standard. Intelligent devices should definitely be able to support multiple information models simultaneously – for example, the dedicated functionalities of an injection molding machine, in addition to the models for energy data or MES interfaces. To reduce the engineering effort, the importance and availability of such industry-specific and multi-industry information models will increase rapidly in the future. OPC UA may not directly increase an industrial device vendor’s sales, but not supporting the OPC UA standard will definitely decrease them considerably.

Trend: SoA
Most of the industry-specific information models developed so far are no longer based on the exchange of bit/byte properties, but rather on SoA services with complex parameters. An OPC UA client that does not support any methods for this purpose or complex parameters will be increasingly hampered in its communication with OPC UA servers. An RFID reader offers no bits to activate a read/write command, but instead uses methods that can be read by humans: ReadTag, WriteTag, and KillTag, among others. OPC UA is ideal for SoA implementation, which is why the German Commission for Electrical, Electronic & Information Technologies (DKE) lists OPC UA as the only SoA solution.

Trend: Service-to-Service
OPC UA provides consistent scalability from the sensor to the enterprise IT level, making a significant impact on the automation pyramid. While this pyramid will continue to exist for the factory’s organizational structure, OPC UA bypasses the communication pyramid entirely. The devices can deliver data, either directly or in parallel, to the PLC, MES, the ERP system or to the cloud level. This is where suppliers see opportunities for new business models. For example, manufacturers can bill for their barcode or RFID reader on a per scan basis while the data being read or scanned never leaves the factory.

Trend: Chip-based OPC UA
OPC UA will continue to be integrated into ever-smaller devices and sensors. Today’s smallest OPC UA software solutions for industry with limited (but readable) functionality require just 35 KB of RAM and 240 KB of flash memory. Now that the first chips with integrated OPC UA have hit the market, OPC UA can make further in-roads into the world of sensors. As a result, OPC UA applications are already extending from the core area of automation into other areas like industrial kitchen appliances.

Summary
OPC UA has already become the de-facto standard for the automation market and Industrie 4.0. In combination with TSN communication, OPC UA will also be real-time-capable. This is not to propagate another fieldbus, but to create a predictable time basis for the exchange of SoA services. Some challenges, such as the configuration of complex TSN networks, have yet to be resolved. This is why the OPC Foundation is not actively promoting OPC UA and TSN at this time. However, OPC UA is covering a growing range of communication scenarios, which makes it increasingly difficult for suppliers to justify proprietary solutions. Products will increasingly differentiate themselves based on the features of the device itself or of external services, not the interface. In the future we will see rapid growth in the information models of additional industries, as OPC UA is the preferred platform of the world’s largest ecosystem for interoperability.
As a long-term active partner of the OPC Foundation, Beckhoff was among the earliest adopters to implement the OPC UA standard in many innovative ways. Adaptation milestones that benefitted Beckhoff’s customers occurred in 2007 (world’s first PLC with integrated OPC UA server), 2010 (first PLCopen-standardized UA client modules from Beckhoff), 2012 (free UA server for Industrial PC diagnostics), 2014 (SoA PLC), 2016 (UA information models in the PLC) and in 2017 (publisher-subscriber model in the PLC).

The first OPC UA server was already introduced in 2006. In 2007, it was officially offered as a TwinCAT software supplement product and installed in the first customer projects. Following its certification in 2008, the “TwinCAT OPC UA Server” rapidly developed into one of the most popular TwinCAT supplement products in the connectivity segment, impressing users with its continuous advancement and integration of the latest OPC UA functionalities.

Another milestone was the development of the so-called SoA-PLC (Service-oriented Architecture PLC), which began in 2013. This enables the development of service functionalities based on IEC 61131-3 methods within the PLC, and their availability via the TwinCAT OPC UA Server as OPC UA methods. Such methods enable OPC UA clients to use these services and benefit from their consistent processing and assignment of input and output parameters. With the rising popularity of OPC UA in various industries, many more so-called companion specifications have been published in recent years. These specifications define the information model mapping from the protocol being used in the respective domain to OPC UA. One
such example is the Euromap77 standard for injection molding machines in the plastics industry. To provide the secure and standardized exchange of information between various platform manufacturers, the Euromap77 model was mapped to OPC UA in the form of a companion specification. The TwinCAT OPC UA Server is based on the IEC 61131 mapping from PLCopen by default. Using this specification, the IEC 61131-type system of the TwinCAT PLC is loaded into the OPC UA namespace. A generic expansion of the server now makes it possible to load any information model. Normally, these information models are available in form of an XML file that defines the type system. The companion specification of the Euromap77 model is one of these. The TwinCAT OPC UA Server builds its type system by importing the respective companion XML, and combines the objects of the XML with variables from the TwinCAT PLC. A linked OPC UA client can now browse the server based on a standardized type system (Euromap77) and access the objects contained therein.

Enhancements in the security model of the TwinCAT OPC UA Server enable the programmer to define various users and user roles, and assign access levels to the individual namespaces and objects. This makes it possible to further protect the already secure communication and client-server authentication that uses X.509 certificates.

In 2012, an OPC UA client was added to the TwinCAT OPC UA supplement product making it possible for PLCs to establish a direct connection to OPC UA servers on the basis of PLCopen function blocks. It also made it possible to call up methods from an OPC UA Server immediately, which enhanced the...
SoA PLC concept even more. To increase the usability of the TwinCAT OPC UA Client, this functionality is now available in form of a TwinCAT 3 I/O device. As a result, the user no longer needs to write any PLC code to read or write data from or to a remote OPC UA server (or to call up methods). A user can simply insert the respective symbols into the TwinCAT XAE I/O configuration and link them to other symbols via regular mapping mechanisms. This is where the mapping mechanism that is integrated into XAE comes into play again: It establishes a link to the OPC UA server, and the symbols are automatically read and created.

The expansion of the OPC UA specification with publisher-subscriber (pub/sub) communication patterns enhances the classic client-server architecture with modern communication mechanisms that enable multi-cast communication in the local machine network, as well as broker-based communication via a cloud service. Beckhoff presented this feature as a real-time-capable prototype at the 2016 SPS IPC Drives trade show. This meant Beckhoff was the first automation technology supplier to implement this pub/sub technology for deterministic M2M communication. The solution is configured via a separate I/O device in TwinCAT XAE.

With the company’s PC-based control technology, Beckhoff supplies the ideal platform for Industrie 4.0 automation projects. After enabling the standardized exchange of data via OPC UA for many years, it has become even better with additional new features that improve the modeling of type systems, security and usability. In addition, OPC UA is offered in more places than just the TwinCAT supplement products. Every Beckhoff Industrial PC is delivered

Fig. 3: The OPC UA client I/O device simplifies engineering requirements
with a free OPC UA server for IPC diagnostics by default. This software can read hardware information such as the CPU or mainboard temperature and initiate file uploads or downloads via OPC UA. Complete directories or individual files can be shared via OPC UA so that OPC UA clients can use this file transfer component to exchange files with the OPC UA server, for example to download log files.

Further information:
www.beckhoff.com/TF6100

Sven Goldstein,
Product Manager
TwinCAT Connectivity & IoT
XTS at the core of a labeling and grouping unit in a packaging line for toothbrushes

Koch Pac-Systeme: Compact machine module delivers quick, software-supported product changeovers
Koch achieves a seamless, fully integrated and efficiently executed packaging process with customized equipment ranging from blister machines to product infeed and blister grouping modules to end-of-line packers. Customers receive solutions that meet industry-specific requirements and are perfectly matched to the size and shape of the respective products. A line for packaging toothbrushes that is fully controlled via Beckhoff TwinCAT automation software and processes up to 320 toothbrushes or 240 blisters per minute is an especially innovative example of the expertise demonstrated by the "Koch Packaging Lines".

Project Manager Gert Müller explains the functional scope and complexity of the line with a total length of 28 meters (92 feet): "In a first step, the line will be operated with two different formats for which the customer uses two different foil thicknesses. What makes the line so attractive is its superior flexibility, because an automatic foil width adjustment feature allows the customer to use different foil sizes to produce additional blister sizes in the future. After the blisters have been formed, the toothbrushes are supplied via a high-speed pick-and-place (HSPP) system that uses a camera to control their position. Next, another HSPP places the cardboard backing and uses ultrasonic spot sealing to keep it in place for the actual sealing process. A laser system applies a code to the back of the card that is verified downstream via a camera system. After the blisters have been separated in a punch station, they are transferred via a two-axis portal to the central labeling and grouping unit before another HSPP system groups and transfers them to a cartoning machine. The packaged blister packs are then transferred to the customer’s downstream packaging steps."

Koch Pac-Systeme GmbH in Pfalzgrafenweiler, Germany, is a specialist for customer-specific blister packaging machines and systems. With extensive line design experience, the company’s engineers are able to implement each customer’s requirements in a flexible and effective manner. The packaging experts have proven their expertise again with a complex new packaging line for toothbrushes. At its center, the eXtended Transport System (XTS) from Beckhoff replaces expensive mechanical systems with software functionalities that make the line more compact and more flexible for faster product changeovers.
**XTS makes labeling and grouping unit more efficient**

The labeling and grouping unit is a prime example of Koch’s expertise in developing highly innovative solutions. Gert Müller: “We installed an XTS circuit that is 11 meters long and equipped with 24 movers with special carriers for single and twin blisters. When the product changes, only the carriers have to be switched out. Since this is a very quick and easy process, setup changeover times are reduced considerably.” Wolfgang Braun, Global Account Manager at Koch, adds: “The end customer wants to produce different formats with our packaging line, and therefore very fast and flexible format changeovers are required.”

Jürgen Welker, Director Automation and Technology at Koch, lists two more factors that convinced the company to use XTS technology: “The high throughput rate requiring the ability to adapt to varying labeling speeds at the labeling station are great benefits of XTS. In addition, the system can be very easily adapted to the various blister formats, since XTS enables flexibility for a wide range of products to be packaged. It is also highly reliable, which is critical, because the end customer requires 24/7 operation with 95 percent system availability.” Jürgen Welker also mentions machine design-related benefits: “Without the compact XTS, the labeling and grouping unit – and therefore the entire line – would have been 2 meters longer and much more complex due to the additional mechanical components that would have been required. It also would have been much less accessible for the operators when format changes need to be executed.”

Wolfgang Braun considers the high level of flexibility and the ability to convert the line very quickly to be key benefits from the end customer’s perspective: “The original plan called for a conventional solution based on a so-called bucket chain. While it was designed to be width-adjustable, it quickly encountered limitations because of the constantly expanding product spectrum. One — much more expensive — solution would have been to add a second bucket chain or even a split line with two separate packaging machines. As a highly flexible and software-based transport system, XTS turned out to be a better and much more cost-effective solution — also for future requirements.”

**XTS ensures high flexibility with software functionality**

Gert Müller explains the flexible motion sequences within the labeling and grouping unit: “Depending on the format, the two-axis system transfers eight or 12 blister packs to four or six movers. These movers then travel to the labeling station. Another HSPP system places the blister packs in multiple layers into the cartoning machine’s product chain in accordance with the outer packaging type and the number of blisters that fit in there. The system stands still for loading and unloading while the labeling process runs continuously. With XTS, all these different movements can be programmed very easily.”

The software functionality of XTS also supports the quick product changeover requirement, because each blister format has its own recipe, including the precise processing positions that can be easily selected with a mouse click. In addition, the machine module has two labeling devices. Depending on the format, the software tells the XTS to which of these it needs to travel.

**Powerful PC- and EtherCAT-based control technology**

A single control cabinet PC from Beckhoff is all that’s needed to control the 24 XTS movers dynamically and with perfect precision. The C6930 PC is powerful enough to also control two Delta robots, handling the robots as additional TwinCAT NC tasks. Both HSPP systems are equipped with servo drive technology.
from Beckhoff. Jürgen Welker confirms the benefits: “TwinCAT provides all necessary functionalities. For example, we use the complete TwinCAT XTS Extension with functions like collision avoidance and cam plate. The fact that each mover is mapped as a separate servo axis in TwinCAT is hugely advantageous for us. That way, we can program and adjust each mover separately, which is convenient and also safe due to integrated higher-level functions like collision avoidance. And to top it all off, there is EtherCAT’s exceptional performance. The controller makes full use of EtherCAT’s extreme speed, particularly where the communication with the many servo drives in the system is concerned.”

Packaging technology on the road to Industrie 4.0

The openness of PC-based control systems helps Koch Pac-Systeme deal with future-oriented issues like Industrie 4.0. For example, the new toothbrush packaging line will exchange status information with the end customer’s ERP system via an OPC interface. A demo installation at the 2017 Interpack trade fair that was developed in cooperation with Beckhoff will show how heavily involved Koch’s packaging experts are in Industrie 4.0 concepts. The system will collect data on the consumption of power and compressed air in a small packaging machine via EtherCAT Terminals, transmit it to the Amazon Web Services™ (AWS) cloud, and display it on a mobile device app.

Further information:
www.koch-pac-systeme.com
www.beckhoff.com/XTS

Jürgen Welker (right) of Koch Pac-Systeme shows Frank Würthner of Beckhoff how easy it is to switch out the blister carriers for rapid product changeovers.
According to Franz Stuefer, who heads the CLC plant, the new process for buffing, rebuilding and curing tires in a sustainable and resource-efficient manner represents a huge step forward in the retreading business for Continental and the industry as a whole. "Retreading extends the useful lifecycle of the tires, saves resources and reduces vehicle fuel consumption and CO₂ emissions by improving the rolling properties of tires. These are significant competitive benefits, because reducing the fuel consumption of trucks and buses is just as important to our customers as the tread life of their tires. After all, retreaded tires account for about 40 % of the market in the truck and bus segment."

Complete resource recycling
When a tire is retreaded, the buffing process generates rubber granulate. In the past, the granulate was either disposed of or it was recycled into lower end products, such as filler material for rail ties. With a new process, 100 percent of the granulate is now processed into high-quality raw ingredients for the new rubber mixture. "This concept of reusing 100 percent of the granulate completes the ContiLifeCycle recycling process," explains Franz Stuefer. "The lifecycle of a tire begins with its production, using raw materials like synthetic rubber, natural rubber or carbon black. Next, the tire hits the road and, if desired, customers
have the option of re-cutting the tread to get more miles out of their tires. Once the tread is worn down, it comes to our CLC plant and is buffed. The granulate enters the mix production process after having passed through an innovative recycling test procedure to finally re-enter the production cycle. Then another tire is retreaded with this mix.”

The conditions were ideal for the construction of the new factory, remembers Franz Stuefer: “We completed the project in only 12 months with roughly 200 Continental employees. We benefited from the fact that R&D, quality management, mixing production, inspection, engineering and Continental Machinery — our own machine and system engineering company — were already on-site. This also generated many synergies. For example, we now fully analyze and evaluate each tire that is sent to us for retreading. This provides the R&D department with valuable information that ultimately benefits the development of new tires.”

Universal control technology
Dr. Paul Malliband, Project Manager of Control and Drives at Continental, notes that the company was also able to apply its synergies and many years of control technology experience for ContiLifeCycle: "We employ PC-based technology from Beckhoff for all control systems in this plant. At the start of the CLC project in November 2012, we used four different controller types. However, to make the maintenance process as simple as possible and streamline the controller interfaces to the MES level, we decided to make PC-based control the standard system. In addition, Continental Machinery, the machine manufacturing business unit of Continental Tires, has used Beckhoff technology in production machines for many years, which provided us extensive expertise directly on-site.”

Beckhoff C6925 and C6650 control cabinet Industrial PCs (IPCs) are used to control all 25 production machines. Malliband explains: “The PC-based control technology from Beckhoff is highly scalable to accommodate every individual application requirement. We use the C6925 predominantly for basic machinery like our vulcanizing presses. The C6650 comes into play whenever more computing power is required. Examples include the multi-axis machines for attaching the tread strips to the tire casing in the cold retreading process, or for layering the strips in the hot retreading process. The same applies for the HMI, where we use the proven CP7931 Control Panel with 12-inch touchscreen and an alphanumeric keyboard. This is supplemented with additional electromechanical keys where necessary, for example when a machine offers many application-specific motion control options.

MES connectivity via OPC UA
In line with Industrie 4.0 concepts, the entire facility is fully networked and connected to management-level IT systems. This is where the openness of PC-based control really shines, according to Malliband: “Vertical integration, i.e. the communication with the SAP system that serves as an MES (Manufacturing Execution System), is implemented via OPC UA. Since all C6925 and C6650 Industrial PCs run an OPC UA client, they directly communicate with the SAP system. At the start of the project, Continental’s standards called for OPC DA for this purpose. OPC UA had not been tested at the time, but it is currently being analyzed for new production plants containing a large number of machines. We currently use several basic communication functions. The move to OPC UA positions Continental as a trailblazer in this area.”

The benefits for universal OPC UA communication are already clear for Malliband: “It will increase the flexibility and efficiency of our production overall as envisaged in Industrie 4.0 concepts. For example, we plan to scan the tire barcode directly on the machine at the start of the retreading process and pass it on to the MES. The MES will then recognize the order for this specific tire and return the appropriate processing recipe to the machine.” Alexander Kruse, Key Account Manager at the Beckhoff Hannover office, adds: “The SAP system is closely linked with the control platform. Production data, such as the barcode data, or different production steps can be exchanged directly via OPC UA. Method requests directly from the PLC into the SAP system will also become more common in the future. This will speed up communications while freeing up processor capacity for other tasks.”

Further information:
www.continental-tires.com
www.beckhoff.com/Industrie40
All-in-one control platform optimizes coffee production

With a 145-year history of building roasting machines and systems, PROBAT-Werke von Gimborn Maschinenfabrik, headquartered in Emmerich, Germany, occupies a leading position in this industry. Based on the company’s extensive expertise and passion for making world-class machinery, Probat industrial roasters are known all over the world for exceptional efficiency, flexibility, quality, durability and reliability.
Continuous innovation plays a major role for Probat, the market leader for industrial roasters and in-store roasting equipment. “To maintain our leading position, Probat operates its own technological center for extensive R&D. Starting with raw coffee beans, we test numerous roasting and grinding technologies to achieve the perfect end product,” explains Andreas Rinke, Head of Portfolio Management at Probat. Automation plays a key role in the roll-out of reliable mass-production processes after they have been developed in the lab. “High performance, flexible software interfaces and ease of operation were the main requirements when we selected the new control platform for our ‘Probatone’ in-store roasters. PC-based control technology provides the perfect answer to these requirements,” says Rinke, which is why all Probat in-store roasting systems have been equipped with all-in-one HMI and controllers from Beckhoff since 2015.

Automation technology is the key to consistent, high-quality roasting results
At first glance, the coffee roasting process does not seem overly complicated – burner performance is essentially controlled via time and temperature threshold values. In the past, this was achieved using a potentiometer that was manually operated by the roast master. This kind of “automation” delivered often excellent, but rarely reproducible results. To ensure a consistent level of quality for the various roasts, a recipe management system was needed, enabling the user to run existing recipes as well as the ability to create and store new ones. At the same time, the system needed to visualize the temperature curves so that the roasting process could be properly controlled and logged.

Andreas Rinke remembers the first automation solution implemented by Probat. It consisted of two CPUs: a 266-MHz ARM™ processor for the PLC and a 3.5-inch HMI panel (with a similar CPU) to visualize the roasting process. Since integrating recipe management into the system was impossible because of the system’s low CPU performance and rudimentary storage options, it was outsourced to apps running under Android, iOS and Windows. The slow user interface and the need to set parameters on two devices were other downsides.

More functionality and user-friendliness – without adding costs
Solving these problems seemed easy: install more CPU power. However, the system also had to stay within the budget set by the existing control solution, necessitating a single-CPU unit. “With this requirement, the decision to use a PC-based control platform was essentially a given,” remembers Rinke. The new system is based on a Beckhoff CP6606-0001-0020 Panel PC with TwinCAT PLC runtime and integrated visualization. The process data is transmitted via EtherCAT I/O Terminals. The system has the following specifications:
- ARM™ Cortex 1 GHz processor
- 1 GB DDR3 RAM

Left to right: Andreas Rinke, Head of Portfolio Management at Probat, and Ralf Stachelhaus, head of the Beckhoff Rhein-Ruhr office, in front of the Probatone 12. Since 2015, Probat has equipped all its Probatone in-store roasting systems with PC-based control technology from Beckhoff.
- 256 MB Micro-SD (max. 16 GB)
- Integrated FPU (floating point unit)
- 7-inch widescreen display, 800 x 480 pixels, touchscreen
- On-board Ethernet adapter 10/100BASE-T TCP/IP
- On-board EtherCAT adapter (I/O interface)
- Web server (IIS)
- TwinCAT Runtime
- Integrated visualization (target visualization)
- Interfaces for web visualization (HTML 5, JS) for local visualization, iPhone, iPad, etc.
- Interfaces for JS, .NET, OPC UA, etc. (ADS interface)

This system configuration delivered significant benefits for the Probatone in-store roasting system. The upgraded CPU provides vastly improved control capabilities, and the user interface is faster with additional functions. For example, the system now provides real temperature curves, making operation much clearer and easier to control. The high-quality 7-inch display was highly appreciated as well as it increases operator comfort. Moreover, the recipes are now stored locally and no longer require apps on other devices. Tried-and-tested recipes can now be run with ease. Each roast is logged and stored, including its temperature curve. In order to keep using the existing apps, the controller is equipped with a Modbus/TCP server.

Future-ready platform

“The new controller represents a major step forward for us, and we accomplished this without increasing the cost,” says Andreas Rinke. The Head of Portfolio Management has no intention to ease up on innovation, however: “For historical reasons, we still must maintain three web applications for Android, iOS and Windows. When we started the development process, no platform-neutral language for web applications was available to reproduce the familiar look and feel people expect from smartphones and tablets. Today, we have such a language in the form of HTML 5, which together with JavaScript and CSS forms the basis for TwinCAT HMI, the new Beckhoff visualization software we fully intend to use.” Rinke also commented that this will enable Probat to implement applications on a single engineering platform while significantly reducing development time for new features.
Major manufacturing steps include soldering processes, assembly processes, potting processes to seal the ERT® modules, and final testing before products are released to the supply chain.
Itron is a globally operating technology and services company that develops solutions for the resourceful use of energy and water. To meet the high demand for its metering products, the company has upgraded many of the assembly cells in its Waseca, Minnesota plant to PC- and EtherCAT-based control technology. The lean and highly integrated control system architecture makes the factory more productive, reduces hardware costs, and simplifies the data handling for product tracking and tracing.

To keep up with the growing market demand for these meters, also known as ERT® (encoder receiver transmitter) modules, Itron had to continuously increase its production volume by adding new production cells to the plant. “The existing control platform that consisted of a PLC for machine control and a separate PC for the HMI proved to be an obstacle to production expansions, and simply adding new machines of the same design was not a permanent solution,” says Adam Moyer, principal controls engineer at Itron. “This is why we decided to upgrade assembly cells to PC-based control.”

**Complete production history, from the factory to the field**
Major production steps at the Itron factory include soldering processes, assembly processes and potting processes to seal the ERT products (including curing after the potting material is dispensed). The company puts great emphasis on the quality of its products in each stage of the manufacturing process. Accordingly, each production step is tracked, from the individual components and their assembly to the shipping and installation of the finished product. For every component that goes into Itron products, a wide range of parameters are logged, such as the lot code, the manufacturing date, the component manufacturer’s name, the installation date, as well as all settings and configurations of the machine on which the module was manufactured. More production data is generated by the extensive tests which Itron performs for each product. These include visual inspections as well as RF tests, programming tests on ERT microprocessors and more. Each of these steps, which are either fully or semi-automated, is controlled via the PC- and EtherCAT-based control system from Beckhoff. “Our quality assurance system tracks the complete history of
To meet the rising demand for gas and water metering devices, Itron has upgraded the assembly cells in its Waseca, Minnesota plant to PC- and EtherCAT-based control systems.

Each product down to the smallest component and section of code,” says Adam Moyer. The serial numbers for all ERTs are stored on a Microsoft SQL server along with every production step and quality test.

“This comprehensive product traceability was a major factor in the decision to switch to PC- and EtherCAT-based control technology,” says the control technology expert. “PC-based control helped us establish connectivity between the automation system and remote databases while managing the incredible volumes of data to implement complete traceability.”

Scalable control platform enables custom-tailored solutions
Itron employs a compact CX5130 Embedded PC as its control platform for new assembly cells. Equipped with a dual-core Intel® Atom™ processor, it can handle PLC, motion control and HMI all on one device. The Embedded PC runs TwinCAT automation software as well as LabVIEW for the assembly cell HMI. “By running the HMI software on the Embedded PC, we significantly reduced the control cabinet space requirements in the assembly cells,” explains Adam Moyer. Some of the soldering and assembly steps utilize 4-axis articulated robots from Stäubli, which are also networked via EtherCAT and controlled by Embedded PCs and TwinCAT software from Beckhoff.

The benefits of this integrated control solution extend beyond cost savings in terms of hardware. They also require less engineering time, because Itron no longer has to write and manage code revisions in two separate systems. This also eliminated the need to develop complex mechanisms that enable communication among hardware components from different manufacturers.

Everything under control
Itron’s assembly cells interface with the SQL database so production data can be transmitted easily from the factory floor. The Embedded PCs send a variety of data and parameters to the database, which authorized Itron production managers and operations managers from all over the world can access via their mobile devices or laptops to check the status of each assembly line. The connectivity from the Beckhoff controller to the database is central to capitalizing on the data. The setup enables Itron to have everything under control, from complete track-and-trace of manufactured product down to the component and exact time of each manufacturing step, to yield data, to real time data for product quality.

All communication protocols in the Waseca plant were converted to EtherCAT. As a result, EtherCAT is used as the network for vision systems, solenoid banks
In order to maintain world-class ERT® product quality, Itron emphasizes comprehensive traceability.

and even articulated robots. EtherCAT has increased data transmission speeds while reducing cycle times. Starting up the assembly cells with TwinCAT automation software is much faster now. It recognizes all connected EtherCAT devices automatically, regardless of vendor.

Itron uses TwinCAT not only for assembly cell control and database connectivity, but also for safety-related applications. The programmable safety functions that are integrated into the standard automation system using TwinSAFE technology from Beckhoff are another key benefit for Itron’s assembly processes. “After switching to TwinSAFE, we no longer had to handshake between the controller and the safety system,” says Adam Moyer. “This saved a considerable amount of cabinet space while further reducing costs and programming efforts.” Specifically, Itron uses TwinSAFE technology to integrate light curtains as well as safety for robotics and other motion control functions, such as pneumatics.

Increased productivity along with space and cost savings
Besides providing more reliable SQL database connections and other enterprise-wide services, Itron has improved its data acquisition and storage operations on the basis of the PC-based control platform. “Assuming the data volume is the same, our overall process cycle time is now 15 to 20 percent faster with the Beckhoff solution,” points out Adam Moyer. Itron was also able to drastically reduce the time spent on software development and machine integration and the space taken up by the control components has been reduced by an impressive 25 percent.
One Mega-Fixu storage unit has space for approximately 30,000 medication packages. Number and sizes of storage units can be selected by customer.
Pharmacy automation advances with PC-based control technology

Finnish company NewIcon specializes in automation solutions for pharmacies. The robot-assisted “Mega-Fixu” storage and retrieval system automates medicine supply and is deployed mostly in hospital pharmacies. The modular solution can be custom-tailored to meet the specific needs of each medical facility. The system can also be integrated seamlessly into the customer’s ERP system, leveraging a Beckhoff Industrial PC as the central control platform.

A quick and reliable solution, Mega-Fixu completely automates the identification, shelving and dispensing of medications, enabling pharmacists and medical staff to eliminate tedious and repetitive activities. It also improves safety, because the enclosed storage system keeps medications safe and secure, and continuously monitors environmental temperature and medication expiration dates. Possible human error when storing and picking medications are therefore a thing of the past. Other benefits include improved workplace ergonomics and more efficient use of space. In terms of scale and cost, each NewIcon storage system is custom-tailored to fit the size and turnover of the respective pharmacy.

High-powered platform integrates PLC, image processing and database functions

The control system and database run on a Beckhoff C6650 Industrial PC (IPC) equipped with a powerful Intel® Core™ i7 quad-core processor as well as a RAID controller and redundant hard disks. The control system, database and ERP link are based on TwinCAT automation software. “The reliability and performance of the IPCs are very important to us because the database comprises 150,000 data points for the various storage positions,” explains Mika Rissanen, automation manager at NewIcon. “In addition, the openness and modularity

Mika Rissanen, Automation Manager at NewIcon Oy
All the controls of the Newicon's Mega-Fixu system are based on Beckhoff automation components, ranging from the powerful C6650 Industrial PC as a database server to CX5020 Embedded PCs that control the storage system, conveyor and drive components. All communication functions are handled by the EtherCAT real-time industrial Ethernet system.
of the solution were among the criteria that solidified our decision to employ PC-based control technology. The modularity of our system perfectly matches the modular control architecture offered by Beckhoff. We also had the ambitious goal to integrate the database, image processing and automation system on a single PC platform.” The powerful C6650 IPC with EtherCAT as the complete communication system have made this possible. Other system benefits mentioned by Rissanen include lower total cost of ownership and integrated support for remote access. “By implementing a PC-based control system, we now have the option to access Mega-Fixu applications remotely for maintenance purposes,” explains Rissanen.

The Mega-Fixu system has a robot-assisted input unit where each package is identified and measured via a barcode reader and an intelligent image processing system. Following this step, the control system determines the most suitable storage location for the package. The system’s X/Y servo axes controlling the robots that shelve and retrieve medicine packages are equipped with Beckhoff AM8000 series motors that feature One Cable Technology (OCT), as well as 2-channel AX5000 Servo Drives. The servo axes’ movements are controlled via DIN rail-mounted CX5020 Embedded PCs from Beckhoff.

Future developments include predictive diagnostics and condition monitoring

“Since the order picking systems for pharmacies and hospitals must work trouble-free and be highly reliable, it’s best when service and maintenance are performed proactively,” explains Mika Rissanen. “The number of systems we have shipped has increased so rapidly that we are considering an even more comprehensive diagnostic and monitoring approach. The TwinCAT IoT and TwinCAT Analytics software tools will make it easy for us to integrate cloud-based services and automated diagnostics into our systems in the future,” says Rissanen. “We appreciate that Beckhoff provides the ability to use the Internet of Things as an integrated part of an automation system and also as a simple, totally separate data collection system that can even be added to existing installations.”

NewIcon Oy

NewIcon Oy, a healthcare technology company founded in 2007 and located in Kuopio, Finland, employs more than 50 people. Company revenue in 2015 was approximately 5.5 million euros, and business is growing rapidly. NewIcon is the market leader in Finland in terms of storage automation systems for pharmacies and hospitals.
Ningbo Shuangma Machinery Industry Co., Ltd, headquartered in Chinese Ningbo, manufactures injection molding machines under the brand name Bole. Shuangma has utilized PC-based automation technology from Beckhoff in its standard toggle machines for several years with great success. Now, this technology will be integrated into their 2-plate injection molding machines.

Injection molding processes place high demands on control technology

Short cycle times and high positioning accuracy are fundamental parameters that are influenced not only by the design of sensors and actuators, but also, to a large extent, by the control system. Therefore, short sampling times with fast program processing are required on the control system side to minimize non-productive times in step sequence processing. The production of complex plastic parts for the automotive industry often requires advanced core-puller programs and a large number of control options that extend as far as special applications. Another industry requirement is integration into production cells with robot-assisted automatic parts removal. At the same time, programming and commissioning times must be as short as possible. In addition, simple solutions are required to transfer process and machine data into cloud databases.

XMold and eMold: control solutions with precisely scalable performance

Beckhoff offers solutions for injection molding machines in three performance classes: the eMold solution, a powerful controller with 9-inch display and closed-loop control, is available for standard toggle machines; the XMold controller, with 12-inch display in portrait mode, is designed for the medium performance class. It can be used for injection molding machines that are equipped with hydraulic, electric or hybrid drives. For large machines, an XMold version with a 15-inch screen is available. All controller variants use the EM8908-1001 EtherCAT I/O board especially developed for injection molding machines. Depending on the design of the machine, these solutions can additionally include EtherCAT Terminals from the extensive Beckhoff I/O portfolio.

Open automation technology answers challenging market requirements and shortens engineering time

Quality requirements for plastic components used in the automotive industry are continually increasing. Therefore, plastics processors demand machines with lowest possible variations in product quality, short cycle times and minimal energy consumption. This trend can also be observed in other sectors, such as high-quality household articles and consumer electronics. For these reasons, manufacturers of injection molding machines focus almost exclusively on 2-plate systems in this market segment. The turnkey solution for injection molding machines from Beckhoff, XMold, is ideally suited to automate such machines, delivering high performance in a wide range of applications.
**EtherCAT for fast, reliable machine communication**

EtherCAT has become the standard real-time bus system for injection molding machines. Outstanding speed makes the protocol ideally suited for demanding control processes such as fast switchover to holding pressure or high-precision mold protection. EtherCAT provides fast and secure communication, not only for data exchange between Beckhoff components, but also with connected sensors. Precise and reliable data communication is critical for accurate detection of the moving plate position, as the required high pressure build-up should be controlled with the shortest possible delay. Neither analog potentiometers nor magnetostriuctive position sensors connected via CAN bus or SSI provide such reliable measurement values with short sampling times. Only EtherCAT sensors meet all the requirements for best-in-class motion control.

The Shuangma engineers also selected drives with EtherCAT interfaces for communication with the servo pumps. Based on the wide market acceptance of EtherCAT, a wide variety of hardware from third-party vendors is also available to the machine manufacturer, allowing Shuangma to offer its customers cost-efficient EtherCAT solutions.

**TwinCAT Injection Molding Application Framework for all applications in injection molding technology**

The injection molding process places high demands on the flexibility of motion and sequence control. The motion controller must be able to operate both cost-optimized hydraulic actuators and fast servo-electric axes, which means conventional CNC solutions are unsuitable for these applications. Beckhoff has developed the Injection Molding Application Framework especially for the unique requirements of injection molding machines. It is ideal for both hydraulic and servo-electric drive technology.

The open, flexible architecture of the framework was crucial for Shuangma in choosing the Beckhoff control platform. With the flexible axis concept and the configurable sequential control by means of interpreter language, the company was able to accelerate commissioning times for its large and special machines. The mature control algorithm—in combination with the powerful XMold CPU—led to a 10% improvement in positioning accuracy with shorter dry-cycle times when compared to the previous controller.

**XMold: the automation system for specialized, high-tech applications**

The architecture of the Injection Molding Application Framework is so broadly based that all injection molding applications are supported. One example of this is the application of the Injection Molding Compounder in a machine developed by Shuangma that combines extrusion and injection molding processes in order to manufacture plastic materials with glass fiber reinforcement. The extruder provides a homogeneous, material-friendly plasticizing process. The extruded plastic mass is then transported into a bulk storage vessel and pressed into the mold by an injection plunger. With XMold, Shuangma is able to control both the extruder and the injection molding machine with one centralized PC-based control platform.

“In this special application, Beckhoff was also able to utilize its extensive expertise in the temperature control of liquid-cooled extruders,” points out Thomas Kosthorst, Business Management, Plastic Processing Machines, at Beckhoff. “The temperature control of an extruder is more demanding than that of an injector cylinder. Injection molding compounder applications often require hotrunner molds with specialized temperatur controllers. As opposed to external hardware solutions, the integrated hotrunner controller can run any number of hot runners only by adding thermocouple inputs. The performance class of the PC needs to be selected to match the application requirements.”

The XMold solution provides special algorithms for servo-electric machines: for instance, the set curve calculation for servo-electric machines takes into account the special requirements of electric injection molding machines, such as fast switchover to holding pressure and jerk-optimized motion control.

In plastics processing, demand for energy consumption documentation continues to increase. Beckhoff offers capable hardware to meet this need, and the Plastic Application Framework delivers the necessary software modules. The XMold user interface is optimally designed for the requirements of injection molding processes; this means that the key parameters for each shot are saved in a freely-configurable table for quality data. Up to 12 (measured) values can be saved per shot and long-term archiving is possible via the local network or using a USB flash drive.

**Open communication standards and TwinCAT IoT as the foundation for Industrie 4.0**

In today’s processing facilities, injection molding machines communicate with central production planning systems. For this purpose, the Euromap 77 interface was defined in the Euromap Organization on the basis of the OPC UA standard, and this interface is available for XMold and eMold. However, concepts for cloud-based communication and analysis are now undergoing initial tests. The TwinCAT IoT software family for Industrie 4.0 communication is well-suited to injection molding processes, enabling cloud-based analysis of machine properties.

However, XMold also offers a wide range of functions for communication from the injection molding machine to peripheral equipment and robots (M2M): the Euromap 67 interface is available for conventional robot interfaces with digital I/Os, and fast Ethernet-based fieldbus connections according to Euromap 75 are supported with EtherCAT. Via EtherCAT, injection molding machines can also be seamlessly integrated into complex production cells, for example in medical technology applications.

**A sustainable solution with Beckhoff IoT technology**

“For many years, embedded systems of a low technological grade have dominated the Chinese domestic market for injection molding machine control,” concludes Shuangma’s Technical Manager Rockey Liu, “Now we need innovative concepts for the reliable production of high-quality parts. The cooperation with Beckhoff offers us a solid basis for technological development. With the open, PC-based control technology, we can completely fulfill our customers’ wishes for higher availability, quality and productivity, while also implementing production concepts in accordance with Industrie 4.0 methods and standards.”

Further information:

www.shuangma-machinery.com/en
www.beckhoff.com.cn
15 years of Beckhoff China – a success story

On 2 November 2016, the Beckhoff China subsidiary celebrated its 15th anniversary. Beckhoff China can look back on numerous outstanding developments: With revenue reaching approximately 100 million euros in 2016 and 241 staff, China is currently the largest Beckhoff subsidiary – and the one with the highest sales volume. In an interview with Zheng Li, editor-in-chief of the Chinese edition of MM Machine Market magazine, Managing Director, Liqiang Liang described how the success story of Beckhoff China unfolded.

Beckhoff China was established in 2001. How did you succeed in entering the Chinese market at the time? Also, how has the company developed since then?

Liqiang Liang: The rapid economic development in China, particularly after the country joined the World Trade Organization (WTO), created an ideal environment for the development of Beckhoff China. In 2001, Beckhoff opened an agency in Beijing, and fieldbus technology was the key factor enabling us to successfully enter the Chinese market. The use of fieldbus technology has been promoted in China since 1997 and has since been increasingly accepted by domestic industries. There was strong market demand, which Beckhoff met with its comprehensive I/O portfolio and support for all common fieldbus systems.

From 2003 on, we began to introduce Beckhoff control system solutions into the Chinese market, ranging from small controllers to Embedded PCs with integrated PLC, NC functions and HMI, and did so with great success. In 2006, due to our continued growth and strategic initiatives, we moved the Beckhoff China headquarters to Shanghai. In September 2007, the “Beckhoff Representative Office” became an official subsidiary and separate legal entity. In the following years, we concentrated even more on vertical markets and established a well-staffed sales network in the main industrial regions in the different Chinese provinces.

In 2001, traditional PLCs were still more common in the Chinese marketplace. How did you succeed in convincing industrial customers of the benefits of PC-based control technology?

Liqiang Liang: Naturally, this was a significant challenge. Having said this, it is worth noting that back then PC-based control technology was by no means as widely accepted as it is today among engineers in Germany and Europe either. Accordingly, the readiness of Chinese customers to try new control technology on their machines was limited. Nevertheless, we succeeded. The key breakthrough stemmed from the introduction of Embedded PCs from Beckhoff, beginning with the CX1000 in 2002. In order to increase market acceptance of
the new control philosophy, we also held numerous TwinCAT training sessions in Shanghai, Beijing, Guangzhou, Chengdu and at other locations. In this way, we were able to reach a large number of engineers and show them the benefits of open control solutions based on PC technology.

Step by step, we kept entering new markets. Let’s look at the wind energy industry, for example. Today, control systems for wind turbines in China are dominated by Beckhoff Embedded PCs. Between 2009 and 2015, approximately 38,000 operational management systems and 31,000 pitch systems with Beckhoff controllers were commissioned, giving Beckhoff approximately a 50 percent share of the Chinese market in this segment.

Which market penetration strategy did you pursue?

Liqiang Liang: Since 2007 we have focused on vertical markets, above all the wind energy industry. Naturally, the expansion of renewable energy installations in China was a big bonus for us. PC-based control technology from Beckhoff is used for wind turbine control, pitch control and wind farm networking. With TwinCAT 3 Wind Framework software, Beckhoff launched an ideal development platform for the new generation of wind turbines, which combines our expertise with Industrie 4.0 technologies. In addition, we expanded our on-site service and technical support for customers in the wind energy sector; we also support wind farm service technicians through comprehensive training resources.

Just like in the wind energy industry, our expansion into other markets was mainly technology-driven. In parallel with the development of the eXtreme Fast Control technology (XFC), we gained a foothold in a wide range of other industries. EtherCAT itself, however, was another major door-opener for us in many cases. Another example is the sheet-metalworking industry, where we successfully applied our software-based CNC solution with positive results.

Currently we are also very active in the area of connectivity to consumer electronics. In the future, we will continue to focus on developing additional markets. Beckhoff’s pioneering role in Industrie 4.0 strategies, which are driven by Germany, will be an advantage for us. The PC-based control technology from Beckhoff has excellent horizontal and vertical communication capabilities, which is a prerequisite for smart factory implementations. With product developments for cloud communication and data analytics, Beckhoff has the right tools to accelerate these developments with our customers today.
Art designs inspired by bubbles in grappa distillation process

When Italian grappa distiller Nardini wanted to build a customer center and research lab at its headquarters in Bassano del Grappa, the company commissioned the celebrated architects Massimiliano and Doriana Fuksas. The “Bolle”, which is what the Fuksas called their glass structures because they remind the viewer of bubbles that rise during the grappa distillation process, reflects the company’s strong tradition of grappa production, paired with a culture of innovation. To maintain indoor climate and ensure that the lighting and multimedia systems are truly state-of-the-art, systems integrator SAE implemented a system based on Beckhoff building automation components.
Nardini’s roots go back to the year 1779, when Bortolo Nardini began commercial production of “aquavit de vinaccia”, a distillation made from “pomace”, which includes the skins, pulp and seeds of grapes after the pressing for wine. To celebrate the company’s 225th anniversary, Nardini commissioned Italian star architects Massimiliano and Doriana Fuksas, who are known for their futuristic designs, to build a new customer center. The “Bolle” are two ellipsoids consisting of concave and convex multi-layered glass shapes. These are inspired by the bubbles that rise during the grappa distillation process. “Balanced” on three-meter and six-meter stilts, the “Bolle” are reflected in the surface of the pond below. Another surprise is the underground structure connecting the “floating” glass bodies. It houses a research lab, Nardini’s quality control department and meeting rooms, as well as an auditorium that is used for cultural events, and a receiving area for customers and visitors.

Technology stays behind the scenes
“Unusual architecture requires special building automation systems,” explains Giovanni Cavallin, the general director of SAE. “With the exception of two switches at the entrances, the solution we implemented is invisible and perfectly integrated into the transparent architecture,” adds Riccardo Marin, software development lead.

The controls are based on four BC9000 Ethernet Bus Terminal Controllers spread across the two “Bolle”, the thermal power supply and the underground auditorium. They operate as dedicated controllers that receive signals and send the respective commands via four different communication protocols: DALI for running the points of light, an ASi interface for controlling the projection screen and the curtains behind the stage, an RS485 serial interface for controlling the seating areas, and Modbus TCP/IP for the audio/video controls and the HMI.

Each "Bolle" has roughly 80 points of light that are linked via DALI and can be dimmed and controlled individually or in groups. To minimize any interference with the design, all wires were concealed in the structural components.

Easy to add features in the future with open control system
The transparent architecture provides visitors with a 360-degree view of the mountains surrounding Bassano del Grappa. Unfortunately, the architects had not considered how hot the “Bolle” would get during days of intense sunlight, which is why they had to be retrofitted with sun shields. “This is where the modular control platform with its DALI interface provided a huge advantage, because adding the sun shields was no problem at all. Since the controller automatically perceives the electric motors of the shields as DALI devices, they could be easily integrated into the overall system and are now controlled via software to meet all requirements. The graphical user interface (GUI) provides both continuous and impulse-controlled settings.

The lighting and HVAC systems are controlled via the touchscreen in the control room, and the sun shields are controlled from a laptop or tablet via Wi-Fi. Each of the BC9000 controllers in the glass “Bolle” features seven DALI modules, to which roughly 100 luminaire and sun shield addresses are assigned.

The entrance to the “Bolle” is located under the pond’s surface; it provides access to various rooms for meetings, receptions and conferences. One of these is a 108-seat auditorium, which is also controlled via a Bus Terminal Controller.

Various lighting scenarios for video screenings, conferences and other activities have been preprogrammed and can be called up on demand. All systems and drives can also be controlled separately. For example, the seating areas can be opened and closed in groups or row-by-row. In addition, the auditorium can be partially illuminated or darkened by controlling individual groups.

Simple and flexible operation
“The best words to describe our building automation solution are simplicity and flexibility,” explains Giovanni Cavallin. “The control architecture is extremely lean, almost minimalist, which matches the building’s structure perfectly. The flexibility and modularity of the Beckhoff control concept, and its openness with regard to various communication protocols, made integrating the different components easy. In addition, the use of standard software solutions instead of proprietary hardware and protocols provides a solid foundation for future expansion. It also keeps risks and costs low when integrating third-party maintenance services, for example.”

A view of the auditorium, which can seat 108 people. The room is controlled via a Bus Terminal Controller. Predefined light scenarios for various event types can be called up easily.

Further information:
www.nardini.it
www.saeimpianti.it
www.beckhoff.it
The Cybathlon is a remarkable contest in two major ways. On the one hand, all the athletes have physical handicaps. On the other, the event measures both the contestant and the machine, so all tasks require the incorporation of the latest technologies. One of the disciplines includes walking with the aid of an exoskeleton. These robotic suits enable paraplegics to walk instead of using a wheelchair. For the Cybathlon, a special course was laid out on which athletes had to master everyday, but nevertheless complex, situations such as getting up from a low chair, overcoming inclines and obstacles on the ground, and climbing stairs.

A total of 66 teams from 25 countries took part in the first Cybathlon, hosted by the University of Science and Technology (ETH) in Zurich, Switzerland. Using the latest technologies in physical assistance systems, people with physical handicaps competed in six demanding disciplines. “Project March 1”, a team of young scientists at Delft University of Technology (TU Delft), participated with its newly developed “March 1” exoskeleton. EtherCAT, the real-time communication system from Beckhoff, provides the necessary speed and reliability for the exoskeleton.

Technology in motion:
Innovative exoskeleton helps paraplegics walk
“The exoskeleton is an old idea that still needs a good deal of additional improvement,” explains Nick Tsutsunava, the chief engineer of the Project March 1 development team at TU Delft, located in Delft, The Netherlands. Currently, existing exoskeletons provide users with relatively little direct control, meaning they are more like a passenger than a pilot. To enable users to control the robotic exoskeleton on their own, Nick Tsutsunava and a group of students established Project March 1 in the spring of 2015. Claudia Bosch-Commijs completes the Project March team as the exoskeleton pilot.

**Perfect convergence of humans and robots**

The team had a little more than a year to develop an innovative exoskeleton that would be able to compete in the Cybathlon. The project was based on an earlier development dubbed the 'Mindwalker', which coordinated walking mechanics with the user's brain waves. "The idea was not sufficiently perfected to translate it into a practical application, however," says Nick Tsutsunava. "That's why Project March 1 focuses on the fact that users walk with crutches to stabilize their upper body. Today, we operate with a so-called point-and-go system," he adds. "This means that the user points the crutch where they want to go, and operates it with buttons on the handle."

The team of developers around Nick Tsutsunava determined early on that the Mindwalker's mechanics would provide the foundation for their new "March 1" exoskeleton. "We changed the electronics a lot, and the drive system is completely different," according to the team leader. "What makes the upgraded March 1 mechanics so special is the addition of two hip joints that allow the user to not only walk straight ahead, but sideways as well. As a result, the pilot can shift weight from one leg to the other – just like during normal walking motions. This adds stability and makes it easier to climb stairs and walk on uneven ground."

Another major improvement is the use of serial-elastic actuators to control the joints. "We inserted a coil spring made of titanium between the skeletal structure and the motor," explains Nick Tsutsunava. "It functions as a shock absorber and allows us to measure spring deformation as an indication of the applied torque with an accuracy of 0.01 Nm. This level of accuracy makes it easier to stabilize the closed-loop control." This is an important feature, particularly since the backpack holding the electronics is quite heavy. The weight of the backpack must be balanced by the hip joints during each step. "With a position-control approach, the exoskeleton would be unable to move forward. However, controlling the torque while the exoskeleton knows that the user wants to move forward makes it possible to compensate for the weight in the back."

**A backpack to hold the robotic brains**

The March 1 exoskeleton has a backpack that holds the batteries and all electronics, which weighs over 10 kilograms. A powerful PC for SIMULINK® Real-Time™ provides the system intelligence. The PC communicates via the FB1111 EtherCAT piggyback controller board from Beckhoff with three data acquisition boards. The connection with the more than 100 actuators and sensors runs over an SPI bus via HDMI cables, and the boards run firmware written in C++. "Roughly two-thirds of the software is safety-related," says Nick Tsutsunava. "The system checks all incoming data and makes sure that no limit values are exceeded."

Further information:
- [www.projectmarch.nl/en](http://www.projectmarch.nl/en)
- [www.beckhoff.nl](http://www.beckhoff.nl)
Numerous high profile technology events scheduled for 2017

ETG events all over the world

With the continually increasing distribution of EtherCAT technology, and the introduction of EtherCAT P technology, worldwide demand is rapidly growing for events to support and inform both existing and potential EtherCAT users. In 2016, the EtherCAT Technology Group conducted a total of 48 EtherCAT seminars, also known as EtherCAT roadshows, in 18 countries. Furthermore, the ETG was present with both joint and ETG-specific information booths at 15 international trade shows, supported various EtherCAT developers during six EtherCAT Plug Fests, and educated its members through several regional ETG Member Meetings.

Since the world’s largest fieldbus organization continues to grow unabated, ETG will continue its ambitious schedule of events into 2017. Besides numerous international trade shows, Plug Fests and meetings all over the world, the group also plans to conduct a large number of EtherCAT seminar series on various subjects.

Further information:

Last year the ETG visited all continents around the world
(here the 2016 Winter European EtherCAT Plug Fest in Liechtenstein).
For 2017, numerous events are scheduled again.
ETG welcomes KOCH Pac-Systeme as 4,000th member

The EtherCAT Technology Group (ETG) has reached another membership milestone: In November 2016, German supplier specialized on advanced packaging solutions, KOCH Pac-Systeme GmbH, joined the organization as its 4,000th member. Jürgen Welker, Divisional Director of Control System and Service at KOCH, explains the reason for joining the ETG: “Beyond the high quality and efficiency, it is the individuality we gain that differentiates our packaging solutions and convinces our customers. We have benefitted from the openness and flexibility of EtherCAT for quite some time, and have recently started to work with EtherCAT P as well. Therefore, official membership in the ETG was the next logical step for us.”

Martin Rostan, Executive Director of the ETG, also reflects on the membership milestone: “KOCH Pac-Systeme joining the ETG is evidence of how well accepted EtherCAT P is already as an extension to EtherCAT. The fact that the ETG has now reached the number of 4,000 member companies is a clear sign that the strong development of our organization continues and is marked by extraordinary growth.” A membership in the EtherCAT Technology Group offers several advantages to companies working with EtherCAT and EtherCAT P, including the possibility to participate actively in the technology’s development.

ETG publishes official EtherCAT P specification documents

Soon after the introduction of EtherCAT P in November 2015, this technology extension to EtherCAT was included in the work of the EtherCAT Technology Group (ETG). Ever since, the ETG has been developing an official specification document and the first draft has now been published. The “ETG.1030 EtherCAT P Specification” defines the basics of EtherCAT P as an extension of the physical layer of the EtherCAT technology. All other EtherCAT standard documents into which EtherCAT P will be integrated have also been extended.

In order to help developers of EtherCAT P devices successfully kick-start implementation, Beckhoff has published an “EtherCAT P application note”, providing a guideline for designing EtherCAT P slaves. It includes the extension of the EtherCAT implementation including associated connectors, electrical specifications as well as recommendations for EMC-compliant design. In addition, the guideline highlights the different design requirements, especially with regard to the usage and connection of supply voltages, and describes calculations on the basis of existing currents and voltages in the network.

When the ETG first accepted EtherCAT P as an addition to the EtherCAT standard, users signaled strong interest in the technology extension. With the publication of the specification documents and the corresponding application note, EtherCAT P can now be included in the development and implementation of a wide range of new products.

All documents mirror the current status of the EtherCAT P technology definition and are available for download on the EtherCAT Technology Group website: www.ethercat.org.
Trade shows 2017

**Europe**

**Germany**

Interpack  
04 – 10 May 2017  
Düsseldorf  
Hall 14, Booth E35  
www.interpack.com

Ligna  
22 – 26 May 2017  
Hanover  
Hall 16, Booth C05  
www.ligna.de

Sensor + Test  
30 May – 01 June 2017  
Nuremberg  
Hall 1, Booth 350  
www.sensor-test.de

Automotive Testing Expo  
20 – 22 June 2017  
Stuttgart  
Hall 1, Booth 1105  
www.testing-expo.com/europe

Husum Wind  
12 – 15 September 2017  
Husum  
Hall 5, Booth B28  
www.husumwind.com

EMO  
18 – 23 September 2017  
Hanover  
www.emo-hannover.de

Motek  
09 – 12 October 2017  
Stuttgart  
www.motek-messe.de

**Austria**

Smart Automation  
16 – 18 May 2017  
Linz  
Booth 235  
www.smart-linz.at

**Switzerland**

EPHJ-EPMT-SMT  
20 – 23 June 2017  
Geneva  
www.ephj.ch

**Denmark**

HI  
03 – 05 October 2017  
Herning  
Hall G  
www.hi-industri.dk

**Finland**

Puumessut  
06 – 08 September 2017  
Jyväskylä  
Hall B, Booth 216  
www.puumessut.fi

Elintarviketeollisuus  
13 – 14 September 2017  
Tampere  
Booth A312  
www.elintarviketeollisuus.fi

**AVITA Audiovisual Expo**  
26 – 27 September 2017  
Helsinki  
Hall 1, Booth 1c28  
www.audiovisualexpo.messukeskus.com

Teknologia  
10 – 12 October 2017  
Helsinki  
teknologia.messukeskus.fi/

**Norway**

Aqua Nor  
15 – 18 August 2017  
Trondheim  
www.aqua-nor.no

**Sweden**

Euro Expo Sundsvall  
20 – 21 September 2017  
Sundsvall  
Hall Main  
www.euroexpo.se

**Africa**

Africa Automation Fair  
06 – 08 June 2017  
Johannesburg  
Ticketpro Dome, Booth D22-27  
www.africaautomationfair.com

KZN Industrial Technology Exhibition  
26 – 28 July 2017  
Durban  
Booth A19  
www.kznindustrial.co.za

**Asia**

China  
Industrial Automation Beijing  
10 – 12 May 2017  
Beijing  
www.industrial-automation-beijing.com
Chinaplas
16 – 19 May 2017
Guangzhou
Booth 5.1M01
www.chinaplasonline.com

Further information:
www.beckhoff.com/trade_shows

North America

Canada

ATX Canada
16 – 18 May 2017
Toronto
Booth 944
http://atxcanada.designnews.com

USA

Offshore Technology Conference
01 – 04 May 2017
Houston, TX
Booth 7447
http://2017.otcnet.org

Windpower
22 – 25 May 2017
Anaheim, CA
Booth 2632
www.windpowerexpo.com

Automotive Testing Expo
24 – 26 October 2017
Novi, MI
Booth 14005
http://www.testing-expo.com/usa

Fabtech
06 – 09 November 2017
Chicago, IL
www.fabtechexpo.com

South America

Brazil

Expomafe
09 – 13 May 2017
São Paulo
Booth H039
www.expomafe.com.br

Fispal Tecnologia
27 – 30 June 2017
São Paulo
www.fispaltecnologia.com.br

ISA Expo Campinas
18 October 2017
Campinas
www.isaexpocampinas.org.br

India

Intec
01 – 05 June 2017
Coimbatore
Hall A, Booth 18
www.intec.coidissia.com

India Machine
28 – 31 July 2017
New Delhi
Hall 12A, Booth P-14

Automation Expo
09 – 12 August 2017
Mumbai
Hall 1, Booth E3
www.iedcommunications.com/index.php

Japan

Embedded Systems Expo
10 – 12 May 2017
Tokyo
West 1
www.japan-it.jp/en/haru

Systems Control Fair
29 November – 01 December 2017
Tokyo
scfmc.jp/en

Malaysia

Automex
24 – 27 May 2017
Kuala Lumpur
Hall 6, Booth 6100
www.automex.com.my

Automotive Testing Expo
01 – 04 May 2017
Houston, TX
Booth 2411
http://atxeast.designnews.com

Pack Expo Las Vegas
25 – 27 September 2017
Las Vegas, NV
Hall South Lower, Booth 6302
www.packexpolasvegas.com

Further information:
www.beckhoff.com/trade_shows
Ultra compact C6015 Industrial PC: Extreme space savings and flexibility

Koch Pac-Systeme, Germany: XTS at the core of a labeling and grouping unit in a packaging line for toothbrushes

PROBAT-Werke: All-in-one control platform optimizes coffee production