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The Verl, Germany-based Beckhoff Automation achieved a growth in turnover of 7% in 2013 with an annual result of 435 million euros. “2013 was a good year for us as we recorded growth above that of the market,” says the satisfied managing owner, Hans Beckhoff. “Following rapid growth in turnover totalling nearly 100% in a two year period from 2010 and 2011 and a downturn of 12% in 2012, we have now returned to a solid growth course of 7%. The signs look encouraging for the future and we think that we can grow more dynamically again in the coming years. We are aiming for double digit growth in 2014.”

Beckhoff is represented in over 60 countries with 33 subsidiary companies and distributors. The export share was about 58% of the company’s total turnover; of that, 28% was generated in Europe (excluding Germany), 19% in Asia, 10% in North America and 1% in the remaining countries worldwide in which Beckhoff operates. “We have continued our growth worldwide. The Asian market and China in particular have excelled, but so too has the North American market. In addition, southern Europe has made a considerable contribution towards the growth in turnover, rebounding from weak growth in recent years,” says Hans Beckhoff. A clear upswing is becoming apparent in the wind energy industry, which has strongly influenced Beckhoff turnover in recent years.

Worldwide sales network and production capacities expanded to support continued growth

Successful financial year 2013: Beckhoff Automation increases turnover by 7% to 435 million euros

In the financial year 2013 Beckhoff Automation achieved worldwide turnover of 435 million euros with an increase in turnover of 7% – this growth is well above the average in the automation industry. The systematic expansion of the global sales network is paying off through a considerable increase in export turnover. The company’s domestic sales network and production capacities in Germany have also been further expanded. The number of Beckhoff employees increased in 2013 by 14% to 2,510. With these strategic investments in infrastructure and personnel, Hans Beckhoff considers his company to be well positioned for double digit growth in 2014.

National and international expansion of the sales network

Beckhoff has continued the expansion of its international sales network in 2013 and has opened nine additional regional branch offices worldwide. In the U.S., a new headquarters office was established in Savage, Minnesota with an investment of $8 million USD, which followed consistent growth of the subsidiary company and is enabling further expansion of the business. The nationwide sales network was expanded to six regional offices with the inauguration of a new regional sales office in Chicago. In China, Beckhoff is represented by 14 local branch offices in addition to the head office in Shanghai.

As far as international development is concerned, Beckhoff is continuing its expansion course unabated in 2014 and is investing in the construction of further subsidiary head offices as the foundation for further growth: Finland, for instance, is getting a new headquarters at a cost of 3 million euros. Business Development Managers have been in operation in Cairo, Egypt and in Riyadh, Saudi Arabia since February, developing the local markets there. With the opening of a Czech subsidiary company in Brno in March 2014, Beckhoff has set a further milestone on the way to penetrating the Eastern European automation market and offering optimum support to customers in the Czech Republic and
Slovakia. Plans for 2014 also include the establishment of representative offices in Indonesia and Mexico as well as the installation of distributors in Peru and Ecuador in order to strengthen the company’s presence both in Southeast Asia as well as in North and South America.

The German sales network, with 11 branch offices currently, will also be gradually expanded via the opening of regional sales offices: for instance, customer service in southwest Germany will grow with the addition of a new sales office in Crailsheim. German customers in the northwest of Baden-Württemberg will also get optimum support from the new Pforzheim office which opened on 1 April 2014.

Expansion of production capabilities
There will also be great expansion at the company’s head office in Verl: an additional 6,000 square metres of production and administration space will be put into operation in 2014. The production site for drive technology in Marktheidenfeld, Germany was expanded in 2013 by the purchase of a new building, so that 2,000 m² are now available there for the development and production of advanced motors.

Technological leadership a primary factor in success
The basis for the success and growth of Beckhoff, apart from the expansion of the global sales network, is the continuous development of new technologies and solutions on the basis of PC-based control. Against the background of discussions regarding Industry 4.0 in Europe and the ‘Internet of Things’ in North America, PC-based control technology from Beckhoff proves to be the ideal automation platform to implement these forward-looking visions. The convergence of IT and automation technology has always been the basis of our control philosophy, so that we – and our customers – are technologically prepared in the best way possible. We feel this all over the world and we are winning many new projects as a result,” says managing director, Hans Beckhoff. New operating concepts, for example, via “Google Glass” or the idea of “social automation” on the basis of “social media,” are becoming constituents of automation. “PC control offers the basis for making machine interfaces available to Cloud-based services,” says Hans Beckhoff. “For example, the machine supplies measured values to the Cloud, which are analysed by higher-level services.”

Industry 4.0 concepts are also being developed further in the field of research. In the technology network, it’s OWL (Intelligent Technical Systems OstWestfalenLippe), which was distinguished by the German Federal Ministry of Education and Research (BMBF) in 2012 as a “Leading-Edge Cluster,” Beckhoff, as consortium leader in the key project “ScAut,” is researching the integration of engineering findings from the most diverse technical disciplines into automation technology in order to increase the intelligence of technical systems.

Training programme for over 160 junior employees
Beckhoff currently employs 2,510 people worldwide; of these, 1,815 work in Germany and 1,645 at the company’s head office in Verl. Of this total, 800 employees are engineers, which is more than 30 %. “We are heavily investing in research and development once again in 2014 with a sum of 32 million euros,” stresses Hans Beckhoff. “As a technology-driven company whose success is based on developing innovative solutions and bringing them to the market at an early stage, we have a very high requirement for skilled engineers.”
For this year's Beckhoff International Sales Meeting (ISM), which was held April 3 to 6, 220 participants from 47 countries had come to Marienfeld, Germany. In the run-up to Hannover Messe, sales engineers from Germany and around the world learned about the latest technological developments from Beckhoff.

Beckhoff has continuously increased its global sales and distribution network in recent years by establishing new branch offices. The company is currently represented in over 60 countries through 33 subsidiaries and distributors. "The ISM, which takes place every two years just before the Hannover Messe exhibition, provides an ideal platform for exchanging information about the latest technologies and innovations from Beckhoff and is a great opportunity for colleagues to see each other in person," says Kai Ristau, Head of International Sales at Beckhoff.

In addition to a comprehensive presentation program covering the latest product developments and updates, the agenda featured workshops during which product and industry managers answered the sales team's questions. "A major part of what makes the ISM so attractive is the opportunity for personal interaction and networking between attendees and product developers and managers from Beckhoff headquarters. Together with its wide-ranging program of team-building activities, this year's ISM was a solid success that will further strengthen our 'big family' company culture," Ristau emphasizes.

Like in past years, the international subsidiaries and distributors had once again been requested to nominate an application with special technological interest for the ISM's Application Award Contest. Ten examples from the large number of submissions were presented, and awards went to Serkan Ciftci of Beckhoff Turkey; Daniel van Doorn of IAL, the Beckhoff distribution partner in the Netherlands; and Aurelio Banda of Beckhoff USA.
SMM 2014: Open PC-based control technology for shipbuilding

The SMM ship building fair in Hamburg is the international platform for the maritime industry. Under this year’s motto “Keeping the course”, representatives of the shipbuilding and shipbuilding supplier industries will exhibit trendsetting technologies for the competitive market from 9 to 12 September 2014. Automation components from Beckhoff are used for a wide range of applications in shipbuilding: from engine room monitoring and engine management to cooling, pumping of liquids, control and cleaning of ballast tanks, and from power distribution and supply to the control of individual cabins on passenger ships and loading/unloading technology for cargo ships. With standardised interfaces the open PC-based control technology offers support for all common bus systems and communication standards generally used in shipbuilding.

Further Information:
www.beckhoff.com/smm

WindEnergy Hamburg 2014: More efficient control of wind turbines

At WindEnergy Hamburg trade show from 23 to 26 September 2014 Beckhoff will its solutions for the future of wind power generation – onshore and offshore. PC and EtherCAT-based control technology from Beckhoff is in use worldwide in over 25,000 wind turbines up to a size of 5 MW. The high degree of integration plus the support of IT and automation standards makes PC-based control technology a high-performing and efficient solution that combines all functions on a uniform hardware and software platform: from the operational management and the control of pitch, converter, gearbox and brakes to visualisation and farm networking. The control technology also enables further functions such as safety technology or Condition Monitoring to be integrated directly into the standard controller.

Further Information:
www.beckhoff.com/windenergy-hamburg

New sales office in Pforzheim

The new regional sales office Beckhoff recently established in Pforzheim as of 1 April 2014 is in line with the company’s strategy to strengthen its German sales and distribution network. With Balingen in the central section of Baden-Wuerttemberg, Crailsheim in the northeast and Ravensburg in the southeast, the northwestern region of the state now has a sales office of its own as well. The new Pforzheim office is headed by Matthias Schneider (on the right). Guenther Breithaupt provides support in the area of application software.
Beckhoff opens subsidiary company in the Czech Republic

As of 1 March 2014 Beckhoff is represented with a branch office in Brno in the Czech Republic and is thus pursuing its strategy of strengthening its market position in Eastern Europe by extending its sales network. The experienced automation expert Tomáš Halva has been appointed Managing Director.

Beckhoff has already been represented in the Czech Republic since 2002 by a distributor and has recorded a continuous increase in turnover in the last ten years. "By establishing our own subsidiary company we will be able to enhance the technical support for our local customers", says Jens-Olaf Brede, Area Sales Manager at Beckhoff. The strategy of establishing branch offices around the world to gain further market shares has paid off: In 2013, the export share of the worldwide turnover of Beckhoff was 58 per cent. "We have won a number of renowned machine building customers in the Czech Republic and Slovakia.

Only with a local presence, however, we have sufficient resources to attend to them more intensively, build up trust in our technology and to tap into new markets", the Area Sales Manager points out.

Traditional mechanical engineering with an emphasis on the automotive industry and its suppliers dominates the market in the Czech Republic and Slovakia, such as metalworking and processing, as well as the woodworking and packaging industries. "These are also the industries where Beckhoff is already
an established automation provider and where we are confident that we have excellent growth opportunities”, explains Jens-Olaf Brede.

“In Tomáš Halva Beckhoff has gained an experienced electrical engineer for the position of Managing Director”, says Jens-Olaf Brede. “Thanks to his many years in sales and marketing at automation companies as well as in business development, Tomáš Halva is very well acquainted with the needs of our local customers, so we are convinced that we have filled the post very well.”

Beckhoff chose Brno, the second largest city in the Czech Republic, on account of its geographical location between Prague and Western Slovakia, which will also be supported from the Czech branch office. “Brno is traditionally the location of many global and local technology enterprises and a centre for automation and mechanical engineering. In addition, we have the possibility to recruit well-trained specialists among the graduates of the Technical University of Brno”, says Managing Director Tomáš Halva, already looking toward future growth in personnel.

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The “Amper 2014” trade show for electrical engineering, which took place in March in Brno, offered the newly founded Beckhoff Česká republika s.r.o a very good opportunity to gain new business contacts.
By replacing traditional mechanical transport and assembly solutions with software functionalities, the eXtended Transport System (XTS) provides a new level of flexibility for machines and plants.

Practical applications illustrate the XTS drive system’s potential for innovation

Software replaces mechanical components while adding functionality and flexibility

The eXtended Transport System (XTS) from Beckhoff combines the advantages of rotary and linear drive principles in a single system, opening the door to completely new ways of implementing compact and highly dynamic machine concepts. Concrete applications, such as the easy-to-implement grouping of different products, illustrate the huge innovation potential of XTS, which replaces complex mechanics with software to make processes more flexible and improve the performance of the entire production line.

The XTS is an innovative linear drive system that moves in a circular pattern. The motor, power electronics and electronic position sensors are fully integrated into a single module. One or more wireless “movers” can travel along a modular and flexible rail configuration in a highly dynamic manner and at speeds of up to 4 meters per second. The movers are mapped as "standard" servo axes and can be controlled individually. If necessary, however, the movers can be easily synchronized with each other as well. Functions like automatic accumulation, collision avoidance and soft stop/start are part of the standard TwinCAT automation software platform. This makes it easy to implement many motion tasks via software that required complex and expensive mechanics in the past.

Flexible and fast motion unlocks machines’ potential

The movers can pick up and move products, adjust the distance between products, and change the speed of products. By working together, they can even clamp a product between them with a defined force and move it. Other motions are made possible by attached kinematic components. For instance, a mechanism can use two movers to generate a rotational force in order to push a product to the side or unscrew a cap.

In combination with the replacement of mechanical functions through software, these exceptionally flexible and fast capabilities deliver many benefits, such
as lower costs and significantly simplified product changeovers and process adjustments. In addition, the customer benefits from short response times, for example, when a feeder component fails. The software responds by redirecting the product stream automatically or at the push of a button. The high functionality and cost efficiency of the XTS also makes it possible to implement workflows that were too expensive and/or complex in the past.

All these benefits don’t just reduce costs and increase the machine’s availability, but raise the overall level of equipment performance. Here, the XTS provides another opportunity for maximizing performance: Since a machine’s slowest processing unit determines its overall speed, potential improvements in the faster units tended to go unrealized in the past. With the XTS, the slowest station can operate faster or be used multiple times, thus eliminating previous bottlenecks. The following six practical applications illustrate how these benefits can be leveraged on the shop floor.

**Product stream separator**

Figure 1 shows the XTS being used as a sorter that separates a stream of small boxes. The vertical XTS is positioned diagonally over the conveyor belt. Based on the information gleaned from an object recognition system, a mover travels to an arriving box and uses an attached angled gripper to push it up or down on the belt. When the box is properly positioned to enter one of the gates, the gripper releases it, and the box travels down the belt in a straight line.

This simple yet extremely effective XTS application features much more flexibility than traditional mechanical solutions, because the boxes can be distributed freely, whether you want to alternate them between the two gates or fill a certain recipe or sequence. Driven by software, the boxes can be easily distributed over the two gates (for example, in a 2:1, 3:2 or 4:1 ratio). You can also set desired distances between the boxes. There is no need to change any mechanical components or tools, which raises the machine’s overall availability significantly. The solution is also very fast. In an existing application, the conveyor moves at speeds of up to 3.5 meters per second, which poses no problem for the XTS. In addition, the control electronics are able to respond easily to speed changes – for example, when the machine starts up. That way, the XTS is always perfectly synchronized with the conveyor.

**Feeder with distance adjustment**

The XTS arrangement shown in Figure 2 is the ideal solution for synchronizing a totally irregular stream of products with a downstream process – in this case, a machine that packages small boxes. Many systems such as blister pack machines or assembly installations cannot be arbitrarily stopped and started, which is why they need precisely defined and regular distances between products. To make this application work, however, the average stream of incoming products must match the processing capacity of the downstream system. The XTS mover with its attached pusher or gripper shoves one of the irregularly arriving boxes from the conveyor belt to an intermediate buffer area and moves or accelerates in such a way that it re-enters it at the preset distance to the preceding box.

What sounds fairly easy with XTS was very difficult in the past and could not always be accomplished in an economically feasible manner. In conventional systems, the boxes are initially accumulated against a barrier, with the conveyor belt continuing to move (and slip) under the stopped boxes. At the right moment, the barrier is removed long enough for a single box to pass through. A typical example of this approach is a bottle conveyor in a brewery, because bottles can tolerate rough handling. With more sensitive products, such as cardboard boxes with heavier contents, this procedure would cause unacceptable damages, however. It also would cause major problems with sticky items such
as cold-cut slices or chocolate bars, because the friction from the conveyor belt would be too strong and cause the products to stick together. For products this sensitive, two conveyor belts are usually employed, with the second belt running faster and the distance between products being regulated via a mechanical adjustment of the belt lengths. This requires a buffer belt between the conveyor belts that is very complex and hard to clean, particularly for food industry applications. Needless to say, an XTS solution is much less cumbersome and less expensive.

Carousel for asynchronous transport with synchronous feed-in

A bottling machine is a prime example of an XTS application using a carousel with asynchronous product transport and synchronous product feed-in (Figure 3). Thanks to the separately controllable movers, the machine can grab the continuously arriving bottles, accelerate them individually, and move them as quickly as possible (even with a head start) to the more time-consuming filling station. The flexibility of the XTS also makes it easy to install several instances of the slower subprocesses such as the filling stations and supply them continuously with bottles. That way, the bottling line can be operated very efficiently and with maximized capacity by installing expensive, but fast subprocesses, such as weighing and labeling, only once, while having several instances of slow units, such as the filling process.

Without the XTS, this would be very complex and expensive. In the simplest case with a traditional system, the entire product stream would have to be stopped and started continuously – with the result that the entire line can only be as fast as its slowest unit. Accordingly, the other stations would have to wait, which would reduce their efficiency considerably.

Individual and varying product grouping

The benefits and simplicity of the XTS are especially apparent in the setup for individual product groupings shown in Figure 4. In this example, different-color boxes (or bags with different kind of chips or candies, for example) arrive at the XTS on four separate conveyor belts. Using two movers to grab each item, the system arranges them in predefined groups and transports them to the next process step, for example, the boxing station. Even the distance between the groups can be controlled.

The benefits of software-based control over mechanical control are particularly apparent in this application. On the one hand, defining new product groups is very easy. For example, all it takes to change the quantity of certain items is to instruct the pairs of movers to grab them in a different order. Changing the total number of items in a group is just as easy. This capability also makes it easy to accommodate temporary offers such as "3+1" specials. On the other hand, if you have multiple conveyors, there is always a risk that one of them fails. With the XTS, this is no problem – at least not if all conveyors deliver the same product. All you need to do is program the software to skip the failed conveyor and pick up more items from a functioning conveyor.

Gantry system for individual track profiles

The advantage of having individually controllable and coordinated movers is also apparent in applications where the XTS is used as a gantry system for individual track profiles (Figure 5), because two movers can be synchronized not only within the same system, but between two different XTS systems, which in this case are installed side-by-side. In connection with matching kinematics...
Further Information:
www.beckhoff.com/xts

components (for example, hinged levers), such a setup makes it possible to transport products in ways other than just in a straight line. This ability comes in handy when you need to travel along a product’s edge or execute a rotating motion, such as screwing on a lid.

In another concrete application, a box could be grabbed via levers and moved underneath a glue jet, for example. Once it arrives there, the movers use the attached levers to guide the product with great precision underneath the glue jet. What makes this solution so special and less expensive is the fact that the usually heavy glue jet is not required to move over the product with the help of an expensive robot; instead, the jet is stationary while the product itself travels through the transport unit.

**Sorting in accordance with defined and flexible patterns**

Figure 6 shows a demo installation from the 2014 Hannover Messe that sorts balls based on their color. It consists of a combination of one rotary-table-type machine from which the balls are picked up and two vertical XTS systems that hold, buffer and dispense the balls as needed.

This is an efficient method for removing bad parts from a product stream or – as in the demo installation – for sorting incoming products based on certain characteristics. Here, too, the advantage of replacing traditionally mechanical functions with software is readily apparent, because the process can instantly adapt to changing selection criteria.
With the introduction of the new ER series, Beckhoff is extending the range of applications that can be served by the EtherCAT Box product line. These exceptionally robust ER series I/O modules in die-cast zinc housings are designed for particularly harsh environmental conditions, for example, in the heavy-duty and automotive industries as well as in robotics. Together with the EP and EQ module series, the EtherCAT Box I/O system covers a wide range of signals for all industrial applications and is intended for use outside of control cabinets.
Utilising die-cast zinc as the housing material, the IP 67 rated I/O modules from the ER series can be used in extremely harsh industrial and process environments. Fully die-cast, they are ideally suited to all applications where increased load capacity and durability are demanded. Typical application areas include heavy industry, for example, press lines and metal foundries, as well as in automotive environments where die-cast zinc is standard or for robotic applications that rely on resistance to weld spatter.

The new EtherCAT Box Modules are the ideal complement to the existing versions in plastic and stainless steel housings. The plastic EP variant is well-suited for use in wet, dirty or dusty environments in general mechanical engineering, in assembly technology and in semiconductor and logistics environments. Additionally, the EQ module series with full "hygienic design," stainless steel housing and IP 69K protection is designed for applications in the food, chemical and pharmaceutical industries.

Die-cast zinc modules available for a wide range of signals
The ER series modules are fully compatible with the EP series and offer the same wide I/O selection: digital inputs with various filters, digital outputs with 0.5 A output current, and “combination modules” with freely configurable digital inputs or outputs. Moreover, analog input modules for current/voltage measurement are available. The range is supplemented by temperature measurement modules, serial interfaces, encoder inputs and motion modules.

The space-saving 30 mm modules and 60 mm wide modules are available in different channel variations. With a height of 126 mm and a depth of 26.5 mm, the ER series modules are extremely compact. Field devices and signals are connected to the modules via M8 or M12 connectors. The ER series provides an EtherCAT interface, a power supply connection and M8 plugs or sockets for signal forwarding. For high-current outputs there are modules with a 7/8” power supply and an M12 EtherCAT socket available. The EtherCAT Box Modules in the die-cast zinc version are qualified for an extended operating temperature range of -25 to +60 °C (storage temperature -40 to +85 °C).

Further Information:
www.beckhoff.com/ERxxxx
Product announcement
Estimated market release:
3rd quarter 2014
CX8000 Embedded PC series with extended master functionality

New master interfaces for CANopen and PROFIBUS

With the CX8030 and CX8050 Embedded PCs, Beckhoff is extending its CX8000 series of ultra compact PC-based controllers with PROFIBUS and CANopen masters. These flexible devices represent inexpensive, space-saving solutions for universal use in control applications that require fieldbus master functionality.

It was already possible to implement fieldbus master functionality with a CX8000 series Embedded C that has an integrated fieldbus slave in combination with an additional EtherCAT master terminal. With the CX8030 and CX8050 this function is now available for PROFIBUS or CANopen – already integrated directly in compact Embedded PCs.

The CX8030 and CX8050 Embedded PCs are ideally suited to connect any fieldbus slave, from valve terminals to drives, in small to medium-sized machine applications. Furthermore, they can be used as gateways between EtherCAT slave devices as well as devices with a conventional slave interface such as PROFIBUS or CAN, as well as for coupling of machine controllers to a higher-level Ethernet infrastructure.

CX8030: In addition to normal data exchange, the PROFIBUS master also supports DPV1 communication. As a further feature, the master interface can also be configured as a slave interface if necessary. A simple PROFIBUS monitor for the CX8030 is available in the TwinCAT System Manager for diagnostic purposes.

CX8050: The CX8050 can operate as a CANopen master and also as a “simple” CAN master. In this case CAN 2.0A and CAN 2.0B are supported, i.e. 11-bit or 29-bit identifier. This means that all CAN applications and CAN devices that are commonly used can be addressed and networked with the CX8050. A simple CAN monitor is available for diagnostics.

The Embedded PCs measure just 65 x 100 x 80 mm and feature the Windows CE 6.0 operating system, a 400 MHz ARM9 CPU, 64 MB RAM and a 512 MB MicroSD card which can be extended to 4 GB. There is also an Ethernet 10/100 Mbit/s interface as well as a USB interface (behind the front flap). The PROFIBUS interface on the CX8030 is a 9-pin D-Sub plug with screening; the CANopen bus interface on the CX8050 is a 9-pin D-sub plug conforming to the CANopen specification with galvanic decoupling.

Further Information:
www.beckhoff.com/CX8030
www.beckhoff.com/CX8050

Product announcement
Estimated market release:
3rd quarter 2014
The EP9224 Smart Power Box offers internal current and voltage measurement in addition to the possibility to connect four EtherCAT Box power supply branches. The values are available to the controller via EtherCAT and support the preventive maintenance of machines and plants as well as error diagnostics, especially in conjunction with the data logging function.

The power consumption for the control and peripheral voltage is monitored, limited and if necessary also switched off in each 24 V supply branch of the Smart Power Box. The input voltage and current values as well as all output currents can be transferred by EtherCAT to the controller as process data and evaluated. In case of an error a continuous data log can be retrieved, allowing the cause of the error to be identified more easily. For this purpose the last 40 values of the input voltage/current, the output current per channel, the \( I^2t \) warning level and the internal temperature are stored in a ring buffer. This information is recorded every 1, 10, 25, 100 or 1000 ms according to requirements.

The current and voltage measurement plus the data logging provide a deep insight into the machine and considerably simplify and accelerate service. In this way the monitoring of the momentary current values minimises the response times to any errors. As a form of Condition Monitoring, this transparency in the system and thus the early identification of deviating machine states also supplies the ideal basis for preventive maintenance.

**Higher total current simplifies system wiring**

EtherCAT Box modules with IP 67 protection typically use M8 plug connectors for the supply of power, which in general are suitable for a maximum current of 4 A. Therefore it may no longer be possible to simply loop the supply through where modules have a large number of outputs. A further limitation concerns the cables: as the M8 plug connectors can only be used up to a maximum cable cross-section of 0.34 mm\(^2\). This results in a considerable voltage drop over larger distances.

The EP9224 Smart Power Box offers the ideal solution for this: Equipped with 7/8-inch plug connectors, it allows a total current of 16 A for each control and peripheral voltage with cable cross-sections of 1.5 and 2.5 mm\(^2\). Even considerably higher starting currents are briefly permissible at the outputs, so that the trouble-free start-up of the connected devices is guaranteed. With these features, a Smart Power Box can be used in place of several conventional terminal boxes with fuses, significantly reducing the costs and complexity of plant wiring.

Further Information:

TwinCAT Kinematic Transformation offers numerous kinematics that are divided into three different product levels, depending on their complexity. These include 2-D, shear, 3-D delta and SCARA kinematics. The new Level 4 version represents a consistent extension. New complex kinematics are supported, for example, 6-axis-kinematics and the Steward platform.

TwinCAT performs the set value generation and necessary kinematic transformations. The set values for the axes are cyclically transferred via EtherCAT to the drive amplifier, e.g. an AX5000 servo drive. The robot movements are programmed directly from the PLC. Path movements for the following of contours can, of course, also be implemented with TwinCAT NC I according to DIN 66025.

With TwinCAT Kinematic Transformation an additional robot controller and thus the learning of a special robot programming language is not required. Accordingly, the entire machine can be operated with just one control CPU.

Further Information:
www.beckhoff.com/TwinCAT3
TwinCAT now supports mxAutomation interface to KUKA robots

At Automatica 2014 Beckhoff and KUKA presented a new common interface. The PLC library under TwinCAT 3.1 supports the mxAutomation interface to KUKA.

Using the mxAutomation library, commands can be sent directly from the PLC to KUKA robots with a KR C4 controller. It is thus possible for the first time ever to program the controller and robot simply – that is without knowledge of a special robot programming language – on one system.

Communication takes place via EtherCAT, with the TwinCAT EtherCAT master and the KR C4 controller from KUKA exchanging data via the EL6692 or EL6695 EtherCAT bridge terminal. In doing so, drive commands are transmitted from the controller to the robot and actual values from the robot to the controller.

Commands can be transmitted very quickly from the PLC to the robot thanks to this efficient, high-performance communication. The PLC programmer has access to the robot position data at all times in real-time. With extended functionality, the direct and close interaction also enables the implementation of applications where high-precision synchronisation is required.

mxAutomation for TwinCAT 3.1 revolutionises the co-operation between PLC and robot. PLC programmers can program movements directly in the PLC and monitor all actual values of the robot in real-time.

Further Information:
www.beckhoff.com/TwinCAT3
With the new EL7211 servo terminal, the EtherCAT I/O system now also offers a complete servo drive with an output current of up to 4.5 A_{RMS} integrated into a space-saving 24-mm terminal housing. This advanced EtherCAT Terminal is available with integrated resolver interface or with the One Cable Technology (OCT) solution. Especially when used in combination with the new AM811x servomotors, users take advantage of an extremely compact, efficient and inexpensive servo system.

The EL7211 servomotor EtherCAT Terminal with integrated resolver interface offers impressive drive power in a remarkably compact design for AM31xx and AM81xx series motors from Beckhoff. Designed with a 24-mm terminal housing, it delivers higher performance, with up to 4.5 A_{RMS} at 50 V DC, than the already proven and popular 12-mm wide EL7201 servomotor terminal with 2.8 A_{RMS}.

OCT simplifies installation and reduces costs
As the EL7211-0010 servomotor terminal supports absolute encoders, it is suitable for the AM81xx servomotor series with One Cable Technology (OCT). OCT combines power and feedback signals into one standard motor cable and significantly reduces material and commissioning costs. The integrated electronic identification plate of the servomotors can be read in automatically by the EL7211-0010 EtherCAT Terminal and simplifies motor commissioning.

The fast control technology of the EL7211 servomotor terminal, which is achieved through field-oriented current and PI speed control, is ideal for fast and highly dynamic positioning tasks. The monitoring of numerous parameters, e.g. overvoltage and undervoltage, overcurrent, terminal temperature or motor load via the calculation of a i^2T model, offers maximum operational reliability. EtherCAT, as a high-performance communication system, and CAN over EtherCAT (CoE) as the application layer, enable optimum interfacing with PC-based control technology.

The new AM811x servomotors, which can be controlled by the EL72xx-0010, offer a scalable output of 50 to 250 W and are designed with a 40 mm flange size (F1) for minimal mounting spaces (see also page 21).

Further Information:
www.beckhoff.com/EL7211-0010
The AM801x and AM811x servomotors with the new flange size F1 enable the implementation of extremely compact, yet highly dynamic drive solutions.

Beckhoff is adding the new flange size F1 with a 40 mm edge length to the AM8000 Servomotor series. Three overall lengths cover a torque range from 0.22 to 0.55 Nm, enabling highly dynamic drive solutions to be implemented with minimised space requirements.

The new AM801x and AM811x servomotors offer a low rotor moment of inertia as well as quadruple overload capacity and therefore meet the highest requirements for motion dynamics even in the smallest of installation spaces. This makes them ideal, for example, for applications with fast cycle changes. The two series differ among other things in their rated voltage. An extremely compact and economical servo system can be implemented by combining the AM811x motors with the EL7201-0010 and EL7211-0010 servomotor terminals, with 2.8 A rms and up to 4.5 A rms respectively, at 50 V DC. The AX5000 EtherCAT servo drive (1/2 canal, up to 3 A) can be used to control the AM801x servomotors, which are designed for 230 V AC.

Optionally, the motors are available with backlash-free permanent magnet holding brake or feather key groove. To offer maximum motor performance in a compact size, the motors are equipped with an absolute encoder and One Cable Technology (OCT). With OCT motor supply and position feedback signal are transmitted via just one cable, significantly reducing the costs for components and installation. On request the motors are available with multi-turn absolute encoders.

Three integrated user benefits
Thanks to the multi-turn absolute encoder integrated in the AM801x and AM811x motors, the absolute position of the drive is known when switching the axis on, making a homing function unnecessary. Thus the system can be started without reference drives to the end positions. In addition, not only can the position of the axis be determined, but also the current displacement speed. The drive position is stored in an EEPROM without battery buffering. With these features the new motor is ideally suited to feed and traversing axes, since limit switches and additional encoders are not required.

The new compact motors can also be rapidly and reliably identified in plant networks thanks to the electronic type plate containing mechanically and electronically relevant data such as serial number, type and manufacturer’s data. The integrated error memory enables on-line diagnostics into the motor.

Moreover, safe drive functions can be implemented very simply even in the smallest of installation spaces using the AM801x servomotors in conjunction with the AX5805 TwinSAFE Option Card. This not only enables traversing and feed axes to be switched off safely, but also programming including safe motion functions according to EN ISO 13849-1 to PLe. The motors can be switched torque-free and monitored in terms of speed, position and direction of rotation. Thus, traversing and feed axes can now also be integrated into the TwinCAT system, which considerably increases the availability of the entire machine.

Further Information:
www.beckhoff.com/AM801x
www.beckhoff.com/AM811x
Flexible network architectures, enabled by EtherCAT

Factory automation integrates systems from different disciplines for the purpose of controlling and managing production orders: production planning systems interact with recipe control at the plant management level, which in turn affects the machine and system control, ultimately resulting in control of the actual production process. This requires communication systems, which are suitable for the wide range of sensor/actuator communication requirements right up to production control level on the one hand, and on the other, can easily communicate with each other across the entire network. Beckhoff has a policy of using open technologies in its PC-based control systems, i.e. EtherCAT for the field and process control level and OPC UA for vertical integration. In other words, Beckhoff has already been meeting the requirements of integrated information exchange from the sensor to the management level and into the cloud for many years, as currently discussed in the working groups of the Industry 4.0 associations, for example.
Within machines and machine modules the focus is on the exchange of I/O data from sensors and actuators, including drives. The general requirements for a precise implementation of high-speed applications are proper real-time and synchronization capabilities as well as short cycle times. The horizontal communication between machines and production units is also subject to real-time requirements. The cycle times may be around 100 milliseconds or significantly less, if the communication is to be synchronized with the production processes. Vertical communication is used for integrating a production unit/line with a higher-level management system, e.g. for production control (ERP). In this case temporal requirements are much “softer”, in the seconds to milliseconds range. At this level, however, several other aspects are relevant, including: security, authentication, alarming, trending, historical data, service-based communication, etc.

Over the years, the OPC UA protocol as defined by the “vendor neutral” OPC Foundation has developed into a widely accepted communications solution for applications without demanding real-time requirements. In conjunction with existing advanced fieldbus systems, companies can therefore use the OPC UA protocol as a versatile link between the MES layer and the production level. Beckhoff recognized the relevance of OPC UA at an early stage. It demonstrated an OPC UA-based prototype control system at the first developer conference in 2006 and has been collecting experience in the field with this technology since 2008. Today, each Beckhoff controller can be equipped with OPC server or client functionality.

In cases where demanding real-time requirements must be satisfied, the open EtherCAT protocol, which was introduced by Beckhoff in 2003 and has been promoted to vendors from around the world by the EtherCAT Technology Group (ETG) since then, is particularly advantageous. Ten years later, the Beckhoff product portfolio includes more than 250 different devices with EtherCAT interfaces, not counting all the PC-based controllers with Ethernet ports, which can be used as an EtherCAT master when running TwinCAT automation software.

At the field level, the familiar EtherCAT device protocol – often (and also below) referred to simply as the EtherCAT protocol – is used for I/O communication within a machine or a machine component. Special features are, among others, highly accurate and deterministic performance with very low cycle times (down to <100 μs), precise synchronization for drive and measurement applications and low connection costs, facilitating use of the technology down to I/O level. The EtherCAT Automation Protocol (EAP) meets the requirements for protocols at the control and production control levels, thus strengthening the horizontal and vertical integration of EtherCAT into the overall system.

Wide range of EtherCAT topologies

With EtherCAT it is not the bus system that determines the network topology, but the system structure. No switches or hubs are required, which means there is no limit with regard to cascading. With EtherCAT there are virtually no restrictions in terms of the bus topology: line, tree, star and any combination thereof are possible, with almost any number of nodes.

For system wiring the combination of line and branches or stubs is particularly beneficial: the required branch ports are directly integrated into the Bus Couplers, e.g. EK1100. Cost-effective industrial Ethernet cables can be used for the 100BASE-TX mode with a length of up to 100 m between two
devices. For longer distances, fiber optic cables are used to establish EtherCAT connectivity. Modular machines or tool changers require an option to switch network segments or individual devices on or off during operation. The EtherCAT slave controllers already include the basic capabilities for this hot-connect functionality: if a partner station is removed, the respective port is closed automatically, so that the remaining network can continue to work undisturbed. Very short detection times (< 15 μs) ensure smooth switch-over. The Beckhoff EtherCAT master supports the hot-connect function for equipment groups or individual units. The user can choose this functionality through simple configuration.

For line redundancy the line is complemented to form a ring. On the TwinCAT master side all that is required (in addition to software activation) is a second Ethernet port. Slave devices already support this functionality in any case.

Naturally, EtherCAT also supports web communication technologies: the Ethernet over EtherCAT (EoE) protocol can be used for any Ethernet data traffic in the EtherCAT segment. Within the EtherCAT segment, standard Ethernet devices are connected via so-called switch-port terminals, e.g. the EL6614. The Ethernet frames are tunneled via EoE. The switch-port unit ensures correct “clocking” of TCP/IP fragments in the EtherCAT traffic, thus avoiding any negative impact on the real-time communication in the network.

TwinCAT, as an EtherCAT master, acts as a layer-2 switch, which forwards frames to the respective devices via EoE, based on the MAC address information. All web technologies can therefore also be used in the EtherCAT environment: integrated web server, e-mail, FTP transfer, etc.

**Integration of other bus systems**

EtherCAT also offers high flexibility in the network architecture down to the I/O level. Thanks to the available bandwidth it is possible to use conventional fieldbus connections as subordinate systems via EtherCAT gateways. This can be helpful for a migration from a conventional fieldbus towards EtherCAT, for example. It enables step-by-step conversion of a system to EtherCAT and integration of legacy devices or automation components that do not (yet) support an EtherCAT interface.

The compact Industrial PC and Embedded PC solutions from Beckhoff are based on this integration. Space for expansion cards is no longer required. In addition to local I/Os, axes and operating devices, complex systems such as fieldbus masters/slaves (gateways), fast serial interfaces and other communication interfaces can be addressed via a single Ethernet port in the PC. The data of the integrated fieldbus are directly available for the master in the process data image.

**System-wide communication with the EtherCAT Automation Protocol**

The EtherCAT Automation Protocol (EAP) defines interfaces and services for an equal exchange of information between controllers (master/master communication) or for interfacing with a central master computer.

The cyclic EAP communication can be handled directly in the user data of an Ethernet telegram, without the need for an additional transport or backup protocol. The EAP therefore enables very efficient data exchange without significant protocol overhead, with cycle times down to the milliseconds range. In cases where data routing within a distributed system is required, the EtherCAT frame can also be transmitted via UDP/IP. Furthermore, acyclic configuration data can
be transmitted via TCP/IP. The precise protocol type is specified in the header of the EtherCAT frame.

The EtherCAT Automation Protocol uses a conventional Ethernet infrastructure and can therefore be transferred via any Ethernet medium, including wireless communication.

The cyclic data exchange is based on the “pushed” or “polled” principle. In “pushed” mode, each communication device (publisher) sends its data cyclically or in a multiple of its own cycle. The receiver (subscriber) can be configured to specify which data should be received from which sender. As usual with EtherCAT, the sender and recipient data are configured via an object directory and process data mapping.

The EAP protocols were introduced in Beckhoff TwinCAT software as early as 2002 at the same time as the RT Ethernet control communication technology and have since been installed in thousands of systems. The open EAP specification is a compatible extension of this concept, which further simplifies system-wide configuration of machine-to-machine communication and enables the easy integration of devices from other manufacturers.

In the engineering environment of the TwinCAT system, the EtherCAT Automation Protocol is configured as an I/O device. A standard Ethernet port, which is interfaced with the real-time control system by the EAP kernel mode driver, is used as the hardware interface. Like for other I/O devices, the input and output variables can be linked in the System Manager, e.g. with a PLC control task or an NC, or directly with other I/O devices, such as a connected EtherCAT system.

To simplify matters further, in the future it will be possible to extend the device-specific configuration to a system-wide configuration with the aid of a central EAP configuration tool. The EAP configurator maps the communication dependencies of all controllers, enables their configuration and subsequently loads the EAP object directories of the individual devices. New communication dependencies, including their internal link with the control task, can be created dynamically.

Therefore, EtherCAT meets all requirements for present and future control concepts. In conjunction with support for vertical communication technologies such as OPC UA, EtherCAT today already offers the technological foundation to act as an enabling technology for the 4th industrial revolution, Industry 4.0.
Hannover Messe 2014 –
PC-based control as a basic technology enabling Smart Factories
At the heart of the Industry 4.0 Forum, the eXtended Transport System (XTS) demonstrated an innovative integrated production process.

With integration into Visual Studio®, the best-known tool for software production and maintenance, TwinCAT 3 provides a universal engineering solution for PLC, C++, MATLAB®/Simulink®, I/O and Motion.

For Beckhoff, the bottom line regarding the world's largest industrial trade show was definitely positive: many visitors, customers, international delegations as well as students participating in the "Tec2You" program for the promotion of young talents in East Westphalia were able to experience automation in action at the Beckhoff booth. Besides showing off the full spectrum of PC-based control technology, the exhibits focused on technology demonstrations like the new Industry 4.0 Forum, which in a straight-forward manner translated this year's trade show motto: "Integrated Industry – Next Steps" into real applications.

Beckhoff delivers basic technologies for intelligent and flexible production networks that can turn out lot sizes ranging from 1 to n. In its special Industry 4.0 Forum, Beckhoff demonstrated how PC-based control technology can be used to
implement basic sub-processes in an intelligent production network according to Industry 4.0 concepts. The demonstration consists of two physically separate production systems – so-called smart factories – that communicate with one another over the Internet. The main job of one system (a pick-and-place XTS) is the intelligent sorting and transportation of products. The second system – the processing centre – simulates a customer-specific production process with two intelligent processing stations, a cross-process quality monitoring system, and a highly flexible handling and conveying system.

At the start of the production process, a pick-and-place robot takes the workpiece to be processed from the warehouse and places it on the mover of the linear XTS (eXTended Transport System). A position sensor makes sure that the workpiece was successfully transferred. The XTS then moves the workpiece quickly and with a high degree of precision to the RFID reader and to the processing stations, where it is machined according to customer specifications.

The flexible conveyor systems, highly dynamic robotics and state-of-the-art identification systems interact to permit the production of lot sizes ranging from 1 to n according to customer specifications. The primary objective of the production network is to operate with exceptional resource efficiency, process reliability and high availability. It collects data from all systems involved (ranging from individual sensors to the cloud), analyzes them on various system levels, and uses them to optimize the overall process. That way, the smart factory is able, for example, to analyze its total energy consumption including that of individual modules in the cloud in order to detect and eventually reduce energy consumption peaks. At the same time, each production system monitors its own energy consumption and its status in order to detect wear-and-tear, contamination or power dips, and to proactively take countermeasures against increased energy consumption, unplanned system downtime or machining errors.

The demo application presented, among other things, the integration of kinematic transformations to control the robots and the integration of sensor functions to collect and analyze process data directly in the controller. For the efficient and anticipatory operation of smart factories, the ability of human beings to combine information about the production process and current system behaviour with planned and actual key production numbers, draw appropriate conclusions and take corresponding actions continues to be indispensable, however.

The Beckhoff Trade Show TV reports in detail about innovations and impressions from the booth in Hall 9.
As part of her traditional opening-day tour of the Hannover Messe, German Federal Chancellor Angela Merkel visited the Beckhoff booth on 7 April 2014, where Managing Director Hans Beckhoff presented his company and the basic technologies it produces for the Industry 4.0 concept.

Among the people accompanying Chancellor Merkel was Mark Rutte, Prime Minister of the Netherlands, this year’s official partner country of the fair, Dr. Johanna Wanka, Federal Minister of Education and Research, Stephan Weil, Prime Minister of the state of Lower Saxony, 50 other guests and about 100 journalists. Hans Beckhoff and his employees welcomed the illustrious delegation. After a short presentation of his company, Beckhoff explained the benefits of his company’s control and drive technology, using an Embedded PC and the eXtended Transport System (XTS) as examples for innovative technologies from Beckhoff enabling “Integrated Industry”, according to the motto of this year’s Hannover Messe.

At the end of his presentation, Beckhoff also explained the status of the “ScAut” research project, which the German Federal Ministry of Education and Research has named a “Leading-Edge Cluster” in the so-called it’s OWL (Intelligent Technical Systems OstWestfalenLippe) technology network.

The delegation of the Federal Chancellor during the opening tour (from left to right): Johanna Wanka, Federal Minister of Education and Research, Jos Out, Managing Director of the Dutch Beckhoff distributor Industrial Automation Link BV, Mark Rutte, Angela Merkel, Hans Beckhoff, Friedhelm Loh, President of the German ZVEI association, Stephan Weil, Prime Minister of the state of Lower Saxony.
Data transparency goes hand in hand with optimization of energy management and consumption.
The drying and processing of wood is a process that requires a lot of energy. Holzwerke Weinzierl GmbH in Germany nevertheless manages to generate more power than it consumes. The basis for this achievement is a modern energy management system that uses power measurement I/O terminals and Embedded PCs from Beckhoff to make the plant’s energy use transparent while continually optimizing it.

Located on a property spanning 22 hectares (54 acres) in the Bavarian town of Vilshofen, Holzwerke Weinzierl GmbH produces roughly 600,000 cubic meters of round logs and 150,000 metric tons of wood pellets per year. The company’s most important energy transfer medium is electricity, which it distributes via seven transformer stations fed by its own medium-voltage grid. The total annual power consumption amounts to roughly 30 million kilowatt-hours, spread at about one-third each over the lumber production, the pellet plant, and 36 drying kilns. By using three solar panel arrays and burning wood bark in four combined bio-mass power and heat generation systems, however, Weinzierl produces 35 million kilowatt-hours of green electricity annually, which enables it to sell roughly 5 million kilowatt-hours to the public grid. Josef Brauneis, Weinzierl’s Head of Electrical Engineering, explains the company’s approach: “Our business is based on three product lines: lumber, pellets, and energy generated from the renewable resource, wood.”

Answers a wide range of energy management and data acquisition requirements
For ecological as well as economic reasons, Weinzierl decided in 2011 to implement an energy management system (EMS) according to the DIN 50001 standard, because only a comprehensive energy data acquisition system would provide the transparency needed to exploit all potential for optimization and maximize the annual power surplus. For starters, the complete power supply systems were connected, including the seven transformer stations and the low-voltage distribution panels. Over time, the end users will be added, i.e. roughly 40 large drives, until finally all energy data and production performance indicators flow into the system.

Selecting the right energy management software was not easy, explains Josef Brauneis: “The systems available at the time did not deliver the capabilities,
In the foreseeable future, Weinzierl wants to integrate energy consumption data from its larger machines into its energy management system, followed by production performance indicators.

flexibility or price-to-performance ratio we were looking for. Although the market has improved in the meantime, most systems either facilitate pure data collection with limited interfaces or you must install a powerful building control system. That’s why we picked the highly flexible Zenon visualization system, which we were already familiar with. It provides very good display, archiving and reporting capabilities.”

In order to implement such a widely distributed and complex EMS with features that went beyond simply collecting data, Brauneis placed high demands on the process interfaces. For example, the system had to cover all energy-relevant facilities on the large grounds and protect against network problems by storing and analyzing the data on site. It also had to handle all current performance indicators and accommodate new ones in a cost-effective manner. Furthermore, it had to be able to use the existing networking infrastructure and keep the control technology as compact as possible, because space was limited.

For Brauneis, having a system with flexible data collection capabilities was also critical for the following reasons: “The interface spectrum had to be broad enough to take and accept energy-relevant signals, preferably from all systems controllers. This included, for example, the integration of an interface (“EisManSlave”) to the utility company’s feed-in management system, the reliable transmission of signals to the combined power-heat generation systems, and the collection, transmission and linking of all signals from the power distribution facilities such as power switch settings, transformer and room temperatures, and fault signals from compensation systems. Needless to say, the visualization software also had to be able to read all of this information.”

**Embedded PCs and EtherCAT terminals provide the best solution**

“The broad product spectrum from Beckhoff was best suited to handle the extensive process interface requirements,” Brauneis continues. “Since implementation, the system consisting of Embedded PCs and EtherCAT Terminals has certainly proved its capabilities in practical use. For example, we were able to easily import the TwinCAT PLC projects via the visualization software’s editor. The same applies to the important separation between the production and EMS networks. With an Ethernet LAN adapter and appropriate function blocks from the TwinCAT PLC library, we were able to easily implement the required data consistency between the EMS and the S5 and S7 controllers on the wood processing machines.”

Today, the EMS comprises roughly 200 measurement points for roughly 400 measurement values regarding output, power, voltage, and power factor. Over the medium term, i.e. after integrating the larger single drives, there will...
Further Information:

www.holzwerk-weinzierl.de
www.beckhoff.com/measurement

The web-based visualization system provides a rapid overview and diagnostic capabilities.

With several bio-mass boilers and solar power installations, Holzwerke Weinzierl generates "green" electricity that is CO2-neutral.

be roughly 500. In the final stage, when heat output, compressed air consumption and diesel fuel consumption as well as the key production performance indicators are included, the system will comprise roughly 1,000 measurement points. The core of the energy data acquisition system is made up of one CX5010 Embedded PC in each transformer station. The Embedded PCs are networked via fiber optic cable and Ethernet, and are equipped with 1.1-GHz Intel® Atom™ processors, providing ample computing power. To collect the energy data, 45 x EtherCAT EL3403 and 30 x EL1014 digital four-channel terminals are currently in use to collect the pulses of various counters. They are supplemented by 20 additional digital input terminals for the signals emitted by the signaling system and numerous analog I/O terminals.

Brauneis particularly appreciates the open and compact design of the Beckhoff control system: “Our systems have grown over many years, which is why they differ significantly from each other. In our old building from 1998, for example, we collected no energy data at all in the past, while the newer systems we added starting in 2006 forward energy data in the form of pulse signals to the next boiler controller, where they are totaled up. Accordingly, we built a new power data collection system with EL3404 power measurement terminals and installed EL1014 digital I/O terminals for the S0 interface of the power meters to use existing information. Just like with the easy integration of the production controllers and the visualization software, this approach demonstrates the great advantages of the open systems from Beckhoff. They also feature a compact design, which is particularly beneficial when you retrofit an energy management system in applications with very little available space.”

If compact size is critical, the EL3403 3-phase power measurement terminals provide another advantage. Since each phase can be analyzed separately and the respective converter ratios can also be computed individually in the PLC, the user can measure three asynchronous motors in single-phase mode instead of the three phases of a single drive. The three-phase performance values can then be easily computed with precision which is sufficient for the power factors and cycle times required for a lumber mill. This approach requires significantly fewer terminals and saves a great deal of space in tight control cabinets. It also contributes to energy savings, because additional terminals and converters would themselves consume additional electricity.

Optimized energy efficiency through better data acquisition

The main benefit of the energy management system is that it makes energy consumption transparent across the entire lumber mill. While the power consumption of the 36 drying kilns with 12 x 3-kilowatt drives each had always been tightly controlled, all sorting and wood rounding systems, as well as the pellet systems with their conveyer dryers and boilers, are now integrated as well. Josef Brauneis: “We added things like a color-coding system to support the line operator. A red signal indicates that the system’s power consumption needs to be reduced, for example, by cleaning a dirty photo sensor or doing some other maintenance. Another example involves turning on the flue gas fans in the boilers with some delay, because each of them consumes a considerable 160 kilowatts. By taking steps like these we were able to continuously reduce our power consumption by roughly 150 kilowatts and keep our peak usage unchanged despite the fact that we added another line and two more drying kilns.

Many ideas for improvements came about as a result of receiving all this information about factors such as unexpected usage peaks. For example, our production buildings feature large exhaust systems that now have additional shut-off devices so that we can turn off the energy-intensive ventilation in specific areas when they are not in use. The EMS also enables us to analyze our energy consumption for individual cost centers and product batches.
To solve age-old problems in precision grinding technology, Echo Hill turns machinery upside down.

Improved gauging makes it easier for Echo Hill to correct the grinding patterns during production based on closed-loop control, which enables automatic modifications right down to the micron level or even below. The machine runs successfully with up to four parts simultaneously, without a decrease in efficiency.

Maximum precision and efficiency for grinding applications
The production of precision parts – in the past the domain of highly specialized craftsmen – is largely handled by machines these days. Centerless grinding is a special technique for precision grinding of cylindrical machine components, in which the workpiece is not fixed, but turns between a fast-rotating grinding wheel and a slower rotating, smaller regulating wheel. This technique is used for the production of precision parts for the automotive, aviation or aerospace industries, for example. Meeting the requirements of minimum tolerances right down to the micron range, short production runs and automated production of lot size one requires powerful, customizable automation technology.

A remote “Economy” Control Panel from the CP690x series is used for machine visualization.
The Canadian company, Echo Hill Automation, based in Beamsville, Ontario, specializes in the production of machines for centerless grinding. Other grinding machines that are currently available in the market can generally only process one part at a time. In many cases, different grinding profiles still have to be set manually. In the past, another issue with centerless grinding was parts gauging.

Echo Hill has invested a great deal of effort in research and development, with the aim to optimize the grinding process. "Most of our customers deal with a wide range of different parts, i.e. production runs tend to be short, with frequent product changeovers. Another factor is that the dimensional tolerances for processed parts have become smaller and smaller over the years," said Harry Schellenberg, President of Echo Hill Automation. "In order to enable high-precision, efficient production with small production runs and different dimensions, we had to redesign our machines."

Echo Hill turns the machine concept on its head

In many cases the grinding heads for this kind of machine can weigh more than 1000 lbs (500 kg), so that the mechanical components that are used for moving machine components are subject to high wear and tear. What’s more, the grinding process is notorious for generating debris, which means that even high-precision grinding machines have trouble meeting the tight tolerances.

Echo Hill’s “Tactic 8” machine is an innovative solution for these challenges. In this machine with an 8-inch grinding wheel, the movable components are turned on their head, so to speak, i.e. the linear motors are mounted at the top of the machine, so that the parts no longer have to be fed under the grinding wheels but can be processed from above. The magnetic force of the linear motors counteracts the weight of the slide bars, neutralizing the weight of the rotating roller slide mechanism, with the result that wear is minimized and the service life of the machine is increased significantly.

Scientific Automation integrates robotics and measurement technology into the control platform

"In addition to mechanical improvements, the Tactic 8 was equipped with the integrated PC- and EtherCAT-based control platform from Beckhoff. This has increased the overall efficiency of the machine,” said Harry Schellenberg: "Originally, we started talking to Beckhoff because we were looking for a robot control system. In the past we used separate controllers for the machine, the robot and the gauging system, which made communication complex. With Scientific Automation we now have a platform that bundles robotics, measurement technology and machine automation on a single PC, software platform and network, which gives us clear competitive advantages."

Echo Hill uses a high-performance C6515 Industrial PCs (IPCs), equipped with a second generation Intel® Core™ i3 processor and TwinCAT automation software. A remote “Economy” Control Panel from the CP690x series is used for machine visualization. "The fact that the HMI software runs on the same PC as our automation software is a significant improvement," said Dan Schellenberg, Vice President and control expert at Echo Hill Automation. "Before we switched to PC-based control as our standard, we used a hardware PLC and a separate PC for the HMI."

"The big advantage of the PC-based control platform is that TwinCAT NC I integrates the whole robot coordination and handling of the three axes in a single controller and software,” said Dan Schellenberg: "Since the PC runs G-Code for complex movements, it is quite easy to modify programs when the parameters change. In addition, it is possible to use different programming languages, ranging from standard to highly specialized languages, depending on what is best for a particular task. For regularly recurring motion control elements, TwinCAT offers function blocks, which save a lot of programming time."
The TwinCAT XML Server software supplement can be used to read and write parts parameters in a standard format. “This is particularly helpful bearing in mind that some of Echo Hill’s applications have up to 4,000 parts parameters, which change continuously during production,” said Dan Schellenberg. “It makes parameter transfer between machines much more flexible.”

Echo Hill implemented full parts testing across the whole grinding process with the aim of achieving maximum precision. High-precision measured data acquisition enables the machining patterns to be controlled during the production, which makes it possible to implement automatic changes right down to the micron level or even below: the measuring system can control all workpieces with a tolerance of up to 6 μm. The Tactic 8 can process up to four parts simultaneously, without loss of precision. Dan Schellenberg is enthusiastic: “Within a few minutes our customers can grind four parts at the same time, with everything straight as a die – that’s the pinnacle of grinding art.”

**EtherCAT Terminals for optimized temperature monitoring and vibration analysis**

EtherCAT is used for machine networking. Different EtherCAT I/O terminals are used for data acquisition, temperature monitoring and vibration analysis on the grinding machines. Echo Hill uses the EL1262 XFC terminal with integrated oversampling functionality, so that binary control signals from the process level can be picked up quickly and transferred to the controller. The base time of the terminals can be synchronized precisely with other EtherCAT devices via distributed clocks. In this way the temporal resolution of the digital input signal can be increased to n-times the bus cycle time. EtherCAT also transfers the length and diameter parameters to the connected vision system, which facilitates machine configuration during changeovers.

**TwinSAFE ensures optimum safety**

Safety over EtherCAT ensures comprehensive safety for the machine, operator and other personnel. Instead of using a separate cable set in conjunction with a special safety controller with its own software and network, TwinSAFE from Beckhoff integrates the safety technology in the standard I/O system – a simple and cost-effective solution.

**Gauging a string of successes**

“The best selling point of the Tactic 8 is that it can process up to four parts simultaneously,” said Harry Schellenberg. Another important aspect for our customers is the improved gauging technology. Now that we use EtherCAT we can execute up to 4,000 scans per second, far more than our previous limit of 1,000 scans,” said the Echo Hill President.

Despite the fact that Echo Hill managed to optimize machine throughput by implementing the EtherCAT-based control platform, there was no cost increase. “Quite the opposite,” said Dan Schellenberg. “Since the robot kinematics run on the central IPC, we were able to push down the total costs for the control system. In addition, we were able to significantly reduce the space requirements in the control cabinet, the footprint of the machine and the system complexity.”

“Another competitive advantage is the shorter changeover time required of the machine,” said the control expert. “Many of our customers produce workpieces for vehicle transmissions, often with very small lot sizes. This requires frequent changes of the machine parameters. With the Tactic 8 machine changeover times have been reduced by over 50%.”

Further Information:
www.echohillautomation.com
www.beckhoff.ca
Ultra-high pressure water cutting heads from Jet Edge master the toughest tasks

Waterjet cutting systems are among the most flexible and precise cutting systems available: they can cut the most diverse materials, from heavy plate to glass to modern composite materials. The advantage of waterjet cutting is that no heat-affected zone is created and the raw materials are not damaged or deformed during cutting. A leading American machine manufacturer, Jet Edge, located in St. Michael, Minnesota, develops and manufactures ultra-high pressure waterjet systems for precision cutting, water blasting and surface preparation. Its latest technological development is the 5-axis EDGE X-5 waterjet system equipped with a Beckhoff PC-based controller that can cut complex components precisely and repeatably.

Jet Edge offers an extensive range of waterjet cutting systems for the most diverse applications: during the Gulf of Mexico oil spill in 2010, the company quickly developed a waterjet system for BP (British Petroleum) to blast away hydrate ice crystals clogging a containment system at a depth of 5,000 ft (1,500 m) underwater. Another high-profile example is the employment of the 5-axis EDGE X-5 waterjet cutting system by Michael Waltrip Racing. The American motor sport team, which assembles about 56 vehicles per year, uses the water-cutting heads to cut more than 1,000 mechanical components for each of the team’s NASCAR Sprint Cup cars.

To win such high-profile business, Jet Edge delivers high-pressure waterjet solutions that run from 36,000 psi (248,211 kPa) to 90,000 psi (620,528 kPa), direct drive pumps that can operate at up to 55,000 psi (379,212 kPa) and innovative motion control systems paired with ultra-high pressure cutting heads. The cutting heads can cut complex, 3-dimensional components from different materials when placed on a flat surface. The cutting heads are suspended on an overhead gantry system that moves over the cutting surface.

Complex precision cutting made easy with PC-based control

In order to offer high cut edge quality with tolerances of .005 inch (0.127 mm) or less, Jet Edge equips its machines with a fast, precise and reliable motion control system. “Apart from that the system must be flexible,” explains Jet Edge Marketing Manager, Nancy Lauseng. “We need an open control system that can integrate the full array of sensors that we use.
for our complex motion control system. Our old control platform couldn’t keep step with the development of our technology, so we were forced to look for an alternative.” Jet Edge chose Beckhoff and developed a solution based on TwinCAT CNC that makes full use of TwinCAT’s entire range of CNC functions.

“TwinCAT is now an integral component of our High Rail and Mid Rail gantry systems, which are capable of advanced 3-dimensional waterjet movement over the work area and ultra-high precision cutting,” says Nancy Lauseng. Since making the shift to TwinCAT, Jet Edge has observed an improvement in cutting tolerances and cut edge quality. The complete machine controller, including HMI with PLC functions as well as the complex CNC control for execution, is implemented on a C6920-0030 Industrial PC. A CP6912 Control Panel is used for the machine display.

Jet Edge currently uses SERCOS II as the fieldbus, while the Industrial PC is equipped with a Beckhoff SERCOS fieldbus card that connects via fiber optic cables to the SERCOS network that controls the I/O and drive components. Bus Terminal I/O is used to implement various machine functions, such as height sensors and plate mapping, control relays and solenoid valves. The BK7520 Bus Coupler connects the SERCOS bus system to the I/O terminals.

Jet Edge waterjet systems to join the EtherCAT industrial Ethernet revolution

“Apart from the extensive product range available from Beckhoff, the long service life of the control products is an important criterion for us,” Nancy Lauseng emphasizes. “In 10 years of operating Beckhoff controls in harsh waterjet cutting environments, Jet Edge has never had to replace a Beckhoff controller.” Also important for Jet Edge is the openness of the PC-based control platform. “We didn’t want to be completely tied to particular vendors. When we replaced our control system we were able to retain the existing motors and drive components.”

Delivering flexible waterjet cutting systems that can be easily adapted to the customers’ evolving needs has propelled Jet Edge into the leading class of machine builders. In terms of cutting technology, there is no raw material or application for which Jet Edge doesn’t have the right tool. This is all done with reliable interfaces between the Jet Edge equipment and customers’ factory automation systems.

“With PC-based control we have a control system in our machines that is no longer a limiting factor for speed, accuracy or quality, and moreover we have been able to significantly lower production costs,” stresses Nancy Lauseng. “As the next step in the development of the automation system architecture, Jet Edge is evaluating a change from SERCOS to EtherCAT. That would help us extend the limits of machine performance into the foreseeable future.”

Further Information:
www.jetedge.com
www.beckhoffautomation.com
Renewtech makes small wind power projects cost-effective

Despite fluctuations in the subsidies for the alternative energy sector, the U.S. government continues to support initiatives for the use of wind energy in single-turbine projects. In many cases, operators take advantage of investment tax credits for wind energy projects below 1 megawatt. This market segment, which had particularly strong growth in 2013 and is expected to increase in 2014, is the specialty of wind turbine specialist, Renewtech LLC.
Renewtech, which is located in Elbow Lake, Minnesota, focuses on 99-kilowatt wind turbines with stall control. The company’s services range from system planning and design to nacelle and control unit assembly to rotor and tower production. Renewtech also uses its team of experienced specialists to renovate and monitor existing systems. Many wind turbines in the 50-to-150-kilowatt range in the U.S. were built in the 1980s and 1990s, and their technology has become unreliable and inefficient by today’s standards. “We see great demand in the areas of refurbishment and replacement, and Renewtech is qualified to maintain many of these installations,” explains Jackie Chelemedos, Director of Business Development at Renewtech. Typical Renewtech projects, for example, are wind turbines that are operated by public institutions such as schools and universities, but also by farms and ranches.

A standard Ethernet cable connects the nacelle with the foot of the tower. The communication is based on EtherCAT.
Winds of change dislodge legacy turbine controls

Wind turbines from Renewtech have a 20-year warranty and pay for themselves over seven to twelve years, depending on the utility rates at each particular location. The long warranty period is based on the company’s use of high-quality components and their capacity reserves, which far exceed the peak requirements for regular wind turbines. This is particularly critical in areas where heavy wind gusts can occur. "For our 99-kW systems we use gearing that is designed for 150 kW with a ratio of roughly 2.3 so that they can handle more than 300 kW in peak periods," explains Matt Kugler, the company’s Senior Commissioning Technician. "In addition, wind turbines from Renewtech operate with two generators instead of one. Despite the systems’ high reliability and redundancy, having remote access and diagnostic capabilities is a key benefit for Renewtech and its customers: “We record the data from each turbine and the entire wind farm. We also store the data from all wind farms in our headquarters. From here we can remotely monitor all of our turbines,” explains Kugler.

In 2012, Renewtech entered the next stage of system development by subjecting the controls of its 99-kW turbines to a critical analysis. As it turned out, the platform used at the time faced a few limitations such as limited vendor support, problems with connecting the systems to standard media and networks, and inflexible software. In short, the company needed a new control platform for its turbines. "We knew that Beckhoff had been very successful on the global wind turbine market and that its technology was suitable for our 99-kW systems,” remembers Steve Martineau, Renewtech’s Director of Operations. During the subsequent development and test stages, Beckhoff application engineers helped Renewtech develop the programming for the new generation of wind turbines. Shortly thereafter, the company decided that PC-based control technology and EtherCAT as the communication system would best fit its needs.

PC-based automation technology advances wind turbine modernization

The standard controller for Renewtech’s 99-kW dual-generator system consists of a CX5020 Embedded PC with Windows CE and TwinCAT PLC Runtime, a TwinCAT SMS/SMTP server, and EtherCAT I/O Terminals. For wind farms with up to 50 turbines, C69xx-series Industrial PCs are also employed as servers. The CX5020 functions as the central controller for the turbine. It monitors the power feed, makes necessary wind direction alignment, records data, and generates error messages. Besides executing PLC, measurement and communication functions, the CX5020 runs the HMI software for visualization on the turbines and monitoring the installed base of Renewtech systems in the U.S. "With its wide operating temperature range from –25° to +60° C (-13° to +140° F), it is also suitable for installations in regions with a hot climate,” says Steve Martineau.
In February of this year, Aurelio Banda was appointed Vice President of Sales and Marketing of Beckhoff USA, the subsidiary that manages Beckhoff business in North America. Banda takes on his new role at the company's headquarters in Savage, Minnesota (near Minneapolis).

"After making significant contributions and driving positive change in regional sales management, the time had come for Aurelio Banda to broaden his attention to the national level and apply his proven leadership abilities at North American headquarters from Beckhoff," said Graham Harris, President of Beckhoff Automation LLC.

Prior to being appointed to his new position, Banda managed the company's Central Region in the U.S. In this role he oversaw a sales team covering the states of Illinois, Indiana, Wisconsin, Minnesota, Iowa, Missouri, Nebraska, Kansas, as well as North and South Dakota. Banda’s team increased sales to new and existing accounts and established a stronger presence in the region by opening a field office in Woodridge, Illinois (Chicago area).

Flexible and cost-effective monitoring via EtherCAT Terminals

The Renewtech system records data continuously. "The EL3413 3-phase power measurement terminal provides us with the most important data. It enables us, for example, to perform power and frequency measurements and manage our complex 480-volt system," explains Matt Kugler. "Finding a flexible and affordable power measurement system that’s also easy to integrate has not always been easy. Most devices are standalone systems that require special hardware, software and other layers of complexity. They are also very expensive." The system with EL3413 terminals collects the power data of all Renewtech applications via EtherCAT and TwinCAT and sends acquired status information to the corporate headquarters in Elbow Lake. Power monitoring alarms are simply e-mailed to Renewtech's experts, who can then fix faults remotely or request help locally.

"Particularly important for us is the EL1502 up/down counter, an EtherCAT Terminal that monitors the speed of the main shaft of the two generators as well as the wind speed with the help of an anemometer," says Matt Kugler. The up/down counter counts binary pulses and transmits the counter value in a galvanically separated manner to the upstream automation system. "At the end of the day, it is safe to say that the broad portfolio of Beckhoff EtherCAT I/O Terminals with their many special features enables us to come up with very interesting developments," adds Kugler. "For example, if we have to add vibration monitoring on all our turbines, we can integrate this feature very easily by using the EL3632 EtherCAT CMS terminal."

Making customers happy is a breeze for Renewtech

"Ever since we added the Beckhoff control system in our Renewtech turbines, their reliability and availability has improved by at least 50 percent," says Steve Martineau. "And since availability is a prerequisite for generating power, and generating power makes money for our customers, its importance cannot be overstated."

Using EtherCAT in wind turbines and wind farm networking has additional benefits, however, says Steve Martineau: "After switching to EtherCAT we needed only two easy-to-handle standard connectors instead of 40 copper cables for 80 connection points. This has saved us two to three labor hours per turbine for cabling."

"Based on our positive experience, we will equip all our wind turbines with Beckhoff controllers in the future," concludes Jackie Chelemedos.
PC- and EtherCAT-based control platform modernizes particle accelerator

Scientific research into the smallest particles of matter is of fundamental importance for many areas of study around the world. Particle research is also supported and used by the nanotechnology and semiconductor industries. High Voltage Engineering Europe (HVE), a scientific company based in Amersfoort in the Netherlands, develops and builds particle accelerators for a wide range of research applications in universities and in the semiconductor industry. With the application of the EtherCAT control components from Beckhoff, HVE is currently breaking new ground in particle accelerator technology.

In a particle accelerator, positively or negatively charged particles or radioisotopes are brought to a high energy level, with the velocities generated in the accelerator approaching the speed of light. The acceleration is generated through very strong electric fields. A familiar application example for a particle accelerator is accelerator mass spectrometry, in which the age of material samples is determined using the C14 method (radiocarbon dating). Since the concentration of the unstable, radioactive C14 (radionuclides) decreases according to the decay law, the age of archaeological finds can be determined quite accurately. Other areas of application for particle accelerators from HVE include simulation-based research into the effects of solar wind and cosmic radiation on the electronics used in space travel or analysis of the surface structure of semiconductor chips.

The particle accelerators built by High Voltage Engineering are DC linear accelerators. They differ from the circular accelerator at CERN in Switzerland, not only in their much smaller size, but also in their design: the DC linear particle accelerators have a high-voltage power supply that produces a direct voltage of up to 6 million volts. This DC voltage generates a strong electric field in an accelerator tube. The tube consists of round titanium electrodes that are separated by insulators, with an opening in the middle. At the center of the accelerator tube is a vacuum, and the charged particles are accelerated along the axis of the accelerator tube by means of an electric field.

The DC linear accelerators from HVE are available as Singletron or Tandetron models. In the Singletron, a direct voltage of several million volts (MV) is applied to the ion source. The electric field accelerates the charged particles from the ion source towards the earth potential. In the Tandetron, the ion source is at earth potential, i.e. the negative particles are accelerated towards the Tandetron terminal, where a voltage of several MV is applied. Here they are recharged into positive particles, so that they can accelerate a second time – this time from the terminal to the earth potential.

As a general rule, the higher the energy, the longer the accelerator tube has to be. The tube is located in a large metal tank filled with insulating gas, in order to keep the high voltage under control. The particle accelerators from HVE are between 3 m and 25 m long.

Factors in favor of EtherCAT: higher speed, greater bandwidth, improved stability

HVE is currently developing a new particle accelerator, the 2 MV Singletron, where EtherCAT is used as the bus system for the first time. Until recently, HVE used the CAN bus system; the switch to EtherCAT was prompted by the fact that the CAN protocol does not provide the required high speed and that the legacy bus technology is no longer being developed further by equipment vendors.
HVE undertook a preparatory study to compare the currently available protocols for industrial Ethernet. The decision in favor of EtherCAT was based on its higher bandwidth, flexibility, scalability, modularity and stability. An important requirement for HVE was that the analog output must be absolutely stable and repeatable, without any drift in the data traffic.

Due to the modularity and diversity of the available Beckhoff I/O terminals, EtherCAT also met the requirement for precise scalability of the control platform.

Integration of measurement technology through XFC terminals

In the 2 MV Singletron, HVE uses an integrated Beckhoff control platform with TwinCAT PLC software, a C6920 control cabinet Industrial PC, EtherCAT as the communication system and EtherCAT I/O components. For HVE, an important argument for the decision in favor of the PC-based control system from Beckhoff was the long-term availability of the components and their backward compatibility with older technologies. From HVE’s perspective, the next generation TwinCAT 3 software also offers a number of engineering benefits. For example, no separate editor is required for programming, and the C++ and C programming languages are supported. C code enables the control system to operate in real-time during programming. The integration of MATLAB®/Simulink® permits the execution of TwinCAT modules that were generated as models in the Simulink® simulation environment.

Further benefits for HVE include the integration of fast and precise measurement technology in the control platform, for example, for measuring the ion bundle profile over time. Special EtherCAT measurement terminals based on the eXtreme Fast Control (XFC) technology from Beckhoff enable fast measurement of very small currents in the nanoampere range, with high temporal resolution. This is a thought-provoking development for high-voltage applications, since it enables even more precise measurement of the shape of the ion bundle in the particle accelerator.

Further Information:
www.highvolteng.com
www.beckhoff.nl
At Norwegian packaging specialist, Hvebergsmoen Potetpakkeri, the potatoes are no longer sorted, weighed, bagged and stacked on pallets by hand. Instead, a fully automated packaging system made by Norwegian machine building company, Intek now performs this strenuous job. The new system increased throughput by 35 percent, says Hvebergsmoen Potetpakkeri, where a large portion of Norway’s potato crop is packaged. The entire process is automated via EtherCAT on a PC-based control platform from Beckhoff. The interaction of EtherCAT and TwinCAT as a multifunctional interface also makes it possible to exchange data with the MES/ERP system for a flexible and demand-oriented workflow.

Open interfaces provide basis for seamless traceability

PC-based control optimizes potato packaging

At Norwegian packaging specialist, Hvebergsmoen Potetpakkeri, the potatoes are no longer sorted, weighed, bagged and stacked on pallets by hand. Instead, a fully automated packaging system made by Norwegian machine building company, Intek now performs this strenuous job. The new system increased throughput by 35 percent, says Hvebergsmoen Potetpakkeri, where a large portion of Norway’s potato crop is packaged. The entire process is automated via EtherCAT on a PC-based control platform from Beckhoff. The interaction of EtherCAT and TwinCAT as a multifunctional interface also makes it possible to exchange data with the MES/ERP system for a flexible and demand-oriented workflow.

According to general manager Elling Ødegaard, Hvebergsmoen Potetpakkeri’s fully automated potato bagging system is among the most modern in Europe. With a capacity of 40,000 tons per year, the large installation covers an area of 12,000 square meters (about 129,000 square feet). End customers include European grocery store chains, Bama and Coop. “Since we package Norwegian as well as imported potatoes, our ‘season’ covers 365 days a year. We process roughly 120 different item numbers per year,” adds the general manager.

The packaging workflows were revolutionized predominantly by two innovations: robots and logistics applications. In the past, the potatoes were packaged by hand – a particularly hard and labor-intensive job. Now ten Kuka robots do this work spread over seven packaging systems and three palletizing centers at Hvebergsmoen Potetpakkeri. “The robots provide more flexibility,” explains Elling Ødegaard, “because a single operator can now control several machines simultaneously.”

PC Control makes customized production possible

The robots take pallets and fill them with bags of potatoes. A standard pallet holds roughly 40 bags, but the system is also able to handle other types like the flatter pallets used by end user Coop, which are automatically double-stacked. While the robots provide the mechanical parts of the plant with a totally new level of “strength”, large portions of the logistics were also replaced – with an integrated order management and production system. “This system handles the automated marking of the packaging and the pallets. It also checks the weight and tracks the products electronically while the potatoes move through the packaging machine,” explains Ødegaard. To perform this job, two label printers have been integrated into the control system that can label two pallets simultaneously.

All customer orders are entered via the ERP system. It is linked to the production system, which assigns the orders to the respective packaging line. The system that checks the weight receives its instructions from the controller via a PROFIBUS interface. The package weight varies depending on the type of potato. The settings are entered automatically with the product selection. Based on this information, the controller transmits the program code to the KUKA robots. All the operator
has to do is select the automatic start of the production cells and press the Start button on the control panel. All machines are configured automatically in response.

Based on the serial shipping container code, the Beckhoff C6930 Industrial PC (IPC) sends all the required information about the ready-to-ship pallet from the TwinCAT PLC directly to the ERP system. "With this system we can track and trace all production data, the location of the respective pallet, the waybill, the invoice and the label data – down to the bag level – for each product type and customer in real time or years later," explains Elling Ødegaard. As a result, the company now has a system that meets the strict track-and-trace requirements for the food industry perfectly.

**An investment that pays for itself**

The spread-out packaging system is controlled via three C6930 IPCs. The separate control stations use 15-inch panels from the CP79xx series with stainless-steel housings. They display, among other things, the current status of the orders as well as the daily production. The communication between the controller and the local I/O units as well as the frequency converters of the robots with the palletizing units runs over EtherCAT, with each production cell having its own control cabinet. To provide reliability, the control cabinets are equipped with uninterruptible power supply units, electrical protection systems and fast-acting fuses. Robust Beckhoff Fieldbus Box modules with IP 67 protection rating are distributed throughout the system outside of electrical cabinets.

To make the system even more effective, general manager Elling Ødegaard plans to install automatic sensors to measure the overall equipment effectiveness (OEE) in real time. All trouble messages generated in TwinCAT will be forwarded directly to a database. "This will provide us with entirely new options to improve the production flows," he says.

**Further Information:**

- [www.intek.no](http://www.intek.no)
- [www.potet.no](http://www.potet.no)
- [www.beckhoff.no](http://www.beckhoff.no)

PC Control Packaging Special:

[www.pc-control.net](http://www.pc-control.net)
Signal generators are required for a wide range of applications in research, development, production, and testing. Application examples include electrolytic coating or demagnetization of metallic materials. Several solutions are already commercially available. However, most signal generators have limited flexibility, resulting in inadequate output power, limitations in terms of sinusoidal output voltage, limited maximum frequency, etc. Such generators are only suitable for certain applications. Aixcon’s aim therefore was to develop a versatile, and at the same time, cost-effective device that can be used in a wide range of industrial applications.

Flexible, modular, powerful

The result is a modular system, based on a signal source and a power section. The signal source consists of a CX9020 Embedded PC, TwinCAT PLC software and several EtherCAT Terminals with eXtreme Fast Control technology (XFC). The main signal generation component is realized using the EL4732 XFC analog output terminal with oversampling. The oversampling technique, i.e. the output of up to 100 time-correlated analog output values per PLC and fieldbus cycle, ensures that the power section can be supplied with high-frequency control signals with a relatively “small” and therefore inexpensive CPU (1 GHz ARM Cortex™). The following functions are possible:

- Base frequency 0 to 1 kHz
- Superimpositions of 0 up to 2.5 kHz
- Offset, duty factor, rise times, amplitudes and frequency modulation
- Sweeping
- Output power between 4 kW and 144 kW
- Signal types: sine, triangle, rectangle, trapezium, DC, individual curves

Simple handling, parameterization and programming

The function generator can optionally be operated via a database or a web interface. The CX9020 already includes a web interface without requiring an add-on. It communicates with the TwinCAT PLC via ADS DLL. This means that any computer can be used as a configuration system without additional Aixcon or Beckhoff software. But that’s not all: the Aixcon software function block (FB_aix_function_generator), which is part of the TwinCAT application software on the CX9020, enables selection of the signal types mentioned above without further programming. Based on configurable parameters such as amplitude, frequency, offset, duty factor and trapezium symmetry, it is possible to realize any current or voltage curves. Likewise, it is possible to modulate functions that are superimposed on the basic function.

"The Aixcon function generator is a modular system, based on the signal source/controller and the power section."
As an alternative to web-based operation, the function generator can also be combined with a FileMaker database. To this end, Aixcon developed a TwinCAT FileMaker plug-in, which conveniently makes data available on the FileMaker. In addition, user-friendly FileMaker interfaces can be created.

Versatile application options
The new, modular function generator represents a freely programmable AC power source for a wide range of applications in research and industry. The CX9020 Embedded PC with TwinCAT software and XFC technology provides a robust, industry-proven technological platform for Aixcon developments. The permitted ambient temperatures between -20 °C and +60 °C in conjunction with the standard IEC 61131 programming tools of TwinCAT PLC enable application in the laboratory (research) as well as in harsh industrial environments (testing, production). Thanks to the wide range of configurable parameters it is possible to generate almost any signal type. A large number of standard signals are already included in the system, without the need for further programming.

Further Information:
www.aixcon.de/en
www.beckhoff.com

Beckhoff XFC technology

Using eXtreme Fast Control (XFC), which is based on a combination of different high performance technologies (see below), it is possible to achieve very short cycle and response times, high-precision synchronization and very high sampling rates (or signal generation) via oversampling terminals. XFC is the optimized control and communication architecture for maximum performance, based on:

TwinCAT, the ultra-fast real-time control software
- Real-time under Microsoft Windows with cycle times down to 50 μs
- Programming XFC real-time tasks according to IEC 61131-3
- The standard features of Windows and TwinCAT are XFC-compatible.

EtherCAT, the ultra-fast industrial Ethernet communication technology
- with 1,000 local digital I/Os in 30 μs
- No sub-bus required, since EtherCAT is available right down to the individual I/O terminals
- Optimized application of standard Ethernet controllers, e.g. Intel® PC chipset architecture
- Extended real-time functions, based on distributed clocks
- Synchronization
- Time stamping
- Oversampling

EtherCAT Terminals, the ultra-fast I/O technology
- complete I/O range for all signal types
- digital and analog high-speed I/Os
- timestamping and oversampling enable very high time resolution (down to 10 ns).

Industrial PCs, the ultra-fast control CPU
- with high-performance real-time motherboards
- compact form factors available, optimized for control applications

The oversampling principle
Process data are usually transmitted exactly once per communication cycle. Conversely, this means the temporal resolution of process data directly depends on the communication cycle time. Higher temporal resolution is only possible through the reduction in cycle time – with associated practical limits.

Oversampling data types enable multiple sampling of process data within a communication cycle and subsequent (inputs) or prior (outputs) transfer of all data contained in an array. The oversampling factor describes the number of samples within a communication cycle and is therefore a multiple of one. Sampling rates of 200 kHz can be realized easily, even with moderate communication cycle times.
TwinCAT CNC controls laser cutting machines for high precision pipe perforation

Perforated pipes are key components in the extraction of petroleum in order to properly separate sand from pumping fluid. The shape, size and arrangement of the punch-outs in the pipe vary according to the specifications of the bore, the geological conditions and/or the consistency of the pumping fluid. The Wuhan Farley Laserlab Cutting System Engineering Company of China has developed a technique for perforating pipes by means of a laser cutting method. The CNC machine, which can be converted flexibly to the most diverse “cutting patterns,” is controlled by a PC- and EtherCAT-based automation platform from Beckhoff.

The Wuhan-based Farley Laserlab Cutting System, a subsidiary of Huagong Laser Engineering Co., Ltd., is one of the leading Chinese companies in the field of high-performance laser cutting and welding machines. “Due to the increasing use of laser cutting technology in the manufacturing of filter pipes that extract petroleum, the demand for appropriate laser cutting machines has surged tremendously,” says Wang Zheng, Deputy CEO of Farley Laserlab.

Integrated PC-based control
Farley Laserlab uses the PC-based control platform from Beckhoff in its laser cutting machines for the perforation of pipes; this consists of an Industrial PC (IPC), TwinCAT CNC automation software, distributed I/O terminals and EtherCAT as the communication system. In the drive technology area, AX5000 EtherCAT Servo Drives and the servomotors from the AM8000 series with One Cable Technology (OCT) are used. “Communication is based entirely on EtherCAT, which is characterized by high speed and reliability. The integrated bus structure of EtherCAT is clear and simple to handle at all levels,” Wang Zheng emphasizes and he adds: “Through the use of the motors with One Cable Technology we have also been able to considerably reduce cabling efforts and costs.”

TwinCAT CNC controls the cutting beam at fast speeds of up to 120 m/minute with precise positioning in the X and Y direction. It also controls the lifting and lowering of the cutting head, the rotation and positioning of the perforated pipe, the tilting of the cutting head, the feeding axis for the feeding of the pipe in the longitudinal direction as well as the axis for the synchronization of the laser beam with the electric drive.

All control requirements integrated on a single PC platform
For the control of the seven servo axes, interpolated motion control is required where the servo axes can position themselves precisely and drive to separate positions. The TwinCAT CNC software platform in use encompasses PLC, visualization, interpolating motion control and multi-axis positioning. “In the past, when Farley Laserlab used conventional CNC systems, we had three different CPUs for the PLC, motion control and HMI. In addition, the software of the individual CPUs was developed on different programming platforms, which meant that different engineers had to specialize in one and work together on the development of the overall software. With the Beckhoff control platform we have the entire machine controller with TwinCAT CNC on a single PC,” explains...
Changbo Gao, deputy chief electrical engineer responsible for the software development of the laser cutting machines for pipe perforation.

**TwinCAT CNC meets complex requirements**
The process requirements for the laser cutting machines for pipe perforation are very complex. The perforation of the filter pipes varies according to the geological conditions and the raw materials to be pumped. Certain applications require vertical, spiral or offset, round, rectangular or trapezoidal cut-outs. Sometimes the perforation must be smaller inside the pipe than at its surface and must be executed at a certain angle so that the oil can pass through better, but the sand less well. When cutting trapezoidal openings, the requirements for the control of the tilt axes are particularly strict, since maximum precision is demanded depending on the wall thickness and angle of inclination. “In addition, the motion control function library in TwinCAT NC PTP offers a convenient interface for changing, for example, parameters such as the tilt angle from within the PLC flexibly and at any time,” says Changbo Gao.

**Flexible parameter adaptations in software**
The prerequisite for high quality pipe perforation and efficient production is the flexible and simple adaptation of the parameters for the laser power, the precise focusing, the pulse frequency, the duty cycle, the feeding speed, the auxiliary gas pressure and the specification of the nozzle of the laser head. These factors are decisive for perforation cutting quality and the overall quality of the pipes. Different hole punching patterns can be stored, such as continuous hole punching or multi-stage hole punching. In addition, the gas pressure and the laser power must be continuously adapted via the motion control pattern of the Z-axis during the hole punching process. “This places high demands on the openness and flexibility of the control system, which TwinCAT CNC entirely fulfills,” explains Changbo Gao. “With the support of Lanli Wang, the technical engineer from Beckhoff China, we have developed various hole punching patterns for diverse areas of application.”

**Remote maintenance simplifies customer service**
Because the TwinCAT CNC platform is PC- and Windows-based, only the control PC need be connected locally to the Internet in order to implement comprehensive remote maintenance and diagnostics. This also simplifies adaptations and the downloading of programs. What’s more: since the entire software is executed on a single CPU, changes to the G-code, PLC program and HMI can be made remotely via the Internet.
Global Strategy Meeting 2014

In April, the worldwide ETG team got together for its 2014 Global Strategy Meeting in Garmisch-Partenkirchen, Germany. Besides employees from EtherCAT Technology Group (ETG) headquarters in Nuremberg, teams from offices in China, Japan, Korea and North America travelled to Germany to discuss the organization’s strategy for the future. Executive Director, Martin Rostan opened the event with a presentation covering the 10 year history of the ETG and EtherCAT. He also thanked the team members for their tireless and in most cases long-term commitment to the ETG: “Becoming the largest global fieldbus user organization with the most members within only ten years is only possible if you are backed by a strong international team.

Having people who are passionate about technology in general and EtherCAT in particular is what makes us so successful.”

The main topics of the meeting included the development and status of EtherCAT technology, the strategic direction of the EtherCAT Technology Group, and administrative matters for the 23 members who were present. Also on the agenda were joint activities and team-building exercises. “Understanding each other is extremely important for our everyday work,” explained Martin Rostan. “Talking openly with each other streamlines the communication within our organization and accounts for a significant part of the success of the EtherCAT Technology Group.”

EtherCAT Technology Group upgrades its website

Just in time for the 2014 Hannover Messe, the EtherCAT Technology Group (ETG) has given its website (www.ethercat.org) a facelift. The changes affect both the public areas as well as the pages that are only accessible by ETG members. Most of all, the updates make the organization’s homepage even more inviting and user-friendly than before.

The main reason for revising www.ethercat.org was to provide better service for members and interested parties by displaying the site’s content more clearly and in a more structured manner. “The duties of the ETG are very diverse and are continuously expanding. To keep providing the visitors of our website with a structured overview of its contents, we had to subject some areas to a general overhaul,” explains Oliver Fels from the Technology Marketing Department, who manages the website at the ETG and supervised the project.

The team enhanced the central search function as well as the download, event and product areas of the site. Thanks to newly added filters, visitors can now find content, documents and products from ETG members more quickly and easily. The area reserved for members features improvements in the developer forum and the knowledge-base. The latter was also updated with new content in order to provide more detailed and easy-to-find information about EtherCAT. One positive outcome of the overhaul is already apparent: “Compared to the previous version we see many more downloads than before,” says Oliver Fels. The website is an important part of the EtherCAT Technology Group’s activities. Besides providing a showcase for EtherCAT technology and the ETG itself, it serves as a current and continuously updated source of information on technical updates, official documents and current events. It also provides an ideal platform for ETG members to advertise their EtherCAT products and services at no cost.
Christoph Widmann, Managing Director of acontis technologies GmbH, is the new chairman of the EtherCAT Technology Group’s Marketing Committee. Widmann succeeds Michael Strauss of SEW-EURODRIVE GmbH & Co KG, who had to relinquish the position because of new duties at SEW.

At the ETG Marketing Committee’s first meeting of the year, Martin Rostan, Executive Director of the ETG, thanked Michael Strauss, who works as the resident expert in industrial communication in the Automation Support Department of SEW-EURODRIVE, for his long commitment and outstanding service to the Marketing Committee. Since 2005, Strauss had been chairman of the ETG working group that deals with all marketing-relevant aspects of the organization, such as the planning of national and international trade show exhibits and seminar series as well as the discussion of current technology issues and their importance for the global market.

Christoph Widmann, Managing Director of German technology provider acontis and an ETG member since 2004, was unanimously elected as the new chairman of the Marketing Committee by the members who were present. He explained his reasons for accepting his new position as follows: “EtherCAT is a global technology and its continued development will definitely pay off for acontis as a company. My position as chairman of the Marketing Committee gives me the opportunity to shape the worldwide marketing activities of the EtherCAT Technology Group while gaining valuable information about EtherCAT in a global economic context.”

ETG Marketing Committee has a new chairman

The www.ethercat.org website is a central information source and meeting place for members of the EtherCAT Technology Group.

ETG publishes Industrial Ethernet system comparison for 2014

The Industrial Ethernet system is the central component of an advanced automation and controls architecture. It is also critical for optimizing the cost and performance of machines and plants. Potential users should base the selection criteria for an industrial communication system on technical as well as strategic aspects. The comparison just published by the EtherCAT Technology Group (ETG) for the 2014 Hannover Messe is considered one of the most detailed and informative studies of its kind. It can be downloaded from the ETG’s website.

Further Information:
www.ethercat.org/download/
Renowned engine and performance electronics manufacturer Cosworth chooses EtherCAT-based test system

The British engineering company Cosworth is one of the world’s most successful independent engine manufacturers as well as one of the market leaders in performance electronics. Cosworth delivers high-performance technologies to a diverse range of industries by leveraging the capabilities the company established over many years spent in mechanical and electrical engineering. As one of the company’s most recent test applications demanded extremely high network performance, Cosworth turned to EtherCAT as a communication system because of the high speed, determinism, and openness it can deliver.

Founded in 1958 by Mike Costin and Keith Duckworth, Cosworth’s excellent reputation is built on outstanding performance, innovation, and successful collaboration. Over the course of 56 years, the company has become one of the world’s most successful independent engine manufacturers as well as one of the market leaders in performance electronics. Cosworth has a string of driver and manufacturer titles to its credit in a wide range of motorsports with impressive performances in Formula One, IndyCar, Champ Car, WRC, sportscars, and MotoGP.

The rationale for developing a flexible, compact, and ruggedized I/O module, which can be deployed in a number of test and operational applications in a variety of industries, followed the development of the devices deployed by a leading Formula One team in its wind tunnel models. According to Maximiliano Lotto, Program Manager, Wind Tunnel Instrumentation and Control at Cosworth:  “We have supplied wind tunnel measurement technology to this racing team for the past 10 years. Because the hardware being used by the team was slowly reaching its performance limits, we were commissioned to find a new solution that offered increased performance and new functionality. We had already discussed the development of Ethernet-enabled standalone modules with the motorsport racing team, but the lack of determinism in Ethernet meant that additional protocols would be required,” says Maximiliano Lotto. “This led us to consider a proprietary protocol, but as we did not want to limit the market potential of our final solution we asked the question, what would be the best option for real-time support and good synchronization between the different nodes in the network?”

“We researched all flavors of real-time Ethernet protocols and quickly realized that EtherCAT offered us everything we needed,” explains the wind tunnel equipment expert. “EtherCAT is open, uses Ethernet as a base, is real-time, deterministic, and provides an impressive synchronization mechanism with Distributed Clocks. Interestingly, the Formula One team had done its own research in parallel and had also decided that EtherCAT was the prime solution.”
The wind tunnel I/O system needed to be powerful enough to handle all the measurement data fed to it, while also being "race hardened". A primary design feature was also that the module needed to be compact as it would be used to get data from a 60 percent scale model of a Formula One car.

Cosworth worked with a leading IC supplier and deployed a chip with EtherCAT on board in order to create a module that offered 32 analog inputs and eight configurable excitation outputs, for use with sensors that measured position, temperature, and pressure alongside laser sensors and other position sensors. Indeed, as Maximiliano Lotto explains: "Anything with a ±10 V or ±5 V output can be connected."

"The unique selling points of this I/O module include its precision, its input density, and its flexibility in that true differential/single-ended inputs and programmable outputs can be configured using software," explains Maximiliano Lotto. "EtherCAT offers us everything we need; moreover, we discovered that this technology is widely disseminated and is already used by numerous manufacturers around the globe. Its openness and real-time capability together with the relatively low implementation costs mean that this technology is extremely interesting to us."

"The Formula One racing team will pioneer use of the first units and act as trailblazer," Maximiliano Lotto explains. Cosworth is also looking to commercialize the technology for other markets, such as in other motorsports, general automotive testing and marine applications — where its IP 67 protection rating will appeal. "Our module is essentially suitable for any market where better than 0.03 percent accuracy is required, coupled with robust construction and a compact design. The unit has been designed by the same specialists who develop race car equipment to be very rugged and 'race hardened' so we can be confident in its ability to operate reliably, even in extremely demanding applications," continues the Cosworth expert.

"We also have plans for a small family of specialized modules," Maximiliano Lotto concludes, "which will share the same form factor. A specialized scanner is also being developed for dynamic air pressure testing for aerodynamics. This device will measure 128 pressure points and will be used to measure all results and bring them into a measurement solution so designers can get an idea of the bigger picture."

Further Information:
www.cosworth.com
www.beckhoff.co.uk
Beckhoff also enjoyed a successful Interpack with a significantly increased number of visitors, because it is precisely the main topics at this year’s trade show – resource efficiency in machines, plants and the use of packaging means as well as flexibility for faster product cycles – that can be optimally implemented with PC-based control technology from Beckhoff. Apart from PC Control as an integrated solution, the wide range of I/O and the highly dynamic servo drive technology, interest was also focused on the two innovation factors – the multi-touch panels and the eXtended Transport System (XTS). They enable completely new, i.e. extremely flexible and efficient machine applications, which in addition are simply and intuitively operable.

Frank Würthner, Business Management Packaging, Beckhoff, is extremely satisfied with the way the trade show went: "The Interpack is one of the most important trade shows in the industry for Beckhoff and it is precisely at this leading trade show that it becomes apparent that we are perceived as an expert full-range supplier for the automation of packaging applications. In addition to that, end users are increasingly prescribing the use of PC-based control technology such as our PC Control. The reasons for this are the growing amounts of data, e.g. for the increasingly complex tracking and tracing, and the increasing demands placed on the speed of the control technology."

Interpack 2014

At Interpack, which ran from 8 to 14 May 2014, around 2,700 exhibitors presented themselves to a total of 175,000 visitors at the fully-booked Düsseldorf Exhibition Centre. The leading trade show for the packaging industry and the related process industry thus attracted 9,000 more interested parties than the previous event in 2011. With foreign visitors making up 66 % of the attendees, a record was also achieved with regard to the internationality.

Further Information:
www.beckhoff.com/interpack
Light + Building 2014

With 211,500 visitors from 161 countries, the leading international Light + Building 2014 trade fair achieved record figures. Between 30 March and 4 April, 2458 exhibitors presented new products for home and building automation under the mottos “Intelligent Sustainability” and “Smart Powered Building”.

At its 240 m² booth Beckhoff focused on solutions for optimising energy efficiency on the basis of integrated, software-based building control. Against the background of new regulations on “sustainability” and “energy saving”, Beckhoff visitors showed keen interest in these product innovations. Options for energy data logging and support for standard protocols in building automation such as BACnet played a key role. With the CX9020 and CX5xxx embedded PC platforms, which are certified according to the latest BACnet Revision 12, Beckhoff is well positioned to enable sustainable operation of buildings of all types, including industrial buildings.

With “TwinCAT Building Automation”, Beckhoff presented at Light + Building 2014 the new TwinCAT supplement that substantially reduces engineering times and integrates all key components of a modern building automation system. Comprehensive software libraries and supplements extend the concept of the modular range of automation components to the software level.

The Beckhoff product portfolio offers an outstanding degree of flexibility and comprehensive support of subsystems such as SMI, M-Bus, EnOcean and more. Georg Schemmann, Business Manager Building Automation, was pleased: “Light + Building is an important trade show for us and our solution partners, where Beckhoff presents new products for building automation and networks with our different customer groups. In addition, we were able to strengthen our contacts with planners and end customers from the automotive industry and operators of large facilities. Topics included new buildings and also refurbishments.”

Prolight + Sound 2014

At Prolight + Sound, which took place from 10 to 13 of April in Frankfurt a. M. in Germany, Beckhoff presented its PC and EtherCAT-based solutions for stage and show technology applications. Using the open, scalable and modular automation technology virtually all systems can be controlled: ranging from theater technology and special effects in stage shows and theme parks to complete lighting and building automation systems.
Automatica 2014

With 731 exhibitors and a total of 34,500 visitors from Germany and abroad this year’s Automatica, which took place from 3 to 6 June 2014 at the Munich Exhibition Centre in Germany registered considerable growth in numbers compared to previous years.

“We also enjoyed a very successful Automatica show,” explains Stefan Lorenz, Head of Sales South Bavaria at Beckhoff. “The visitors readily recognize the advantages that our highly integrated PC and EtherCAT-based control and drive technology solution has to offer. All the more so since now the mid-size enterprises in the manufacturing industry are increasingly discovering small-scale robotics, and PC control is ideally suited to the integrated automation of so-called production cells.”

“Especially with regard to the two key themes of the fair – ‘Integrated Assembly Solutions’ and ‘Man-Machine Co-operation’, the benefits of our PC-based control and drive technology were obvious,” Dr. Josef Papenfort points out, Product Manager TwinCAT at Beckhoff. “PC-based control with EtherCAT communication is certainly one of the cornerstones for robotics and assembly technology applications. With Safety over EtherCAT, safety functions are integrated right into the robotics, which is indispensable not least in the interests of occupational safety. The seamless integration of control technology with robotics, for example via the extensive TwinCAT kinematics library or the new mxAutomation Interface to the KUKA robot controller, immensely facilitates the implementation of Integrated Assembly Solutions. In addition to that, TwinCAT 3 provides a complete Visual Studio® engineering environment.”

Further Information:
www.beckhoff.com/automatica

Sensor + Test 2014

8,000 trade visitors from Germany and abroad gathered information on the state of the art in sensor and measuring and testing technology at Sensor + Test 2014, which took place from 3 to 5 June in Nuremberg. There was a slight increase in the numbers of both visitors and exhibitors. Pascal Dresselhaus, Product Manager TwinCAT at Beckhoff, gives the trade show a very positive assessment:

“The feedback from the trade show visitors showed that our TwinCAT 3 automation software serves the needs of testing and measurement technicians in an outstanding way. The integration of MATLAB®/Simulink® in particular has been very well received. Database connectivity for the storage of measured data and the integration of charting tools into the engineering environment are further key benefits of the overall system.”

Further Information:
www.beckhoff.com/sensor-test
Trade shows and events 2014

Belgium
Indumation Network Event
September 18, 2014
Leuven
Hall Brabanthal, Booth RED-12
www.indumation.be/networkevent

Denmark
Automatik
September 09 – 11, 2014
Bröndby
www.automatik2014.dk

FoodTech
October 28 – 30, 2014
Herning
Hall L, Booth 9250
www.foodtech.dk

Finland
Suomen Asuntomessut
July 11 – August 10, 2014
Jyväskylä
www.asuntomessut.fi

Tekniikka
September 03 – 05, 2014
Jyväskylä
Hall D, Booth D206
www.teknikamessut.fi

Prosessiteollisuus
October 08 – 09, 2014
Helsinki
Hall C, Booth C39
www.easyfairs.com

Norway
ONS
August 25 – 28, 2014
Stavanger
Hall M, Booth M-1222
www.ons.no

Russia
Hi-Tech Building
October 29 – 31, 2014
Moscow
Hall 2-2, Booth 2-122
www.hthb.ru

Sweden
Trä & Teknik
September 02 – 05, 2014
Gotenburg
www.svenskamassan.se/sites/tra-teknik/
Scanautomatic
October 07 – 09, 2014
Gotenburg
www.scanautomatic.se

Switzerland
Sindex
September 02 – 04, 2014
Bern
Hall 2.0, Booth D04
www.sindex.ch

Turkey
Eurasia Packaging Istanbul
September 18 – 21, 2014
Istanbul
www.packagingfair.com

Africa
South Africa
The Control Roadshow Port Elizabeth
August 21, 2014
Port Elizabeth
www.whatssnewinprocessing.co.za
Electra Mining Africa
September 15 – 19, 2014
Johannesburg
Hall 7, Booth 811
www.electramining.co.za

North America
Canada
ATX Montreal
November 19 – 20, 2014
Montreal
Booth 1415
www.atxmontreal.com

USA
Semicon West
July 08 – 10, 2014
San Francisco
Hall South, Booth 2410
www.semiconwest.org

Industrial Automation North America
September 08 – 13, 2014
Chicago
Hall East, Booth 4905
www.imts.com/iana

Pack Expo
November 02 – 05, 2014
Chicago
Hall North, Booth 4740
www.packexpo.com

Fabtech
November 11 – 13, 2014
Atlanta
Hall B, Booth 2151
www.fabtechexpo.com

For additional information on our worldwide subsidiaries’ and partner companies’ trade show schedules please check:
www.beckhoff.com/trade_shows