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Production data for even more productivity

From the Internet of Things to the Internet of Services – Beckhoff will present solutions at the SPS IPC Drives trade show in Nuremberg, Germany, that underline the increasing convergence of Internet, IT and automation technologies, representing an important foundation for IoT and Industry 4.0 projects. Ronald Heinze, Chief Editor of Open Automation magazine, interviewed Managing Director, Hans Beckhoff in the run-up to the major international trade show.

"Without automation, further improvement in living standards around the world becomes hard to imagine and even more difficult to actually achieve," states Hans Beckhoff. Automation technology deals with automated production, process control in power generation, and with water supply, among other important infrastructure for civilization. "Automation technology affects many areas of human life," he further explains. "Any increase in well-being in societies is closely related to industrial productivity gains." This dynamic provides compelling reasons to undertake constructive technology assessments – from both positive and negative standpoints. "Particularly due to the fact that automation technology stimulates progress, it requires serious self-analysis," emphasizes the entrepreneur.

As an example from the field, he mentions Nobilia, the world's largest kitchen manufacturer, where Beckhoff technology plays a key role in advanced production methodologies. The number of production stages per custom kitchen was reduced significantly, despite the fact that manufacturing in batch size 1 has been around for years through the integration of Industry 4.0 concepts. However, increased productivity highlights only one benefit of automation. Many modern products could not be produced at all without the aid of advanced control technology, due to their nearly endless variety of dimensions and formats, or due to stringent precision and quality requirements.

Through the open, fully-integrated product range based on PC-based control technology, Beckhoff benefits tremendously from this development. For 2015, Hans Beckhoff once again expects a revenue growth percentage well into the double-digit range. This should enable the leading automation company from Germany's Eastern Westphalia region to approach the turnover threshold of 600 million euros or even exceed it – another milestone achieved after a highly successful financial year in 2014. "The Asian region is a significant factor in this dramatic growth," notes Beckhoff. "Southern Europe and North America are also developing at an impressive rate."

For next year, the Company Director expects these positive growth trends to continue based on a healthy influx of orders. Even though the overall global economic situation can be volatile, the company will continue major strategic investments into technology research and development. Beckhoff is very optimistic about the market for automation technology overall, asserting that any temporary decline due to any unforeseen crises will be overcome quickly, and the positive overall development will resume. "Growth will, and indeed has to, return," says Hans Beckhoff reassuringly. In order to prepare the company for future growth and development, the central Beckhoff headquarters building in Verl, Germany will be expanded by a further 27,000 m² in 2016 to accommodate additional warehouse and production space. "On the production side, this will prepare us with the infrastructure needed for two further years of growth," the Managing Director states decisively.

Data-based applications for even greater progress

Data-based applications create new opportunities for society to progress. In the B2C sector, this can go as far as transforming lives. "Whole professions can change for the better and new ones can rise up," says Hans Beckhoff. "Cloud databases make this possible, and many new applications will emerge as a result. One example outside the realm of automation is cloud-based diagnostics in the medical industry."

Further significant growth is also expected in the manufacturing sector. "Automation has always been the driver for productivity improvements," says the Managing Director. "With Industry 4.0, this trend is accelerating further." Batch size 1 manufacturing is becoming increasingly common in many applications, both in mass production and in smaller, decentralized production facilities. "PC-based control has been established as the ideal platform for both production models," says Hans Beckhoff. The use of highly-connected systems and devices will continue to grow and on the production side, new business models will emerge to better access and capitalize on the additional production data.

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Today's major industry trends such as batch size 1 manufacturing and 3D printing, as well as new business models for Industry 4.0, require data-intensive automation. The question is: How will the large volume of data be managed? At the upcoming SPS IPC Drives 2015 trade show, Beckhoff will present its new TwinCAT Analytics technology as the answer. "This exciting new technology enables TwinCAT 3 automation software to store process data in a cycle-synchronous manner and record it in a standardized data model. This is a true Industry 4.0 technology that is beneficial for all industries," the Managing Director underlines. The data can be stored locally, such as on a server or externally in a secure cloud database. "The result is a full 'transcript' of the process image and the production data," Hans Beckhoff explains enthusiastically. "This is similar to a data recorder, where all data is logged and serves as the basis for a wide range of useful analytical functions."

Analyses can be performed easily for service tasks. For the purpose of optimization, the cycle times and/or the energy consumption of each individual module can be analyzed, as one example. The duty cycle of pump motors or the number of switching cycles of solenoid valves provide a means to perform diagnostics for predictive maintenance. "Operating hour counters provide important information for condition monitoring," confirms Hans Beckhoff, the physicist. "In conjunction with TwinCAT Analytics, we will present new functionalities in TwinCAT Scope, initially for cycle time analysis."

The machine "transcript" can, for example, be used to analyze malfunctions that may have occurred during the night, without the need for new measurements. "The recorded production data with corresponding context data is ideally suited to such analysis," he says, reassuringly. Error messages are stored and process variations can be precisely traced. In the context of batch size 1, TwinCAT Analytics enables complete documentation for each individual workpiece. TwinCAT Analytics also enables the compacting of cyclically logged data.

"After gathering detailed feedback in consultation with our customers, we intend to open up our data stores for other software manufacturers, with the intent to implement new business models," continues Hans Beckhoff. OPC UA lends itself well as a vertical data transport route, as the data can be transferred easily into the cloud in just a few steps. "In this way, an online CMS can be realized as a cloud service and as a part of TwinCAT Analytics."

Controllers and services directly communicate with each other

Another new highlight from Beckhoff at SPS IPC Drives also relates to provisions for data in IoT and Industry 4.0 applications. "With new TwinCAT IoT Communication, we present an easy-to-use software library for IoT applications," reports Hans Beckhoff. The library supports widely-used protocols for cloud communication, including AMQP and MQTT for push messages to smart devices. "By fully-leveraging these standard protocols, each industrial controller can communicate with cloud-based services," says Hans Beckhoff. One service may deliver alarm and status messages to smartwatches, for example. The software is quick and easy to configure and, together with an Embedded PC as the IoT controller, TwinCAT IoT enables seamless connection between the Internet of Things and the Internet of Services.

Both software products are new examples of the convergence of information and automation technology. "Our convergence effort started as early as 1985 with the beginnings of PC Control," says the Managing Director. "This has continued consistently, right up to the introduction of TwinCAT 3 with Visual Studio® integrated and the newest products to use production data for IoT and Industry 4.0, which will be presented at this year's SPS IPC Drives." At Beckhoff, new product innovations quite often emerge from technological observations of IT trends, in some cases even from studying consumer products such as data glasses for use as a wearable HMI. "After all, Google has even announced an industrial version of the data glasses," Beckhoff continues.

From a historical perspective on IT trends, first there was the Internet, followed by all the innovative ideas about what to do with it. Similarly, for data mining,

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Hans Beckhoff expects the emergence of many other good ideas that answer how to utilize stored production data, noting that machine controllers will provide the corresponding information.

Despite this increasing convergence, the future marketplace will still offer enough added value for suppliers of automation technology, according to Hans Beckhoff, because they have significant expertise in the underlying technologies. These include control of sensor and actuator signals, production of intelligent CPUs in compact, industry-compliant designs, the creation of software for controlling motion sequences, measurement technology and much more.

High-performance web-based user interfaces

An important prerequisite for highly flexible manufacturing is a high-performance process visualization that provides users with an overview of production, anywhere and at any time. In order to save engineering time and avoid multiple data entries, control and visualization are "cast into one piece" today.

With the new TwinCAT HMI solution, Beckhoff now presents its own HMI software system, based on pure web development technology via HTML5 and JavaScript – yet another example of the increasing convergence of automation technology with IT. "TwinCAT HMI has a high-performance, yet basic structure that utilizes state-of-the-art technologies. It is completely modular and is quick and easy to configure," emphasizes Hans Beckhoff. "The platform-independent system offers multi-client, multi-runtime and server capability." Any device with an integrated web browser can be used as a display for the HMI system, which offers many exciting new possibilities. "The application framework makes it easy to map the machine logic," he further adds. "Source code management is included as a standard feature."

Based on the "What-You-See-Is-What-You-Get" (WYSIWYG) programming philosophy, users can assemble pages intuitively. In other words, a document is displayed on the monitor during editing exactly as it appears when it is output on another device. It is also possible to incorporate cameras and related devices. Additionally, software specialists can write their own programs in high-level languages and integrate them in TwinCAT HMI. Seamless connectivity is ensured through a wide range of common or industry-specific protocols, including OPC UA, TwinCAT ADS or BACnet. As the software is further expanded, TwinCAT HMI is certain to become one of the main product lines from Beckhoff.

Many new products for SPS IPC Drives

In addition, Beckhoff will present a wide range of new products at SPS IPC Drives that further expand the already extensive automation technology portfolio. One of the new products is a motherboard for a new, entry-level compact IPC class. The new board will become the centerpiece of control cabinet PCs and 7-inch "built-in" Control Panels. In the area of drive technology, a new Beckhoff Motion Designer engineering tool will be presented as a technology demonstration, which now also maps part of the mechanical design process. "Our new Motion Designer significantly simplifies drive technology system design," adds the Managing Director.

"For the XTS linear transport system, we will present a quadruple kinematic system, which enables three-axis motion in Cartesian space," continues the business owner. Integrated in TwinCAT NC with G code, it is possible to realize three-dimensional movements. As an example he mentions the "flying" three-dimensional material handling robot, which offers many benefits compared with the likes of stationary pick & place applications.

"This year, we will present an exceptionally large number of new products," Hans Beckhoff concludes. "We therefore look forward to a trade show with many thought-provoking discussions with our customers." As a result, further productivity advances and innovations for all involved are guaranteed.

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