"Social automation" for Industry 4.0

The concept of Industry 4.0 requires close interaction between IT systems and automation technology – something that Beckhoff has focused on for 30 years. In this interview, Managing Director Hans Beckhoff gives a business update and tells Open Automation Editor-in-chief Ronald Heinze about how Industry 4.0 is already being implemented and how the underlying principles can lead to concepts of the future such as "social automation".

"We are quite pleased with the business results of 2013 thus far and overall turnover will most likely grow by 5 to 10 percent," says Hans Beckhoff, Managing Director of Beckhoff Automation, putting the revenue target for the year around 440 million euros. In the previous year, the company had suffered some sales declines caused by macroeconomic slumps in the solar and wind energy industries. The Managing Director views the results of the past two years also as a "return to normal" after several years of above-average growth. After all, Beckhoff has experienced an average annual growth rate of 16 percent since 2000.

Much of the current growth comes from the export side of the business: "China in particular stands out with increases between 15 and 20 percent," says Hans Beckhoff. Other countries with above-average growth include Turkey and a few European countries such as Austria and Finland.

Beckhoff views the global economic situation as very stable, with a tendency towards moderate growth. "Next year we will aim for double-digit growth again," says the entrepreneur. He is also optimistic as far as overall business development is concerned: "Automation is a cross-functional technology used in almost all areas. Not just in machine-building and systems engineering, but also in areas such as building automation, medical technology and the entertainment industry. Wherever you see economic growth, automation plays a critical part." For the automation industry, this means successful companies must recognize new trends early and identify growth areas in terms of technology and geography alike. "At this time, the US economy is growing again, and the southern European countries have bottomed out and will soon join their northern European neighbors on the path towards renewed growth," says Hans Beckhoff.

Accordingly, Beckhoff is continuing its international expansion. The company is currently setting up offices in Saudi Arabia and Egypt. However, expanding the existing Beckhoff network is just as important, says the Managing Director, particularly in important markets like Southeast Asia and China. Hans Beckhoff is convinced: "There are also excellent growth opportunities in our traditional markets like Germany, Europe and the US. PC-Control has been proven as a powerful control philosophy and is the obvious and attractive technological platform for "Smart Factories" and "Smart Control", which are part of the Industry 4.0 concept.

The demand for high-performance automation systems has spread all over the globe. "Companies that lead technologically all over the world are interested in our entire portfolio of solutions which is based on PC-Control and EtherCAT," continues Hans Beckhoff. "The technology divide we saw in the past has essentially disappeared."

Automation helps solve sociopolitical problems

"Automation is the answer to numerous great challenges facing mankind around the world," Hans Beckhoff says about the sociopolitical aspects confronting his company. As the Earth's population increases from 7 billion people in 2010 to approximately 8.3 billion people in 2030, "we forecast that prosperity will grow threefold by 2030, which translates to three times the demand for goods. This requires that products be made using less energy and with fewer natural resources. To master this kind of challenge, you need great ideas." Beckhoff believes that this development provides the business and science communities with great opportunities to both participate and profit: "Our automation technology is called upon to create great solutions, and this technology is up to the task."

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The concept of Industry 4.0 resulted from the search for general development trends in implementing these giant tasks. "The German federal government, under the leadership of Chancellor Angela Merkel, has been working together with Acatech, the German National Academy of Science and Engineering, in recognizing the potential advances that could result from the continued development of our production technologies," explains Hans Beckhoff. After some initial doubts about whether the term "Industry 4.0" is merely "old wine in new bottles," Beckhoff considers Industry 4.0 to be a "good umbrella term

and a handy keyword for some basic trends in automation and manufacturing technology as well as information, communication and Internet technologies." He believes that optimizing the interaction between all these technologies will lead to a new level of quality and result in higher levels of productivity and efficiency in manufacturing.

According to Hans Beckhoff, the basic technologies required for Industry 4.0 include automation technology along with the required sensors and actuators, information technology with its networking, server and database technologies ("Big Data"), as well as Internet technologies with web-based communication and web-based services such as cloud computing. "The Industry 4.0 initiative encourages us to analyze each aspect of automation for new innovations," the visionary continues. "Every engineer and scientist is called upon to take part in this effort with his or her concepts." Beckhoff is also analyzing how new concepts can be created in the context of Industry 4.0: "We reconsider all production and associated automation aspects and their potential for Industry 4.0. As a matter of fact, our PC-based control technology provides the perfect toolbox to truly implement Industry 4.0. Virtually all of our control systems enable network and web connectivity while using Windows as their operating system." As a result, today's users don't think twice about integrating Beckhoff controllers into their production network, linking them to databases, performing remote maintenance over the Internet and, if desired, even request services via the cloud.

Maximum flexibility and deep integration into existing IT architectures are standard features that users of the open PC-Control platform from Beckhoff have enjoyed since 1986, the year in which we delivered our first PC-based controller," says Hans Beckhoff. "The capabilities described in Industry 4.0 have been part of our control philosophy from the start. In other words, we have 'lived' Industry 4.0 from day one. Many functions and services are already available and more will follow."

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Long-term stability and scalability

PC-Control has another important benefit: "Since both hardware and software are durable and reliable technologies, system operators enjoy lower life cycle costs," states Hans Beckhoff. Yet another benefit: besides being long-lived, the ability of IPC technology to handle high computing requirements and storage capacities makes it suitable for analyzing the large data volume captured by condition monitoring components or for signaling critical data to higher-level monitoring systems. This data can then be used to analyze machine condition, for example. "This is where traditional PLCs quickly encounter their limits, because they do not provide sufficient processing capacity for such tasks, which are not directly control-related, but more future-oriented," explains Hans Beckhoff.

In addition to performance and stability, the PC-Control architecture features exceptional scalability with regard to Bus Terminals, software and CPUs, which Beckhoff considers to be "one of the great strengths of the Beckhoff system architecture for everything from very small applications to the largest systems." The uniform system architecture covers all aspects of automation.

The same applies to hardware, for example, the IP 20-rated I/O modules: "We are proud that Beckhoff introduced the electronic bus terminal device category together with Wago at the 1995 Hannover Fair," recounts Hans Beckhoff. "This development surprised visitors, competitors and the entire industry at the time. The ground-breaking solution was widely accepted, used – and ultimately copied. Needless to say, we kept improving our Bus Terminals over the years. For example, for 10 years we have built our E-Series bus terminals, which use EtherCAT as the internal as well as higher-level bus and, as a result, can implement the fastest, deterministic response times. "Since EtherCAT Terminals don't require an additional sub-bus, the resulting system architecture is very powerful," says the Managing Partner. Beckhoff Bus Terminals feature "the widest selection of signal types, integrated measurement technology functions to support the Scientific Automation concept, as well as the eXtreme Fast Control (XFC) architecture. "From the 400 available signal types, machine builders can select the 10 to 15 that are usually needed for each application and cover all requirements perfectly," adds Beckhoff. The Bus Terminal series also has solutions with integrated drive technology functions. Hans Beckhoff is convinced that "Bus Terminals will continue to be a core component of the automation architecture for many years, if not decades, to come. Also, we will keep advancing this architecture in a strategic and systematic manner."

EtherCAT represents another successful core element of the Beckhoff system architecture: "We are proud that with EtherCAT we introduced a network technology 10 years ago that makes automation easier, more powerful and, last but not least, more affordable," says Hans Beckhoff. "EtherCAT has become a global standard that serves in many companies and industries as the foundation for their respective system architectures. Over 2,500 companies support EtherCAT today!"

Customer benefits + new developments = innovations

"Listening to your customers and understanding them is critically important," says the General Manager. "As an industrial equipment manufacturer, it is also our duty to keep an eye on general technology trends in general and understand them, and, of course, to use a good amount of creative thinking in the process. The next requirement involves development expertise. 'Total customer orientation' by itself is not enough. It is the mix of potential customer benefits and new technologies that leads to fresh ideas and innovations that generate evolutionary and sometimes even revolutionary progress," Hans Beckhoff summarizes. "We sell hardware and software in the form of products, but the things we actually deliver to our customers are creativity and trust." All of this works only in close cooperation with machine manufacturers and end users, says Beckhoff. "As a platform supplier we carry a responsibility that we take very seriously," he adds. Using the same approach, the company currently assesses all aspects

of Industry 4.0 in collaboration with customers, generating new ideas that the parties implement together.

Whether centralized or decentralized automation concepts are being used as a result depends on the particular application. According to Hans Beckhoff, individual machines operate more effectively if they are controlled centrally, which is why there will be no major changes in the automation architecture of the machines themselves. "The debate about whether 'centralized or decentralized' is better is at least as old as our company," recalls Hans Beckhoff. There is no clear answer. "Processing machines are more likely run with central automation concepts, while segmented, but cooperating assembly lines are more likely run with decentralized solutions." For both options the physicist sees parallels in nature, which he divides into two levels: "Among mammals, which include humans, biological evolution has selected a mostly centralized control architecture as effective and viable. On the other hand, humans live together as individuals based on social rules, which is more akin to a decentralized architecture." Hans Beckhoff is convinced that Industry 4.0 will mostly affect the area of social structures, i.e. the upper part of the automation pyramid: "The machine sends information upward and in return gains benefits from this in the form of services." This development will have little impact on the machine's traditional automation structure, however, in his opinion.

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New services for "social automation"

"As an Internet-capable communication platform, our TwinCAT automation software is completely ready for Industry 4.0," says Hans Beckhoff. The company also plans to add standardized interfaces to Industry 4.0 services in the future. Particularly, the definition of new automation services will provide opportunities for further developments, Beckhoff believes. After all, why shouldn't there be a Facebook for machine automation? What useful features can be implemented in this context? Hans Beckhoff finds it exciting to contemplate such concepts, which is why he coined the term social automation in the style of social media.

"PC-Control provides the ideal basis for such an approach, because it can enable machines with interfaces to cloud-based services," explains Hans Beckhoff. With such an interface, the machine would deliver data "upward" for analysis, which would in turn generate new benefits. As examples he mentions the traffic services provided by Google and Tom-Tom, which use mobile phone density to predict traffic jams more accurately. For automation, such new services could generate a new quality of knowledge, which could then be used to enhance the flexibility and efficiency of production processes and to support Industry 4.0 concepts more actively. Without a doubt, automation will continue to evolve in ways that mirror other technologies of our time – such as social media – and change life as we know it for the better.

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