



Hans Beckhoff in an interview with Christian Vilsbeck of A&D

“Trust reduces complexity”

Beckhoff is well-known in the world of automation for PC-based control systems, EtherCAT and other sophisticated technologies. Talking with Christian Vilsbeck, editor-in-chief of automation magazine A&D, Hans Beckhoff reveals why he wasn't taken seriously at first, why not every component has to be intelligent, and why digitization without a human touch will fail.

A&D: Your passion as a graduate physicist was the subject of nuclear physics. What brought you to automation?

Hans Beckhoff: I studied physics with a Faustian drive because I wanted to learn what holds the world together at its very core. The other side of my character was shaped by growing up in the family of an electrician. At the end of my studies, I had both a scientific research background with nuclear physics as well as practical training from home. Physics and electrical installation are actually not too far apart. It is often exciting how much technology you can work into automation and how scientific approaches frequently lead to success in the industry.

You started introducing PC-based controllers very early on. Were you convinced at the time that this technology would succeed?

Hans Beckhoff: I founded my company in 1980, at that time offering microprocessor-based position controllers for machines. Then a great variety of interface and I/O cards were added to our product offering until we ultimately connected a PC with a hard disk for data storage via a fairly slow interface. That was the moment we realized that this approach to a control system was wrong – we needed to use the PC itself as the machine controller. We removed our complete software from the motion controller and implemented it on the PC under Microsoft DOS. Amazingly, when judged against popular opinion at the time, it worked very well – and this was the birth of PC-based control technology. Following that, however, we realized the risk that we could possibly lose our previous business base because a disruptive change was taking place, in a manner of speaking. That gave us a big scare, because we knew that if we came to that conclusion, others certainly would too. For quite a while we considered whether to choose a different solution. Ultimately, we took the path that led us

to the forefront of the PC-based control movement – and time has shown us that it was the right decision.

Apart from PCs, you were already using optical fiber networking in the 1980s. Were you perhaps too visionary and technology-driven at that time?

Hans Beckhoff: If we'd done the same as other big automation companies and just labelled those solutions as "Beckhoff", no one would have had any reason to buy from us – buyers tend to stick with the original. Since we distinguished ourselves very strongly in technological terms from the outset, we perhaps alienated 80 percent of this big, entrenched market – so much so that most didn't take us seriously. From the remaining 20 percent, however, we gained a great many innovative customers. We developed, tested and successfully delivered numerous revolutionary technologies together with these small and mid-sized customer companies.

How about your current business models – have they changed due to Industrie 4.0?

Hans Beckhoff: At present, companies in every single segment of industry need to look very carefully to see whether they are affected by this, what new business models may apply to them and if realignments in the company are necessary. We have been practising Industrie 4.0 and digitization for many years without thinking of it under these terms. As a manufacturer of PC-based automation technology, we are naturally in a leading position because the benefits of our solution are now penetrating even further into the industry's consciousness. As the communication bandwidth into the cloud increases, this also naturally opens up new business opportunities and also functional possi-

bilities. We are monitoring that carefully and are working to put our customers in a position to make best use of this technology at an early stage.

Beckhoff is very much technology-driven, but software is becoming increasingly important, especially due to digitization. Is your focus shifting accordingly?

Hans Beckhoff: We've also been a software company for a very long time. Software is a core component of our products at every level. Moreover, there's still a great deal of potential for innovation in the hardware. So we have aligned our business strategies with all product lines; in other words, we want to be the leading specialists for IPCs, I/O, drive technology and software for our customers. We are always on the right track if we master technology well, deliver high-quality products and, in addition, guarantee innovation and exceptional value. Hardware and software are foundational technologies – and we develop both of them intensively. As a technology provider, it is our duty to develop our own ideas that positively surprise our customers, so to speak – and we succeed in doing so regularly.

Modularity and flexibility in system design are important topics for machine builders. What solutions and advice do you have here?

Hans Beckhoff: A great many! It starts with our new standard, EtherCAT P. This combines EtherCAT communication with integrated power on a 24, 400 and 600 Volt basis, enabling the connection of machine modules with a single plug connector that integrates communication, power supply and safety functionality. Of course we also offer many small controllers that cost only a few hundred euros and have both a Microsoft operating system and Ethernet onboard. These are perfectly suited for communicating from one cell to the next. However, we also analyze our customers' machine types to learn what is better – centralized or decentralized control. There are organizational, manufacturing and economic reasons why one would want to provide machine components with integrated intelligence. However, there are also functional aspects. If you can picture a machine that must control a large number of motion sequences in

“We manufacture the motherboards for our controllers ourselves. That means we offer not only long-term availability for up to 10 years, but also special adaptations for customers on request.”

Hans Beckhoff

correlation, we always recommend entirely central approaches. The actuators, sensors and drives should be as “stupid” as possible – the intelligence needs to be in the central processing platform. Only then do these elements remain easily exchangeable for the machine manufacturer, independent of any specific functions.

Central intelligence naturally needs computing power. But aren't your new DIN rail-mounted PCs with 12-core Intel® Xeon® processors over-dimensioned?

Hans Beckhoff: Many-core architectures and automation technology go together very well! The machine becomes much more powerful because multiple processes can operate in parallel by nature. “More powerful” also means that we can have the machine run with shorter cycle times. With one of our controllers, we are currently in the midst of a transition from a cycle time of two or five milliseconds to 100 to 200 microseconds. We need significant computing power for this acceleration, however. Wherever control takes place, the machine runs more smoothly and generates fewer overshoots if cycle times are reduced. The throughput increases due to a cycle time reduction of two to five percent. These are enormous benefits. Or just consider advanced algorithms, integrated image processing and measurement technology – there are many possible applications where high processor performance is advantageous.

On the other hand, would you also see a Raspberry Pi as a viable alternative for inexpensive PC Control?

Hans Beckhoff: If you were to pack a Raspberry Pi into a robust housing with a proper power supply unit and industrial interfaces, while guaranteeing EMC immunity, then it would cost just as much as our ARM processor-based standard products. That said, we find the Raspberry Pi software environment exciting. For quite a while now, we've been discussing whether to bring a Raspberry Pi variant onto the market that combines this ecosystem with our products. The decision ultimately depends on whether we can identify enough specific customer benefits.

Your company also focuses strongly on integration of measurement technology into PC Control solutions. Do you see the advantage of simplified communication here?

Hans Beckhoff: Absolutely! The control system knows the timing of the machine and can record correlated measured data. With external measurement devices, you first have to establish correlation via synchronization signals. In EtherCAT, we have a communication bus at our disposal that is ideally suited to measurement technology and can push input data into the memory of the PC in real-time. Additionally, we've added measurement technology properties to our TwinCAT software that make it possible to measure the machine itself and/or the workpiece. Both run better when they are integrated into the control platform when compared with separate measurement technology devices.

Extracting added value from all the measured data from machines poses problems for many machine builders and industrial enterprises. You have tools such as TwinCAT Analytics software, but how much consulting is involved in the digitization business?

Hans Beckhoff: In particular, we believe that automation and digitization are rather complex topics, and we are committed to providing consulting services. That's why we've expanded our sales network in Germany with field offices every 150 km. Ultimately, our business is a human affair because the customer's automation engineers and ours have to understand each other well. They must tackle complex tasks and problems together, which means sticking together through thick and thin. Thus, an integral part of our offering to the customer is that we not only supply the software and hardware, but also the intensive support that goes with it.



“The throughput of a machine can be increased by two to five percent simply by reducing the cycle time through the use of powerful PC-based control.”

Hans Beckhoff

The cloud very quickly comes into play when considering the analysis of data. Which solution do you favor here?

Hans Beckhoff: As far as technology, services and worldwide data centers are concerned, the big infrastructure providers Microsoft and Amazon – and in special areas SAP and IBM – are clearly ahead of the automation providers. That’s why there are more and more third-party applications that run in these ecosystems. At an early stage, and as one of the first automation companies to do so, we prepared our control technology for data exchange with the large cloud providers in order to optimally integrate their deep learning services and cloud storage resources. Our customers can thus use the best cloud solutions on the market “at the click of a mouse”.

Let’s move from the cloud back to your beginnings.

You originally had 30 employees and now there are more than 3000. Has your management style changed from then to now?

Hans Beckhoff: I perceived it to be a harmonious, progressive development – nothing really disruptive. We’re still a technology-driven company. In the creation of this technology I value employees who are very original, and who are not only masters in the state of the art, but also develop ideas of their own. Everyone can do some thinking “outside the box” and have fun; every idea is discussed democratically and no one is made to feel a fool of themselves. However, that is followed by a leadership decision as to whether we follow up on an idea or not.

From that point of view, not much has changed. The principle of “trust reduces complexity” still applies. If you trust people, they’re much easier to work with and you can expand much faster on a global scale. In my experience this trust almost never leads to disappointment. However, you have to be prepared to take risks and occasionally bounce back from an unexpected setback.

Will Beckhoff soon surprise us again with a technical revolution as a result of this “blue-sky thinking”?

Hans Beckhoff: Yes, of course! But I’m not about to say what that is just yet.

What distinguishes Beckhoff from other full-service automation providers?

Hans Beckhoff: Despite all our focus on state of the art technology, we are and remain a very human, down-to-earth company. Our customers feel that too when they get to know our employees. Not only that, we are regarded as a very reliable company in particular because we assign such great importance to human trust and have proven our ability to deliver this in the long term. One decisive point is also our technological drive: we will continue improving automation technology and offer customers new and even revolutionary strategies for machine automation. I believe that’s what we stand for, and it’s what absolutely distinguishes us from other mid-size enterprises and large companies, because they are sometimes less open to change.