

PC Control for woodworking machines

From dynamic Drive Technology to complete solutions for the wood industry

Over two decades of experience, Beckhoff has established profound know-how in the woodworking industry. Every step in the woodworking process can be regulated via the open PC-based control platform from Beckhoff. Functions such as “flying saw,” “cam plate” and CNC as well as industry-specific solutions such as “linear path control” and “drill optimization” are either integrated into TwinCAT control software or are available as additional software modules. In the run up to the Ligna Hanover 2009, the global trade fair for the woodworking industry, PC Control spoke to Stefan Sieber, Sales Associate at Beckhoff headquarters in Verl and Industry Manager for woodworking machines, about market opportunities, XFC and new products.

Mr. Sieber, Beckhoff established a foothold in the woodworking industry as far back as 1985. What was the reason for that?

From a historical point of view, the woodworking industry was the second industry – following mechanical engineering for window profile machining – in which Beckhoff was able to successfully make a breakthrough with PC Control. Naturally, this has something to do with the fact that the woodworking and furniture industries are very strong in the region of eastern Westphalia, where the head office of Beckhoff is located.

For which woodworking processes are Beckhoff products used?

Our primary target group is the mechanical engineering companies that manufacture plants for the woodworking and furniture industries. A large number of them are located in the traditional mechanical engineering countries such as Germany and Italy, as well as in the surrounding European countries of Austria, Switzerland, Northern Spain, France and Scandinavia. Our control technology has a very strong presence in the areas that are connected to the manufacturing of chipboard. These areas include wherever boards are transformed into furniture and even one production step before that, e.g. in coating and surface treatments, such as laminating, veneering, printing and painting as well as various sanding and drying processes. However, our customers are usually concerned with the manufacturing of machines and plants for furniture production.

What challenges do woodworking machines in particular pose to the Beckhoff product range in comparison with other types of mechanical engineering?



Manufacturers of metalworking machines often rely on “all-in-one offers,” including the controller, software, I/O terminals, drive technology, etc. It’s somewhat different in the case of woodworking machines. Here we are dealing with a heterogeneous customer base dominated by mid-sized companies. Not only the companies, but also the machine controllers are often highly unique and customized. The consequence of this is that sometimes only a single component from the Beckhoff product range is integrated into such solution concepts. Fortunately, our PC-based control technology is distinguished by the fact that, as a rule, interfaces to open systems or proprietary systems can be established without any problem. In this way, individual

parts can be replaced step by step until a complete solution is delivered in, say the second or third step. This is one of the big advantages of our PC-based automation, which offers universal openness: we always find ways to connect existing control systems to ours by providing the appropriate interfaces. This flexibility and the integration potential of our control platform are, along with extraordinary performance, among the main reasons why Beckhoff is so strong in the woodworking industry.

Were industry-specific developments necessary?

Our control solution essentially comprises the Industri-

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woodworking machines



18–22 May 2009
LIGNA
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World Fair for the Forestry and Wood Industries

Ligna 2009 – the world trade fair for the woodworking industry

Beckhoff will present its PC- and EtherCAT-based control technology for woodworking machines at Ligna 2009:

- | Ligna Hanover Fair 2009, Germany
- | 18 – 22 May 2009
- | Opening hours:
Monday to Friday: 9 am to 6 pm
- | Beckhoff booth: Hall 19, Booth D20

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a suitable solution together with the customer. In the case of large mechanical engineering firms, the project typically only requires intensive attention during the startup phase; in the case of smaller companies, we often take care of the complete automation of the machine, including commissioning and support. The trend is clearly towards complete solutions as plants become more complex.

What does such a complete solution encompass?

In real terms, it means that we determine the needs and the design of the components, draw up the plans for the project, take care of the installation and wiring of the components, carry out the programming and commissioning, and finally hand over the finished, functional machine. However, that doesn't mean that we have to permanently take care of such project tasks for the customers, because they usually become familiar with our control world within a short period of time. In addition, a good control technology should avoid any kind of dependency in any case, in our opinion.

How important is real-time automation to the woodworking industry?

That is a very important point. One just has to see that woodworking machines can be extraordinarily complex. Even a final trimming saw, which initially looks simple from the outside, is not just comprised of a rotating saw blade, but usually encompasses a considerable number of servo and positioning drives. Very powerful and very fast PC systems are required to cope with such requirements. A real-time environment on the PC is required as soon as several axes in a machine have to be controlled in a coordinated way; the machine requires a proper operator interface (which is

al PC, the automation software, the drive equipment, the Bus Terminal I/O and EtherCAT. In this respect, there is no difference between the industries, since the PC-based automation platform sets itself apart precisely by the fact that it can be used universally. However, we have developed many application-specific solutions for the woodworking industry in the form of software modules for all possible work steps; for example, linear path control and drill optimization or special interfaces for a series of machine types.

Are special technological contents developed for the industry?

We have two kinds of customers. One of them orders

– in a goal-orientated manner – precisely what is needed, for example a PC, I/O terminals, drive technology or some combination of those items. However, the number of customers who have their own profound and broad control know-how and view us exclusively as pure component suppliers is tending to decrease. The reason for this is that the machines are becoming increasingly complex and demands on personnel are growing in terms of technology and time. We acquire the majority of our customers through our well-founded industry experience and our competence as a solution provider. In this case, the machine manufacturer often provides us with the performance data that needs to be complied with. We then work out



actually always the case) and should remain a cost-effective part of the machine.

– That is one of the specialties of Beckhoff.

Many machines are in use in furniture factories, some of them with very large footprints. That requires both horizontal and vertical integration of the control system. How does Beckhoff cope with such requirements?

Integration is a very important aspect, because single unit production with a lot size of one is becoming the order of the day more and more in furniture production. The prerequisite for this is communication capability, which is a further advantage of the PC-based solution from Beckhoff. Just imagine: in the case of a lot size of one, the parts to be machined are involved individually in the manufacturing flow at transport and manufacturing speeds of anything up to 100 m/min, depending on the respective part of the plant. Every part that enters a processing machine may require a different kind of machining. This means that the machine must retool for the next part immediately after a machining step. The units of the machine must be adapted to the next machining process fully automatically, cycle for cycle, through several chained machines. If, as is usual in traditional production plants, the position data were to be communicated back and forth between higher-level computers and the machine controller and between that and the local axis positioning controllers, the flow of production would come to a standstill just as a result of the communication times. A lot size of one would then not be economically justifiable. Such requirements can only be coped with if all sub-tasks – and these also include communication with other machines, master computers and the job database – are performed by one powerful controller.

What characteristics must the “PC for all tasks” have?

Beckhoff always uses the latest processor technology, e.g. the Core™ Duo and the Core™ Quad architecture so PC performance increases constantly. For users, this means that they do not need a completely new automation concept in order to serve the next evolutionary phase of mechanical engineering, but rather that PC-based automation offers adequate possibilities for development.

But that doesn't mean that Beckhoff only serves the high-end market, does it?

No, definitely not. Most machine manufacturers also have simpler machines in their portfolio. It makes relatively little sense to offer multi-core processors here. For this reason, we have rounded off our controller range in a downward direction in recent years, and this will also be continued and expanded. Naturally the engineering platform will remain the same.

How is the subject of axis drive and positioning accuracy assessed in the woodworking industry?

One has to differentiate here, depending on the type of machine and the degree of automation. There are stationary machines in which the workpiece is fixed and the CNC and drilling work is then started. High accuracy on the order of 1/100 mm is required here. On the other hand, there are continuous production machines in which the workpiece is machined and, depending on the process, mechanically gauged during the movement phase. The accuracy requirements are not usually so high here, because the precision is more likely to be determined by other machine parameters such as mechanical parameters. The crowning glory of the whole thing is continuous CNC machining. – This

makes it clear that widely differing demands are placed on the drives and the detection of their positions.

What type of drive is predominant in woodworking machines?

Certainly, the emphasis lies on servo drive technology (rotary or linear) in CNC machines alone due to the demands for dynamics and accuracy. However, simple positioning drives play an increasingly important part as the degree of automation increases. We find here the entire range of drives that automation technology has to offer: from stepper motors, DC motors and multipole synchronous motors to the good old switched directional drives (fast/creep axes). There is naturally a whole series of different encoder systems to match, if they are required. The message to our customers, however, is that they don't need to worry about the drive system. Our TwinCAT automation software supports everything that is standard on the market.

What technological functions are used by the woodworking industry?

The technological functions that are used most often are the “cam disc” and “flying saw,” which are integrated in TwinCAT. Besides those, NC functionality in the NC I or CNC versions is important. However, Beckhoff has also developed several function modules especially for the woodworking industry, e.g. differential gears. In days gone by, each of these tasks would have required its own hardware. Beckhoff implements these functions just by executing ready-made software modules on a fast PC controller. The distribution of the data to the drives and I/O terminals is mostly performed by EtherCAT, the high-speed Ethernet fieldbus.

What innovations from Beckhoff await visitors to the Ligna 2009 woodworking trade fair in Hanover?

Beckhoff will be expanding the drive technology, since woodworking machines have an extraordinarily large number of drives. Among other things, we will be presenting the expansion of our AX5000 series with rated motor currents of up to 170 A. The range of products in the Industrial PC and I/O series has been expanded as well. Safety technology has also increased in importance: with the integration of TwinSAFE technology into the EtherCAT Terminal system (E-bus), the high performance of EtherCAT with its fast communication and enhanced diagnostics, is now also available for safety technology.

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