

TwinCAT enables efficient mechanical engineering and high-performance glass processing

Compact and high-precision glass cutting machine

The main objective of global machine builder, LiSEC is polyvalent, i. e. very versatile machines, which can be easily adapted and parameterized to the respective application as a stand-alone system or system module. This requires PC-based control for highly scalable control and flexible technology, which – as the glass cutting machine, “base Cut” clearly illustrates – is extremely compact and facilitates precise machining procedures.



“base Cut”, the compact flat glass cutting system from LiSEC enables high precision and low cutting tolerances in straight and shaped cuts.



With base CUT, glass plates from 2.3 to 19 mm thickness as well as 3.7 x 2.6 m, and in the future, also 6.0 x 3.3 m glass plates can be processed depending on the application.

The Austrian company, LiSEC Maschinenbau GmbH, with its headquarters in Seitenstetten, has specialized in flat glass processing for over 50 years. Their portfolio ranges from glass cutting systems to glass processing, such as technology for smoothing and grinding glass edges, to production lines for insulating glass. In recent years, LiSEC has increasingly reinforced its leading position as a supplier of automated complete systems, with complementary operator expertise through a separate glass processing division. Other features include a separate software program connected to Beckhoff software, TwinCAT, via ADS communication for production planning and optimization or for order entry and inventory management as well as "transparent production" developed in the framework of Industry 4.0.

Scalable control technology simplifies machine building

The PC-based control technology from Beckhoff results in numerous advantages for LiSEC, as Dr. Markus Schoisswohl, Head of Automation at LiSEC, explains: "Since system visualization requires one anyway, also using a PC as the controller was a no-brainer for us. In addition, there is the exceptional scalability and high flexibility of PC Control. This is very important to us, because it enables us to implement machine automation as economically as possible. Finally, our systems offer a huge number of configuration options that go hand-in-hand with the best possible support from a control technology standpoint. Also, TwinCAT makes it easy to keep new systems updated to the latest software version without reprogramming."

Andreas Rohrweck, head of L1 (PLC) & L2 (Visualization) at LiSEC lists another advantage, scalability: "The fact that the processes are quite similar in different machines means that we can be more efficient with uniform control programs. For example, the new glass cutting machine, base CUT – as a stand-alone machine with basic functionality – uses the same control program as a high-end system in the system network. With the Beckhoff solution this can be scaled brilliantly, both in terms of software as well as with regard to the drive technology available from Beckhoff. The TwinCAT System Manager provides ideal support for this by adding a layer of abstraction for the programming and hardware levels."

According to Dr. Markus Schoisswohl, speed and openness are also central properties of PC Control: "Due to the increasing modernization of our division, the demand for advanced automation systems is rising. That is why a flexible solution for system-wide communication that accommodates different networks is so important to us. The EtherCAT industrial Ethernet system handles the communication tasks and forwarding of the real-time data transfers among the machines. Non-time critical data are transferred by client-server technology via TCP/IP, for example, to a higher level line coordinator." Andreas Rohrweck adds: "The speed of EtherCAT also benefits us in the area of motion control. The servo-axes are operated in 1 ms clocks, for example, to meet the especially high requirements in the CNC machining of glass edges. This is supported by TwinCAT NC I software, which also facilitates highly dynamic controls."

Powerful control and drive technology provides the necessary high precision in each movement. Andreas Rohrweck explains: "There is a broad distribution here with respect to the processing steps and the range of machinery, beginning with relatively less critical single-axis positioning tasks (simple point-to-

LiSEC's automation experts (from left to right): Gerald Eichler (Department Head, Cutting and Logistics), Christian Hofner (Department Head, Level 2 Visualization), Arnold Kerschner (Department Head, Glass Processing/Frame Production), Dr. Markus Schoisswohl (Head of Automation), Andreas Rohrweck (Head of L1 & L2) and Augustin Geiblinger (IGU Lines)



Due to its compact design, it was possible to mount the Beckhoff C6930 control cabinet IPC (bottom right) directly in the operator terminal and the AM8000 servomotors (top left) were placed in the cutting table under restricted space conditions, saving an enormous amount of space.



point movements), to complex machine tools operated in the CNC environment. In the process, e. g. the grinding, the boring of holes or milling require much greater precision than glass cutting. For example, a cutting tolerance of 0.2 mm is sufficient for base CUT; for machines that polish edges on the other hand, this value lies in the hundredth of a millimeter range. TwinCAT NC I can handle all of this, supported by ready-made function blocks for smooth starting after an S-shaped ramp and much more."

Compact machine design through space-saving control components

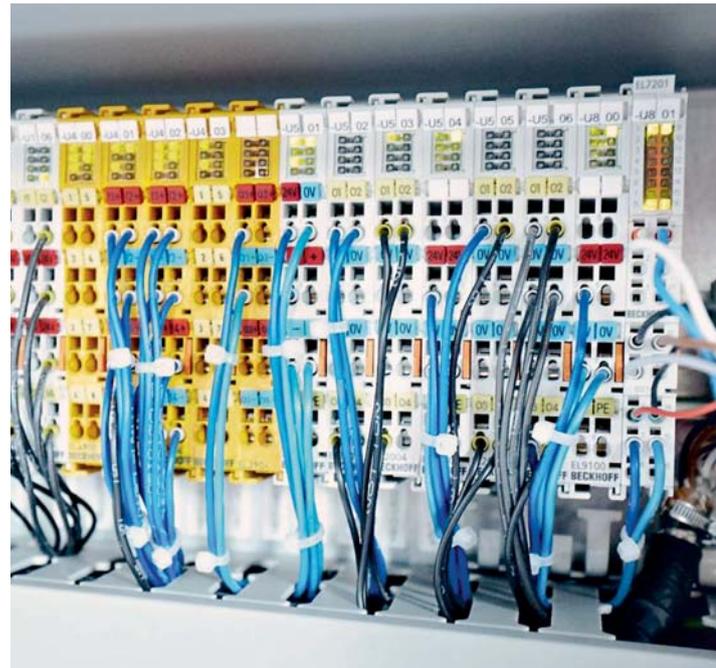
Tasks accomplished with PC Control using base CUT and a 2-axis NC with auxiliary axis include: automatic search for workpiece zero point, automatic detection of workpiece position with corresponding correction in the NC program, automatic measurement of unknown glass plates as well as standard PLC tasks such as tilting the table up. The heart of the control system is a Beckhoff C6930 control cabinet Industrial PC (IPC), which according to Andreas Rohrweck, excels due to its very compact and robust design: "Due to its low space requirements we could integrate this IPC directly into the operator terminal in the base CUT. In addition, the C6930 has all the necessary interfaces for our machines as well as the option of to use high availability SLC flash memory. Also, high scalability through numerous options is a decisive factor for us, since the C6930 is employed in our entire range of machinery."

Since the operator terminal for base CUT is placed directly on the machine, LiSEC also stresses the importance of space saving components here. In Andreas Rohrweck's view, the compact drive technology is also a major contributor in this: "The X- and Y-axes are jointly controlled via the AX5206 2-channel EtherCAT Servo Drive. In addition to this, there is the EL7201 servomotor terminal for the Z-axis, integrated directly in the EtherCAT I/O system. Both of these save a tremendous amount of space in control cabinets. Furthermore, One Cable



With the TwinSAFE terminals (left) and the EL7201 servomotor EtherCAT Terminal (right), extremely compact safety and drive technology can be integrated seamlessly into the control system.

The AX5206 2-channel Servo Drive also contributes to the compact machine design.



Technology (OCT) to connect the AM8000 servomotors ensures compact design and reduced installation efforts. The same goes for the safety engineering directly integrated in the PC Control architecture via the TwinSAFE terminals, the AX5801 TwinSAFE drive option card and the Safety over EtherCAT protocol, with which the functions 'Control On', 'Emergency Stop' and 'Safe Stop of Axes' are implemented in base CUT."

Advantages through high computing power and online change

Due to its high computing power, the C6930 IPC can process several runtimes simultaneously. Andreas Rohrweck explains: "Like all LiSEC machines, the basic system of the base CUT can be upgraded and networked. For example, the cutting table can be augmented by downstream glass crushing systems. To this end, up to two additional runtimes are available on the C6930 from base CUT, so that additional systems requiring only a few user interventions do not need a separate IPC. This reduces costs and engineering time while eliminating a cross-controller and expensive axis synchronization."

For Dr. Markus Schoisswohl, the Online Change feature first implemented through TwinCAT, is indispensable: "The ability to load a new program on the controller on the fly is tremendously important to us, in particular with very large processing systems. This makes machine prototyping and adjustments as well as remote maintenance of systems much easier. This is a huge advantage, in particular for end customers, since they can benefit from program updates without stopping production."

Universal control philosophy from basic machines to complete systems

Since 1999 LiSEC has consistently relied on the PC-based control and drive technology from Beckhoff, both in series machines and systems as well as in its own glass processing division. In the Hausmening, Austria plant, for example, all machines and peripherals are thoroughly validated through in-house production before these production lines or machines are used at the customer's site.

One example is base CUT, the glass cutting table designed as a basic, stand-alone system for straight cuts and shaped cuts of flat glass. The machine, the smaller of two models is only about 4.6 m long, 3.2 m wide and 1.4 m high, has a massive steel frame with a cutting bridge that can be tilted or used in a stationary position. Glass plates from 2.3 to 19 mm in thickness can be processed as well as 3.7 x 2.6 m glass plates; in the future, it will also be possible to process 6.0 x 3.3 m glass plates. The position of the manually inserted glass plate in X and Y directions are automatically recorded and, if necessary, the bearing plate is rotated accordingly.

Further information:

www.lisec.com

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