

Schirmer cutting and processing center in use at EgoKiefer

Fully-automated manufacturing of PVC windows over 1,500 sqm plant

The Swiss window and door manufacturer EgoKiefer develops, produces, sells and installs window solutions in PVC, PVC/aluminum, timber and timber/aluminum as well as entry doors. In 2008, the company produced approx. 660,000 m² windows and over 2,250 doors. In order to meet the exacting demands on its production systems, EgoKiefer recently commissioned a fully-automated Schirmer cutting and processing center fitted with Beckhoff control components.



At its plant in Altstätten, Switzerland, EgoKiefer AG relies on a new cutting and processing center from Germany's Schirmer Maschinenbau GmbH. It is designed to facilitate a two-shift operation for window production. "Our long-term objective is to expand the production from currently 8 hours to 10 or 11 1/2 hours," explains Hans Beutler, Technical Services Manager at EgoKiefer.

The new production plant was implemented in record time. Just 12 months separated the issue of the order and commissioning. "One of the biggest challenges lay in the translation of the system design into available space," reports Hans Beutler. "The dimensions in which the processing stations plus interlinking were to be fitted were extremely tight. The plant, with layout developed in close cooperation with Schirmer, is therefore extremely compact.

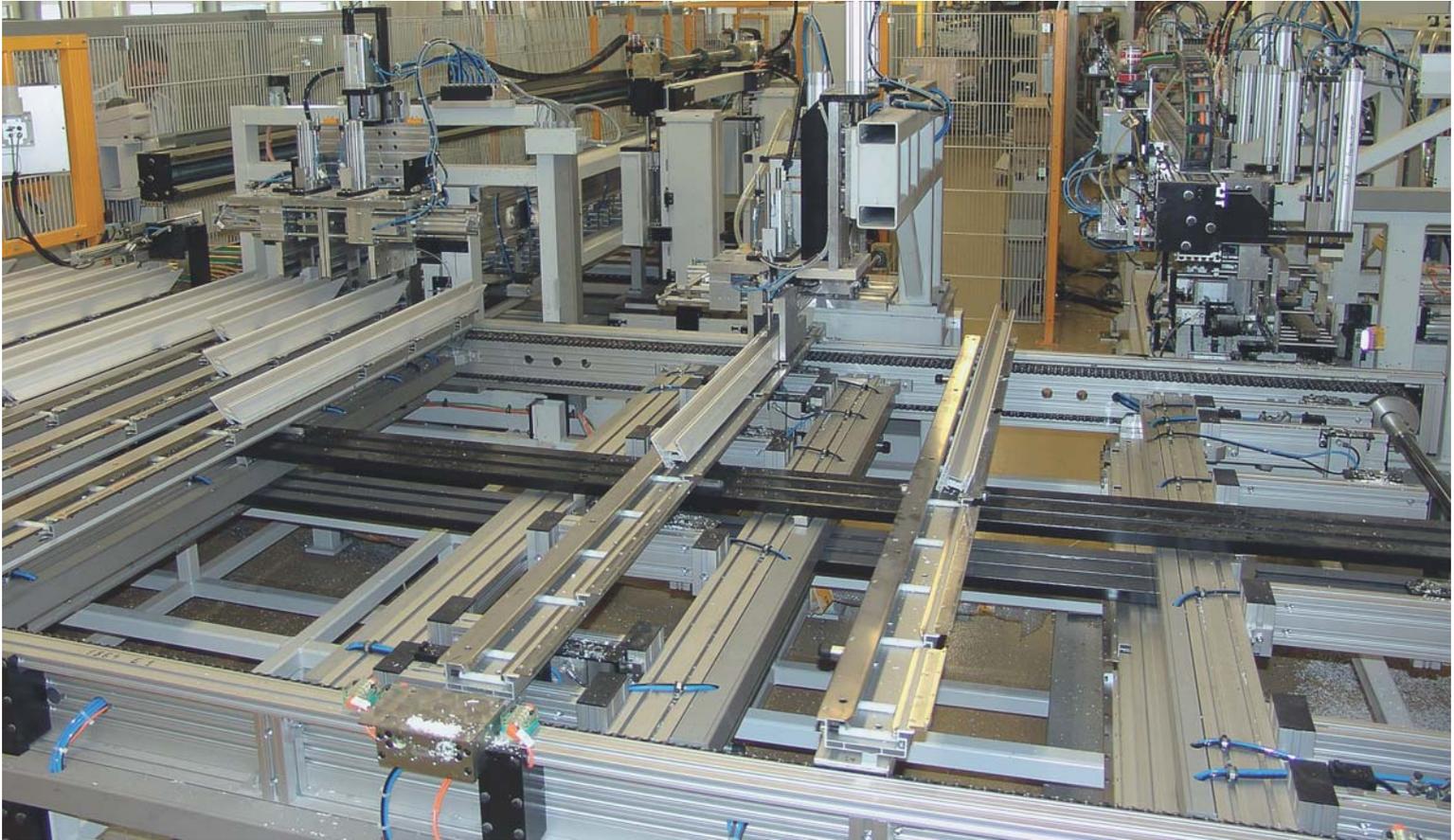
Working in partnership generates confidence

Schirmer Maschinenbau undertook the design of the processing modules, all mechanical engineering and installation while Beckhoff was responsible for the system automation and programming. "There are already two Schirmer production plants with a Beckhoff automation platform in op-

eration at the production site in Villeneuve in the west of Switzerland. These were installed some years ago. Another plant was installed at the Altstätten site in 2006. We have benefited greatly from the long-term cooperation between Schirmer and Beckhoff," says Hans Beutler. "Until we had fully mastered the system, we were in almost daily contact with the machine suppliers and the Beckhoff specialists." External machine control is also possible in the context of remote maintenance. If program modifications are required for optimization purposes, the Beckhoff programmers can arrange to that effect with the EgoKiefer staff on site.

Hans Beutler, Technical Services Manager, EgoKiefer AG, in front of the Control Panel for the BAZ 100046 Tandem machining center for 12 PVC profiles





View of EgoKiefer AG's new cutting and processing center

No refitting for profile changes

EgoKiefer produces its current EgoKiefer MPR2, MPR3 and XL®PVC windows systems fully automatically with the new, high-performance PVC window element cutting and processing center. This means the capability to process three different profile types fully-automatically with no refitting, and the assembly of customized windows to order from the pre-produced profile sections.

The cutting and processing center includes several processing modules: a total of 16 interlinked stations are required for the complete processing

of every PVC window element. Starting with the profile bar, a second production line takes care of the cutting, insertion and screw fastening of the steel reinforcement with continuous welding of the steel profile, assembly of the various locking elements, incl. safety locking elements, and fully-automated stacking of the profile sections into compartment trolleys, in which they are sorted and transported for further processing. This is one of the largest processing centers for window production with a footprint of approx. 1,500 sqm.



EgoKiefer, according to its own information, is the leading manufacturer in the Swiss door and window market and is part of the windows and doors division of AFG Arbonia-Forster-Holding AG. The doors and windows division incorporates the brands EgoKiefer, RWD Schlatter and Slovaktual. In 2008, the division reported net sales of 382.5 million CHF (approx. 250 million Euros), which, thanks to the acquisition of Slovaktual and internal growth, represents an increase of 28.3 percent compared with the previous year. EgoKiefer employs around 950 staff. As an integrated overall supplier, EgoKiefer develops, produces, sells and installs window solutions in PVC, PVC/aluminum, timber and timber/aluminum as well as entry doors. Its registered office is in Altstätten in the St. Gallen Rhine Valley, where the company was founded in 1932. Production also takes place in Villeneuve in French-speaking Switzerland. EgoKiefer has an active presence in all regions of Switzerland: the distribution network comprises eight branches, several sales offices and over 350 workshops. It also has a national window/door service with more than 80 employees.



SBZ II bar processing center with insertion unit for PVC profiles up to 3,750 mm long and gripper tongs positioned by NC for positioning speeds of up to 180 m/min

Fully-automated production down to batch size one

We might not instantly envision window production involving a highly complex production process. However, the variety of designs and sizes and the fact that rather than producing large quantities of standard windows, windows are produced exclusively to order down to batch size one. This places specific demands on the precision and flexibility of the production system. The fully automated cutting and processing center employed at EgoKiefer can process PVC profile bars up to 6.5 m length. It can produce work pieces from min. 230 mm (clear dimension) to max. 3,500 mm (clear dimension); the maximum outside dimension is 3,726 mm. The PVC profiles are fitted with steel reinforcement, which is cut to size, inserted and screwed in place by the fully-automated Schirmer cutting machine.

The individual window elements are then processed further in two Schirmer BAZ 1000 processing centers. The first processing station is loaded with PVC profiles from a feed magazine by an insertion unit. Drainage and ventilation boring, lock case milling, millings for the basic ventilation system, center-boring for the transom welding and locking element marking is carried out here. Two sets of transport tongs with linear drive move the profiles via an interim station to the BAZ 1000-VU processing center. This is a horizontal drilling station with a single-spindle drilling unit, a basic ventilation milling unit with three milling motors, a locking element marking station, a stamping station for notching the central sealing web on the frame, a double stamp for punching out the glass

support for the XL® window sashes, a VU double sawing unit (2 x 45°) for simultaneous first and last cut and V-cut for transoms to be welded in and a 90° and 45° saw unit. A conveyor belt for removal of PVC waste and an automatic extraction station for residual pieces (which are removed via a conveyor belt) ensure an uninterrupted process flow.

The steel reinforcement processing starts with the manual insertion of the 6 m long steel profile. A total of six Schirmer steel machining centers are in use throughout the plant. They all have automatically adjustable pro-

Panel for display of residue PVC profile lengths





Complex structure of pneumatic valve terminals with connection to Beckhoff Bus Terminals



Compartment trolley for the accommodation of up to 208 machined profile sections

file guides. The profiles are initially welded into a continuous profile by a welding machine, sawed to length for matching the PVC profiles, inserted fully automatically by linear drive insertion units into the PVC profiles and screwed into place. Inside the insertion unit, the steel reinforcement is fitted using the tongs positioned by the NC and linear drives at a process-capable positioning speed of up to 180 m/min.

High-performance automation platform

From a control perspective, the system is in two parts; each sector has a controller in the form of a C6140 Industrial PC from Beckhoff. All plant statuses of the respective sector are displayed on the associated Control Panel. Hans Beutler says: "We wanted all error messages to be displayed on a central Control Panel."

All automation modules, from the IPC through the Bus Terminals to the Panels, are networked via the EtherCAT Industrial Ethernet bus system. The peripherals are connected by Bus Terminals to EtherCAT Couplers. In addition, the entire plant encompasses around 40 servo-axes and six linear axis drives with travel paths of 15 to 20 m plus displacement measuring systems for absolute values. The installed software includes TwinCAT PLC and TwinCAT NC PTP for positioning applications.

EgoKiefer's window production program is data-coupled with the system controller and supplies the order data (such as production data records). This is processed first in the order preparation and translated into effective machining programs.

Outlook for plant operation

During the commissioning of the processing center, the main focus lay in optimizing individual processes. Firstly, this involved achieving the planned production capacities, and secondly, ensuring that the processes run smoothly, safely and problem-free. "In this respect, we have retrofitted an automatic mechanical traction testing during the continuous welding of the steel inserts," explains Hans Beutler. This is because, for the first time, the continuous welding is not done by spot welding, but by an 8 mm welding bead. "We must be sure that the welding is sound and will hold," comments Hans Beutler. This testing cycle was implemented by enhancing the TwinCAT control program.

According to Hans Beutler, 10 to 15 years utilization are expected from these kinds of production plants. Components vulnerable to wear however, e.g. welding equipment, may need to be replaced after 10 years. The cutting and processing line has been designed according to the PC-based control platform in order to sustain such replacements and can be modified for future products.

EgoKiefer AG

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