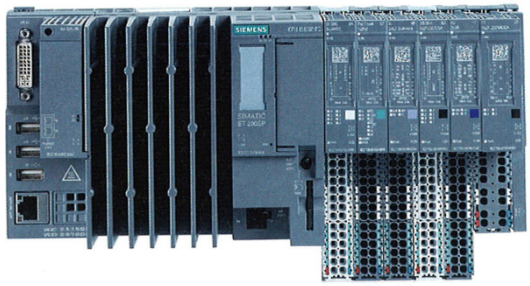
HOB DIE HOLZBEARBEITUNG 6-2017

Lot Size 1 for door blanks

Noble doors are the sign of elevated demands and individuality. For the manufacturer this often means Lot Size 1 – but please fully automatic, order controlled and with maximum material yield. Such a production can now be realized much easier and be operated a lot more flexible using Open Controllers which combine PLC and IPC technology to offer a reliable, open and flexible overall system. **by RALF SANKOWSKY, FRANK TERBRÜGGE, SIEMENS**



↑ Bürkle achieves the functional and process technical flexibility of the machine modules by using Siemens open controllers (picture: Siemens)

← With a highly flexible future-proof line Bürkle realized the order controlled production of door leaves in many variants (picture: Bürkle)

The core businesses of Robert Bürkle GmbH are pressing and coating technologies – mostly in the form of turnkey production lines which are tailored to a high degree to the relevant application. Many Bürkle systems process wood based materials. A growing number of customers are also active in the automotive and aircraft industry, the thermal insulation industry up to the printed circuit boards and photovoltaic industry. Efficient engineering oriented to each individual customer and its branch is one of the core competencies at Bürkle – which is at the same time a continuing challenge for the developers.

Future-proof automation concept. The machine manufacturer has implemented an automation concept which considerably simplifies the construction of individual lines for a flexible order controlled production. It uses the Open Controller ET 200SP made by Siemens and the engineering framework TIA Portal. “It is a lot easier for us to be able to implement all automation tasks using consistently TIA Portal throughout for small machine modules up to big stations.”, states Andreas Lammert, Head of Electrical Engineering at the Branch Office Mastholte as reason for opting for that system. “With open controllers we can realize functionally very complex line parts using standard technology without having to use additional engineering tools. It is of an absolute advantage that simple machine modules which are automated through a standard PLC can be seamlessly integrated in an open controller based project.”

All software components of the machine control, IPC control up to and including the safety control are developed in-house at Bürkle. Software development thus belongs to Bürkle’s core competencies.

Local intelligence for complex processes. Open controllers are factory-made pre-installed CPUs. They include a windows based IPC part and a PC based variant of the SIMATIC S7-1500 as software PLC – in case of need in the error-proof variant. The specialty: the software PLC is independent of Windows. It runs on a separate processor core with its own real-time operating system parallel to Windows. It is as reliable and performant as hardware PLC. The PLC simply continues to operate even with updates and new starts of Windows. And: as a Profinet head control for the periphery system ET-200SP it offers an excellent connectivity to the field level, control level and IT level.

Door leaves of great variety. Reason for Bürkle’s line automation was the order from the Dutch door manufacturer Reinaerdt Deuren for a fully automatic, completely order controlled production line for door blanks. The new line produces door blanks in sandwich design and are made up of frame, core and skins. On top of that, the line masters the core layer construction with nested complex rails and stiles – and that in symmetrical or asymmetrical arrangement. The rail and stile materials processed range from softwood to hardwood up to compound materials. Regarding the core inlay materials, special materials such as rock wool hardboards are not unusual.

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Production parameters for every single door. “All possibly conceivable door leave variants are produced fully automatically and order controlled to customer dimensions. Each door may possibly be completely different in design from the preceding door”, explains project manager Carsten Henkenjohann the flexibility of the line, which allows at the same time the manual infeed of special materials and the prioritization of particularly urgent orders. Due to the great number of possible door executions as well as the occurrence of special sizes, the production processes and the parameters for the individual stations are extremely varied and diverse. “Therefore we need a complex pre-planning and tracking of the production parameters for each door component and for every process step in order for every component to be at the right spot at the right time”, clarifies Lammert. “Finishing the thought, that leads to a lot size 1 production.”

Structured process with clear tasks. The dissolution of the production orders sent by an SQL server into individual lots with one door leaf each is done by the host computer of the line, a BOX IPC427D. The operator releases the prepared production order or single doors of it. If he chooses so, he can also bring forward other orders or lots if this is required because of the scheduling situation or material availability. The host computer transfers the production parameters of the released lots to the individual machine stations via Profinet where they are evaluated and executed on a machine level.

When complex operations are required, which is the case in nine out of ten line stations, this process is taken over by applications running on open controllers. Examples for this are for instance the rail and stile handling or the continuous gluing of core inlays which both require extensive calculations in cycle time. Furthermore, the Windows based part of the open controller hosts also the visualization of the station and collects production and quality data, which are transferred to the host computer for part tracking and process monitoring, but are also analyzed on a local level: the IPC application for instance calls for maintenance works and provides the operator with the relevant information displayed on the screen. All this is happening without putting any strain or burden on the actual machine control of the station which is running undisturbed in the same unit as a software PLC on a separate real time operating system with its own processor core of the open controller. Overall this results in an automation architecture which supports clear structuring of complex lines and processes in both hardware and software

Integrated safety concept. That simplifies also the realization of safety functions appropriate to the situation. When an emergency-off event has occurred for instance in the cutting station, there is no reason from a safety point of view why the press and gluing station should not be kept operational. The clearly structured module and automation concept of the line supports such an approach. Bürkle has therefore realized the complete safety functionality of the line in one central error proof software Siemens PLC on the box IPC of the host computer. This allows safety reactions being differentiated according to line parts and the deactivation of individual line parts during regular operation, which considerably increases overall availability of the line. Thus it is possible for instance to service the complex continuous gluing of core inlays whereas the remaining line works through the collected orders of door leaves with pure honeycomb filling.

Ready for personalized markets. “With the implemented automation structure, we can realize complex customer requirements in a more simple and economic way than before”, states Lammert. “We now have the flexibility to enable an efficient production also with small and smallest lot sizes and that - as can be seen - up to lot size 1. Our new open controller based automation concept therefore supports all those companies which want to get fit already today for Industry 4.0 and markets that get ever more and more dynamic.

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