



Highly effective automation

New safety concept for tablet presses



bachmann.



Since the mid-1990s, tablet press manufacturer Kilian has relied on automation engineering systems from Bachmann electronic. The new models in the Synthesis range now also feature Bachmann's safety concept. These models therefore achieve PLe according to DIN EN ISO 13849-1.

The Bachmann M1 system is found in almost all tablet presses which are manufactured at Kilian in Cologne. "To date we have had good experiences both in terms of the products as well as in terms of the advice we have received", says Klaus Rosenbach, Head of Automation Technology at Kilian. The safety engineering in the presses was previously supplied by a different company. However, the latest safety standards demand even more intelligent safety solutions. "The revised standards situation, but also the new requirements of our Synthesis range which will be launched in the middle of the year have necessitated a rethink in terms of the safety concept of the machines. We felt that the Bachmann safety solution was ideal for our requirements." The new range will include two basic models: the Synthesis 500 and the Synthesis 700. Depending on the tablet type and the customer requirements, these can then be adapted to suit the specific needs of the customer.

New machine type

The most popular machine types which are produced in Cologne are single and double presses. One example of a special development is the Synthesis 500 ZSM. The letters ZSM stand for the German words "double-layer" and/or "encapsulated core", and this particular product comes with a number of special requirements for the production process.

»Basically, it is as though a tablet is produced within a tablet« Mr. Rosenbach explains the production principle. Here, the Synthesis 500 ZSM compresses the shell around the previously manufactured core. To do this, the machine starts by adding a defined quantity of dosing mixture into the matrix, then the core is inserted, more powder is added and then the shell is finally compacted in several stages. »In the past, there was a mechanical coupling between the matrix disk and the core feeder. The new system now uses a servo«, explains the specialist from Kilian, adding the following information about the benefits of the new system: »As a result the phase relation can now be controlled.« With the aid of a camera system

which is integrated in the machine, the system checks that every core is positioned in the middle of a tablet. The tablet is blown out of the system if the specified tolerances are violated. If the core is not 100% accurately in the middle of the tablets for a whole series of produced tablets then this is automatically corrected via the phase relation. »With the old mechanical control system that was not possible«, explains the specialist for automation, adding: »This principle is completely new in the market place, and we have patented it.«

Due to the comparatively high complexity of the production process, the reject rate with this machine is lower than that of single or double presses: Around 100,000 tablets are produced every hour.



▲ **Synthesis 500 ZSM:**
Two-layer encapsulated core tablet press from Kilian with the safety controller system from Bachmann.

Advantages of automation technology

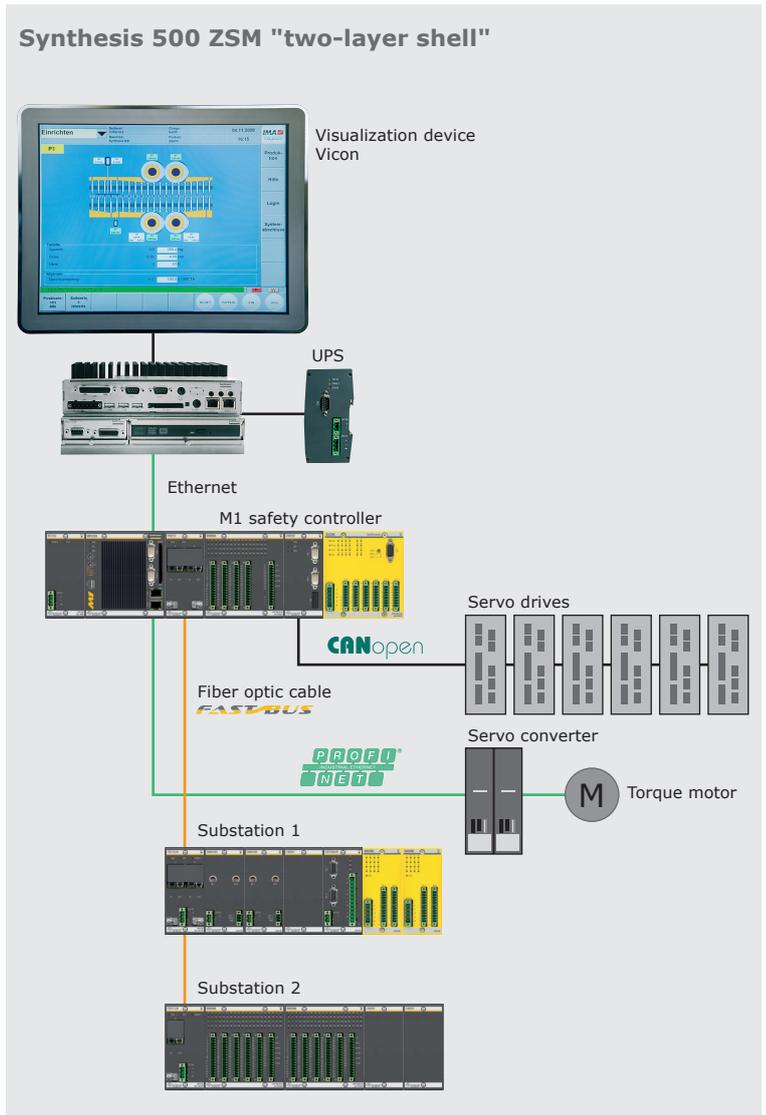
For several years now, Killian in Cologne has trusted Bachmann expertise in the field of control and visualization technology. There are many reasons for this. One of the key criteria

is the modularity of the M1 automation system. This allows it to be flexibly adapted to specific customer requirements, i.e. the particular machine type. "The system also has an open networking concept which we really like", says Klaus Rosenbach, pointing at the ability of the system to be remotely positioned at a distance of up to 100 m via FASTBUS substations. Here, the proprietary bus system based on fiber optics guarantees high immunity to interference and genuine real-time behavior. He also mentions the following additional reasons in favor of Bachmann automation technology: "Bigger machines which produce up to 1 million tablets per hour sometimes vibrate. In addition, these machines are often used in three-shift operation, which causes their insides to get hot. Consequently, the hardware of these machines has to be suitably robust. This requirement is met 100% by the Bachmann-M1."

Another factor is the fact that the production process with these machines runs at high speed. The dosing mixture is compacted in several steps until the tablet reaches the required strength. In the process, the pressing forces need to be continuously monitored and adapted where necessary – also at high speed. The measurement is performed using expansion measuring strips (DMS). "At the time, Bachmann developed a dedicated DMS module for rapid recording of measured values which was individually tailored to our requirements: the DMS202. This development was not only key for our tablet presses but also highlights the flexibility and customer focus of this automation technology supplier", adds Klaus Rosenbach.

The intelligent, programmable safety concept

These advantages also come to bear on the new models in the Synthesis series. Here, the possibility of total integration of the safety components in the M1 system also plays a very important role in the implementation of the new safety concept. The master controller – supplemented by the programmable safety module SLC284 – remains in the control cabinet. The safety module has 16 digital inputs/8 digital outputs which can be used in pairs in a redundant layout. Programming can be performed using the function block language according to IEC 61131-3. The engineering tool SolutionCenter is available for programming,



configuration and monitoring. Protection against manipulation is realized through configurable user schemes with access and function restrictions. The cycle time can be adjusted up to 5 ms.

The two substations contained in the machine are connected via FASTBUS to the master controller in the control cabinet. The advantage of the Bachmann safety concept lies in the fact that there are no system-based limitations. In theory up to five substations are possible. In addition, the standard and safety modules can be freely positioned and mixed. One example of this is the substation 1 of the Synthesis 500 ZSM, which has both standard and safety-related I/O modules. In principle, surplus safe

I/Os can also be used as standard I/Os. On the ZSM, the safety limit switches and the emergency stop switches are connected to the safety modules of substation 1. "With such a large number of safety limit switches and emergency stop switches in a machine, users want to see individual messages on the display which provide accurate information about the status of the machine", says Mr. Rosenbach. For example, the customer wants to know which door or window is currently open on which side of the machine, whether the emergency stop switch was tripped by a connected machine etc. "However, in addition to using the HMI as a source of information about faults, he also wants to be able to call up general status messages. The new safety solution enables such detailed diagnostic functions without additional wiring or bus connections", he adds. In order to highlight the volume of safety-related messages, he goes further by saying: "On a machine like the Synthesis 500 ZSM between 15 and 18 safety-related messages can appear." Earlier machines had the disadvantage that these messages had to be read into the controller separately. In the safety solution which has now been realized they are directly available in the controller from the outset.

However, according to Klaus Rosenbach the safety solution from Bachmann really comes into its own in connection with the changeover of the machines from a mechanical gearbox to a torque motor. In addition, some of the mechanical handwheels on the machines are now no longer required. For safety reasons, work on this type of machine is only permitted with the doors and windows closed. "However, customers want to be able to run a drive in jog mode with a door or window open", explains Klaus Rosenbach. This option is permissible in principle provided certain conditions are met. For example, jog mode is only permitted if the window which is open is the one on which the jog mode keyswitch was set. All other windows must be closed. "This is only possible with the aid of intelligent, programmable safety engineering", says the expert. The torque motor is actuated via a servo converter which communicates via PROFINET with the M1 controller. The other servo drives in the system are connected via CANopen to the master controller.

The software concept

An IPM1400 with a remote 19-inch display from Bachmann is used for visualization of the process. The proprietary control and visualization software Vicon from Kilian runs on this. This software is used across the board on all machines at the Cologne-based tablet press manufacturer. When it was first introduced, the software was based on the visualization software M-VIS from the Austrian automation expert. This was then modified and fine-tuned by Kilian to suit their requirements and the requirements of their customers. "With Vicon you can select recipes, display diagnostics or even carry out remote maintenance", says a very pleased Mr. Rosenbach. This "in-house development" of the software took place against the background of the regulatory requirements of the GAMP and GMP regulations and the corresponding documentation regulations.

The software is designed for the maximum configuration of a machine, and this complete version is certified in accordance with the regulations. Thanks to the modular layout, individual modules which are not needed on smaller machines can be masked. Describing another of the system's advantages, the expert explains that "if certain software modules are not required for a particular type of press then they can be deactivated without any need to re-certify the complete machine".

Outlook

After the changeover of the machines in the Synthesis range, the other tablet presses at Kilian are also due to be changed one-by-one to satisfy the new safety standards. "We were undoubtedly one of the first customers to implement the safety solution from Bachmann. However, this courageous step has been anything but a disappointment. This is also underlined by the fact that the solution will also be incorporated in our other machines", adds Klaus Rosenbach at the end. ■