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Intelligent networking
Modular safety solution for food processing machines

In the food industry, however also in other sectors of machinery manufacture, flexibility is becoming an increasingly important characteristic of machines and systems. At the same time businesses favour safety systems that provide operational efficiency and cost advantages in addition to the essential safety function. An example of how these requirements can be implemented is demonstrated by the sliced meats processing system, manufactured by market and technology leader Weber Maschinenbau, which is made safe using a modular safety controller from Schmersal. The service package included the commissioning and validation of the system by tec.nicum, Schmersal's service division.

In the food industry individual machines and systems are often integrated to form interlinked complete plants. And these days machines have to be more flexible than just a few years ago. This is due to the fact that product life cycles are becoming increasingly shorter, there are ever more promotional articles and special quantities, and both the trade and the end consumers require a greater variety of products. Weber Maschinenbau, a leading system supplier for slicing applications, based in Breidenbach, Hessen, meets these demands by developing and producing complete lines for slicing production, which are characterised by an intelligent networking of the line modules.

Production line with seven machine modules

Schmersal has now safeguarded such a complex system from Weber Maschinenbau for the processing of cold meats using the PSC1 safety controller and decentralised I/O extension modules. The system comprises a total of seven machine modules: two slicers, which cut the products into slices, two pickers, which place the products in layers into the packaging, a thermoforming packaging machine, a labeller and end-of-line equipment (final inspection, stacking). The entire line consequently extends over a length of approximately 50 meters. All of the modules incorporated into the system have to be equipped with an emergency stop switch, not only the slicers that slice meat and cheese products at up to 2,000 cuts per minute. The emergency stop function must be designed so that when an emergency stop device is triggered all hazardous movements of the machine and its operation come to a standstill in a safe and appropriate condition. Emergency stops are grouped into stop categories according to technical conditions: The stop category 0 used on the Weber Maschinenbau system requires the immediate shutdown of the machine by immediately switching off the energy supply. The term „immediate shutdown" is also defined in the standard DIN EN 60204-1: For stop category 0, the reaction time between the actuation of the emergency stop device and the disconnection of the end circuit may not exceed 500ms.

Safety controller PSC1 with up to eight expansion modules

Because it had to be possible to stop the machines from any position on the line, a total of almost 30 emergency stop switches were installed on the Weber Maschinenbau system. It was necessary to develop a concept for the superordinate emergency stop system to ensure the safe evaluation of signals. The PSC1 safety controller is an efficient solution for complex systems: The key components of this control system are two freely programmable compact controllers (PSC1-C-10 and PSC1-C-100). In the basic version, both have 14 safe inputs (up to PL e according to ISO 13849 or SIL 3 according to IEC 61508), 4 safe semiconductor outputs, two safe relay outputs, two signalling outputs and two pulse outputs for sensors with contacts.

Safe IO expansion modules are available for both variants; these modules can be installed both centrally in the switch cabinet and decentrally. The decentral modules communicate with the compact controller via Ethernet SDDC (Safe Device to Device Communication). In addition it is possible to monitor up to 12 axes safely by means

Fig. 1: The PSC1-C-100 is a modular and freely programmable compact controller for the safe processing of signals from safety switching devices

K. A. Schmersal GmbH & Co. KG
Möddinghofe 30
42279 Wuppertal
Phone: +49 202 6474-0
info@schmersal.com
www.schmersal.com

Fig. 2: Safe IO expansion modules are available for the PSC1 safety controller; these modules can be installed both centrally in the switch cabinet and decentrally.

Fig. 3: Weber line concepts include various modules and are individually designed to meet customer requirements.
Photo courtesy: Weber Maschinenbau GmbH

of comprehensive functions using the „Safe Drive Monitoring“ module (SDM). In this way it is also possible to integrate safe drive monitoring with all the related functions (safe stop, shutdown, movement, positioning…) in the compact control system.

The six expansion modules incorporated in the Weber Maschinenbau line for safe signal evaluation of the emergency stop components were connected to the PSC1-C-100 via an internal safety-oriented Ethernet bus. When an emergency stop is activated on one of the machines in the line all other machines in the line are switched off by the controller.

Minimal wiring
Networking the machines in the safety chain through the Ethernet bus and the PSC1 safety controller considerably reduced the amount of cabling. „It is a simple, convenient and also very fast safety solution“, said Waldemar Stetinger, application engineer at Schmersal. „The modular design enables the safety components to be quickly modified if one of the seven machines is converted or extended for a new product“. If necessary the PSC1 safety controller can also be replaced very easily, because it has an SD memory card enabling programs to be saved. Consequently, reprogramming is no longer necessary if the hardware is replaced.

„The line equipped with the PSC1 system has been in operation at our customer‘s site for almost one and a half years. Now the customer has ordered a second line to be put into operation at the beginning of 2019, also with the PSC1 control system. A happy customer, this is for us a clear sign that we are dealing with a good safety solution“, explained Dennis Kasek, Project Manager at Weber Maschinenbau.

Commissioning and validation
Weber Maschinenbau also relied on the service division tec.nicum from Schmersal for the implementation of this safety solution: tec.nicum took care of the commissioning and validation including the documentation. Tobias Keller, Safety Consultant at tec.nicum explains „Validation according to EN ISO 13849-2, which shows that the design of the safety-related parts of control systems meets the requirements of EN ISO 13849-2, still lacks attention“. „Because the early involvement of the validation process prevents costly design errors. Validation, if performed carefully and thoroughly, makes it easy to implement any measures ordered by the authorities or as a result of legal proceedings“.

Dennis Kasek sums up the PSC1 system: „The networking of the individual modules and the resulting minimal cabling – that‘s a smart solution.“

Fig. 5: The PSC1 system enabled cabling to be considerably reduced.

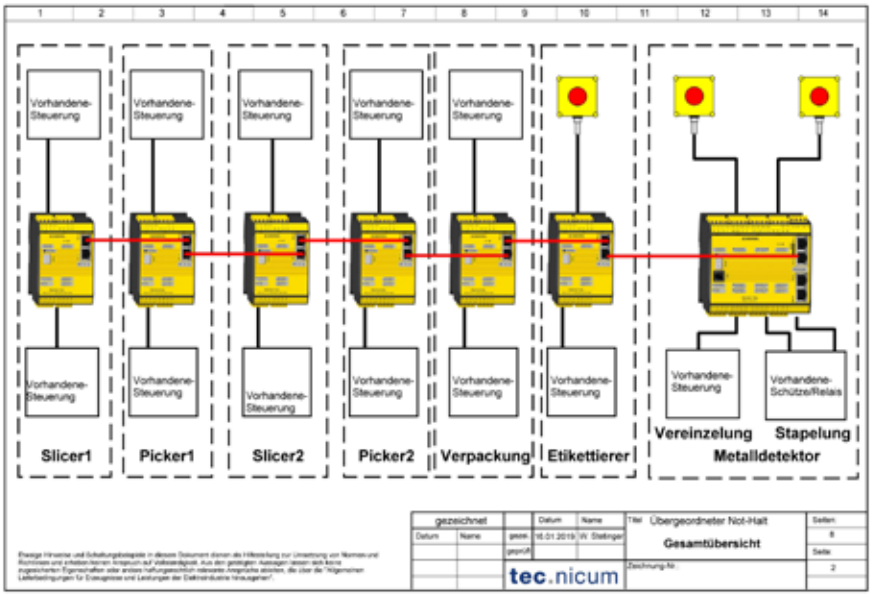

Fig. 4: The six expansion modules incorporated in the Weber Maschinenbau line for safe signal evaluation of the emergency stop components were connected to the PSC1-C-100 via an internal safety-oriented Ethernet bus.