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Safety Special

Safe automation
with SIMATIC S7-1200

2017

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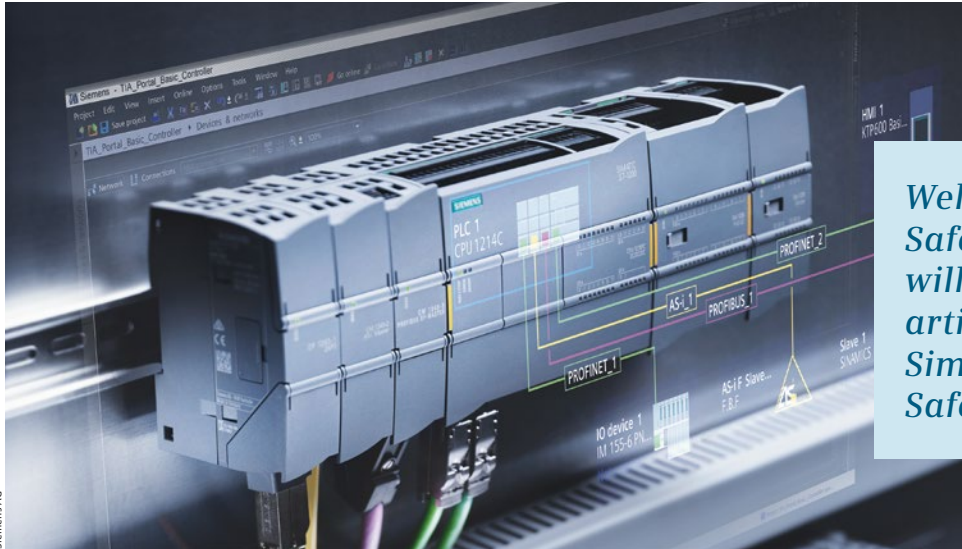
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Welcome to the first GO! Safety Special. Here you will discover fascinating articles about the Simatic S7-1200 with Safety Integrated.

Resource efficient and future-proof

With Simatic Safety Integrated, Siemens offers integrated safety solutions for greater flexibility, transparency, and efficiency.

Machine manufacturers are required by law (e.g., the Product Safety Act in Germany) to ensure the safety of humans and the environment. In other words, machines that are put on the market in Europe must be safe for their intended purpose and must meet the foreseeable conditions of use. To date, basic safety functions were usually realized by simple electromechanical components, while standard automation was implemented by electronic systems (PLC, Soft PLC). With the intuitive TIA Portal engineering framework and fail-safe Simatic Controllers, comprising the Basic, Advanced, and Distributed versions, as well as the new Simatic S7-1500 Software Controller, users can now enjoy all the benefits of the Simatic world for their safety automation as well.

The examples cited in this issue demonstrate how the fail-safe Simatic S7-1200 controller is enabling users worldwide to benefit from Simatic Safety Integrated, in particular through use of the smallest controller for standard and safety functions.

The application areas range from food processing machinery and packaging machinery, to comprehensive conveyor solutions in large-scale manufacturing environments, for example, at the automotive component supplier Fori Automation. A widely-acknowledged benefit of Simatic Safety Integrated is its enhanced flexibility, which enables easier application of the control solution to varying machine sizes.

In terms of the digitalization of production processes in industry, data integration and the transfer of so-called smart data via open standards are becoming ever more important in maximizing the efficiency of machine and plant operation, conserving resources, and avoiding expensive downtime. Simatic Safety Integrated users have been particularly convinced by the cost savings they have achieved thanks to its integrated engineering tools, efficient use of resources, as well as the installation benefits, which include minimal wiring and improved error diagnostics options. ■

Integrated added value

Simatic Safety Integrated integrates safety solutions seamlessly into standard automation systems, enabling higher machine availability and more efficient production processes.

In the age of Industrie 4.0, production lines not only have to be flexible, they also need to be available and cost-efficient. At the same time, they must comply with the necessary safety requirements. As the demands placed on the manufacturing industry in

adapting to market needs increase, so do the challenges facing machine manufacturers.

Simatic Safety Integrated implements consistent safety solutions based on Totally Integrated Automation (TIA)

by seamlessly integrating safety functions into standard automation systems. Together with the Sinamics drives and the integrated safety functions of Profinet and Profibus via Profisafe, Siemens offers maximum integration and consistency.

SIMATIC Safety Integrated – all built in



Engineered
with one click

Without
additional wiring

User-friendly
diagnostics

SIMATIC Safety Integrated represents the seamless and convenient integration of safety technology into standard automation applications. This means **one controller, one engineering, one communication for standard and fail-safe automation.**

SIMATIC Safety Integrated ensures the highest reliability and saves time and costs

- **More efficiency:**
Intuitive engineering of fail-safe automation in the Totally Integrated Automation Portal (TIA Portal)
- **More uniformity:**
Standardized diagnostic functions for standard and safety applications
- **More scalability:**
Wide range of safety-related hardware

More efficiency – engineered with one click

TIA Portal provides a common user interface for standard and safety applications and thus enables maximum



data consistency. All the engineering and programming tools required to implement a fail-safe application are built into the Simatic Step 7 user interface and have a common design structure. The Simatic Step 7 Safety Advanced and the Simatic Step 7 Safety Basic option packages enable safety programs to be created in the LD and FBD programming languages. PLCSIM facilitates testing without the need for any hardware.

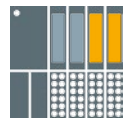
Fail-safe controllers for maximum integration and investment security

With the Simatic Controllers, Siemens can offer the right controller to meet varying requirements. The range comprises Basic, Advanced, and Distributed Controllers, as well as the Software Controller with Safety



Integrated. They deliver impressive scalability and consistency, and thanks to Safety Integrated they ensure a seamless integration of safety functions. External safety solutions are therefore not required. This means less wiring and a reduced number of models and components.

The ideal I/O



The Simatic ET 200 offers a wide range of I/O systems for standard and fail-safe automation – for solutions in the control cabinet or directly on the machine. The modular design enables the Simatic ET 200 systems to be easily scaled and to be expanded with fail-safe I/O modules, for example. Additional I/O stations for safety systems are therefore not required.

Mobile and safe operation

The Simatic HMI Mobile Panels with Profinet connection transfer the functionality and performance of the



Simatic HMI Comfort Panels to mobile devices, thereby improving the ease of operation due to enhanced flexibility. For the customized integration of operator control devices into the safety architecture, the Simatic HMI Mobile Panels offer an integrated emergency stop button as well as a three-stage enabling switch. The connection can be wired or wireless.

Cost-efficient and flexible infrastructure

Profinet enables standard IT communication (TCP/IP, OPC UA) while allowing the transfer of user, process, and diagnostic data in real time via a single cable. Profile communication

(such as Profisafe, Profidrive, and Profienergy) can be integrated with no additional wiring. This enables safety system solutions to be flexibly designed. Thanks to fieldbus technology, diagnostic functions can provide more details compared to solutions based on conventional wiring. Profinet and Profisafe enable machines to exchange data in a safe way – and even wirelessly.



More than just safety

Simatic Safety Integrated offers much more than just safety. Users can also benefit from the fail-safe automation solutions of the Simatic portfolio and TIA Portal. Standard automation know-how and existing network infrastructures with Profinet or Profibus via Profisafe can be used in safety applications. Another advantage is

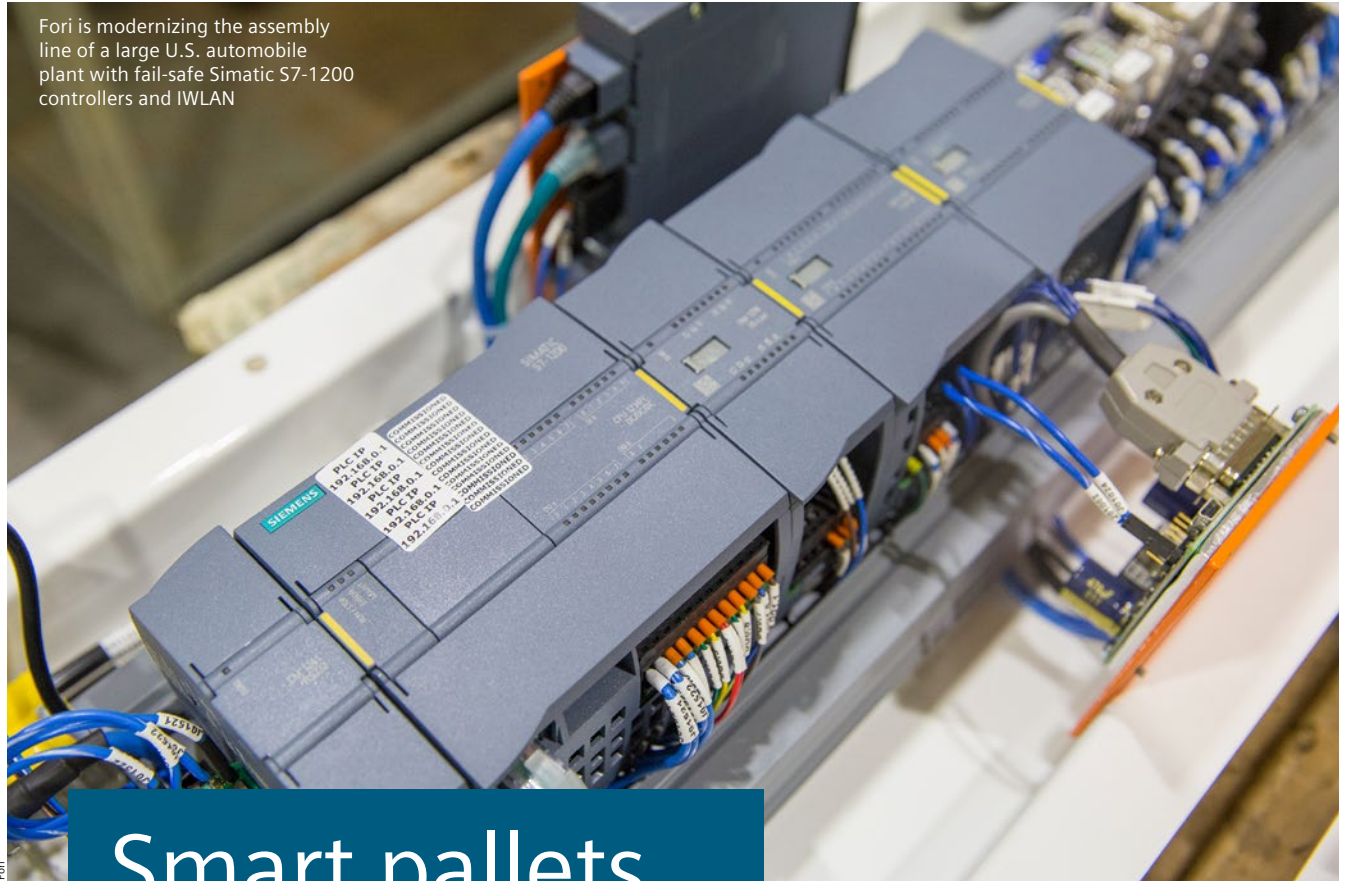


the seamless integration of the complete portfolio, which enables a uniform design of the safety functions and the corresponding diagnostics, and assures minimal downtime. ■

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Fori is modernizing the assembly line of a large U.S. automobile plant with fail-safe Simatic S7-1200 controllers and IWLAN



Smart pallets



A new, flexible rail guided system is replacing the old conveyor belt-based assembly line

Automotive industry: Fori Automation Inc., a specialist in automatic conveying and handling systems, is modernizing the assembly line of a large U.S. automobile plant with rail guided carts, fail-safe Simatic S7-1200 controllers, and IWLAN.

“Our customer must be able to introduce additional products onto the line without the usual long retooling times,” reports Dean Colwell, controls engineering manager for assembly and welding systems at Fori Automation, on the demands of a large automobile plant in the U.S. for its new assembly line manufacturing suspension modules. The aim was to replace the existing conveyor belt-based system with a flexible rail guided system. “The new line also has to be more cost-efficient than the old one.” The new, flexible assembly solution enables the customer to respond efficiently to changing product demands and other general requirements.

Because floor-running carts are able to move much more easily in different directions than conventional conveyor systems, Fori opted for rail guided carts (RGCs) to make the assembly line scalable and flexible.

From flexible communications to integrated safety

Fori supplied the customer with a highly flexible system with which the pallets on the existing rail system are made “smart.” The pallets were fitted with Poka-Yoke mechanisms, with the necessary data being processed by a PLC on the cart. This also demanded a flexible communications platform. Key project requirements were fast roaming and an integrated approach to all control and safety functions in the RGC system.

To meet the specified aims, the Michigan-based equipment supplier relied on technology from Siemens. The TIA Portal engineering framework permits commissioning and configu-

ration of all system components from one central location, for example. Fori installed fail-safe Simatic S7-1200 controllers as well as Scalance access points and client modules for wireless communication – one of the main requirements, because the RGCs are autonomous and cannot be connected to a fieldbus system for the transfer of control signals or warnings. Since the Simatic CPUs feature the necessary communication functions as standard, all connections within the system architecture and to the higher-level host system can be made in a cost-efficient way. Scalance offers real-time communication and fast roaming – key features considering the often long RGC lines, which require multiple access points.

Another major factor was the integration of safety functionality into the PLC, because the individual RGCs have a safety bumper, an emergency stop switch, and optional safety scanners. As Colwell points out, despite the fact that each safety switching device has to have a specific function, the parameters might change frequently depending on the RGC’s working range. With conventional hard-wired safety systems that would not be feasible.

A lower-cost alternative

Price was another key factor in the switchover from conveyor systems to rail guided carts. “The flexible cart system costs the same as a conventional conveyor system,” says Dan Connelly, head of the Fori Assembly Lines division. “Yet it combines all the benefits of such a conventional conveyor system incorporating pallets with the advantages of 360 degree

operator access.” The installation process is also much more economical, as it reduces the time and labor required by 25%. The assembly line can be configured as desired, in keeping with the process at hand or the available space. The material racks can be located both outside and inside the line. “We can also configure the line with stops, or as a single continuous line,” Connelly adds. “That makes the process in general much more flexible, productive, and cost-efficient.”

Comprehensive protection

Since the PLCs communicate with each other, the system permits the creation of loading lists as well as improving production monitoring. An existing installed controller from another manufacturer was also easily integrated into the system.

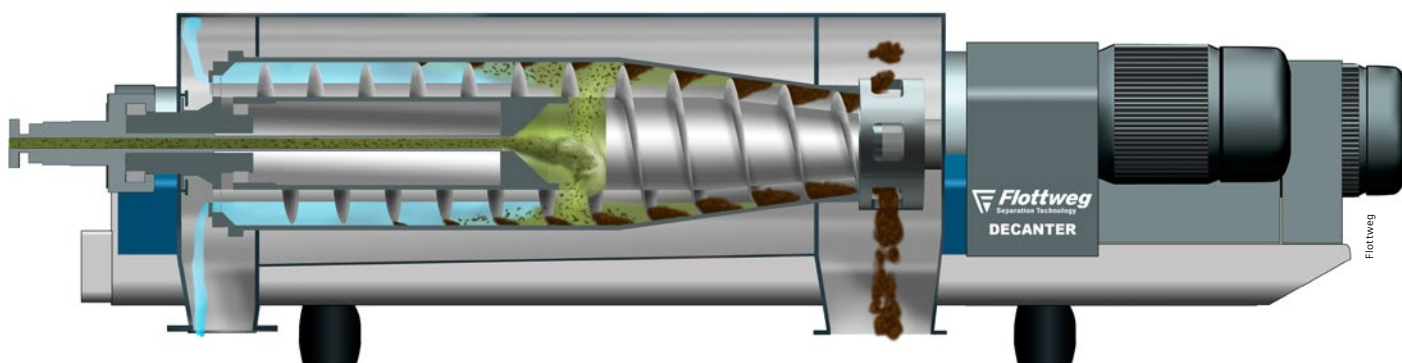
The fail-safe Simatic S7-1200 controllers offer system-integrated diagnostic and safety functions. Diagnostic data are continuously available via the HMI and on the web server – in this case TIA Portal. All error messages are displayed in plain text. The system is comprehensively protected against unauthorized modifications to code or process values both in the PLC and in TIA Portal. ■

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Safe separation

Machine building: The Simatic S7-1200 with Safety Integrated is enhancing the separation technology options for Flottweg SE in Vilsbiburg, Germany.



Decanter centrifuges play an important role in many industry sectors – whether in the production of chemicals or for waste separation

Whether in food technology, the chemical industry, or the disposal of everyday items – centrifuges play an important role. “We were looking for a control solution that is compact and economical, but offers enough functional options for us to adapt our systems to any filtration process optimally and without committing excessive time and effort,” reports Bernhard Niedermeier, one member of the management team responsible for upgrading the automation systems at Flottweg SE in Vilsbiburg. Simplicity, intelligence, modularity, and efficiency were the requirements which the company specified for a controller to handle decanters used in the separation of liquids and solids. That is why its new generation of controllers for standard systems is

called SIMP Control® – safe, intelligent, modular, and high performance.

This highly compact solution is based on the Simatic S7-1200. It can be used both for standard automation and for safety systems. “That alone is a major benefit for us,” Niedermeier explains, “because we were previously employing a solution with separate safety switching devices, which meant that customizing systems was more complex.” Safety is key when operating the horizontally rotating decanters, and even more so for the much faster vertically rotating separators. Due to the heavy intrinsic and process weights, combined with radial acceleration reaching as much as 10,000 g, any faults can have disastrous consequences.

Integrated safety solutions in a compact design

Most conventional process controllers are unable to efficiently handle the complex separation processes. With the Simatic S7-1200, Flottweg’s automation experience is available to any user. Defined interfaces are provided for integrated communication with the complete plant. Bernhard Niedermeier comments, “The controller’s diagnostic routines immediately detect and diagnose wiring faults.” With SIMP Control®, the company is committed to intelligent performance and flexible safety. The new, modular, compact controller reduces component variance and makes installation less complex. It is smaller, more cost-efficient, and easier to integrate than other solutions.



The decanter centrifuges at Flottweg in Vilsbiburg have been equipped with the Simatic S7-1200 fail-safe Basic Controller since the end of 2016

Fail-safe control optimizes safety systems

Fail-safe speed and vibration monitoring is vital for the safe operation of centrifuges. To be able to shut down individual machine components in a fail-safe manner, the compact controller integrates a module with fail-safe relay outputs. It immediately cuts the power to the drum and worm drives. "The market demands such plug-and-play solutions – for both standard automation and safety systems," the product management department emphasizes. It is not just the programming complexity that is reduced by such a flexible solution; the likelihood of faults occurring is also much less.

Different operator control levels

The three different operator control levels are for operators, service personnel, and programmers. The

same applies to the safety systems. Depending on the machine, the operator can set safety limits directly on the display, whereas only the responsible programmer has access to the safety program.

The icons on the color display of the KTP 400 HMI panel, perfectly matched to the controller, support



Safe, intelligent, modular, and high-performance – Flottweg developed its own controller on the basis of the Simatic S7-1200

global operation. Whereas previously all instruction and information texts had to be translated into the local language, today just a few lines of text on the display need translating. The machine's abstract presentation mode proves much more practical in everyday operation than a detailed 3D view. Too much graphical information increases the risk of overloading the operator. Abstract depictions, on the other hand, provide immediate clarity. For example, the KTP 400 displays utilize four internationally recognized colors in order to make the visualization even clearer and simpler.

Fail-safe compact controller offers great benefits

The Simatic S7-1200 features an SD card slot in addition to its internal memory. When a CPU is replaced, the SD card is slotted into the new device, and everything runs as before. Programs can be updated and data transferred in the same way. When Flottweg sends a user updated program components, all the user has to do is save the files to the SD card and slot it back in the machine. This also assures copyright and intellectual property protection, because the programs can be linked to the card's serial number. ■

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»With our new SIMP Control® we have combined standard automation and safety technology on a shared platform.«

Bernhard Niedermeier, Flottweg – ATE Development

Optimally wrapped

Packaging technology: With fail-safe Simatic S7-1200 controllers, the manufacturer Fahrenkämper in Löhne, Germany, is able to deploy its wrapping machines individually and flexibly.

Wood panels or boards, steel parts, long goods, tires, and many more items have to be packed for shipping after production. "Our machines are often the final link in a production chain and have to work reliably so that the underlying logistics systems run smoothly," says Frank Fahrenkämper, owner of Fahrenkämper Entwicklungs- und Vertriebsgesellschaft mbH. The company has been developing and building horizontal wrapping machines for the packaging industry for the last 20 years. In the

process, a circulating ring unrolls the film while the product is fed through at a defined rate and wrapped. Horizontal wrapping machines are much more energy efficient and material conserving than heat-shrink tubing solutions and can be adapted to a variety of products. To ensure that not only the control systems, but also the complete safety systems can be conveniently and economically adapted, the company relies on the modular fail-safe Simatic S7-1200 controller from Siemens.

Saving up to 30 percent with fail-safe control

Dirk Hartmann, PLC programmer at Fahrenkämper: "The control and safety systems of most of our machines are customized to the specific requirements of our customers. Another consideration is that customers often need to incorporate subsequent adaptations to changed or new production processes." This is where the modular controller featuring integrated safety functionality reveals its strengths, as Fahrenkämper affirms: "Our engineering time and effort, including programming in SCL (Structured Control Language), wiring, and commissioning, have been cut by around 30% compared to before."

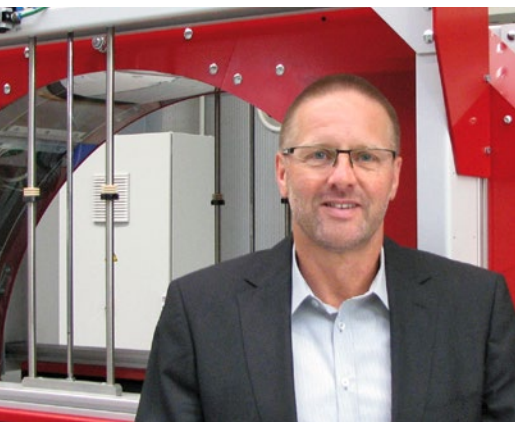
This was because previously the company employed a solution comprising control and safety technology which was complex to engineer. It also did not offer the option of modular expandability. "It was anything but convenient," Dirk Hartmann

reports. On smaller wrapping machines with up to two protective devices, the standard Simatic S7-1200 controller is used in conjunction with a separate safety switching device, yet even with just three protective circuits the fail-safe controller variant becomes the more cost-efficient solution.

"In both cases the basis is the same though," says Hartmann. Programming and parameter setting are carried out with the aid of the TIA Portal engineering framework. Alongside the ease of use and clear layout of the program, Hartmann sees the greatest benefit in the fact that "the standard automation and safety systems operate with the same database." This means that complex variables assignment and the like are a thing of the past. And even complete program modules can be stored not just locally, but also globally.

Profinet or Profibus – as required

The new wrapping machine solution is synchronized to the plant control by Profibus. This is a typical requirement for retrofit projects. A dedicated Profibus card can therefore be integrated alongside the S7-1200 controller to ensure easy data exchange. This turns the controller into an intelligent Profibus slave, linked directly to the higher-level control system. All that needed to be done to achieve this was to download the relevant GSD file and implement it in the overall plant control system – a Simatic S7-400. Anyone who uses Profinet can use the Ethernet ports integrated into the base unit.



Fahrenkämper

»Our engineering, wiring, and commissioning time and effort have been cut by as much as 30 percent thanks to the modular fail-safe Simatic S7-1200 controller.«

Frank Fahrenkämper, owner of Fahrenkämper Entwicklungs- und Vertriebsgesellschaft mbH



1

Fährenkämper

- 1 The TE 400S fully-automated wrapping machine for long goods
- 2 The TD 1600 pallet wrapping machine
- 3 "Flower pot packing" with the TE 600 S fully-automated wrapping machine



2

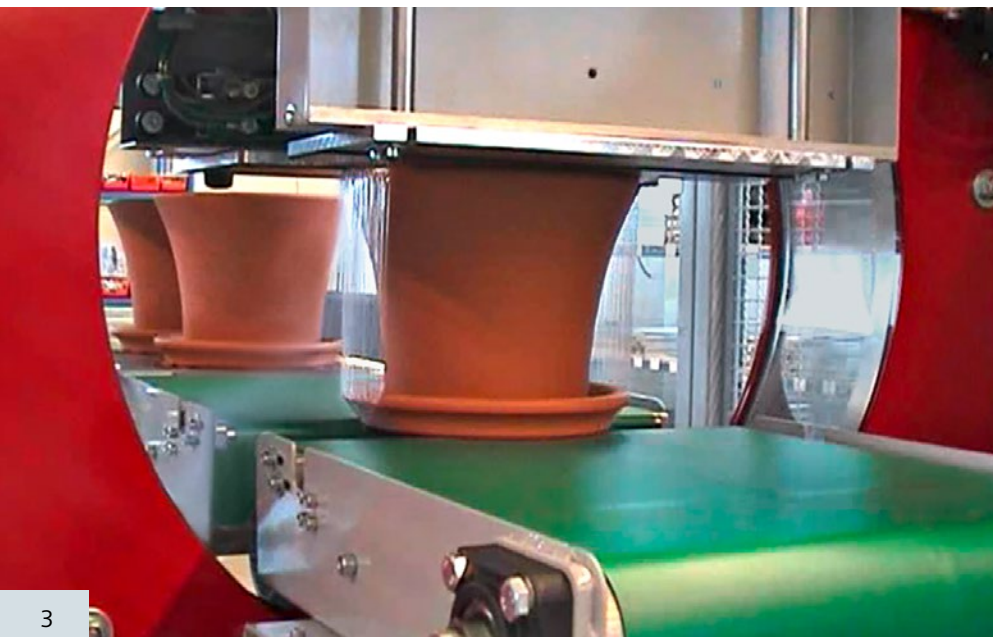
Fährenkämper

Compact, fail-safe control for all application cases

"Wherever technically feasible, we will in future be employing the powerful, compact, modular, and expandable S7-1200 control solution as standard," Fährenkämper asserts.

The possibility of running standard automation and safety systems on the same platform underpins his strategy. At the same time, the time and effort for visualization are much less. The experts in Löhne have opted for a second generation Simatic HMI Basic Panel with a color display.

The visualization in TIA Portal features the same look and feel. All data are consistent, thanks to the shared database. In-machine diagnostics and fast data transfer between the controller and panel via Profinet enable end-users to benefit from the state-of-the-art control technology. When a safety function is triggered, for example, the operator immediately sees an on-screen alert. That speeds up service procedures, enhancing the availability of the horizontal wrapping machines. Fährenkämper is happy: "We can turn a simple, circulating ring into a convenient, safe packaging system, capable of adapting optimally to any packaging situation." ■



3

Fährenkämper

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Safely packaged

Packaging technology: With the Simatic S7-1200 fail-safe controller, Italian manufacturer M.C.M. is enhancing the safety of its packaging machines, while improving transparency and flexibility.

"Many customers are skeptical about electronic solutions, concerned that potential machine faults cannot be quickly repaired," says Gianluca Marzaroli, owner of M.C.M. (Macchine Confezionatrici Marzaroli). Together with Siemens, the Italian manufacturer of packaging machinery for flow-packs and filling machines for food products has succeeded in finding a reliable solution. It incorporates the Sinotion motion control system, Sinamics drives and Simotics motors, and fail-safe Simatic S7-1200 control-

lers. Marzaroli comments: "A faulty component can now be easily replaced without having to recalibrate the parameters or use special tools."

Maximum performance with safety and flexibility

M.C.M. has more than 40 years' experience in packaging machinery for flow-packs and filling machines for food products. Because M.C.M. places great value on the reliability and efficiency of its machines, it was only after the year 2000 that the

Italian company changed over from mechanical to electronic components, when they became sufficiently reliable.

Today M.C.M. employs servodrives and brushless servomotors. The switch to electronic components greatly enhanced the quality of the machines, as they were made much more flexible, quiet, direct, and intuitive for operators to use.

M.C.M.'s corporate goal is to sell high-quality products, incorporating

The Simatic S7-1200 controller quickly reveals where a problem lies and enables exact diagnosis

maximum safety and flexibility, combined with the ability to adapt to customers' requirements. And Siemens is helping the company to achieve this. "The most important factor is fast startup," asserts Marzaroli, who had been on the lookout for a powerful, flexible, low-cost system. "Simotion precisely meets our requirements. Together with the Simatic S7-1200, it enables us to access and diagnose all machine components."

The fully electronic Flow-Pack M254 machine, for example, packages ice-cream and snacks, and thus requires fast, direct indication of hazards in order to reduce downtime. The fail-safe CPU 1214 FC quickly indicates where there is a problem, enabling timely and targeted intervention. "We can now differentiate which safety device on the machine has been activated automatically or manually," Marzaroli reports. "That makes sequence diagnosis in the machine segments and in the safety devices much more accurate. Thanks to the S7-1200 controller, we can identify what is happening in the various machine segments and intervene accordingly."

It is not just the machine downtime that has been substantially reduced, but also the cabling: the system featuring Safety Integrated allows the safety functions to be programmed directly in the controller. As a result, changes during planning of the machine's safety functions can be made quickly and easily.

Flexible and scalable

Modular, powerful, and easy to use – those are just some of the benefits of the Simatic S7-1200. The controller is connected to other automation units via the onboard Profinet interface. The modular system is also

flexible and scalable in its configuration. The benefits are not just in the hardware. The TIA Portal programming provides special functions and libraries.

The CPU 1214 FC is able to control standard and safety automation functions. Together with the fail-safe SM 1226 I/O modules, it provides an integrated safety solution in the Basic Controller segment. Thanks to these products, M.C.M. complies with the Safety Integrity Level 3, which is required for this type of machinery. The CPUs can be programmed in TIA Portal in Simatic Step 7 Safety Basic.

"We will be continuing to use this fail-safe controller from Siemens in future," Marzaroli promises. "It allows us to create a more efficient emergency stop circuit for our machines, which we can also adapt for complex configurations or safety requirements." ■

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**»Simotion
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Gianluca Marzaroli,
Owner of M.C.M.



Sharp equipment under control

Machine building: Foodlogistik in Neubrandenburg, Germany, is modernizing its multi-purpose cutters in a safe, simple, and space-saving way with Safety Integrated.

The food processing machinery of Foodlogistik Fleischereimaschinen GmbH based in the eastern German state of Mecklenburg-Western Pomerania produces large volumes of ready-to-use food. It typically produces cutlets, roulades, and goulash, as well as a variety of vegetables. Foodlogistik offers its customers – including butcher shops and supermarkets – a broad range of machines, which are marketed worldwide.

Danger under the hood

The machines use knives and cutter discs to cut the foodstuffs to the desired shape by rotation and axial motion. The material is transported either manually or automatically via docked-on conveyor belts.

There are two safety-critical areas on such machines: the feeder hopper and the cutting chamber. Both areas are protected by a cover with a manipulation-proof coded magnetic switch. These protective switches are read via two channels and integrated into the machine's safety system. If the contacts are tripped, the machine is immediately halted and the rotating knives come to a stop within 0.2 seconds.

In the past Foodlogistik assured the functional safety of its machines by a discrete safety solution. That means the safety components operated autonomously, were separately wired, and were connected to the machine control system only via an interface.

Into the future with Safety Integrated

The DicR comfort multi-purpose cutter is the first manual machine with which Foodlogistik is pioneering a new technological generation. Previously, the company employed a discretely cabled controller with no visualization of machine functions in conjunction with its semi-automatic multi-purpose cutters. It is now using a fail-safe CPU 1214 FC. The functions are controlled via a graphical user interface on a touchscreen. The HMI, the CPU, and the drives communicate via Profinet. The CPU 1214 FC assures functional safety in conjunction with fail-safe input and output modules. Mathias Zippel, Foodlogistik's head of mechanical engi-

neering, automation, and service, is delighted: "Compared to the past, Siemens technology takes up a good 30% less space in the control cabinet."

The two Sirius 3RM1 motor starters have replaced the bulky reversing starters which were previously in use. The Sinamics G120 frequency converters are equipped with the Safe Torque Off (STO) integrated safety function. Rather than implementing functional safety by way of external contactors and safety switching devices, the safety functionality is integrated directly into the frequency converter. Thus it needs no additional cabling. "I estimate the time and effort for cabling alone are at least 20% less," Zippel adds.



Mathias Zippel, head of mechanical engineering, automation, and service at Foodlogistik Fleischereimaschinen GmbH (right), and Rüdiger Röhrs, safety specialist from Siemens in Hamburg



30 percent

more space in the cabinet

20 percent

less time spent cabling

Less complexity with more functionality

Fewer cables, interfaces, and components also means fewer sources of faults. This alone saves time and money. That is not all. Rather than having to program multiple different components and specify interfaces, just one common engineering framework – TIA Portal – is needed for all the machine's processes and safety functions. All program blocks are stored in a global library and can be reused for subsequent projects. System diagnostics is an additional feature.

Moreover, the Simatic S7 controller permits largely automated adaptation of rotation speed and feed rate to the desired cutting result in both continuous and cyclic mode. "The operator now no longer has to adjust the cutting process by trial and error. Instead, the machine auto-adjusts, delivering the desired result after just a few cuts, and with a high degree of repeat accuracy," Mathias Zippel explains.

A solution with future potential

Flexibility is another factor. The size and output of a machine are no longer an issue. The machine manufacturer can apply the same concept all across its product range. From process control to functional safety, and from the user interface, through the diagnostics, to integration into higher-level control systems.

Foodlogistik is now looking to expand the newly applied technology to more of its machines. Mathias Zippel comments: "Ultimately, all our machines are operated in the same way. Larger customers, especially, appreciate having a uniform operator control concept, so they can deploy their staff flexibly on any machine." ■

Foodlogistik's food processing machinery produces large volumes of ready-to-use food, including cooked meats, cheese, cutlets, and vegetables. The company is modernizing its multi-purpose cutters with safety technology from Siemens

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Compact heating chambers are versatile in use and allow for rapid product changeovers

Siemens AG | W. Geyer

Machine safety at no additional expense

Industrial automation: Möller GmbH in Diepholz, Germany, relies on an automation solution with Simatic Safety Integrated to control a compact heating chamber.

Möller GmbH, an enterprise founded in 1983 by Dieter Möller, initially specialized entirely in HVAC systems for stables. Today the company has a portfolio of clearly defined application areas: electrical installation, agricultural HVAC systems, and

photovoltaics. Möller is also well established as a versatile partner in the industrial automation sector, offering everything from a single source. This includes engineering, design, and execution, through to commissioning.

A simple heating chamber with an interesting interior

One of the company's recent projects took place close to home. P+S Polyurethan Elastomere GmbH & Co. KG, also based in Diepholz, was modernizing its production system and constructing

a flexible solution for the production of elastic polyurethane (PU) foam elements. This required several compact heating chambers, which had to be versatile in use and allow for rapid product changeovers.

In this production process, a PU compound mixed according to a pre-defined recipe is poured into a steel mold whose inner shape matches the geometry of the plastic component. The mold must be protected by a heavy safety clasp in order to withstand the pressure from the material reaction. The material then passes into a heating chamber, where it expands and sets under precisely defined temperatures until it has assumed its final form.

P+S production planner Rainer Riemann describes the application: "We wanted a heating chamber for small to medium-sized plastic elements made from a polyurethane elastomer." Such elements are used as durable elastic stop buffers in conveyor systems and machines, for example. To meet this aim, the project team developed a unit consisting of a solid heating plate with a hood over it. The hood has a flap on the front of the heating chamber which can be manually lifted and then controlled by a motor. This means the heating plate is accessible from above, which enables a heavy casting mold to be placed in position and taken out again, for example. Möller was contracted to develop the automation system for the heating chamber.

The system is controlled via an external panel wired to the controller. The panel features three machine status indicators, a switch to move the hood forward and back, and the mandatory emergency stop button.

The hood is operated by two ergonomically positioned manual switches, which have to be pressed simultaneously.



»When costed in detail, this (Safety Integrated) solution is simply the best option.«

Anthony de Carvalho,
Project Manager, Möller GmbH

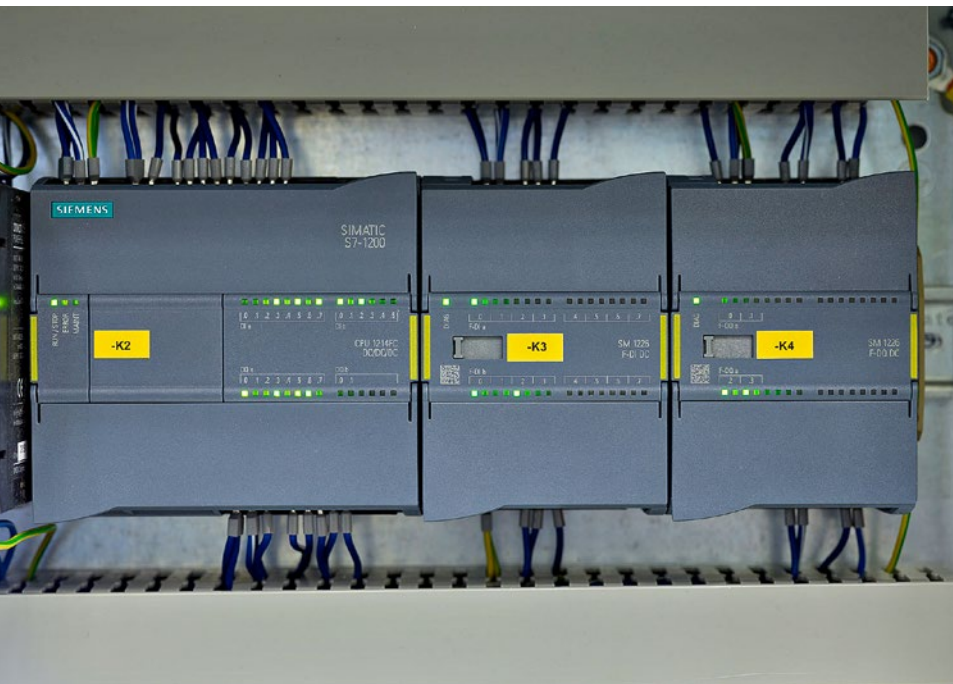
The heating chamber with a fan for a faster and more even distribution of the process heat, along with the separate control panel

A clear case for Safety Integrated

Although it is essentially a fairly simple application, the heating chamber still requires a number of safety devices. Safety personnel must ensure, for example, that the hood can only move back once the front flap is open. Two switches are required to operate the hood, so as to rule out the possibility of injury to the operator. There is also the mandatory emergency stop button to further protect operators.

Möller decided the effort and expense required to install a separate system and link it to the controller solely for the functional safety of the machine was too great. "We build a lot of large controllers. However, for just two or three safety functions, a separate safety system is really no longer worthwhile," asserts Anthony de Carvalho, project manager in the Möller instrumentation, control, and automation division. So Möller made the decision to install a CPU with

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Thanks to the Simatic S7-1200 fail-safe controller, Möller does not need to wire an additional safety system

Safety Integrated via 16 fail-safe inputs and two corresponding outputs. This not only saved on the complete wiring of an additional safety system, it also made the implementation and commissioning much simpler.

Manual process supported automatically

“The heating chamber is actually part of a largely manual work process. It is designed primarily for smaller-scale production, enabling us to switch quickly and easily between different products,” explains Riemann. “In the interest of efficient work processes, however, a carefully designed automation system was still needed,” he adds. The heating plate is equipped with five individually controlled heating elements, for example. Each of them supplies 1.5 kW and they are activated in stages to avoid high current peaks. The heating is also a two-stage system. After the hood

closes, the system is automatically brought up to the required temperature. If this is not reached within the defined time window, the second stage is activated. The temperature can be set using a control unit on the door of the control cabinet. The current operating status is displayed by an indicator on the control panel. When the indicator goes out, the heating time has finished and the front flap can be opened.

Looking to the future

Möller already had extensive experience using fail-safe Simatic S7-1500 controllers. However, the new heating chamber was the first application in the lower power range using the Simatic S7-1200 controller with Safety Integrated. Carvalho thought it only logical to utilize the company’s existing experience in this product application area. He did a cost analysis and came to the clear conclusion that an

integrated safety solution would be the best option. Simpler wiring was just one of many benefits that helped him reach the decision. In addition, with an integrated safety solution there would be no need to manage two completely different systems in terms of concept design, installation, and service. The solution also enables the simulation and testing not only of all the machine’s functions, but also its functional safety, right from the development phase. Furthermore, the fail-safe Simatic S7-1200 Basic Controller can access safety-related data directly. This means there is no need to configure interfaces to transfer basic information. “Thanks to the TIA Portal engineering framework, with its common user interface for standard and safety automation applications, all the programmers are able to familiarize themselves with the system quickly and easily,” explains Carvalho. “This enables us to implement streamlined development processes because we are always working with the same engineering tools, and we are able to use the same function libraries for each new application. Even the wiring diagram does not have to be newly drafted every time.”

In addition, the solution offers major benefits in terms of technical service. With conventional safety solutions, a fault usually has to be localized by a time-consuming process using a multi-meter. With the Simatic S7 controller, a laptop can be connected and a wealth of status information can be accessed via its web browser. This streamlines the troubleshooting process and greatly enhances the availability of the machine. Carvalho is convinced: “We will be using the Simatic S7-1200 controller with Safety Integrated even for small-scale applications in future.” ■

➤ [siemens.com/s7-1200](https://www.siemens.com/s7-1200)

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The quick route to a safe machine

The Simatic S7-1200 Starter Kits provide an easy entry into simple automation tasks – from engineering with TIA Portal to solutions for fail-safe applications.

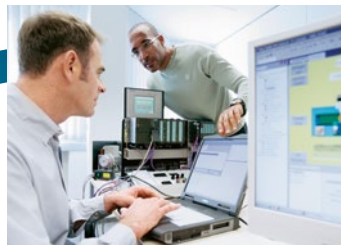
➤ **Starter Kits:**
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The media system provides a comprehensive overview of the methodology for implementing safety functions with the Simatic S7-1200.

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