

advance

The Magazine for Totally Integrated Automation

Volume 11, Number 1, 2012

SIEMENS

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in installation networks?

Automation Technology: The Solutions Business is Changing

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creates freedom

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advance 1-2012

Published by: Siemens Aktiengesellschaft, Gleiwitzer Str. 555, 90475 Nuremberg

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Tel.: 0 91 31/91 92-5 01, Fax: 0 91 31/91 92-5 94,
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Printed by: Wünsch, Neumarkt
advance appears four times a year
Circulation: 12,000

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This issue was printed on paper manufactured
from chlorine-free bleached cellulose.

ISSN 1611 101X (Print)

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Cover photo: W. Geyer



With the Chengdu electronics plant, Siemens plans to strengthen its presence in one of the most dynamic markets in the world

+ Growth in China

New Plant for Automation Technology

The Siemens Industry Automation Division is continuing to expand its presence in the growth region of Asia. A new plant in Chengdu (in the Chinese province of Sichuan) will develop and manufacture high-end Simatic controls and automation components starting in mid-2013. The plant is intended to help satisfy the growing global demand for modern and energy-efficient automation solutions. Annual growth in the Chinese automation market has been estimated by leading analysts at about 8 percent in the coming years.

The groundbreaking for the Chengdu electronics plant took place in February 2011. The first phase of the expansion comprises about 3,000 square meters. Depending on

further market growth, it can be expanded to up to 10,000 square meters and employ a workforce of more than 1,000 people. It is a subsidiary plant of the Amberg electronics plant in Germany, in which Siemens has been developing and manufacturing the majority of its controls for decades, and just like its parent it is being built as a “digital plant” in which the development departments and production are closely linked. The uninterrupted data flow ensures the highest-quality manufactured products as well as optimal transport and delivery processes.

www.siemens.com/simatic

+ WorldSkills Competition 2011

Winners of the Competition “Industrial Control”

Hee Jae Yoo (gold) from Korea, Yuki Okayama (silver) from Japan, and Andrin Cavegn (bronze) from Switzerland are the winners of the competition “Industrial Control, Skills 19” of the 41st WorldSkills vocational world championship in London. Siemens sponsored the category “Industrial Control” and provided all competitors, including the 25 finalists in the plant electricians’ discipline, with automation and drive technology. The core components were the Simatic S7 control CPU 314C, the Simatic TP177 HMI touchpanel, the Sinamics G120 frequency converter, and the corresponding software.

Roland Scheuerer, project manager of the program “Siemens Automation Cooperates with Education” (SCE), presented the winners with coupons for equipping their trade schools with the original Siemens core components from the competition. SCE supports research, development, and educational institutions of all types in their industrial-automation teaching missions and offers added value in the form of partnerships, expert knowledge, and expertise.

The nonprofit organization WorldSkills International (WSI) has been pursuing the goal of increasing the quality of vocational training worldwide for more than 60 years. After regional and national preliminaries, a vocational world championship of nonacademic professions for participants up to



The winners of the program “Siemens Automation Cooperates with Education” (SCE) with Roland Scheuerer, project manager

22 years of age is held every two years – the next one will be in Leipzig, Germany, in July 2013.

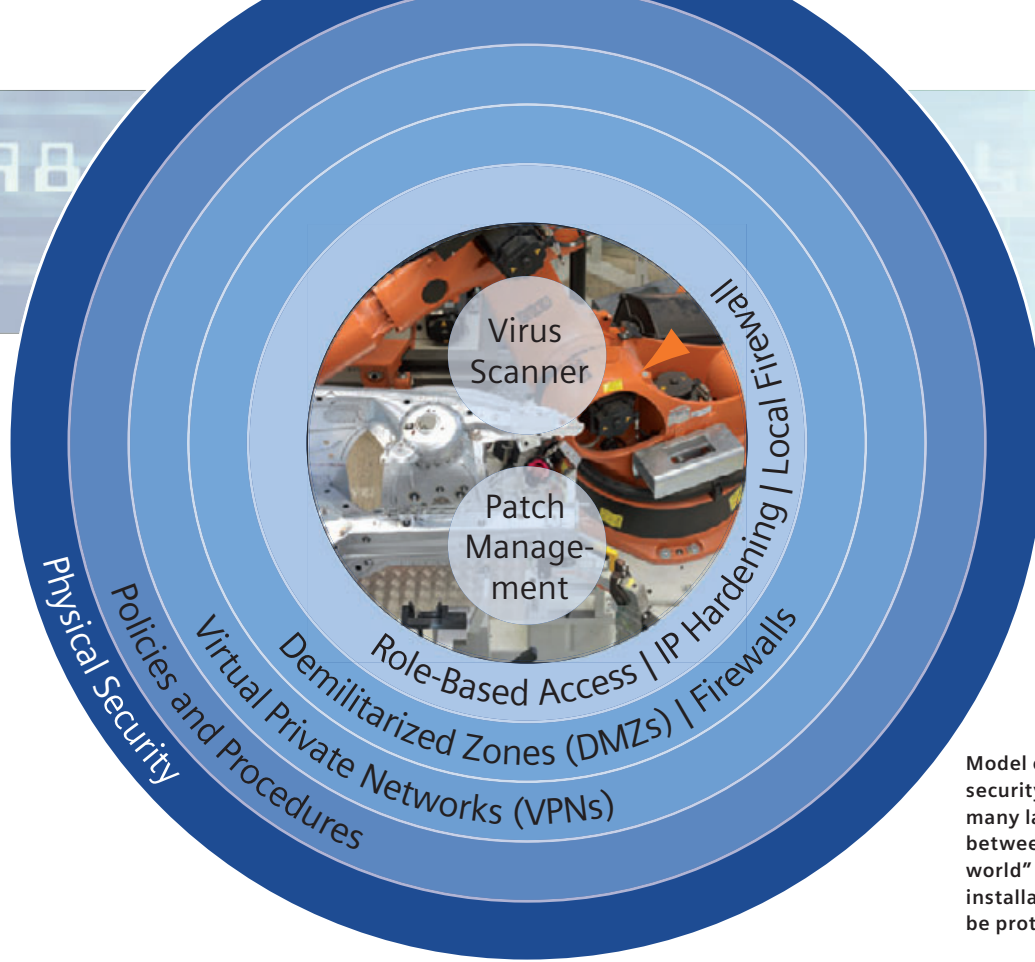
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Security in Data Traffic

Ethernet-based communication is becoming more and more important in the production area. In addition to the now possible use of open and standardized IT technologies, the main advantage is the continuous networking it provides. However, the vulnerability of these networks, and thus the risk of serious economic loss, is increasing. This is due to the fact that since standardization, the number of users having access to critical and formerly isolated areas is constantly growing. IT security therefore plays a decisive role. ▶





Model of a multilayer security concept with as many layers as possible between the "outside world" and the machine or installation that needs to be protected

» While IT security in office networks has long since become standard, the situation in production is quite a different matter. Established security concepts such as office firewalls are not that easy to apply to automation networks. These networks play by their own rules. For example, the protection of automation networks must not conflict with requirements such as performance or usability. Additional costs also play an important role.

How can potential risks be minimized using adequate yet affordable security in industrial automation? There is no easy answer, since every plant has different limiting conditions, risks, and protection goals. However, proven approaches with a manageable number of key components with which an efficient security concept can be developed do exist.

Security awareness as the basis

No matter how good the security concept is, it is of no use if not all the employees have a basic understanding of the issue. A promising security management solution can only be implemented with full awareness of all parties, assigning responsibility,

defining processes and measures, and developing corresponding emergency plans.

The preconditions for such a solution are a sound risk analysis and the determination of the resulting protection goals. Otherwise the company is in jeopardy of taking unsuitable measures that are too expensive, ineffective or that weak points will not be detected and corrected.

If there already exists a connection between the corporate IT network and the industrial IT network, it is imperative that all interfaces be protected. First, the permissible types of access from the corporate network into the industrial network need to be defined, together with the kinds of data that may be transferred in the opposite direction. These definitions are then translated into regulations and access rights and implemented via corresponding technical measures. Network intrusion detection systems (NIDS) and firewalls that detect access attempts in the entire network and regulate the data traffic in both directions take first priority in this process. It is also possible to set up a demilitarized zone (DMZ) in which both networks can exchange data without being directly linked.

Protection of the control systems

Just like PC systems in offices, PCs and PC-based control systems in the industrial network need to be protected against malware, and possible gaps in the operating system or the user software need to be closed. Many of the protective systems that have been proven in the office environment can be used for this purpose, for example, regularly updated virus scan software. However, these do not detect all viruses and are sometimes completely powerless against new viruses. Timely updates can also be a problem in the automation environment, for example, if no maintenance windows are available.

A good alternative to antivirus software is whitelisting software. This type of software uses what are called positive lists (white lists), through which a user can determine which processes or programs may run on a computer. If a user or piece of malware then tries to install a new program, it may be possible to install it; however, the program cannot be started and therefore cannot cause any damage.

It is more difficult to protect PLCs and HMI systems that either don't use a commercial operating system at all or an older



IT security for IWLAN

Security concerns when using WLAN in an industrial setting today are no more or less justified than when using line connections. Since the current IEEE 801.11i standards are universally implemented in modern devices, sufficient security is ensured in different applications.

The extension of the IEEE 802.11 standard (IEEE 801.11i) aims to significantly improve the until now inadequate Wired Equivalent Privacy (WEP) encryption method. Part of the protocol has been anticipated prior to completion under the name WPA (Wi-Fi Protected Access). WPA allows

secure encryption using the temporal key integrity protocol (TKIP). By using pre-shared keys, the integration into existing systems has become easier. The complete extension will be implemented by WPA2.

Using IEEE 802.1X (the general method for authentication and authorization in IEEE 802 networks) with the RADIUS (Remote Authentication Dial-In User Service) network protocol allows the unambiguous identification of users. Moreover, 802.11i includes the regulations for the use of the Advanced Encryption Standard (AES) for the encryption of data.

version. The use of third-party security software is not possible in this situation. What's more, access to the system functions of the devices is often not possible or limited. Here, the manufacturers of automation hardware are called upon to implement corresponding security mechanisms and make setting options available to the user. Another important point is the fundamental robustness of the systems regarding the influence of faulty data telegrams and larger, unwanted data streams. The manufacturers must make sure that the devices are tested for any weak points and "hardened" accordingly with certain measures. As with PC-based systems, it should be possible to deactivate services, protocols, or unused interfaces in PLC and HMI systems. Using functions provided by Siemens controls such as password protection, component encryption, and copy protection, for example, lays another essential building block for the protection of the industrial network.

Network security with cell protection

Most of the automation devices today do not have sufficient security functions of their own to be able to protect themselves

against all conceivable threats. Due to their long service lives, this is not going to change any time soon. Yet these devices need to be protected somehow. The cell protection concept has proven effective as a solution to this dilemma. The idea is simple: specially hardened network components (security appliances or security modules) are used that have security functions such as firewalls and virtual private networks (VPNs). These security appliances are connected upstream from the automation devices and form the only access point to these devices, thus protecting them. In this way, automation cells are formed and the network is segmented from a security viewpoint at the same time. Using the firewall of the security appliance, the data traffic from and to the cell can be controlled and thus unauthorized access prevented.

The security appliances can also set up secure VPN channels with each other, so that the communication between the cells can be encrypted and safely authenticated. This way the data transmission is protected against manipulation and espionage. In addition to the Scalance S security appliance, Siemens will soon also offer these security functions in certain net-

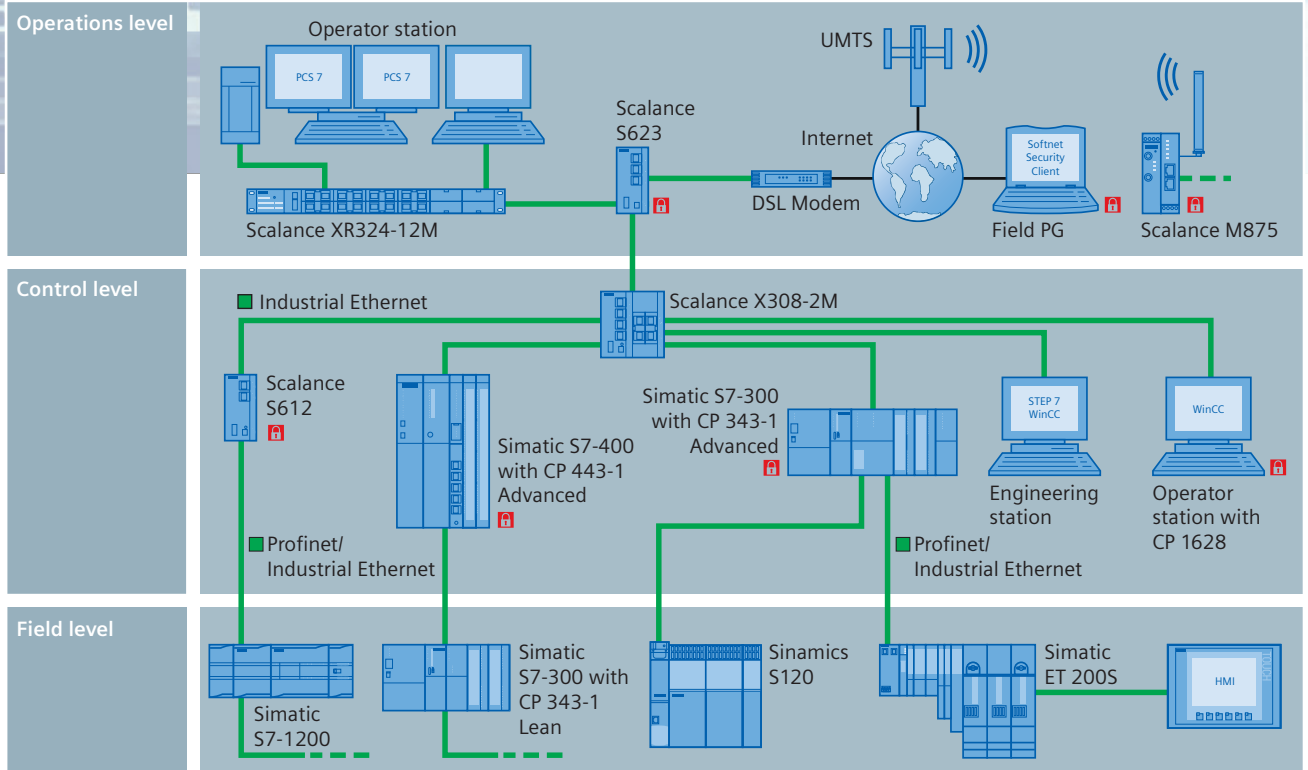
work components for Simatic S7 controls and PCs.

The advantages are obvious: One security appliance can protect several other devices, meaning that these functions do not need to be installed and administered in every device. Within the cell, the real-time communication remains unaffected by performance-intensive security functions, and yet access to the cell is protected.

Devices that cannot be protected by the cell protection concept must protect themselves. In this case, the communication participants must authenticate themselves directly on the device. Application-specific access rights can be realized using several protection steps, for example, through different passwords per protection step.

Protection against access

All access to a network must be monitored if unauthorized access is to be prevented. In addition to secure remote maintenance access and secure connections to other networks, the ports of network switches and routers also need to be considered. The ports of the network components ►►



Realization of the cell protection concept using Scalance S security appliances as well as Simatic S7 and PC communications modules with integrated security function (see lock symbol)

► must therefore have at least corresponding access lists that determine which devices may connect to which ports. Many network switches support the IEEE 802.1x standard for this. The authentication of participants connecting to a port is performed by an authentication server, which is queried accordingly by the network switch.

Additional security is achieved by using only hardened products, if possible. Hard-

ened means that the products have been inspected by the manufacturer for any weak points already during their development, and that detected weak points have been eliminated so that they cannot be exploited by hackers or malware.

All pulling together – for secure automation

Even though the threats to automation networks have increased and become more complex, a well-thought-out security concept and application-specific measures can allow automation networks to be operated even today with a reasonable degree of security at an economically justifiable cost. Naturally, the operators are responsible for the secure operation; however, manufacturers like Siemens can support them with corresponding consultation and secure products and components. In any case, the effective implementation of a functioning security concept requires the cooperation of the users and the operators, but also of the manufacturers of automation technology. In addition, stan-

dardization bodies need to draw up corresponding guidelines and – where possible – show standardized processes or measures.

The above-mentioned security products and the industrial security concept by Siemens represent a comprehensive approach that offers companies in all industries a way to achieve higher security in their industrial networks – in five steps. +

5 steps to a more secure installation network

- + Security management
- + Protection of the interfaces between corporate and installation networks
- + Protection of PC-based systems in the installation network
- + Protection of the control level
- + Network security

MORE ON THIS TOPIC:

+ www.siemens.com/industrialsecurity

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Fit for IT Security



"IT security is a matter of the mind. Only when you have a basic understanding of the issue can you implement the necessary requirements."

Stefan Woronka, Head of Industrial IT Security Services

There can be no question that IT security needs to reliably protect industrial plants from both internal and external attacks – today more than ever. But how can a high level of security be achieved? Security experts at Siemens are applying themselves to answering this question in security assessment workshops conceived specifically for this purpose, with the goal of understanding and implementing industrial security requirements.



All photos: Siemens AG

Understand and safely implement industrial security requirements with the aid of security assessment workshops

During a security assessment workshop, the participants familiarize themselves with the current IT security requirements in industrial plants. They also receive information on effective ways in which risks can be minimized. For this, Siemens offers a comprehensive security concept built on the requirements of the ISA 99 standard on "Industrial Automation and Control Systems Security." The one-day workshop starts with a presentation on industrial security and then examines issues such as threat scenarios, standards, and statutory regulations, as well as strategies for the protection of automation systems. In addition, the security concepts for the Simatic PCS 7 process control system and the Simatic WinCC SCADA system are introduced in detail.

Based on interviews with the client's systems specialists, the security of an actual plant or automation system is analyzed in the context of these assessments. In this process, areas of activity to improve system security are also determined. The results of these assessments are then made available in a final written report explaining the weak points identified and proposing measures for their elimination.

Successful security assessment workshops have already been carried out with several companies. +

Clean Power





Current incentive programs increase the attractiveness of hydropower plants. Requirements for profitable operation are state-of-the-art mechanics and measurement, regulation, and process control technology. Experienced providers rely on Siemens components.

Power generation from renewable energy sources is experiencing high growth rates. The share of hydropower depends on regional conditions, with considerable requirements based on water law and ecology standing in the way of the construction of new plants. Tax incentives and attractive feed conditions, however, make it increasingly interesting to reactivate or modernize old plants. With modern technology, the yield can be doubled in many cases, so the investments break even quickly.

The German company Bock Energietechnik, based in Floß, specializes in electrical engineering equipment for hydropower plants. Bock has developed a standard for this, consisting of a core of established and proven components that can be easily adapted to the relevant conditions. This core includes flexible Kaplan turbines that make optimal use of a changing water

supply at all times, as well as Loher generators, which have the leading technology in the field with their copper rotors and reach an efficiency of over 96 percent.

Ecological requirements determine operation

The art of operating the plants lies in obtaining the highest possible yield while at no time infringing on the requirements of the water authority. The requirements for an operating permit for a hydropower plant include fish being able to migrate past the plant to their upstream spawning grounds at all times. To ensure this, a fish ladder must be built and constantly supplied with sufficient water. That is why every hydropower plant has a dam upstream from the power plant that stores the water at a specified level. This level guarantees an adequate supply of flowing ►

The fish ladder must always be passable for fish



“User-friendliness is a crucial factor in our plants. With Simatic WinCC flexible the customer immediately gets all the important information at a glance.”

**Erich Dannhäuser,
Software Developer, Bock Energietechnik**



All photos: W. Geyer

The water level at the dam is the set point for the regulation

Established and proven components for the generation of electricity

► water to the fish ladder and is therefore the most important set point for the plant's control system.

Bock's expertise lies in keeping the efficiency of the plant at the highest possible level with a fluctuating water supply. Modern Kaplan turbines have adjustable guide vanes, thus enabling the adjustment of drag. Complex cascade regulation results from the specification to keep the water level constant at the dam; at the hydropower plants supplied by Bock, this is mapped in a Simatic software controller.

Outstanding project in the Bavarian Forest

Bock was able to realize a downright scenic project in Bad Kötzing. The plant on the Regen River was not only brought up to date technically, but also built in such a way that it blends perfectly into the landscape of the Bavarian Forest. Upon viewing it one cannot help but think, "Clean power is being generated here!" Depending on the water supply, up to 200 kW are produced and fed into the grid – around the clock. The plant is small but impressive. Ecological, economic, and aesthetic aspects were all equally taken into consideration.

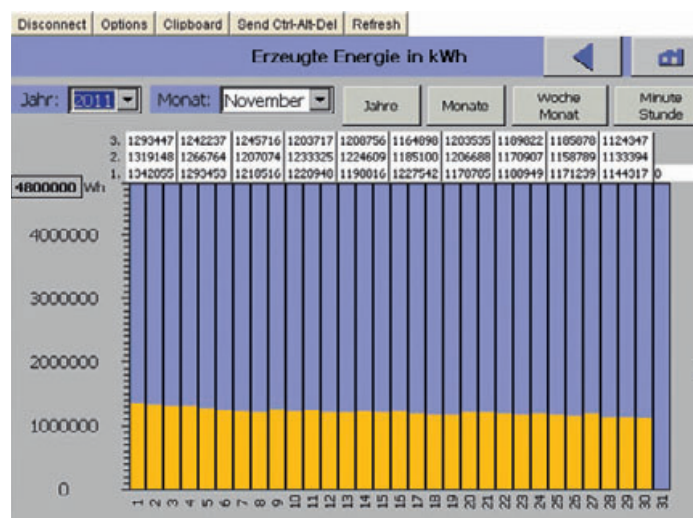
Control, regulation, and visualization in one device

The Kötzing hydropower station is regulated via a Simatic Multi Panel 277 with a WinAC MP software controller. The periph-

ery is connected via ET 200S. Here too, Siemens technology is used as far as possible. Sentron PAC measuring devices record the performance and energy yield. The water level is measured before and after raking in order to determine the optimal time for activating the rake cleaner. PT100 temperature sensors track the water temperature. In the event of frost, the sealing lips are heated so that the gate valve and rake cleaner do not freeze up. The Simatic Multi Panel 277 is also responsible for this and for the control of the monitoring cameras. The device has a 10" touchscreen for the visualization via WinCC flexible.

Erich Dannhäußer is responsible for the software development at Bock. User-friendliness has absolute priority for him:

"We design the plants in such a way that the customers have all the important information in sight on one screen. Simatic WinCC flexible is eminently suited for this." In addition to the current water level and performance data, information on preventive maintenance is shown; the plant obtains this information by managing running time meters for important units. Part of the screen is reserved for plain text messages. WinCC flexible supports the division of messages into three different categories: Info alerts are used, for example, for announcing maintenance requirements. Auto-boot alerts show disruptions that do not require any action because the plant – for example, after a power failure – starts up again automatically. An uninterruptible Sitop power supply for the hy-



The energy history shows operators the yield of their plant and gives maintenance engineers important tips on plant optimization



from hydropower: Kaplan turbine and Loher generator



The turbine house in idyllic scenery

draulic control minimizes performance losses here by delaying the opening of the spillway. Action needs to be taken immediately only in the case of emergency stop alerts. With the aid of the Smart Service option, these messages are transferred to the cell phone of the operator.

Remote maintenance as service

Waterworks run self-sufficiently, without operators on-site. The possibility of remote maintenance is therefore vital. "Ideally, the operating company is informed via cell phone whenever a disruption occurs. We have left instructions on eliminating disruptions in WinCC flexible, which help operators locate and remedy possible disruptions quickly. At the customer's request, the plant can be accessed remotely, so that it can be monitored and also operated or optimized if necessary. Our customers value the support provided by this safe VPN- and password-protected access possibility," explains Dannhäußer.

Practical operations log

Having disruptions displayed on a cell phone is important, but what is of even greater interest to operators of power plants is yield. An operations calendar – designed as an additional feature in Simatic WinCC flexible – records energy production or output to the minute. The data are filed in condensed form on an SD card and can be retraced over several years. And yet the operations diary is

much more than a gadget. The CSV data can easily be filed in Excel tables and, for example, correlated with weather data.

The option of comparing energy values with other operating data has a very practical use: Dannhäußer values the operations log as a further possibility for carrying out system diagnostics. If, for example, the generated output decreases despite a constant water level, this could indicate that the turbine is not optimally adjusted or that another disruption exists. Small interferences in the system can be tracked via performance monitoring.

Good prospects for the future

Dannhäußer's job has become his hobby. He has found a partner to exchange tips and tricks with in Bernd Geyer of Siemens. So the search for the optimal controller begins anew for every plant. In future projects, they are considering using

Bock hydropower plants automated with Simatic

- + **Bad Kötzing:** Kaplan turbine, 200 kW; Loher generator
- + **Cologne:** Kaplan turbine, 45 kW; water-cooled Loher generator; waste heat used for the heating of a neighboring house
- + **Saxony:** 1 Kaplan turbine, 350 kW, and 2 Francis turbines, 250 kW; efficiency optimization according to water supply
- + **Hungary:** Rake cleaning control, dam guide vane control
- + **Passau:** Kaplan turbine, 300 kW; synchronized generator; data transfer via fiber-optic cables

Profinet with fiber-optic technology instead of Profibus – to better protect the monitoring cameras from lightning, if nothing else. Two more plants are going to be modernized on the Regen (German for "rain") River in the near future – and the operating companies are certainly not going to be left out in the rain. +

MORE ON THIS TOPIC:

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The Solutions Business is Changing

The trend toward concentration on the core business is apparent in many areas. This results in opportunities and challenges in equal measure. Automation specialists benefit if they expand their core competences by increasing their industry and technology know-how. At the same time, any resulting additional costs must be compensated. Engineering tools such as TIA Portal make an essential contribution here.

HMR Automatisierungs- und Prozesstechnik GmbH is a certified Siemens Automation Solution Partner with experience in a great variety of industries. The reference list shows that well-known companies all over the world from both the manufacturing and the process industries repeatedly execute large projects with HMR.

Automobile manufacturers as well as chemical companies and public-sector clients make up the company's customer base. The up-and-coming company has been in business since 1982 and today has 90 employees. Currently HMR is realizing, among other things, a parking garage in Dubai with more than 30 fail-safe controls. Another project is a huge sturgeon farm in the desert – equipped by HMR with highly available Simatic automation technology – that produces considerable quantities of

caviar, which is in high demand even in the sheikhdom.

We spoke with Richard Huber, project manager at HMR, about the requirements in today's project business.

Mr. Huber, compared to the past, what has changed the most in the execution of large projects today?

Richard Huber: In the past, customers had very specific requirements for the realization of projects. We as experts were expected to have the expertise when it came to project management, programming, and the commissioning of the automation technology. Today, customers are increasingly outsourcing everything that is not directly part of their core competence. We are increasingly being involved in the design of the actual solution. Industry expertise is simply taken for granted –

and the projects must not become more expensive because of it.

How do you manage to remain competitive under these more demanding conditions?

Huber: That is indeed one of our greatest challenges, because developing expertise costs money. More efficient engineering tools play an important part in this for us. Our employees have to learn how to work with their tools quickly, and to do so intuitively. TIA Portal is an excellent example of this. Here, HMR was the pilot customer.

Now you are using the software in production.

Huber: Yes, that's right. The automation of a welding machine commissioned by PAKS GmbH was a challenge. For HMR, it was a very interesting object, since it is



All photos: W. Geyer

“Our employees have to learn how to work with their tools quickly, and to do so intuitively.”

Richard Huber, Project Manager, HMR

Joining plastic pipes

technologically very demanding, and the available volume is manageable yet expandable. The experience with TIA Portal was completely positive already in the pilot phase. It was important to us to test the user-friendliness of the system. For this purpose, we let specialists and novices work with it. Both were delighted. I am especially happy that the colleagues with little experience learned how to work with it a lot faster than had been possible with the previous systems.

Even though the welding machine is currently still a pilot project, we are planning to use the software modules developed here in larger control systems as well.

PAKS GmbH, an HMR customer based in Rimbach, Germany, is a specialist in the development and manufacturing of production systems for high-quality plastic components for a wide variety of applications. First and foremost, PAKS works as a supplier to the automotive industry. The order for a novel pipe system posed a new challenge for PAKS and HMR. A kind of mat, consisting of bonded lengthwise and diagonal pipes in fixed modular dimensions, promises to be more sturdy and easier to lay than the hose systems prevailing until now. Plastic material of the highest quality and absolute mastery of the bonding technology are prerequisites. Here, PAKS can fall back above all on its experience in the automotive sector. The plant consists of a welding machine with a cutting table, which picks up and processes both the diagonal and the lengthwise pipes. HMR was able to realize the entire positioning and temperature control of the heating mirrors with a Simatic S7-1200. A Basic Panel was chosen for selecting the heating circuits. For the first time, the HMR specialists used TIA Portal in production for the project management and programming. The controller modules integrated in Step 7 were sufficient for the more complex temperature controls as well.

"We are very pleased with the pilot project and are looking forward to the future expansion."

Steffen Petrausch, Managing Director, PAKS



HMR Automatisierungs- und Prozesstechnik GmbH

The core competence of the Siemens Solution Partner is the design and realization of industry-specific automation solutions, with the goal to turn the latest technical developments into efficient solutions. With numerous sites all over Germany, HMR guarantees its customers optimal support and fast on-site service.

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In your opinion, what is the greatest advantage of TIA Portal?

Huber: In our view, the main advantage of TIA Portal lies in the common data basis for user programs and visualization. Previously it was necessary to enter every variable in each system individually. With TIA Portal, now one input suffices. The amount of time saved is enormous and increases along with the size of the project. Added to this are the data consistency and increased transparency – further factors that carry great weight, especially in large projects.

One thing is certain for us: with TIA Portal, we consider ourselves to be optimally prepared for the challenges, as mentioned above, that result from the fact that more and more industry knowledge and technological expertise are required of us. The intuitive operation and the reduction of the input to almost half the effort enable us to stay competitive even under these conditions.

If you want to offer professional engineering today, you have to be able to use tools that are all of one piece, meaning

they don't cause version or compatibility problems. TIA Portal fulfills this requirement as well. This way we gain time to wholly concentrate on the requirements of our customers, who are themselves under competitive pressure.

Mr. Huber, thank you very much for speaking with us.

MORE ON THIS TOPIC:

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Efficiently Burning Carbon Dust

A Bavarian plant manufacturer succeeds in efficiently burning energy sources such as lignite and similar fluidizable dust materials with modern technology. Integrated automation makes the dust dosage and combustion efficient and flexible.

Due to its comparatively easy excavation, lignite continues to have its place in the energy mix – especially when the incineration plants operate at high efficiency. “Our dosing feeders and hot-gas generators make a decisive contribution here,” explains Peter Schöfmann, who is responsible for electrotechnology at plant manufacturer Carbotechnik Energiesysteme GmbH in Geretsried, south of Munich. “Our boiler plants reach an efficiency level of more than 92 percent.” Compared with competitive products, the Carbotechnik plants also excel through

the rapid changeover from dustlike fluidizable energy sources to gaseous energy sources.

High accuracy in dosing

In order to burn dustlike energy sources efficiently, dust and air need to be uniformly mixed. Moreover, uniform combustion according to the required performance is necessary. The dosing accuracy of Carbotechnik’s dosing feeders exceeds plus or minus 3 percent. The cylindrical drum is filled to about two-thirds capacity

with the dustlike fuel. If an air blower presses the air through the floating floor at slow speed, the material fluidizes: it expands by about a third and takes on liquid-like characteristics. The fluidized dust is conveyed to the feed lines to the downstream combustion systems via horizontally rotating perforated discs.

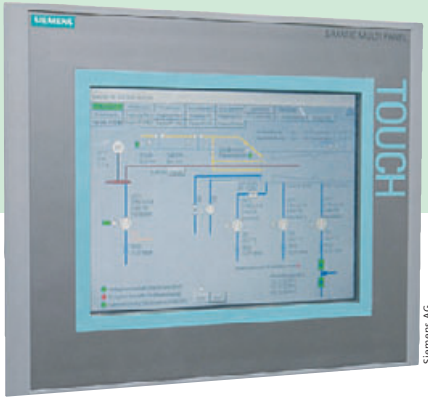
Because such dosing feeds are also supplied to customers as a subsystem, autarkic operation is an advantage. “We use the Simatic ET 200S distributed I/O module, which can be adapted flexibly to every requirement,” explains Josef Hündegger of the electrotechnology department at Carbotechnik. If the dosing feeder is supplied as a subsystem, the ET 200S is equipped with a safety-oriented IM 151 F head assembly. This CPU processes all the signals and communicates with the overriding system control via stackable Profibus or Profinet modules.

Visualization with remote access

“It is important for us to be able to observe and archive the process data at all times in order to continuously improve the dosage and combustion technology,” emphasizes Schöfmann. That is why the expert uses an MP277 Multi Panel with touch screen for archiving and visualization in every plant. Carbotechnik’s customers highly appreciate the so-called



The dosing feeders and hot-gas generators for fluidizable materials by Carbotechnik Energiesysteme are coordinated for lignite dust. They can, however, be adapted to other energy sources via parameter settings at any time



The MP277 Multi Panel is suitable for remote diagnostics and maintenance via Profinet as well as for the archiving of important process data

“Synchronized components provide clear overall solutions that lead to an efficient result.”

Smart Service supported by the Multi Panels – that is, password-protected remote diagnostics and maintenance via an IP address and a VPN connection.

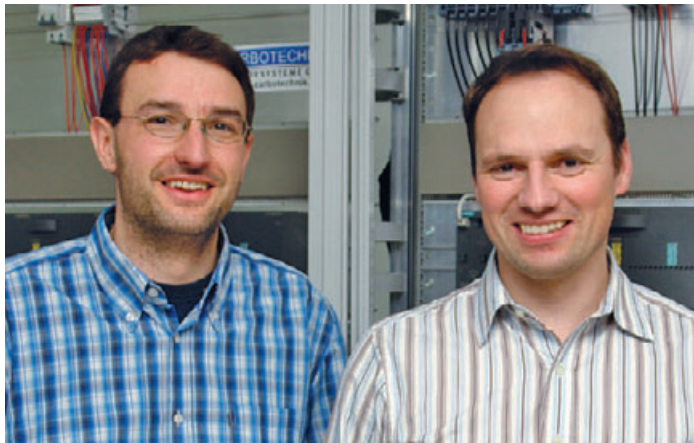
Carbotechnik plants can be parameterized by the process engineer almost entirely via the visualization. “Here too, the integrated automation solutions prove to be an advantage – right down to the software,” Schöfmann explains.

With the WinCC and WinCC flexible visualization software, plant images can be drawn easily, parameters can be displayed or modified, errors displayed, faults accumulated, and values archived. The archive can be saved on a standard commercial USB data stick with the MP277.

In the case of hot-gas generators, sophisticated process technology plays an important role in the greatest possible residue-free combustion of the dust-air mixture from the dosing feeder. Constant, clean, self-sustaining combustion results from the circulation of combustion air, mixed air, and cooling air. “No permanent backup flame is required, and the fuel costs remain low,” says Schöfmann. Additionally, the outer walls stay comparatively cool, so that a cladding with fireclay can be dispensed with. This saves investment costs, and the burners can be heated to their full capacity in the shortest possible time.

Safety technology included

The automation specialist uses the Simatic S7-315 F 2DP/PN control system mainly because of its high memory capacity. This system, like the ET 200S, is available with a Profinet connection and a fail-safe CPU. “It is very practical to be able to process



Peter Schöfmann (right), head of the electrotechnology department at Carbotechnik Energiesysteme GmbH, and his colleague Josef Hundegger, are convinced of the possibilities of Totally Integrated Automation

standard and safety-orientated signals on the same automation platform,” Schöfmann and Hundegger point out.

A safe stop must be guaranteed for the frequency-controlled dosing disc in the dosing feeder during maintenance work. To that end, the ET 200S frequency converter, or alternatively the Sinamics G120, is equipped with the corresponding safety feature. The filling-level sensor and the motor starter ET 200S for the agitator above the floating floor, as well as everything in the hot-gas generator that has to do with combustion, must be subjected to safety-oriented monitoring. This includes the analog measurement of the air quantity, the pressure controllers, and the gas valves for the ignition – no problem with the Simatic S7-315 F.

After the positive experience with the dosing devices and burners, Schöfmann

has been completely won over by Totally Integrated Automation (TIA): “Everything fits together.”

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Power Supply with All-Round Protection

Control systems, operating devices, sensors, and actuators are normally powered by a 24 V DC switching power supply. Modern power supply units such as Sitop offer a maximum level of service security. However, longer power failures, extreme fluctuations in power supply voltage, or a defective load can have a considerable impact on plant operation. For such cases, Sitop offers a unique range of products to protect against disruptions on the primary and secondary side.



operating data required in this case and the subsequent controlled shutdown of the PC usually take no more than a minute. The high-capacity double-layer Sitop UPS500 capacitors with degrees of protection of IP20 and IP65 supply sufficient power for this and are absolutely maintenance-free. And because the capacitors do not emit any gas, control cabinet ventilation can also be dispensed with. Short charging times restore the buffer availability quickly after a power failure. In addition, the USB interface enables easy communication with a PC.

To increase the system reliability of the power supply, Sitop power supply units can be extended flexibly with uninterruptible power supplies (UPS) as well as various additional modules – up to complete all-round protection.

Reliable 24 V power supply even during power failure

To protect 24 V loads from longer power failures as well, Sitop power supply units can be extended accordingly.

The buffer module for the Sitop modular power supplies enables bridging of up to 10 seconds, the maintenance-free DC UPS with capacitor technology enables bridging in the range of minutes, and the

DC UPS with battery modules up to hours. All DC UPS modules have the same basic features, with extensive monitoring capabilities and signaling contacts, and are available with a PC interface. A free software tool ensures simple integration into PC-based automation solutions: it assists the further processing of status messages as well as the safe shutdown and correct reboot of the system.

Uninterruptible power supply with capacitors

In many PC-based automation solutions extensive damage can be avoided in the event of power failures by bringing the plant to a defined state. The securing of

Uninterruptible power supply with battery modules

If buffer times of hours are needed for the 24 V supply, or if a larger buffer current is required, the DC UPS with maintenance-free lead accumulators offers optimal safety. Processes or parts of processes can continue to be operated from it, measuring values can be recorded without interruption, and communication is maintained. The elaborate battery management of the compact DC UPS modules also ensures optimal charging of the accumulators – and thus reliable buffer availability. The active accumulator test function even checks the age of the accumulators, making a preventive replacement of the accumulators superfluous and saving considerable costs. All the relevant messages are signaled by potential-free contacts, optionally also via a serial or USB interface.

Sitop all-round protection advantages at a glance

Sitop power supply units can be extended scalably with uninterruptible power supplies as well as various additional modules:

Sitop DC UPS with capacitors

- + Buffering up to a range of minutes
- + Maintenance-free capacitors avoid battery replacement
- + No ventilation of installation location necessary
- + Suited for standard rail mounting (DIN rail) assembly and distributed applications (IP65 degree of protection)
- + Easy PC integration with DC UPS software tool

Sitop DC UPS with battery modules

- + Buffering up to a range of hours
- + High security and availability due to monitoring of operation availability, battery supply, battery age, and state of charge
- + Uninterruptible transition from standby to buffer operation
- + Easy PC integration with DC UPS software tool

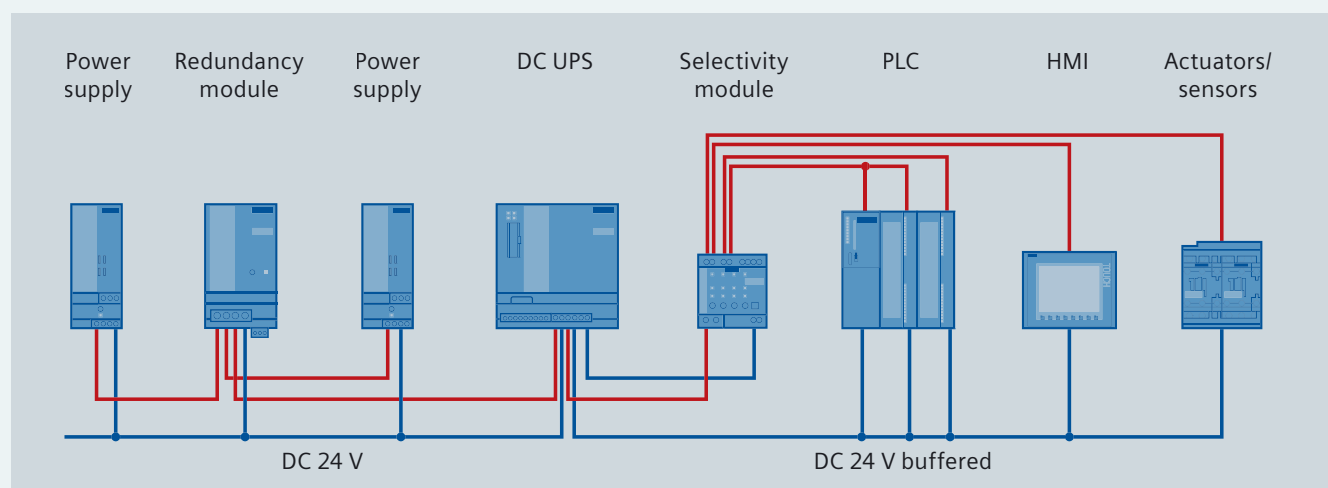
Sitop selectivity modules

- + Safe cutoff even in case of low short-circuit current
- + Uninterruptible operation of loads such as PLC by immediate cutoff of faulty circuits in case of voltage drop danger
- + Error diagnosis via LEDs and signaling contacts
- + Manual reset and remote reset

Sitop redundancy modules

- + Configuration of a redundant 24 V power supply up to 40 A
- + Diagnosis message via LED and signaling contacts
- + Adjustable switching threshold for LED and signaling contacts

Complete all-round protection with redundancy module, DC UPS, and selectivity module



Selective fuse protection of 24 V load circuits

Whether robust electromechanical loads or highly sensitive electronics are used, in modern plant and mechanical engineering all 24 V loads are supplied via a common line from an individually controlled switching power supply.

In order to prevent load defects from leading to a total voltage drop at the output of the power supply, the 24 V power supply circuit is divided into individual circuits and fuse protected selectively. The Sitop PSE200U electronic selectivity module is especially tailored to the behavior of switching power supplies. The electronics allow for short-term current peaks and isolate overloads electrically, even on long,

thin lines and in the event of "creeping" short circuits, where the current is limited by high ohmic resistance. The selectivity module reliably switches off the faulty load feeder, and the remaining loads continue to be supplied without interruption. The defect, including its channel, is displayed by an LED on the device and transmitted as a common signal contact. This can easily be interpreted by a control system, e.g. Simatic S7 PLC, and transmitted as a message onto the operating device. The error can thus be localized quickly and downtimes are minimized.

Redundancy for even greater safety

Redundancy modules provide additional protection from a failure of the 24 V power

supply. Thanks to the isolation of both power supplies via diodes, a faulty power supply unit has no influence on the power supply and the 24 V power supply remains secured. +

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High-Tech Equipment in a Historical Setting



The Silesian Theater in Opava has modernized its stage control system with state-of-the-art Siemens technology



During the modernization of the stage control system of the Silesian Theater in Opava, the persons responsible made sure that the automation would meet the most current standards. They placed particular emphasis on a comprehensive safety concept.

The Silesian Theater in the Czech town of Opava has a long tradition. The first theater performances took place there already in 1630. Today it houses a theater and an opera company as well as a drama studio and an opera studio. In order to be able to continue providing the discriminating audience with a sophisticated theater experience, the Silesian Theater decided to carry out a general modernization of the stage control system. Elvac Automation s.r.o. from Ostrava took over the realization of the automation and, based on its experience with such projects, decided on Siemens components for the entire stage machinery.

Individual performances always ready to be retrieved

An MP377 Multi Panel with a 19" touchscreen is available for monitoring the entire technology. An additional CompactFlash memory card, on which all performances are recorded as CSV files, enables

the archiving of individual performances. Moreover, performances that have concluded can be saved on a USB flash disk, from where they can be read and saved in the Mobile Panel as required. In this process, it is possible to operate individual flies as well as multiple flies at the same time. Simotion D has proven to be the best solution for these requirements.

Control of up to 48 axes at the same time

The flies in the Silesian Theater are controlled with two Simotion D445-1 motion controllers with extension for the Profinet IRT bus. The D-series Simotion system controls up to 48 electrical and hydraulic flies, each of which is equipped with two measuring devices. The Simatic S7-300 controller with CPU 319F-3PN/DP ensures operational safety in this process. Sinamics S120 frequency converters with integrated SS1 safety functions and the fail-safe TM54F module control the electric drives.

The Profisafe profile guarantees safe communication between the Simatic S7-300 and the drives. The entire control system is designed locally with Simatic ET 200M peripherals and safety modules.

Modern stage technology

Both at Elvac Automation and at the Silesian Theater the responsible persons are happy with the result. Libor Chromcák, PLC programmer at Elvac Automation, confirms: "By using the most up-to-date Siemens automation components for the control system, we were able to create a modern control system for the stage technology that combines electromechanical and linear hydraulic flies."

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Dealing Safely with New Standards

The EN 954-1 standard expired at the end of 2011. Machine manufacturers and operators now need to act in order to not jeopardize the sales and operations of their machines. Siemens supports them in implementing the new requirements of the machine directive with the current standards.

The first step toward a safe machine is a risk assessment. This process leads to risk-reducing safety measures that result in the design of a safety function ("functional safety"). Functional safety means protection from a hazard caused by a defective machine function. The two new standards ISO 13849-1 and EN 62061 address both the qualitative and the quantitative aspects of safety functions. This makes it possible to produce calculated proof of the quality of a safety function. Safety Integrated supports the user in this process with the online Safety Evaluation Tool (see box).

Detecting, evaluating and reacting

A new approach is seeing the control functions as a whole and incorporating detecting, evaluating and reacting. First the requirements for the safety functions that are to be realized need to be described in detail. Then solutions are selected and the safety

functions mapped to specific hardware and software. Their quality is checked and evaluated until the safety integrity required in the risk assessment has been achieved. Finally, the safety functions must be validated through analysis and review so that the achievement of the requirements can be documented. +

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+ Support for safety standards

Safety Evaluation Tool

The Safety Evaluation Tool for the ISO 13849 and EN 62061 standards supports users in the realization of safety functions. The TÜV-approved online tool guides users step by step from establishing the structure of the safety system to selecting components from any manufacturer to determining the achieved safety integrity. As a result, the user receives a compliance report, based on the standards, that can be integrated into the documentation as proof of safety.

www.siemens.com/safety-evaluation-tool

Sitrain standards training courses

Sitrain offers a comprehensive range of training courses on Safety Integrated:

- + Current European directives and CE marking in the machine and plant environment (ST-CEKEN)
- + European safety standards for functional safety in practice according to EN 62061 and EN ISO 13849-1 (ST-NSSTPRX)
- + Risk assessment management methodology for the realization of risk assessments according to standards EN ISO 14121-1 and/or EN ISO 12100 (ST-RAM)

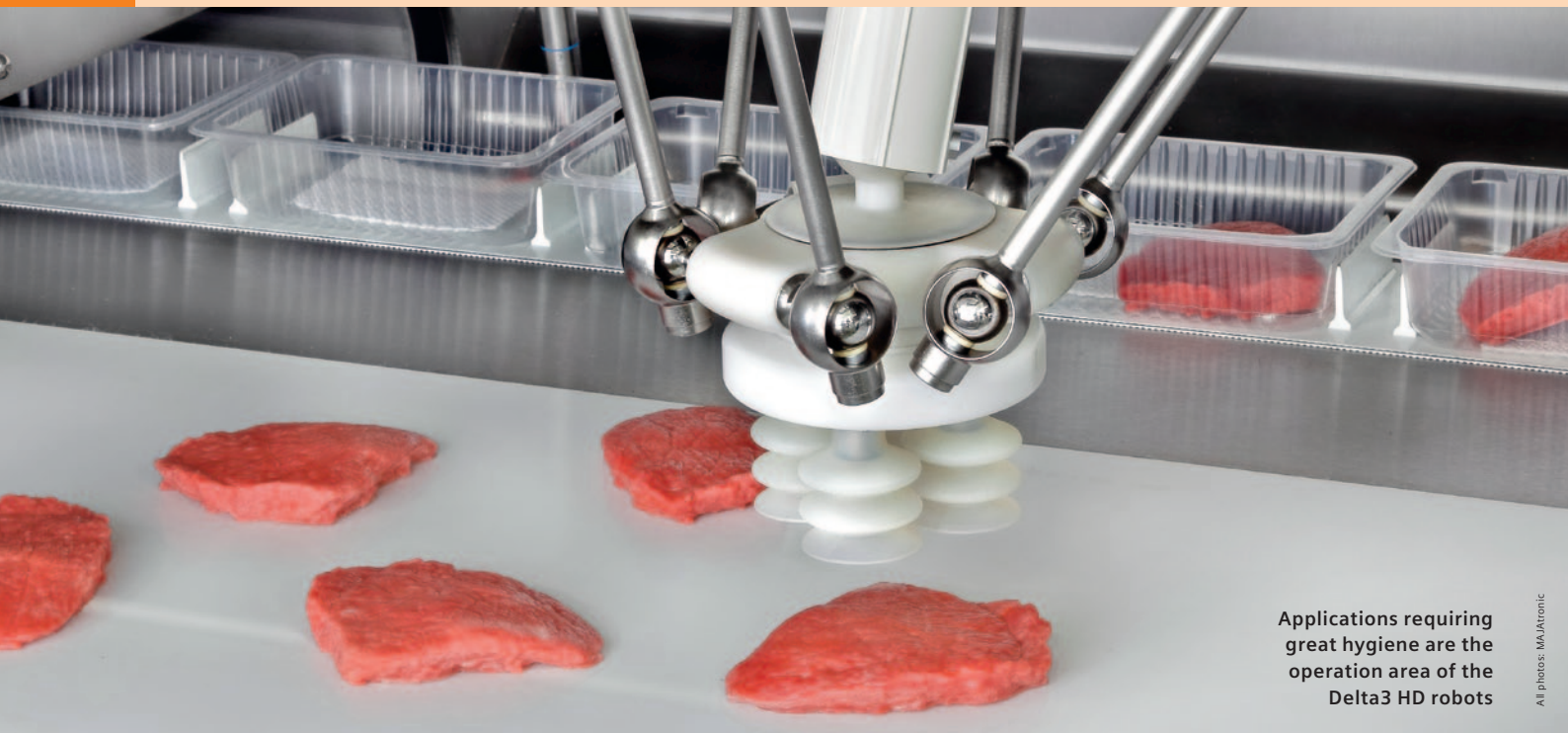
www.siemens.com/sitrain-safetyintegrated

Functional Examples

Look at certified safety concepts including SIL- and PL-evaluation on the internet at

www.siemens.com/safety-functional-examples

Hygienic Handling



Applications requiring great hygiene are the operation area of the Delta3 HD robots

All photos: MAJAtronic

Products by MAJAtronic GmbH are the first choice where maximum hygiene, noncorroding materials, smooth surfaces, and easy cleaning matter. For its innovative autonox24 robot, the company relies on the motion control system Simotion and the tested Simotion Handling Toolbox software library.

MAJAtronic GmbH, based in Kehl, Germany, has been developing complex serial machines with a focus on the meat processing industry since 2002. In response to the ever-louder calls for flexible automation in the food industry, the company started searching for a robot mechanics supplier. The result was disappointing: "If 500 units would be purchased per year, we could think about creating a special robot," was the standard answer from the market leaders – and incentive enough for the employees in Kehl to take the development into their own hands.

Under the OEM brand autonox24, a comprehensive range of robot components was created for a variety of uses, for example, in the food and packing indus-

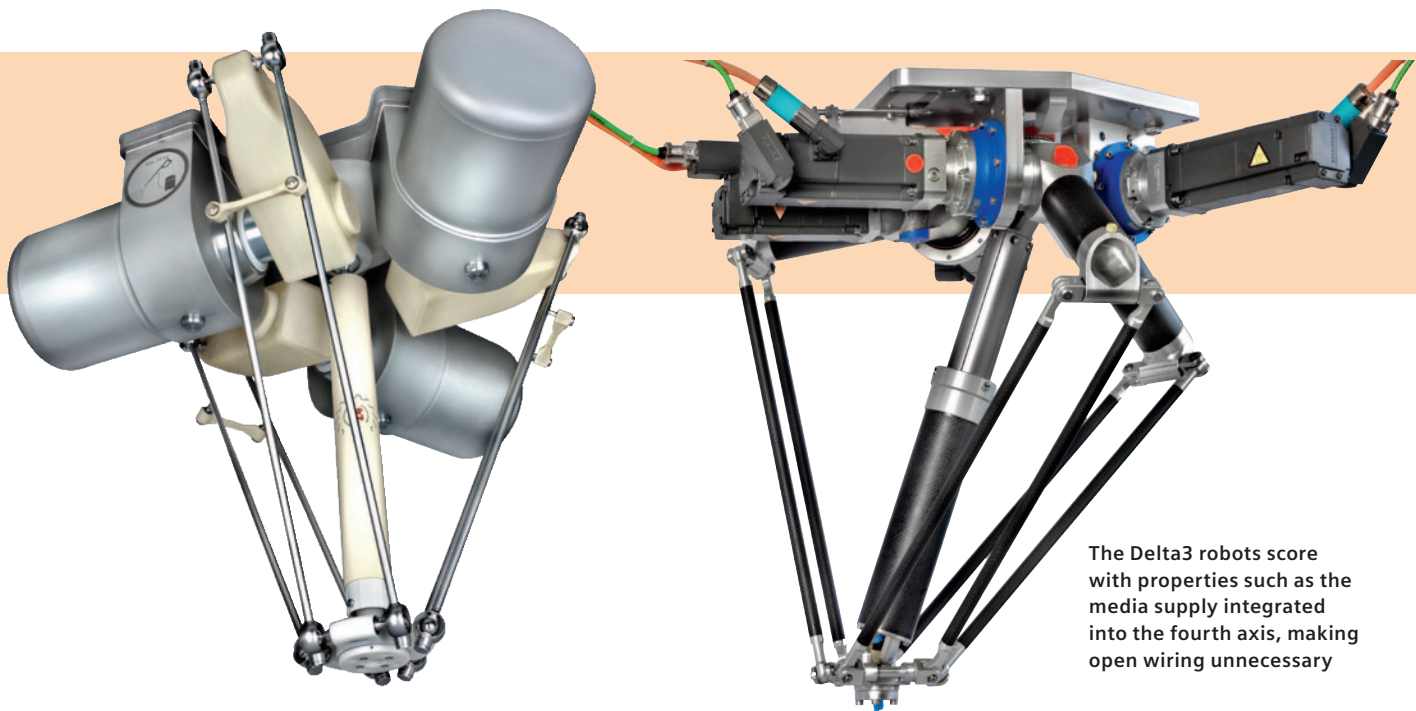
tries. All devices have highlights, such as not losable robot arms or the media supply integrated into the fourth axis. This makes electrical wiring laid externally along the robot arms a thing of the past. The immediate location of the valves near the gripper makes minimal gripping, suction, and placement times possible. Another advantage: special design requests are possible even for small quantities.

The right solution for every industry

The autonox24 robots in hygienic design (HD) are the first choice where food safety and resistance to chemicals matter. Whether placing meat skewers, dividing endless ropes of dough into exactly weighed rolls, or slitting pretzels – with

their IP69k degree of protection, the robots are perfectly suited for all tasks in extreme conditions involving contamination, humidity, or temperature, such as is the case in the meat processing and baking industries.

In order to be able to present its OEM partners with a comprehensive product range, MAJAtronic offers in the meat processing industry proven, air-conditioned HD image-processing units (2D and 3D). An interface developed just for this purpose simplifies the communication between Simotion and the various camera systems. For this reason, the results of the image processing can be easily read and processed in terms of location, orientation, form, volume, or quality of the product. "If the customer needs a virtually indestructi-



ble control panel that can be steamed during operation, he has come to the right place with autonox24,” explains Clemens Ratajczak, who played an instrumental role in the development of the robot.

A special lightweight line was designed for nonfood applications in which extreme acceleration and speeds are required. The benefits of the consistently lightweight construction with CFK structural components show to advantage especially under extreme loads in continuous operation, for example, in packaging.

Less engineering effort, more programming safety

In order to do justice to the complex automation tasks, MAJAtronic relies on the motion control system Simotion and the Simotion Handling Toolbox. In the interaction with the Sinamics S120 drive range, Simotion offers an ideal basis for flexible and modular automation.

The innovative Simotion Handling Toolbox software library allows the efficient implementation of handling applications and is suited for use on all Simotion platforms. All common kinematics – such as Delta3 pickers – are already implemented in the system. Furthermore, the option to integrate customer-specific kinematics with a universal transformation interface exists as well.

What is especially interesting: several kinematics can be implemented on one control together with software modules of other machines. This means synchronization with proprietary control architecture is no longer necessary – and real-time synchronization as well as uninterrupted data storage are now possible without problems. Automatically calculated, optimized movement profiles allow for every track to be covered as fast as possible without exceeding any dynamic limit values of the system.

By programming in the high-level Structured Text (ST) language, the user can flexibly expand the application. With Simotion Scout, all applications and hardware platforms have a continuous engineering system at their disposal. The modular and standardized software library reduces the engineering effort and averts programming errors.

Simotion Handling Toolbox

Basic libraries

| | |
|-------------------------|--|
| Simotion Handling Basic | Function block for easy handling |
| Simotion Top Loading | Standard library for high-end handling |

Additional libraries

| | |
|--------------------------|---|
| Transformation Interface | Integration of customer-specific kinematics |
| Product Register | Product management for pick-and-place |
| Message Handling | Managing of messages from control and drive |
| OMAC 3.0 | Operating mode manager |

3D visualization

| | |
|------------------------------|--------------------------------|
| Kinematics Simulation Center | 3D visualization of kinematics |
| 3D Trace Tool | Presentation of 3D curves |

Automation sets standards

MAJAtronic GmbH and its customers are very satisfied with the efficiency, reliability, and flexibility of the selected drives and automation solutions, because with them, the MAJAtronic Delta robots have set new standards for automation in the food industry.

MORE ON THIS TOPIC:

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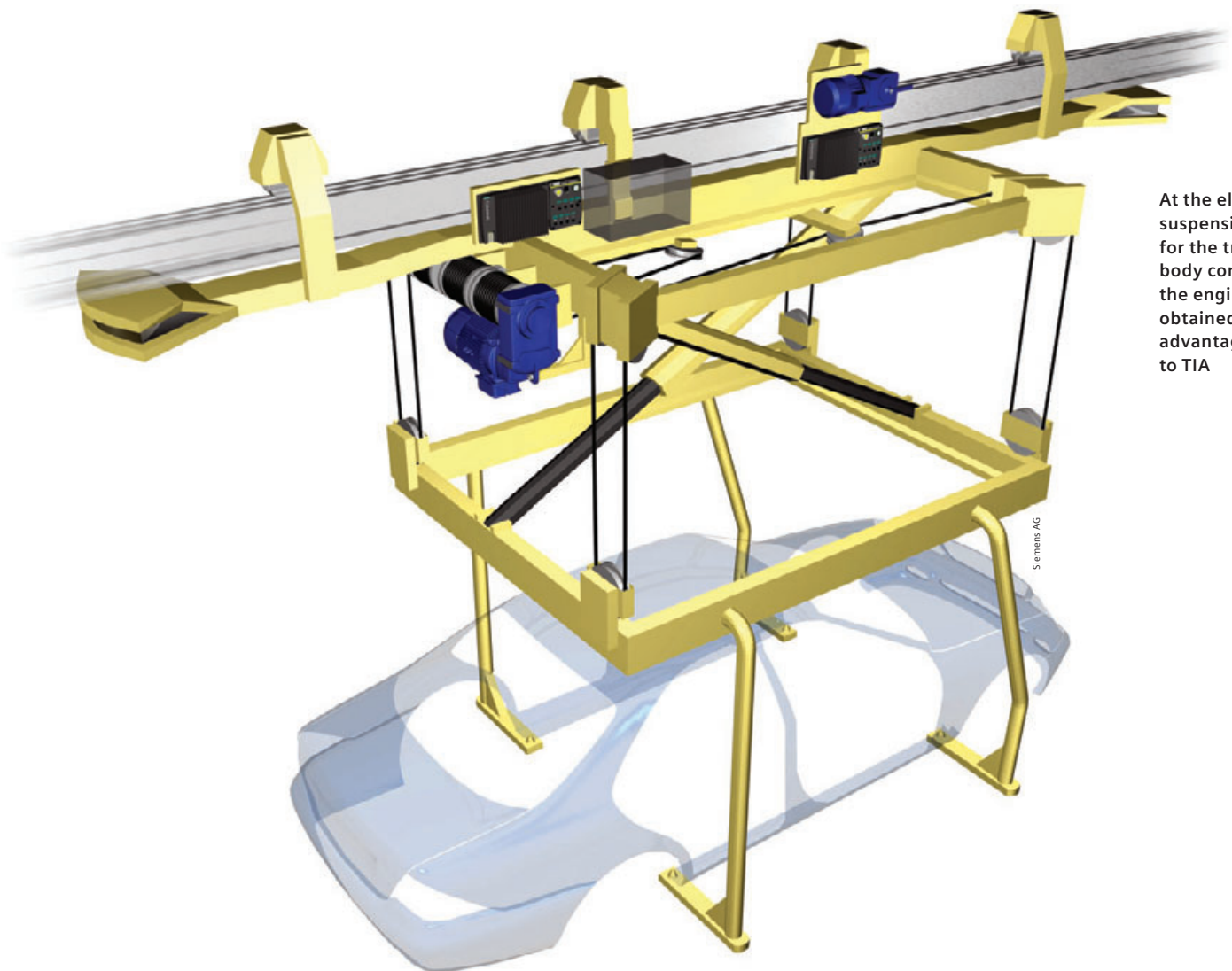
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Safe Materials Handling

Originally developed for a large automobile manufacturer, a materials handling technology solution based on modern converter technology is now proving its worth to other end customers. It moves body components with a high degree of flexibility, availability, and safety.



At the electrical suspension track for the transport of body components, the engineers obtained numerous advantages thanks to TIA

Siemens AG

The basis for this conveying technology solution is an electrical suspension track that can handle body components up to loading weights of 3.5 t horizontally and vertically. With the help of the integrated automation approach Totally Integrated Automation (TIA), the

engineers obtained several advantages. For example, there is only one hoist and traction motor per lifting gear. Moreover, the degree of standardization is high. Standard components such as the decentralized Sinamics G120D frequency converters enable the desired flexibility, avail-

ability, and safety. The modularly designed Sinamics G120D are available in a power range of 0.75 to 7.5 kW. While 3 kW are sufficient for the horizontal movement, the maximum power range was chosen for the hoist movement. Power elements and controllers can be combined individually;

however, the required hole pattern for the assembly is always identical. Should it turn out that a more powerful version is required after the device has been brought into service, no changes to the mechanical fixation are necessary.

Another advantage of the suspension track is the control technology, particularly the signal transmission to and from the process level. Although data feeding lines are generally used in the logistics industry, the plant manufacturers decided in this case to use Industrial Wireless LAN (IWLAN) transmission paths based on Profinet. Besides the purely mechanical advantages such as the reduction in hardware, this solution is particularly practical in the area of switch points and side tracks, where failures are common.

Onboard safety

The reliability and safety of each lifting gear are effectively ensured on board, as both the frequency converter and the distributed I/O modules on the individual lifting gears are appropriate for safety-related tasks. The Simatic ET 200S distributed I/O module safeguards the intelligence of the standard automation and safety technology. Equipped with a fail-safe F-CPU, it is situated in a connection box. It receives only starting and stopping commands from the system control via IWLAN and otherwise pilots the lifting gear autonomously. This special construction technique also disburdens the plantwide bus system.

The sensor signals are bundled outside the connection box via a fail-safe Simatic ET 200pro distributed I/O module with an IP65 degree of protection. Both stations communicate in a fail-safe manner via Profinet with the Profisafe communication profile. The Sinamics G120D frequency converters complete the intelligent and fail-safe subsystem, as they are capable of encoderlessly converting the STO (Safe

Torque Off), SS1 (Safe Stop 1), and SLS (Safely Limited Speed) safety functions according to norm EN 60204. If an emergency stop is triggered, the STO function switches the hoist drive to torque-free immediately. The braking drive guarantees a rapid application of the brake and thus prevents sagging. At the same time it ensures that the motor cannot start again. As no galvanic isolation is required between the motor and drive, an additional contactor was saved. Instead of redundancy there is only an additional interceptor brake, as it is known from elevator technology.

Safe production

The traction drive also uses the SLS function. Without a transmitter – and thus without signal feedback – this function monitors the speed of the motor and ensures that no programmed maximum or minimum speed is exceeded or undershot. The advantage of this is that production can, for instance, continue to run with open protective doors. In this case the moving speed is reduced to such an extent that no danger can result from it.

Alternatively, a safe stop can be programmed via SS1; this is suitable, for example, when protective areas with cramped spaces need to be opened or entered, or when people enter a protection area in the direct vicinity of the electrical suspension track. Here the SS1 function ensures a safe halt without causing an abrupt stop.

A further advantage of the electrical suspension track: it saves energy. Particularly in the case of loads weighing several tons, such as cars, the energy feedback in generator operation plays a crucial role. For this reason also, the Siemens converter has proved to be an ideal solution: the power module of the drive is able to feed power back into the network during lowering and braking operations. +

Sinamics G120D: highlights at a glance



+ Many innovative features:

Innovative feedback ability, optional integrated safety technology, and uniform drilling dimensions for all performance variables

+ Accelerated engineering and rapid commissioning:

Standard use of connector technology for energy, communication, and sensor technology plus optional micro memory card for parameter saving

+ Low-cost and integrated solutions:

Consistency of Sinamics integrated into the automation level through Totally Integrated Automation (TIA)

MORE ON THIS TOPIC:

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Snow for Sure

Those who want to guarantee tourists good ski slopes at all times must invest in modern technology. The innovative drive solution for the high-pressure pumping systems of a snowmaking machine considerably reduces power consumption, and therefore costs, thanks to electronic pressure and speed control.

The Schmittenhöhe mountain in Austria has been a popular destination since the days of the empire. During the winter, tourists enjoy the ski area with its scenic surroundings and 77 km of slopes and 26 cable cars and ski lifts. All the slopes can be covered with artificial snow, which guarantees ideal winter sport conditions during the entire season. With the aid of 295 snow guns and 86 propeller systems, around 1.1 million m³ of snow are brought to the slopes each winter, with a maximum capacity of approximately 1.5 m³ of snow per second.

The physical principle: when cold water is atomized under high pressure via nozzles and with the aid of compressed air, crystals form that gather on the ground as snow. This works particularly well at temperatures in the range between -5°C and -10°C. "As there are increasingly

reservoir at Plettsau Kopf is 58 m long and went into operation at the end of 2010.

Efficiency at all levels

"The critical factors for us are, among other things, the high availability, high operating safety, and high sustainability of the system," Mayer explains. In terms of sustainability, energy-efficient solutions and systems with low maintenance costs are in demand. That is why those responsible decided in favor of a converter solution in connection with 3-phase asynchronous motors to actuate the huge water pumps. Siemens Innsbruck took on the project responsibility, supplying the electrical system, measuring technology, control, and visualization.

1PQ8 motors now actuate the high-pressure pumps. They are ideal where

Responsible use of resources made Schmitt AG use energy-saving frequency converters for the pressure and speed control of water pumps at an early stage. The latest unit extension was with Sinamics G150 – two devices with a power-handling capability of 250 kW each, seven devices with a 400 kW capability, and one with 560 kW. The frequency converters are delivered as ready-to-use cabinets.

Their special advantages are their high reliability and control accuracy. Although they are capable of vector control without an additional encoder, an external speed sensor is used in this project. As many pumps are attached to the same feed network, the characteristic curves must be as close to identical as possible. This is obtained by exact pressure and volume flow rate control, which is only possible via external speed sensors in connection with precise pressure sensors – and thanks to which the Austrians save a considerable amount of power year in and year out.

Integrated harmonic wave compensation

Due to the many frequency converters in the power supply system and the high capacities, harmonic waves need to be compensated in Zell am See. In order to comply with the total harmonic distortion (THD) values specified by the electricity supplier, line filters are required. The Sinamics G150 with the L01 option, the so-called Line Harmonics Filter, has been available as Sinamics G150 High Power since 2010. In these devices the compen-



All photos: Siemens AG

"We invest in reliable and energy-efficient technology in order to be able to prepare the slopes with high-quality snow for as long as possible."

Hannes Mayer, Technical Manager, Schmitt AG

fewer cold days, the ski-area operating companies have to continually invest in the efficiency of their snowmaking machines," emphasizes Hannes Mayer, technical manager at Schmitt AG in Zell am See, which today operates 12 pumping stations. The newest pump at the water

availability and a long service life for pump drives are important and are available in the output class up to 1,000 kW. Up to 375 kW, the upper limit of validity under the new international efficiency norm, they are also available in the high-energy-efficiency class IE2 according to IEC 60034-30.



At the new high-pressure pumping station at Plettsau Kopf, 1PQ8 3-phase asynchronous motors guarantee a reliable drive system



Schmitt AG in Zell am See, Austria, ensures continuous good snow quality on the slopes with 295 snow guns and 86 propeller systems

sating filter is completely integrated between the control unit and the power element of the converter as a tested cabinet unit. The frequency converter switches the filter off automatically as soon as it is no longer needed. The L01 option not only saves space and cabling expenditure compared with earlier solutions with individual devices; it also helps prevent errors during installation.

Increased availability

For the production of snow that is as fine-grained as possible, the water must shoot through the nozzles with a pressure of about 20 bar. Because the station at Plettsau Kopf is at about 1,400 m above sea level and the guns at the summit are at about 2,000 m above sea level, the water

pumps must generate pressure of up to 100 bar. If one unit of equipment fails, a rapid shutdown of the pumping system is necessary to avoid damage. "Such an advantageous individual shutdown was easy to realize thanks to the optional fail-safe shutdown of the Sinamics G150," explains Harald Ruetz, project manager at Siemens in Innsbruck.

Only if an emergency stop is triggered are all aggregates disconnected from the grid. The individual shutdown considerably increases the availability of the snow-makers because in the event of a fault all unaffected pumping systems can continue to run. All in all, a highly available system was put into action with the 1PQ8 3-phase asynchronous motors and Sinamics G150 frequency converter – a system that also fulfills the user's require-

ments for energy efficiency and sustainability. The conclusion of Ruetz and Mayer: "With modern technology, efficient ski-area operation can be ensured at all times – even with a cloudless sky, just as the tourists like it." +

MORE ON THIS TOPIC:

- + www.siemens.com/motors
- + www.siemens.com/sinamics

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Flexible Axle Production with RFID



During the assembly of axle drives for commercial vehicles, all relevant machine data and operating data are recorded with a new radio-frequency identification (RFID) solution. To ensure that the material flow and the data flow are optimally synchronized, the transport controls and workstations have been uncoupled. This allows the flexible modification of the assembly line for future product generations.

In the Mercedes-Benz factory of Daimler AG in Kassel, Germany, about 3,000 employees manufacture, among other things, 650,000 axles for trucks, vans, and trailers. The transport controls installed in the preassembly and the main assembly of

the transporter axle production needed to be uncoupled to facilitate any plant expansions necessary due to product changes and changed quality criteria of future axle lines.

Together with this modification, a new foundation for quality management is being laid. From now on, the parts data collected during production will be available across all process steps during production, as they are accessible at any time and archived in a traceable way. Until now, the basic process control communicated exclusively with the product planning and control system. The product carriers moved the parts without any connection between product data and workstations. The chips on the product carriers were equipped only with the numbers of the product carriers.

RFID system with many advantages

"Ease of operation, the sturdy design, and noncontact performance without visual contact pointed to an RFID solution for the

identification system," explains Jürgen Golob, who is responsible for electrical modifications in the maintenance and production engineering team at the plant in Kassel. "The transponders can be read and written reliably and remarkably fast even in rough environments." The new solution is based on 45 Simatic RF350R readers that are installed along the assembly lines and at the workstations. Every reader is connected to an external antenna and networked with an ASM 456 communication module. In turn, each communication module connects two readers with the network via Profibus. The maximum distance between transponder and reader is 125 mm. The 80 workpiece carriers are equipped with Simatic RF340T transponders and have a storage capacity of 8 KB each. "This gives us sufficient resources even if the requirements increase," explains Golob.

Additional parts of the new installation are two Simatic S7 317-2DP controls for the transport lines. There are three Panel PCs Simatic IPC477 PC control panels with



Simatic RF300: advantages at a glance

- + Sturdy, compact components with high degree of protection (up to IP68)
- + Particularly fail-safe data communication with high data security
- + Maintenance-free transponder of up to 64 KB
- + Fast data transmission between reader and transponder (up to 8,000 bytes/s)
- + Extensive status and diagnostic functions
- + Simple integration into Simatic, Profibus, and Profinet

Simatic RF350R reader record the information of the RF340T RFID transponder on the pallets. The control system then decides in which direction the pallet moves

Central Simatic PC477 PC control panels with 15" touchscreens give an overview of the entire production line and allow for manual intervention in the processes

All photos: W. Geyer



15" touchscreens and supporting feet fixed centrally in the preassembly and the main assembly areas. They give the employees an overview of the production line and let them intervene in the processes. Process visualization at the stations takes place via Simatic HMI panels.

In addition to the preassembly and main assembly production data, a data set also comprises what is known as a contact pattern, which, for example, also provides information on the interaction of the tooth profiles of the ring gear and drive pinion gear. Since these images require a lot of memory, they are transferred directly to the server of the manufacturing execution system (MES) for commissioning, assembly monitoring, and machine data acquisition. A pallet change takes place during the transfer of the workpiece from the preassembly to the main assembly. Part of the data is transferred to the RFID transponder of the new pallet via DP/DP couplers and Profibus. Once the rear axle housings are complete, they are moved into an uncoupling module. The data from

the main assembly are also transferred to the MES server. The RFID transponder memory is erased and the product carrier is reintroduced into the assembly cycle.

"Not OK" products to the rework station

The transponder also automatically receives information on the quality of the workpiece from the processing steps of the production. Before a pallet leaves a station, the control system determines whether the manufactured piece received the status "OK" or "Not OK" during the check. When a product carrier then passes a switch, the reader implemented there reads the data set, and the control system decides, based on the quality status, in which direction the pallet moves: to the rework station or to the next assembly station.

"The system has run without problems from the start," emphasizes Golob. Now, the plant is working with a solution in which the "intelligence" of the preassem-

bly and main assembly transport controls is integrated into the workstations. "Thanks to the new system, we can realize further modifications to the assembly line significantly faster and more economically than would be possible otherwise," explains Golob. The new RFID solution always provides meaningful, current data that follow the product from the start. Material and data flows are optimally synchronized and make identification reliable and traceable. +

MORE ON THIS TOPIC:

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Wireless and Faultless

Ethernet communication via Industrial Wireless LAN makes a suspension track system in the production of PU cast skins for instrument panels largely maintenance-free. The changeover from Profibus contact lines to the wireless system minimizes errors and thus increases productivity.

The automotive supplier Faurecia Innenraumsysteme in Wörth am Rhein, Germany, claims to be the only manufacturer worldwide to have mastered the serial production of polyurethane cast skins with particularly fine radii. In the production of high-quality cast skins for dashboards for the Mercedes-Benz S-Class, dimensional tolerances in the contact lines often led to increased contact erosion at segment transition points, resulting in frequent short circuits, which in turn disturbed the repeaters (Power Rail Boosters) for the Profibus communication. Communication errors and failures accumulated, so that the system needed more and more intensive maintenance and had to be completely overhauled at certain intervals. All these problems have now been solved by the changeover to Industrial Ethernet communication via an Industrial Wireless LAN (IWLAN) system.

Cast skins for the automotive upper class

By means of an oval, roughly 210 m long 2-rail suspension track, 24 mold carrier cars loaded with tools for the various components of a dashboard are transported through an automated multistage process at Faurecia. Within the oval there are four positioning areas, so that several parallel processing stations can be reached. Outside the core process, cabins for the laser cleaning of forms and for tool changes and repairs are tied in via a switchyard. The upper and lower parts of tools can be moved vertically in the mold carriers and swiveled into different positions for the manual removal and subsequent cleaning of the cast skins. Like the energy supply, the data exchange between the mold carrier cars and the superimposed system control was at first realized via 13 contact

line sections divided into two packages. At the end of 2008 Intronix GmbH & Co. KG of Neutraubling, Germany, was entrusted with the changeover to wireless communication via IWLAN, thus eliminating the need for sliding contacts.

Safe communication without contact lines

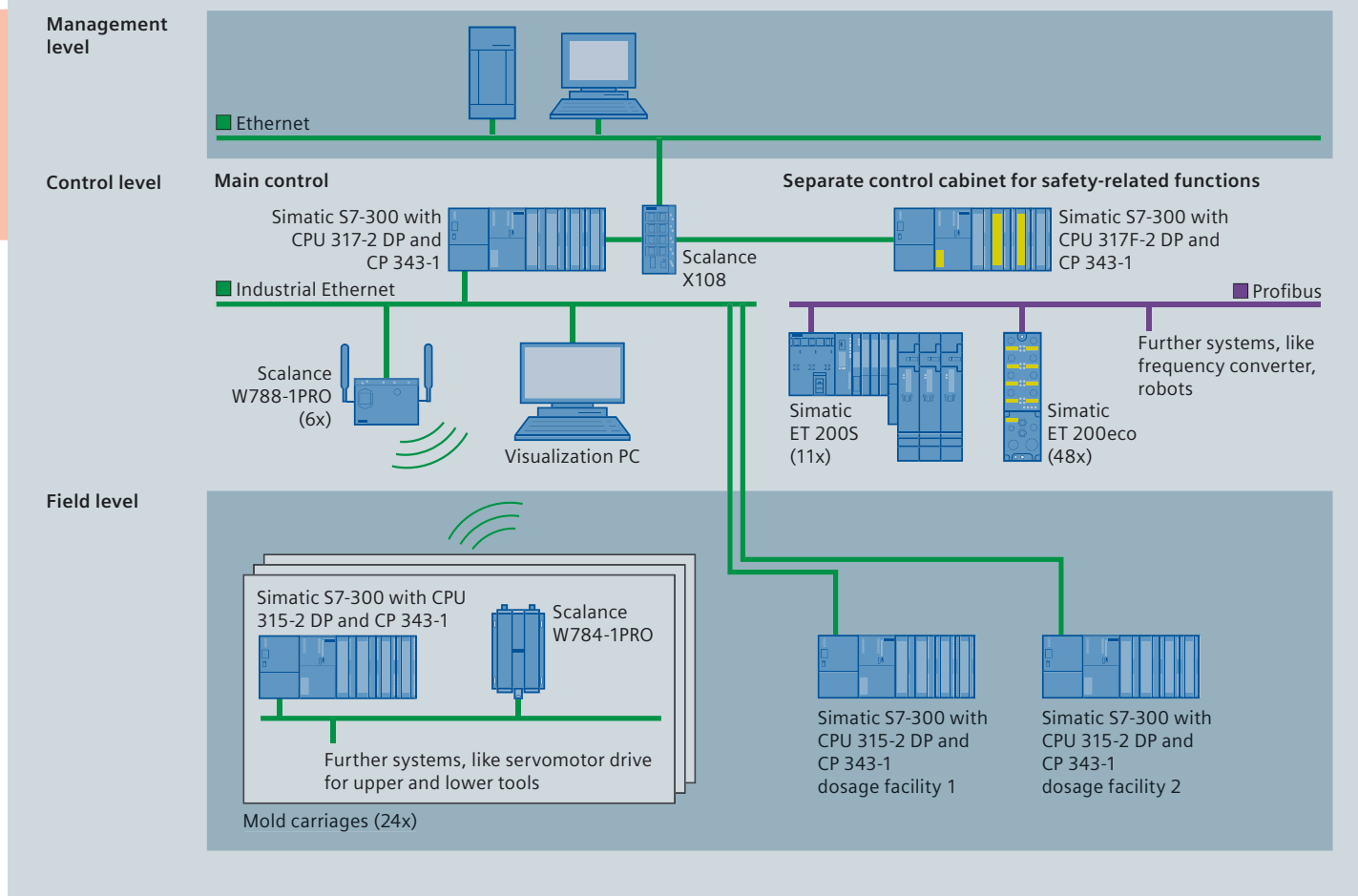
The production process is controlled by a Simatic S7-300 central head controller with CPU S7-317-2 DP in the main control cabinet above the unit. This controller communicates with the Simatic S7-300 controllers with CPU S7-315-2 DP on the mold carriers via additional CP343-1 communication processors, Scalance X108 unmanaged Industrial Ethernet switches, and IWLAN components of the Scalance W wireless series. There is an additional Simatic S7-300F with CPU S7-315F-2 DP

Communication advantages of IWLAN technology

- + More fail-safe communication thanks to predetermined signal processing
- + Extensive possibilities for remote maintenance by modem via a TeleService Adapter IE
- + Simple integration into the company network
- + Simple installation, reliable operation, and low maintenance requirements for the Scalance components



The mold carrier cars are transported via a 2-rail suspension track through the multistage casting process



Integrated automation solution by Siemens: the 2-rail suspension track is approximately 210 m long with several positioning areas for parallel production

that maintains a connection with the master controller for safety-related tasks in the stationary part.

In this way the signals of the safety system are also analyzed for visualization and operation management. The positions of all mold carrier cars are detected by a newly installed absolute path measuring system.

"In order to be on the safe side and also to have a certain redundancy, we installed six Scalance W788-1Pro access points with omnidirectional antennas in the plant, but only three of them are in active use at any given time," explains Gerhard Korunka, managing director responsible for software and hardware at Intronyx. In the event of a disturbance or the failure of an active access point, the nearest backup device would take over the communication. Data security would then be provided through the intermediate storage of the data. The counterparts in the control cabinets on the mold carrier cars are Scalance W746-1Pro IWLAN clients, each with two omnidirectional antennas leading outside.

The internal connection to the corresponding control system is carried out via a Simatic CP343-1 Lean Industrial Ethernet communications processor. Current status and process data are also exchanged for the end customer's quality assessment. The interface for unit operators is a central PC-based visualization system.

Reduced maintenance requirements, minimized costs

The new IWLAN installation runs without disturbances, says Edmund Weigel of Faurecia's service department: "Communication has become much safer and also faster, and the technical availability has increased by a good 15 to 20 percent." At the same time, maintenance requirements have been drastically reduced because parts could be dismantled and therefore less equipment needs to be maintained than before. Calculated over the year, this has reduced scheduled downtimes for service and maintenance and nonscheduled downtimes due to stoppages by 16 shifts. Faurecia can now produce the required

number of units in a shorter time and further increase its delivery capacity. In addition to saving time, the conversion eliminated five complete copper track sections and 35 Power Rail Boosters – and thus also considerably reduced costs. The IWLAN system was amortized already within the second year after purchase. Due to its success, Faurecia is also interested in equipping future plants with the Siemens system. **+**

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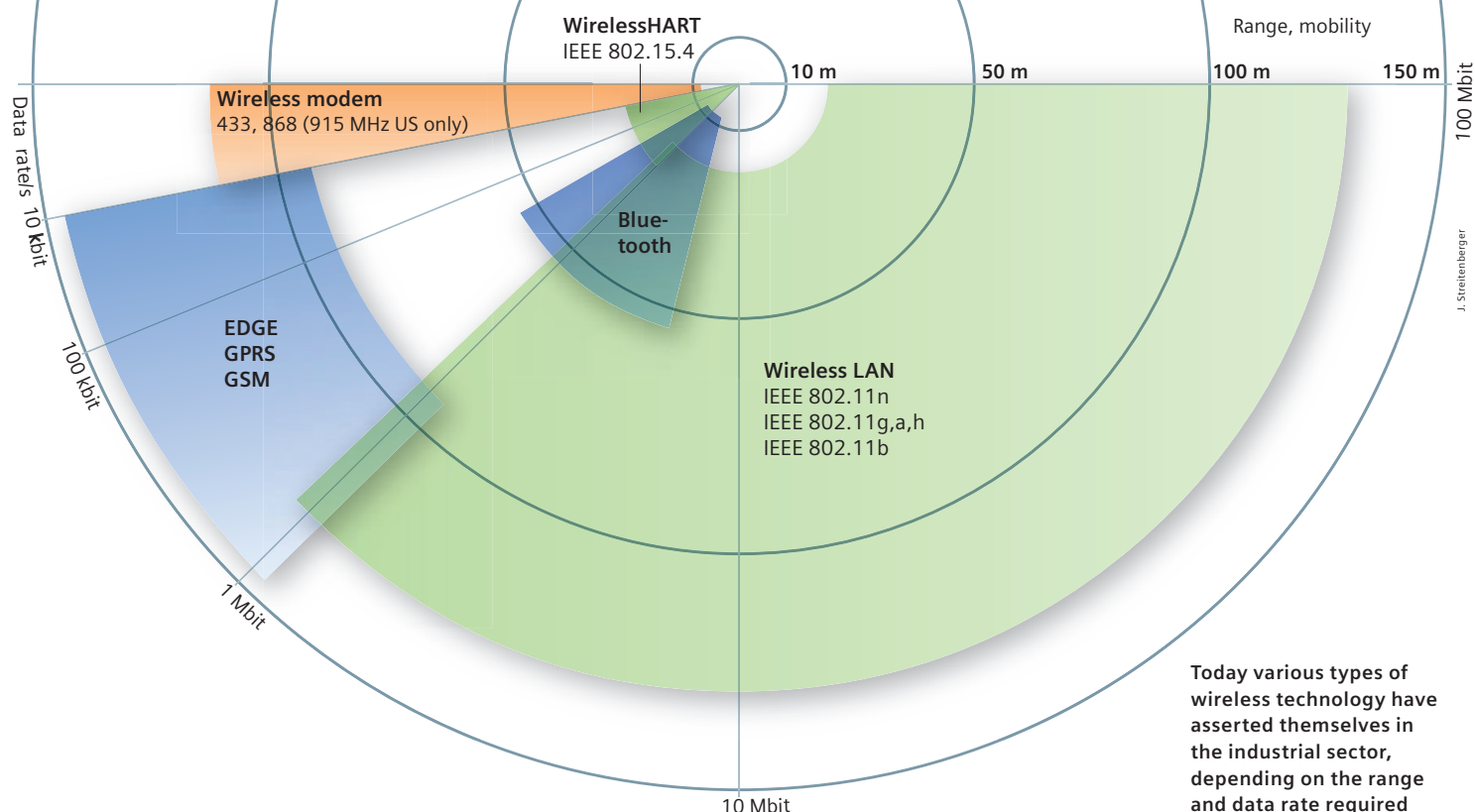
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Wireless Communication in Industry



Communication in large factories benefits from wireless transmission technologies. Wireless LAN based on IEEE 802, for example, is a strong and active standard that has been developing with the market requirements for more than 10 years.

WLAN originated in logistics and special areas of industry where operating safety and stable transmission were very important. After all, electromagnetic interference decreases significantly above 1 GHz, and WLAN uses a spread spectrum technology in the microwave range at 2.4 GHz or 5 GHz, which makes the signal very resistant to interference from narrowband signals. The technique is not new; however, it has only been increasingly used since the late

1990s, when low-cost integrated circuitry came on the market.

Control of multipath propagation

Only from this point on was it possible with the available chipsets to control multipath propagation. At transmission frequencies above 1 GHz, radio waves are reflected off metal objects and reach the receiver via various routes. Since the waves have different transit times, the

same information reaches the receiver from different directions and with a time lag. The receiver must decode weak and "slurred" signals. The advantages of multipath propagation: radio waves reach even behind shaded machine components, and the effective radio field is expanded.

In 1997, the first 802.11 standard was defined for WLAN. Soon others – for example, Internet users – wanted to use the "wireless" medium, and that led to many

customers making an investment, with a positive impact on costs and acceptance. WLAN became an important wireless technology in industry as well; however, the requirements here are very diverse. So far no one standard that meets all needs at the same time has been able to gain general acceptance, as the physical benefits, but also the economic aspects, are too different.

Technologies for every application

If range and worldwide network coverage are of primary importance, the GSM/GPRS mobile communications standard with its further developments UMTS and LTE is in the lead. The global availability of the infrastructure makes GSM/GPRS perfect for monitoring machines or for coupling control systems over long distances. However, if the communication partners are within just a few meters of each other, Bluetooth (IEEE 802.15.1) and the now increasingly popular ZigBee (IEEE 802.15.4) share first place. As with WLAN, there are no license fees due for the globally available ISM band at 2.4 GHz. In industry,

Bluetooth is found wherever few and simple machine components communicate with low data rates. ZigBee becomes important when it comes to linking sensors. In process automation, the WirelessHART standard, based on IEEE 802.15.4, has won through. Here, the required response times are on the order of seconds, and the data volume is measured in kilobits instead of megabits. Reliability and low energy consumption are of primary importance.

Industrial Wireless LAN

When an Ethernet data network is extended to wireless in the LAN area, WLAN dominates the field in industry as well, with gross data rates of several hundred mbps. No network provider is needed, the frequency band is available globally, and companies can use or export the same device worldwide. The Industrial Wireless LAN (IWLAN) version is often used, since optimizations make its use possible even when operational safety is crucial. The data packages in communication between the machines

and the control system are likely to be small; however, they must be transferred cyclically and within a specified time slot.

For transport systems, IWLAN also allows for setting up a communications infrastructure made of any number of access points, which "hands over" a control riding along on a car from one access point to the next (roaming), but with short interruptions in the communication. Only thanks to the optimizations for industry can a standard WLAN chipset be used, so that cyclical data traffic can be transmitted wirelessly. This way, even safety-related signals can be transmitted using the Profisafe protocol. A wide variety of industrial applications can be realized using these processes.

And the development continues. For example, the new wireless standard IEEE 802.11n offers data rates of up to 600 mbps, after 802.11g and 802.11a had allowed for gross rates of only 54 mbps. This way it is possible, for example, to transmit several services through the same communication channel, making new applications possible also in an industrial environment (see box). +

+ The next-generation IWLAN

The further development of IWLAN has resulted in two technologies that have proven their worth in company networks already: the wireless standard IEEE 802.11n and WLAN controllers. The new n-standard scores with substantially higher data transmission rates of a maximum of 600 mbps and greater robustness. At the heart of a controller solution is the central management of a WLAN system. From an economic standpoint, using a controller that configures the controller-based access points through the wired network makes sense starting from about 10 access points.

Where IWLAN handles the wireless communication in industrial applications, the reliability can be increased even more through the transmission characteristics of IEEE 802.11n. And where managing larger IWLAN installations takes a lot of effort, an IWLAN controller makes many things easier. Furthermore, both technologies are also suitable for introducing new applications such as video transmission and Voice over IP in industrial environments.

IT security note

Suitable protective measures (including IT security, e.g., network segmentation) must be taken to ensure secure operation of the plant. Further information on industrial security can be found at www.siemens.com/industrialsecurity.

MORE ON THIS TOPIC:

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Excellence in the Mirror



All photos: Siemens AG

The Italian company Bovone takes another step forward with its mirror silvering lines and consolidates the preeminent position – in terms of quality and competence – that it has enjoyed for many years. With the use of Sirius compact starters with IO-Link, the company sets new standards.

The Italian company Bovone takes another step forward with its mirror silvering lines and consolidates the preeminent position – in terms of quality and competence – that it has enjoyed for many years. With the use of Sirius compact starters with IO-Link, the company sets new standards.



Sirius 3RA6 with IO-Link – Benefits at a Glance

- + A PID controller can be used for temperature regulation for a better final product and high flexibility within the oven.
- + In case of a fault, rapid replacement of the individual motor starter is possible without stopping production.
- + Drastically reduced wiring saves space, reduces costs, and enables faster commissioning.

Elettromeccanica Bovone S.r.l., founded in 1954, is the leader in Europe in glass manufacturing. From the first galvanic coppering processes, to the construction of whole lines for mirror production, to revolutionary high-quality glass machinery, Bovone is renowned for its comprehensive and unrivaled expertise. The company is involved in three primary activities: machine building (edging machines and beveling machines) for glass manufacturing, laminated safety glass lines, and mirror silvering lines that can be perfectly adapted to the customer's requirements thanks to their modular structure.

Optimal drying process

In the mirror silvering lines, the drying process marks a critical phase that guarantees an optimal finished product. As a first step, the glass panels in widths of 2,250, 2,600, or 3,300 mm are first loaded on the line and washed by scrubbing machines. Then they are treated with chemical solutions (mirroring phase) and dried in a pre-heated furnace. Two other chemical treatments are then performed via curtain coaters that apply a layer of covering and protective paint, with drying in an intermediate furnace taking place between these treatments. After passing through the second curtain coater, the glass panels must be dried in the final furnace.

Perfect solution for critical process

This is another critical phase in which temperature control plays an essential role. For this purpose, all 165 infrared lamps are controlled by 110 Sirius 3RA6 compact starters with IO-Link communication. The Sirius compact starters replace and improve upon the classic solu-

tion for motor starting: the functionality of a circuit breaker, contactor, solid-state overload relay, and various optional mountable accessories are combined in smaller dimensions and with an attractive design.

Thanks to communication via IO-Link, it is now possible to use a PID controller for temperature regulation and select or de-select a single lamp's filament remotely, whereas before only manual control was possible. The result is a better final product and high flexibility in the final furnace. "With the Sirius compact starters with IO-Link, a fault in a single motor starter is directly communicated to the operator, and we can control each filament of the infrared lamps," emphasizes Giuseppe Romano, technical plant manager at Bovone. If a fault happens, the improved diagnostics allow for better process control and rapid replacement of the individual motor starter without stopping production. Romano continues: "The wiring effort has been drastically reduced, as well as the hardware input modules of the PLC." In fact, thanks to the IO-Link connecting system, the connection points decreased to less than one-third of the approximately 400 required with conventional wiring for the 110 motor starters in use. This has led to space savings in the control cabinet, fewer errors during the commissioning phase, reduced wiring costs, and faster commissioning of the plant. The advantage of this: the electrical switchboard, which was divided into three pieces for transport, was quickly reassembled, because only some flat cables had to be re-connected instead of a huge quantity of conventional cables.

When the drying process is finished, the glass panels, now mirrors, are transferred to a final cooling section and automatically unloaded from the line.

Fail-safe, high-performance, and user-friendly control

Another important factor in a good product result is optimal control of the mirror silvering line. Bovone uses a Simatic F-CPU 315-2 DP and its safe I/O to ensure that all the requirements for the type C standard of this kind of machinery are fulfilled. For the HMI, the choice was the Simatic Multi Panel MP377 15" Touch, which represents the top of the Simatic operator panel range in terms of performance and display format. Despite the great number of motor starters, the panel allows the users to easily manage the process through all the operational phases.

Great success

Sirius compact starters with IO-Link have updated the technology of the mirroring line while decreasing the overall cost of installation – not to mention the advantages for the end customer in terms of system transparency, operation, and maintenance. The plant has been working perfectly since last September with 100 percent customer satisfaction. +

MORE ON THIS TOPIC:

+ www.siemens.com/sirius-motorstarter

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Perfect Interaction

Together with the AS-i Master CP 243-2, the Simatic S7-200 has shaped the market for small controls for a long time. Now the Simatic S7-1200 continues this perfect interaction with AS-Interface. Using the AS-i Master CM 1243-2, engineering is as simple and straightforward as using Profibus or Profinet.

The Simatic S7-1200 has continued to systematically develop the concept of powerful and scalable small controls. Together with Totally Integrated Automation (TIA) Portal, the system provides the perfect conditions for a connection to underlying AS-i networks. Like all Simatic S7-1200 communication modules (CMs), the AS-i Master CM 1243-2, which was newly developed for this purpose, can be easily connected to the CPU on the left side. There, the control can be extended to up to three CMs.

Advanced functionality

With AS-i, the functionality of the control and the number of I/O devices or peripherals that can be connected can be significantly extended. The AS-i Master CM 1243-2 supports the most recent AS-i specification 3.0. This means that up to 62 participants or up to 992 I/O points can be linked to the control over a length of up to 600 m. The AS-i slaves used in this process range from digital or analog I/O modules for standard sensor or actuator technology to powerful motor starters and frequency converters with integrated AS-i. One of the functions of the AS-i Master CM 1243-2 is the integrated AS-i power-fail recognition. The firmware can be extended via update for future additional functionalities.

Since the AS-i bus also supplies the slaves with energy, a special central power supply unit is used for the AS-i network.

Moreover, the new AS-i Master is also AS-i Power24V compatible and can be centrally extended by a DCM 1271 data decoupling module at the control. This way, one central standard 24V power supply unit can be used in applications with up to 50 m bus length. Implemented together with the 24V power supply unit of the Simatic S7-1200, bus-based automation solutions can be very powerful yet cost-effective. With the new DCM 1271 data decoupling modules, several AS-i networks can now be supplied through only one power supply unit, thus reducing costs. In addition, the data decoupling module monitors the connected AS-i network for overload or possible ground fault.

Easy engineering in TIA Portal

Along with the technical properties, the engineering of AS-i networks plays a decisive role. Great importance was placed in TIA Portal on simple and intuitive operation, for example, for the configuration of an AS-i network, and on the clear presentation of the diagnostics. Moreover, AS-i networks are now displayed graphically in the network or device view, while retaining identical handling to that of Profibus and Profinet. What's more: all the software components – for example, for configuring the hardware of the AS-i Master, for programming the PLC, or for designing the control screens for HMI Basic Panels – are combined in TIA Portal, so no additional software is required. The signal

information transmitted by the AS-i bus can be integrated into a control screen of an HMI Basic Panel using drag and drop.

Numerous communication options

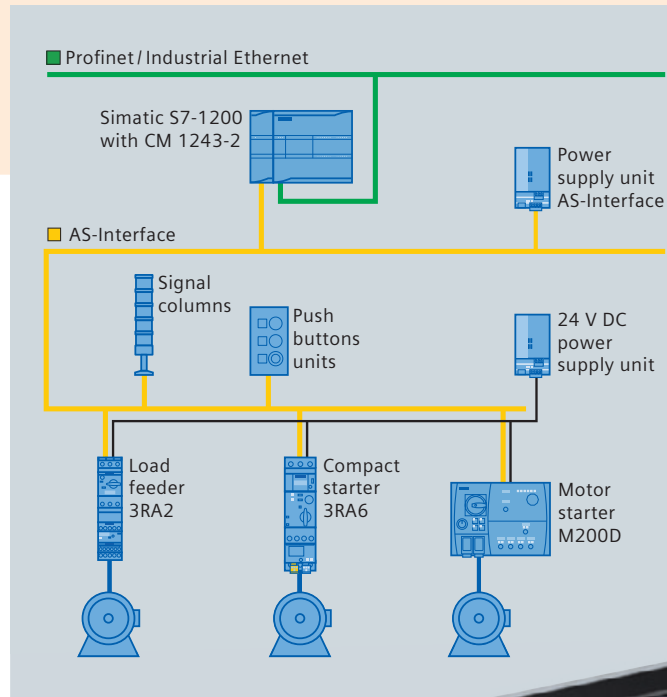
The AS-i Master CM 1243-2 is especially strong in combination with the Simatic S7-1200 CPU, which has an integrated Profinet interface by default. This Profinet interface for connection with a PC can also be used for direct communication with other controls or for connecting a control panel. Even long-distance communication is possible through the integrated TeleService/TeleControl functions of the Simatic S7-1200, optionally also combinable with the GPRS communication module. This way, diagnostics and parameterization of all connected AS-i networks are no longer a problem, even across great distances.

It is also possible to use the integrated web server for diagnostics; this server can also display Web sites that adjust to different users. With it, all data of the AS-i network can be visualized and adapted by users for their own operating concepts. The direct interaction between the AS-i Master; the fast rear plate bus; and the powerful, programmable CPU in the Simatic S7-1200 significantly shortens the response time at the AS-i bus. In addition, the higher control system is informed or integrated via Profinet or Profibus. The proven graphical interfaces of the FUP and KOP programming languages are available



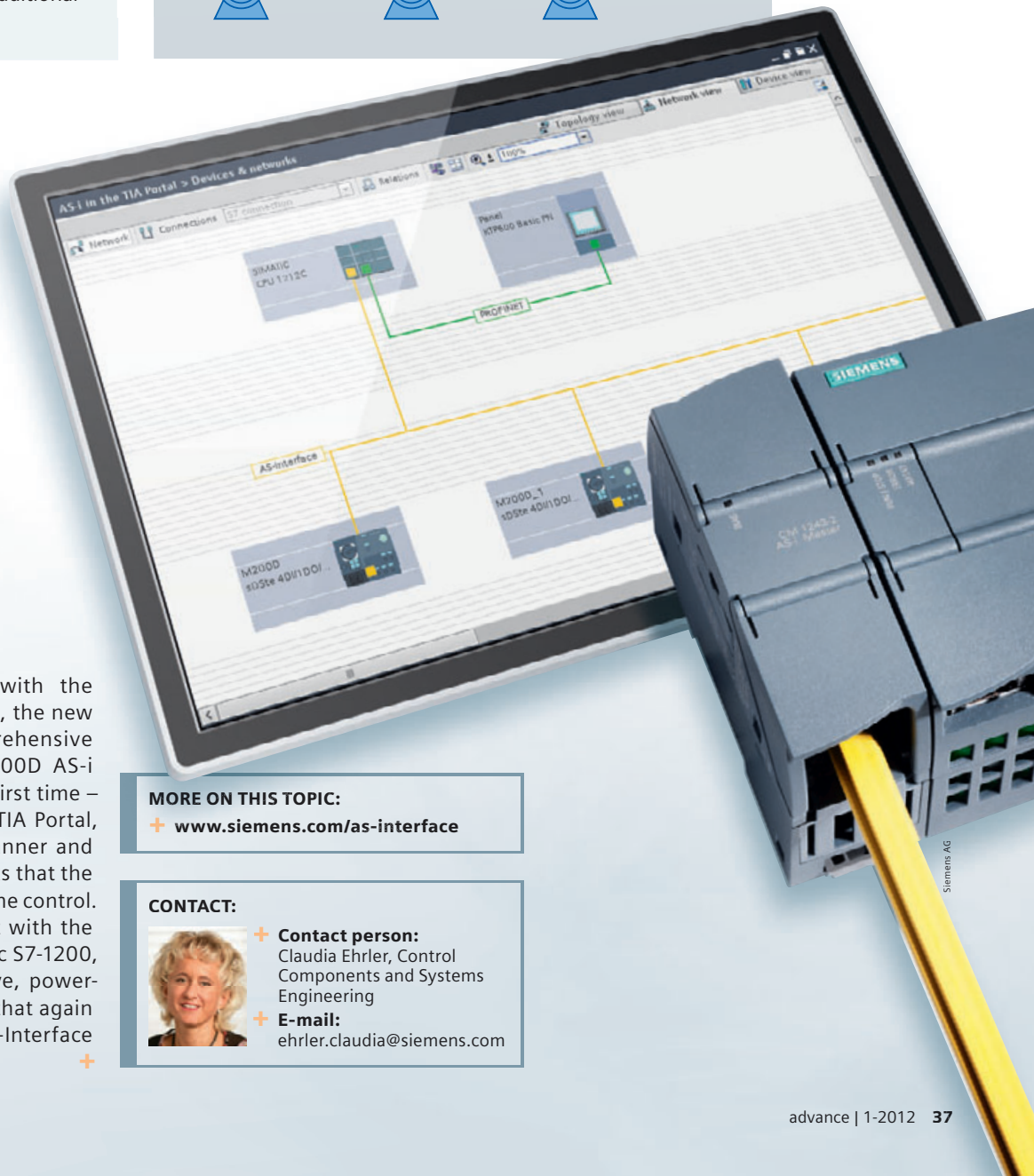
Highlights of the S7-1200 AS-i Master

- + Master according to AS-i specification 3.0
- + Up to 62 AS-i slaves or 992 I/O devices per master
- + AS-i I/O signals can be processed in the control just like hardware I/O signals
- + Access via web interface possible
- + Integrated transmission of analog values and AS-i power-fail recognition
- + Supports firmware updates
- + DCM 1271 data decoupling module, e.g., for AS-i Power24V
- + Parameterization of Sirius M200D AS-i motor starters without additional function blocks in the control



Sample configuration of Simatic S7-1200 with CM 1243-2

Perfect interaction with TIA Portal: the AS-i Master CM 1243-2



for programming. Together with the Simatic S7-1200 and AS-i slaves, the new CM 1243-2 makes the comprehensive parameterization of Sirius M200D AS-i motor starters possible for the first time – from the parameter screen of TIA Portal, in a completely automated manner and without complex function blocks that the user would need to program in the control.

In summary, we can say that with the new AS-i Master and the Simatic S7-1200, Siemens presents an innovative, powerful, and efficient small control that again sets a higher standard in the AS-Interface sector.

MORE ON THIS TOPIC:

+ www.siemens.com/as-interface

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Product Videos

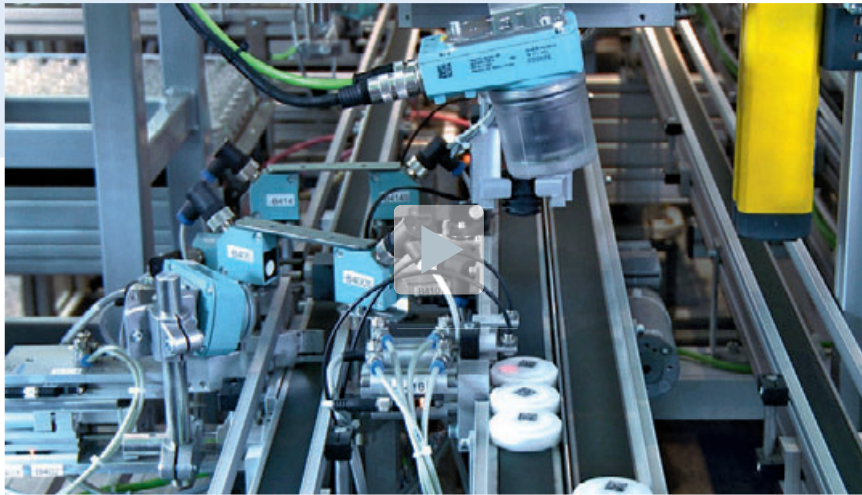
Easy Installation, Configuration, and Much More

In the area of industrial identification, Siemens offers, among other things, a comprehensive range of code reading systems for 1-D and 2-D codes as well as OCR. The stationary Simatic MV420 and MV440 systems facilitate high reading reliability and various communication options.

Three new product videos show step-by-step how easy it is to install and configure code reading systems as well

as set them up and optimize them for special applications (OCR and high-speed applications without external trigger). They also demonstrate how easily the systems can be integrated into automation solutions using TIA Portal. +

www.siemens.com/ident



Simatic MV420/MV440: Easy installation and configuration

[www.youtube.com/
watch?v=MRezegP7_M8](http://www.youtube.com/watch?v=MRezegP7_M8)

Simatic MV420/MV440: Setup and optimization for special applications

[www.youtube.com/
watch?v=Gmk3a_R96tU](http://www.youtube.com/watch?v=Gmk3a_R96tU)

Simatic MV420/MV440: Easy integration into the automation level

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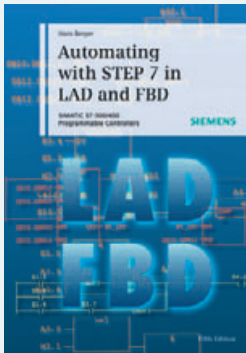


Library

Hans Berger

Automating with STEP 7 in LAD and FBD

Simatic S7-300/400 Programmable Controllers



5th revised and
enlarged edition,
2012, 480 pages,
160 illustrations,
110 tables, hardcover
ISBN 978-3-89578-410-1,
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This book was written for all users of Simatic S7 controllers. It describes elements and applications of the graphic-oriented programming languages LAD (ladder diagram) and FBD (function block diagram) for use with both Simatic S7-300 and Simatic S7-400. It provides an introduction to the latest version of the programming software Step 7 with new functions for Profinet IO. First-time users are introduced to the field of programmable controllers, while advanced users learn about specific applications of the Simatic S7 automation system. +

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| Event | Location | Date |
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| Anuga | Köln | 03/27–03/30/2012 |
| Green Energy Expo | Daegu, Korea | 03/28–03/30/2012 |
| Win 2012 | Istanbul | 03/29–04/01/2012 |
| EWEA | Kopenhagen | 04/16–04/19/2012 |
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Siemens has been developing motors for over 100 years. Today, we have a motor portfolio that is second to none worldwide – for every performance, power rating and application. No matter whether it involves motion control-motors with a high dynamic performance, efficient

low-voltage motors, well-proven DC motors or customized high-voltage motors to address your particular application. We have now given our motors a name that reflects their performance – **SIMOTICS**.

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