A new sugar factory on the Red Sea benefits from integrated automation with Nahmat and Simatic PCS 7

For a plant at CSL Behring, Siemens Solution Partner MPA Regele provided an automation solution with Simatic PCS 7 and Simatic Batch

Technology from Siemens ensures easy handling and highly transparent processes in the firefighting vehicles made by Tony Brändle AG
Dear Readers:

Sustainability is becoming an increasingly important factor in the competitiveness of our customers in the food and beverage industry. Investments must contribute toward saving energy as well as an efficient use of resources and raw materials. At the same time, the innovation cycle in the food and beverage market is becoming shorter and shorter – new tastes and target-group-oriented product packaging and presentation are becoming increasingly important. Additionally, companies must be able to record information for every batch and to track it for each product – for example, to be able to recall a defective batch in time before it reaches the shelves in stores. Last but not least, the consumer also expects products that always taste the same and always have the same quality. Siemens has developed special solutions for all these requirements based on established industrial standards, proven components, and open interfaces. We would like to present some examples in this issue of *process news*, which focuses on the food and beverage industry.

One other topic that is becoming increasingly important as process automation becomes increasingly networked with surrounding IT systems is the protection of the automation technology against unauthorized access or attack. To address this issue, we have implemented a comprehensive security concept for our process control system that protects against these dangers. Read more about this on page 14.

We hope we can give you a few valuable ideas in this issue.

Best regards,

Olaf Plante
Siemens AG
Corporate Account Manager for SABMiller
Innovation through Partnership

The long years of collaboration between Siemens and Ziemann Ludwigsburg GmbH have paid off again: together they have built the largest brewery in Colombia.
Founded in 1852 in Stuttgart as a coppersmith workshop, Ziemann has become one of the world’s largest manufacturers of production systems for breweries, supplying a complete range of brewery equipment, from malt handling to the pressure tank. Ziemann has become well known and acknowledged for its innovations and revolutionary new developments in the brewing industry. Ziemann produces in Germany, France, Japan, China, India, Brazil, and Mexico utilizing state-of-the-art European engineering and design.

Research and development, operator training, and the development of new recipes and test brews for product development take place in Ziemann’s own pilot brewery. The company also has branch offices in Bangkok, Hong Kong, Hanoi, Moscow, Tokyo, Caracas, and Miami.

**Joint development of Braumat PCS 7**

Ziemann and Siemens began their partnership 35 years ago. Because Ziemann builds only a limited number of brewery installations per year, the company decided not to develop the appropriate process control technology itself but to collaborate with Siemens. The two companies also work together closely on system development. The Braumat PCS 7 process control system, for example, is a joint development of Ziemann and Siemens, which was tested and developed to market maturity in the Ziemann pilot brewery.

The partnership with Siemens has paid off for Ziemann. The combination of Ziemann’s sound brewery know-how and Siemens’ automation expertise enables the development of innovative and brewery-compatible solutions that enjoy a high level of market acceptance. The two companies have successfully completed more than 60 joint projects.

**A superlative brewery in Colombia**

The highlight of the last two years was definitely the Bavaria brewery Cervecería del Valle in Colombia, which was built by Ziemann and automated together with Siemens using Braumat PCS 7. Bavaria belongs to the SABMiller Corporation and is Colombia’s largest producer of beverages. The new brewery meets all the criteria of a contemporary beer production facility: continuously high quality, maximum effectiveness and energy efficiency, minimum emission of waste products, and a lean operating structure. All sections of the new brewery, from malt processing to the brewing house (hot block), from the cellar (cold block) to filtration and transfer and to the filling plants, are automated with the Braumat PCS 7 process control system.

Each of the three sections of the automation solution – brewing house and malt processing, cellar, and filtration section and subplants – is equipped with two AS 417-4 automation systems. These automation systems are networked with each other via Industrial Ethernet. Three pairs of redundant servers record the process information and send it to the master control level. A total of eight multiclients, which are equipped with up to four screens each, are used to operate and monitor all the processes. Each of the three automation sections has its own engineering system. The terminal network is also built up as an

### Automation technology
- Braumat PCS 7 V6.133
- 3 automation sections with 2 AS 417-433 each
- 3 pairs of redundant servers
- 8 multiclients with up to 4 screens each for visualization
- 3 Braumat PCS 7 engineering stations

### Measuring technology, power and control cabinets
- 52 Sitrans F Magflo 1100 3 inductive flowmeters
- 2 Sitrans F Massflow mass flowmeters
- 169 Sitrans P 300 pressure transducers
- 157 Sitrans T temperature transducers
- 169 Limes microwave limit switches
- 10 Sipan 32 analyzers
- 12 power and switch cabinets for energy supply and frequency converters
World’s largest brewery in Piedras Negras, Mexico

The largest beer company in Mexico, Grupo Modelo, has contracted Ziemann and Siemens to equip the world’s largest brewery. Grupo Modelo was founded in 1925 in Mexico City and brewed 12.9 million hectoliters of beer in 2007, of which 31.8 percent was exported. Thirty million hectoliters of beer will be produced annually at the new site in Piedras Negras when all the construction phases have been completed. An almost 40-mile-long pipeline supplies fresh water. This is the first time Ziemann has built a brewing vat this large: The straining vat breaks all records with a diameter of 15.2 meters. In the first of a total of three construction phases that are to be completed within two years, 10 million hectoliters of beer will be brewed per year initially. Thanks to the modular design, it will be possible to expand the capacity of the plant gradually and as planned, to 30 million hectoliters per year, without interrupting production. The project includes a brewing house with energy recovery and vacuum evaporation, a malt kiln, a yeast cellar, cooling technology, three filtration lines for 1,200 hectoliters of beer per hour, clean-in-place systems, 70 fermentation and storage tanks, and automation of the entire plant with Braumat PCS 7.

Industrial Ethernet network. In addition to the entire automation technology, Siemens also supplied most of the process instrumentation.

Management information and quality assurance

Siemens also implemented the Simatic IT manufacturing execution system to link to the IT systems for management oversight. This enables targeted data exchanges to be implemented between the production system and the enterprise resource planning (ERP) system. All the relevant production data are collected, evaluated, and transferred manually or automatically as key performance indicators for management evaluation. The integration of a laboratory information system based on Simatic IT Unilab ensures continuous quality assurance and control. This system controls the taking and analysis of samples throughout the brewing process. Special analyzers such as gas chromatographs are directly linked to Simatic IT Unilab. This automation solution reduces error rates and saves valuable working time in the laboratories.

All from one provider

Siemens took on the complete programming of the control system as well as the installation and on-site commissioning for this project, in addition to supplying the hardware components for the control technology and process instrumentation. “The delivery of the entire control technology by one provider offers great advantages, of course, both for us as the plant manufacturer and for the actual customers in Colombia. Because the local Siemens personnel are completely familiar with the techniques and technologies, fewer personnel are required for the commissioning, for example. The customer also benefits from good and, above all, local availability of spare parts and service,” explains Martin Friz, head of sales automation at Ziemann.

In spring 2008, beer production in the new brewery began with an annual volume of 3.5 million hectoliters. The scalability of the plant will allow this output to be increased to up to 4.5 million hectoliters per year. The new brewery plant is therefore ideally equipped to serve the country’s expanding beer market. Not only the end customer but also Ziemann and Siemens are rightly proud of Cerveceria del Valle, the first brewery in South America to be equipped with Braumat PCS 7. A follow-up project is already in the pipeline: the largest brewery in the world will be going into operation in Mexico, also built by Ziemann and automated with Braumat PCS 7.

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Companies in the dairy business are working hard to improve the processes and plants used for raw milk processing in order to produce milk and dairy products that will stay fresh longer.

These extended shelf life (ESL) dairy products can be kept unopened on a cool shelf at 8 to 10 degrees Celsius for up to 21 days. Previously used ESL methods included heating up to 127 degrees Celsius, injection and infusion processes, indirect heating, degermination (spores), microfiltration, and treatment with high pressure or ultrasound. However, the use of high temperatures runs the risk of denaturing the proteins and therefore reducing the product’s quality and acceptance.

Alternatives to thermal treatment

One alternative method of reducing the bacteria count in the milk is so-called deep filtration, which is already being used successfully in the beverages industry to achieve microorganism elimination rates of almost 100 percent.

In deep filtration, the solid particles are mechanically trapped and adsorbed inside the filter material. In a pilot project, GEA TDS is currently examining whether deep filtration can also be used to extend the shelf life of dairy products. The company has tested the treatment of whey and milk by deep filtration with a reduced thermal treatment but with the omission of an additional heating step.

Since the quality of raw milk varies, the process parameters must be adapted and optimized accordingly when changing batches. With its mobile pilot plant, GEA offers dairies and cheese factories the possibility of trying out this new technology in their own production processes with little effort and determining the specific physical variables and operating parameters for their companies’ processes.

Efficient measuring technology

All quality-relevant process steps are monitored with process measuring instruments. The instruments must be very accurate and stable over the long term. The measured values are the basis for controlling the process and cleaning the filters, which in turn have an influence on throughput and product quality. Further requirements are a low temperature drift, sanitary process connections, and suitability for cleaning in place (CIP) and sterilization in place (SIP), as well as easy and error-free handling.

Due to the requirement profile, GEA decided to equip the pilot plant exclusively with Siemens equipment, with one of the main reasons being that GEA wanted a strong partner for future development on a
Siemens AG ensures high measuring accuracy even at temperatures above 150 degrees Celsius. The maximum 0.075 percent measuring deviation and long-term drift of only 0.25 percent in five years allow processes to be run at close to optimum efficiency and thus the productivity of the plants to be increased.

The Sitrans FM MAG 1100 Food flowmeter with a Magflo MAG 6000 transmitter is used for volumetric flow measurement. The magnetic-inductive flowmeter complies with all hygiene standards. Particles, viscosity, and temperature do not affect its performance. The temperature in the pilot system is measured with a Sitrans TH300 temperature transmitter.

The pilot system currently still has a manual control; later it will be based on a Simatic S7-300 controller for industrial plants to ensure the uniformity of the data flow, interfaces, and engineering. A Sirec DM digital display recorder visualizes and saves the measured process parameters so that they can be evaluated and compared at the end of a test series.

**Easy installation, successful tests**

GEA completed the installation of the equipment and a trial run with water within one day. The pilot plant operated perfectly in several dairies on its first assignments and thoroughly satisfied its customers.

**Overview of process measuring technology**

- Sitrans P300 pressure transmitter
- FM MAG 1100 Food volumetric flowmeter
- Sitrans TH300 temperature transmitter
- Sirec DM process-value visualization and data-storage display recorder

**Specially designed for process industry requirements:** the Sitrans P300 pressure transmitter, the magnetic-inductive Sitrans FM MAG 1100F flowmeter with a MAG 6000 transmitter, and the Sitrans TH300, the universal transmitter using the HART protocol.
 Opening New Markets

Savola, Egypt

Nahmat and Simatic PCS 7 simplify commissioning and production start-up in a sugar factory on the Red Sea.
The Near and Middle East has been one of the fastest-growing sugar markets for years. Several large refineries have gone into operation in this region in recent years – for example, in Jeddah, Saudi Arabia, where the Savola Group operates a sugar factory that was equipped with Simatic PCS 7 four years ago.

The Savola Group is one of the largest industrial corporations in Saudi Arabia and, with a market share of approximately 70 percent, is the market leader in the sugar sector in Saudi Arabia. During an expansion of the company’s sugar business in 2005 and 2006, Savola decided to build a new refinery in the Egyptian port of Shokna on the Red Sea.

The location offers the advantage that the new factory can use the same supply routes as the parent refinery and serve the booming Egyptian market for white sugar. With a planned capacity of 2,500 tons of white sugar per day, the factory will equal the production capacity of the world’s largest refinery in Dubai.

**Experienced partners and state-of-the-art technology**

In Tate & Lyle Process Technologies (TLPT) from London, Savola found an engineering and technology provider that has been active in the sugar business for generations. The new sugar refinery was to be designed from the very start to meet the latest standards regarding both quality and efficiency. The plant concept was specified in the basic design phase in intensive meetings with Savola and TLPT. The process devices, for example, were to be networked exclusively via Profibus PA and AS-i.

The heart of the plant consists of a central engineering workstation and a central control stand. The installation is supplemented by options for local operation. This makes handling the process control easier for personnel who had little experience with the process and the plants at the beginning of production. These local terminals are implemented as PCS 7 Web clients.

For the application engineering, basic software from Nahmat was adapted to the special requirements of this refinery. The various product parameters are always ready as preselections for the operators. This allows the availability of the appropriate supply media, such as the levels of the various juice tanks, to be checked at the start of the crystallization process and ensures that no interruptions occur during the process. The software was also adapted to the crystallization curves that have been used at TLPT for many years. Thanks to the flexibility of the software, this modification was easily implemented after the technical and technological clarification.

**Rapid implementation despite demanding conditions**

Construction of the new facility was delayed due to the location of the building site on a new industrial

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**New markets for sugar production**

The reduction in European sugar production enforced by the World Trade Organization, and especially the restrictions on exports of white sugar, has led new suppliers to fill the resulting gap. New production capacities for white sugar are still sprouting all over the Mediterranean region, from Syria (via Israel) to Morocco. The majority of the projects, with the exception of those in Egypt and Morocco, are sugar refineries, that is, plants that buy raw sugar – for example, from Brazil, Thailand, or Australia – and then turn it into white sugar.
**New drive behind old mills**

The sugar industry in Indonesia is also experiencing a renaissance. This country, which was already an important raw sugar producer in the early 20th century, is expanding its capacity for processing sugar cane in response to the growing demand. One of the sugar mills currently being put back into operation is SF Cepiring near the city of Semerang in central Java. The mill was closed in 1996 and has remained inoperative since.

A joint venture between the Indonesian government and a private investor recently purchased the factory premises. In addition to a thorough modernization of the process plants, the sugar mill has since been overhauled and the capacity of the mill installations expanded. Various alternatives for driving the mills were discussed, including a central turbine as an energy source. However, it was doubtful whether the gear would be able to cope with the relatively high load in this type of drive.

Since sufficient electrical energy is available on the factory premises, the operator finally decided to split the power train and keep only the last transmission stage.

The new gear and the new drive for this variant were supplied by Siemens. The system consists of a Siemens gear and a Siemens motor with matching converter. Another advantage of this variant is that the capacity could be increased from 3,000 to 4,000 tons of sugarcane per day without further conversions.

The components were delivered and installed on-site in early 2008. The mill started operation in August 2008. Thanks to the variable-speed drive, sugarcane of different fiber contents can be processed. The mill is also optimally prepared for an expansion of the automation system. The next modernization step will include equipping the plant with modern instrumentation and automating the process with Simatic PCS 7.

The various individual Simatic S7 controllers – for example, for the centrifuges and in the packing department – were also linked via Profibus and commissioned.

Following successful completion of the three-month trials in October 2008, the plant was gradually run up to full performance, allowing the operating personnel to be trained effectively in the handling of the plant. Thanks to the standardized and user-friendly automation, the plant is functioning to the customer’s full satisfaction. Concrete plans for expanding the factory in Shokna are already in place.
Smart MCCs in process automation

Smart Control Cuts Costs

Energy consumption is the second largest operating expense in a plant. One starting point for improvement is optimizing the energy consumption of motors. By using smart motor controls, factories can not only eliminate wasteful energy expenditure but also prevent unplanned downtime and improve overall operational efficiency. The tight integration of motors, drives, and Smart motor control centers (MCCs) into a process automation system has multiple benefits: It cuts energy consumption, and it also reduces the cost of installation, commissioning, operation, and maintenance in an environmentally responsible way. Smart MCCs with an intelligent motor management system such as Simocode provide a wealth of data regarding the condition of the motor. This can be presented in the DCS in a clear and easy-to-read format. With this information, operators can modify operating parameters, analyze performance, and reset faults from the control room through tools such as the software Simatic PCS 7 Asset Management. Inefficient motor operation can be identified by analyzing the data that is recorded in the DCS. Using the real, quantitative data, energy efficiency projects can create efficient use of capital resources with high return on investment (ROI).

Gas analysis ensures heating power station visibility

Full Transparency

The premises of the heating power station of E.ON Westfalen Weser Energie Service GmbH not only have no fences, but the power station also boasts perfect visibility with respect to emissions. The parameters for carbon monoxide (CO), nitrogen oxides (NOₓ), and oxygen (O₂) emissions are determined according to the directive governing large furnace and gas turbine systems (13. BImSchV). The complete solution, which includes Ultramat 23 gas analyzers installed in a container, was supplied by Siemens. Flanges, into which the heated sample collectors fitted with dust filters are inserted, are located on platforms at both stacks. From there, the measuring gas is fed down to the measuring container in heated hosepipes and then cooled to well below room temperature. This procedure eliminates the water, which is captured as condensate, as water interferes with the measurement and it can also damage the measuring instrument. The dry gas is fed to the Ultramat 23 analyzers, either directly or via a so-called NOₓ converter.

A wall-mounted “Emi computer” collects and processes the measured data and makes them available to the operator as well as to the supervisory authorities via an online link. It is therefore always clear whether the plant is in compliance with the restrictions in the permit.

Extended version of the article online:
www.siemens.com/processnews
Modern industrial systems are connected directly or indirectly to the Internet – for example, via office networks. Simatic PCS 7 offers a framework for reliable protection against the resulting threats.

Process units today are typically networked with other corporate divisions. Data exchange between all levels is a necessary prerequisite for efficient management of the entire company. However, this networking is associated with greater security demands, and mechanisms such as those offered by the IT industry for the office environment can be used only under certain conditions. Whereas confidentiality is the top priority in the IT environment, availability and operability come first in the production plant.

The security framework of Simatic PCS 7 offers a solution for the comprehensive protection of a process system. The framework is unique in that it provides a total solution. It is not restricted to the use of individual security methods (such as encryption) or devices (for example, firewalls) but is based on the interaction of many security measures in the system network. The classic IT security measures of firewalls, virus scanners, access controls, and other methods are also employed for IT security in the process environment. However, they must be used in such a way that the work of the total system remains largely unaffected in the event of the failure or malfunctioning of individual components.

Siemens developed the PCS 7 security framework to address this issue. The framework is based on the “defense in depth” strategy, an idea with military origins: defense forces are not concentrated along one line but set up in different ranks. Attackers must overcome these ranks level by level. “Defense in depth” is based on the work of the Idaho National Laboratory.

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<th>Simatic PCS 7 security framework: comprehensive protection against attack</th>
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The PCS 7 security manual is available as a download from www.siemens.com/simatic-pcs7, “The click to...” menu item Technical Documentation, sub-item Simatic PCS 7 System Documentation.
Laboratory and is recommended by the US Department of Homeland Security.

**Forming security cells and protecting them with IT**

The process plant is divided into individual plant sections according to the “defense in depth” strategy. Every section forms a so-called security cell, which may extend from a small unit to an entire building. Each cell operates with complete independence and is protected by all the necessary safety mechanisms. Defined and monitored transitions control the data and personnel traffic between the cells. All other cells remain unaffected in the event of accidents in a single cell. This strategy ensures maximum security and at the same time divides the complex overall task into manageable, controllable segments.

**Checking data traffic in and between the cells**

Individual computers or entire networks run within a security cell, depending on the size and tasks of the cell. They must be protected from unauthorized access. Therefore, firewalls and virus scanners must be placed at all points of access to the security cells. No further firewalls are then required within the cells, so management of computer security is much simpler, and the performance of the system is not reduced. The PCS 7 security framework supports the firewalls of Scalance S and Windows and three different virus scanners. Because the workstations in the process control system usually operate with the Windows operating system, PCS 7 recommends the installation of the security patches provided regularly by Microsoft to close current security gaps in Windows components. Operating errors – intended or accidental – can cause devastating errors in the process system, so a dedicated user and rights management system with precise access control is required. The minimalism principle should always apply: individual users and individual applications are assigned only as many rights as they actually need for their respective tasks.

**Organizing plant security with PCS 7**

With the PCS 7 security framework, a procedure model is available that makes the complex task of protecting process control technology clearly manageable and controllable. Users can reliably andtenably protect their process systems against unauthorized access and faults in a step-by-step fashion. PCS 7 supplies the answer to the question of “how.” The question of “with what” is comparatively simple: Well-known elements of classic IT security are used. The trick is to apply them in such a way that security is ensured at all times with reasonable effort and manageable administration.

Another central aspect is that specific regulations for sustained security have to be defined – and have to be observed in everyday business. This applies equally to plant manufacturers and operators. Security should be anchored as a design goal as early as in the development process. It must be an integral part of system tests and a prerequisite for production releases. In Simatic PCS 7, security is verified continuously in a special Security Lab, enabling plant owners to recognize new dangers in time and to counteract them accordingly. The PCS 7 security framework includes comprehensive documentation with a concept description, numerous recommendations for technical safety measures, and suggestions for the practical implementation of the organizational regulations.
Nordzucker AG benefits from Totally Integrated Automation in its first bioethanol plant in Germany. The plant, operated by the Nordzucker subsidiary fuel 21 GmbH, also exploits synergies with the neighboring sugar factory.

Nordzucker AG is one of Europe’s leading sugar producers. In early 2008, the company’s first bioethanol plant went into operation at the sugar factory site in Klein Wanzleben near Magdeburg, Germany. The entry into the sustainable energy resources market has created a promising second line of business for the company.

After the recent liberalization of the sugar markets, bioethanol production has provided new perspectives and will help secure sugar beet farming in northern Germany. The bioethanol plant is located next to a Nordzucker AG sugar factory to which 3,600 farmers in four German states supply approximately 1.3 million tons of sugar beet annually.

**Year-round production**

The new plant, with a production capacity of 400 cubic meters of bioethanol per day, is operated by the wholly owned Nordzucker subsidiary fuel 21 GmbH.
& Co. KG. In addition to various qualities of bioethanol, the company also produces fusel oils, higher alcohols, and vinasses. With equipment for fermentation, distillation, and vinasse concentration, the new plant uses the production and services of the neighboring sugar factory in several ways. It supplies the raw juice as a process feed during the three-month sugar beet campaign as well as thick juice and molasses for the rest of the year. This allows year-round operation. The new plant is connected to the sugar factory’s power supply, process water systems and wastewater treatment, which creates additional synergies.

To create further capacity, the sugar factory is being equipped with additional thick juice tanks as well as plants for wastewater collection and cleaning. The boiler and turbine station has been extended with a waste heat boiler system with additional firing and a gas turbine for power generation.

**Electrical engineering from one source**

Special challenges faced in the completion of this project included the short construction time of approximately 12 months as well as the introduction of new technology. Nordzucker required economically and ecologically state-of-the-art process and plant technology for the production process to enable cost-effective and sustained operation of the plant right from the beginning.

Siemens received the general contract to supply and install the energy supply, the drive and automation technology, and the field instrumentation, including the engineering, assembly, commissioning, and project management. The Siemens Solution Partner on/off engineering gmbh took on the engineering services.

The contract also included six transformers with a busbar trunking system, a Sivacon low-voltage system with more than 70 fields and intelligent Sipart load feeders as well as the drive technology for 250 drives, of which 70 are controlled by Sinamics G120 and G150 frequency converters.

The heart of the automation system is the Simatic PCS 7 process control system with redundant servers and integrated F-technology for the Ex area, eight automation systems from the Simatic S7-416/417 series, six clients, a link to the sugar factory’s existing Teleperm M control system, and Profinet links (ProfiBus and Profinet PA) to the field devices. The fermentation, the rectification and dehydration, the ethanol store, and the bioethanol production subplants are each controlled by an automation system. Another four automation systems control the new sugar factory plants: the thick juice tanks, wastewater system, new boiler, and boiler burner and gas turbine. The process instrumentation for measuring temperature, pressure, flow, and filling level at approximately 1,500 process points includes instruments from the Sitrans and Sipart series. Such a comprehensive automation solution was only possible with the Totally Integrated Automation (TIA) concept from Siemens, with the unique uniformity of its system base – from the energy supply and PCS 7 process control technology to the drive technology and field instrumentation.

The entire bioethanol plant is controlled and monitored by one control room. It was completed in March of last year and has been operating to the customer’s full satisfaction since then. The construction of the new bioethanol factory has enabled sugar beet processing in Klein Wanzleben to increase from 13,000 to 16,000 tons per day.

**Additional thick juice tanks increased production capacity for Nordzucker**
CSI Behring, Germany

Double Score

Siemens Solution Partner MPA Regele provided an automation solution for a plant at CSL Behring that ensures maximum product security and availability.
CSL Behring is one of the world’s leading manufacturers of plasma derìvates and employs more than 7,000 people worldwide, 1,900 of them in Germany. The company operates production sites, plasma donor centers, and research and development departments in Europe and the United States. One product of the Marburg, Germany, site of CSL Behring is albumin, which is obtained from blood plasma in a multistage process. The existing ultrafiltration plant for albumin was to be replaced recently by a new plant built to meet the latest requirements. To do this, a new production plant was installed parallel to the continuing operation of the old plant.

An experienced partner for a demanding project

CSL Behring contracted Siemens Solution Partner MPA Regele GmbH to provide the plant automation. MPA Regele has been working in close cooperation with Behring since 1991 and has already supplied many plants in the fields of blood plasma processing, ultrapure water media, and water neutralization and disposal. The new plant was designed for full-load operation with a maximum standstill time of four weeks per year. This resulted in high demands on plant availability. Since the failure of even a single batch is extremely problematic, the plant and especially the plant automation must ensure maximum production reliability. The operability of the plant must be ensured under all circumstances, and the batch documentation may on no account fail. Therefore, the automation system had to ensure high redundancy of all functions and high measuring and control accuracy.

In addition, CSL Behring wanted to link the batch automation to the manufacturing execution system. MPA Regele and CSL Behring chose Simatic PCS 7 with Simatic Batch as a process control system. CSL Behring had already had positive experiences with Siemens process control technology and automation systems and had a broad knowledge of these technologies. Simatic technology-based pharma-compliant solutions can be created easily with specific features for pharmaceutical applications, especially in connection with 21 CFR Part 11 compliance, another important advantage of the Siemens systems in this environment.

Redundant systems for maximum availability

Following the contract award in February 2007, MPA Regele created a total of approximately 200 single programs for the individual processes. The dialysis, master and solution vessels, cleaning-in-place (CIP) system, and paste feeder were automated with redundant close-to-process components in connection with the Simatic PCS 7 process control system. The I/O periphery and the valve islands were designed as non-redundant systems. The entire operation as well as the alarm and process data acquisition and the data recording and reporting are handled by the PCS 7 system with a highly available AS 400H automation system, a redundant OS-server pair, a redundant domain controller, a redundant batch server, and three operating clients.

An additional station is provided for the engineering. The asset management and process device manager (PDM) software package is installed and configured on this station for the service personnel. The systems are networked with each other by a redundant terminal and system bus.

MPA Regele carried out extensive tests during the project phase, despite the tight time schedule, to rigorously test the system functions, partly in two-shift operation. The factory acceptance test for the automation system took place in December 2007. The entire system including the process technology equipment was then commissioned at the plant engineering company and in mid-2008 at CSL Behring. The documents created by MPA Regele for the site acceptance test are compiled so they can be integrated directly into the qualification at CSL Behring, and CSL Behring therefore does not need to repeat the tests that MPA Regele has already carried out – this made the qualification of the plant much easier.

After successful test runs in November 2008, the first production batches with the new plant began in December 2008.

MPA Regele GmbH

MPA Regele is an experienced partner for process automation in the pharmaceutical, chemical, and food and beverage industries and is a certified Siemens Automation Solution Partner. The company focuses on hardware and software planning, programming of programmable logic controllers (PLCs), and the configuration of process control systems as well as their qualification, especially with the Simatic PCS 7 and Simatic TI systems. MPA Regele develops individual concepts on the highest technical level, from detail engineering to complete solutions.

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Conserving water and energy are critical aspects of water system design for the pharmaceutical industry. Water cost, scarcity, and strict regulations force companies to explore new solutions to remain competitive. Siemens Water Technologies has pioneered many innovative technologies and processes to optimize water use offering cost-saving techniques that enhance the reliability and performance of water systems.

A growing need for water conservation

There are three main forces behind water conservation in industry: reducing operating costs, meeting regulatory requirements, and conserving natural resources / improving public perception. Reducing the cost of water, water disposal, and utilities is increasingly important for the pharmaceutical and virtually every other industry to maximize profits and, in some cases, to merely survive. Regulatory requirements usually fall in two groups. The first upholds the quality of discharged or reused water. The second limits how much water the facility discharges. Violations result in severe financial penalties or endanger plant operation. Regulations for the pharmaceutical industry are especially strict, and conservation and public perception are equally critical.

No more wasteful water recirculation

Most purified water systems for pharmaceutical production put unused water in a recirculating standby mode to help con-
trol microbial proliferation. Ultraviolet light and ozone may also be used to help control organism growth. This approach has been used for decades. Now, Siemens has pioneered a new approach that eliminates the need to recirculate water. This S3 process uses a sanitize/start/stop approach that runs when needed and stops when not needed.

Recirculating water consumes electricity for pumps, ultraviolet lights, instruments, and other devices. Often the water must be heated or cooled. Processes such as reverse osmosis produce a waste stream. The S3 solution from Siemens eliminates most of this waste by shutting down the water system when it is not needed. In standby mode, S3 administers brief periodic heat sanitization, quickly heating the water to 85 degrees Celsius. This effectively challenges microbial proliferation and sanitizes the water more frequently than typical water systems, while consuming much less energy. When a redundant water train is used, the savings of S3 are greatly multiplied. Like conventional systems, the S3 solution can be combined with chemical cleaning, chemical sanitization, and conventional heat sanitization.

Reuse instead of discharge

Another central aspect of water conservation is the reuse of water. A healthcare products manufacturer in the United States needed to increase production while lowering water usage. Faced with strict regulations on wastewater discharge, the manufacturer knew that failure to comply would result in severe financial penalties and crippled growth. The company chose a Siemens solution that allows it to reuse its wastewater. Siemens was chosen because of its technology portfolio and reputation in water technologies for pharmaceutical production. Also, Siemens could provide a local team of industry experts for service and technical support.

The wastewater in this case contains a high-molecular weight organic compound, which must be removed before this water can be reused. However, specific inorganic ions are also present, which should not be removed. Among many choices, nanofiltration was selected because it can remove the specific organic compound while preserving the inorganic ion levels. The nanofiltration membranes performed exactly as designed, confirming that they were the best choice. Siemens’ process knowledge, piloting capacity, and full complement of filtration technologies provided a comprehensive, integrated treatment package.

The reuse system saves approximately US $3,360,000 over a 10-year period. The wastewater stream that is recovered and reused totals almost 200,000 cubic meters a year, saving the cost of discharge and lowering the plant’s feed water requirements. Savings are even greater when one considers the regulatory penalties avoided and the facility’s ensured ability to grow. The tremendous success of this system has resulted in multiple duplicates or closely related system designs around the globe for this progressive pharmaceutical company.

The specifics for this example water system:
- 150 GPM make-up water requirement
- Operation: 7 hours / day, 5 days / week, 250 days / year
- Feed water cost: $1.33 / 1,000 gallons
- Wastewater discharge cost: $2.77 / 1,000 gallons
- Electrical cost: $0.05 kWh

The following cost saving analysis includes annual savings and a 10-year projection that includes projected utility cost increases.

<table>
<thead>
<tr>
<th></th>
<th>Annual savings</th>
<th>10-year projection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw water and filters</td>
<td>$77,105</td>
<td>$1,117,989</td>
</tr>
<tr>
<td>Electricity</td>
<td>$28,789</td>
<td>$417,062</td>
</tr>
<tr>
<td>Water softener</td>
<td>$2,469</td>
<td>$35,799</td>
</tr>
<tr>
<td><strong>Total savings</strong></td>
<td><strong>$94,525</strong></td>
<td><strong>$1,370,377</strong></td>
</tr>
</tbody>
</table>

S3 solution: the economic side

The S3 process utilizes a sanitize/start/stop approach rather than the potentially wasteful approach of continuously recirculating water systems. There are many examples of this successful technology being utilized in pharma operations, proving its value in the industry. An S3 system runs when needed, and stops when it is not needed, saving water, electricity, and wastewater production. The economic savings from the S3 approach can be dramatic, often saving many millions of liters of water per year. Large water systems, redundant trains, high raw water costs, high discharge water costs, and water discharge limitations can greatly increase the savings of the Siemens S3 solution. While the savings are greater on larger, redundant systems, even relatively small, single-train water systems with moderate water costs can still result in rapid payback and significant savings, as a recent example at a US-based pharmaceutical company shows.
The fire engine is controlled by a 19" Simatic Multi Panel

The new special fire engine of the InfraServ industry fire brigade is equipped with state-of-the-art technology in every sense

Tony Brändle, Switzerland

Not Only in an Emergency

Technology from Siemens ensures easy handling and highly transparent processes in the firefighting vehicles made by Tony Brändle AG.

With a staff of 55, Tony Brändle AG, a family business in Wil, Switzerland, builds special vehicles. “We produce the entire range of vehicles for the fire brigade, for example – from the chief’s personal vehicle to the special fire engines for industry fire brigades,” says owner and chief executive officer Peter Brändle. The company’s customers are primarily located in Switzerland and Germany. A large percentage of the orders come from the professional fire brigades of large industrial customers, especially in Germany.

Due to Brändle’s long years of experience and innovations such as the patented foam feeder, the company is a leader in the field of fire engines for industry fire brigades.

Peter Brändle stresses the fast availability of the Brändle vehicles in operation: “All our vehicles start at the push of a button. The simple handling is decisive for our customers because the firefighting team must be able to handle the vehicle immediately in an emergency situation.”

State-of-the-art automation and instrumentation

Brändle relies on state-of-the-art technology to further optimize the operability of the extinguishing systems. One example is a highly modern fire engine that Brändle recently delivered to the InfraServ industry fire brigade in Wiesbaden, Germany. The vehicle was the first in which a Simatic Multi Panel with a 19-inch touchscreen was installed at the rear of the vehicle for operating and monitoring the systems. Peter Brändle explains: “The large screen offers enormous advantages, particularly for operating when wearing full firefighting equipment and with
Tony Brändle AG

The company was founded in 1946 by Tony Brändle and formed into a family AG in 1981. Today, Tony Brändle AG is owned by sole shareholders Peter and Claudia Brändle. Founded as an auto body shop, Tony Brändle AG broke into the fire service vehicle construction market in the early 1960s. In the ’80s, Tony Brändle patented a self-developed foam mixer for fire engines. Thanks to continuous development, Tony Brändle AG is now one of the largest Swiss specialists for innovative, tailor-made solutions in fire engine construction.

The basic data of the new fire engine:

Customer: InfraServ factory fire brigade, Wiesbaden, Germany

Technical data:

- Extinguishing performance: 2,000/4,000 l/min
- Water: 5,200 l
- Foam: 4,500 l
- Mixing range: 150 to 8,000 l/min with 0.5 to 6 percent foam
- CO₂: 180 kg

Automation and instrumentation:

- Simatic MP 377 Multi Panel with 19” touchscreen
- Simatic WinCC flexible
- 5.7” Simatic TP 177 Touch Panel in driver cab
- 20 Sitrans Magflo MAG 1100 flowmeters with MAG 5000/6000

Tony Brändle AG

relatively complex vehicles. We can display a simple flowchart on this large panel in which all the necessary vehicle information, all the pump data, and all the flow volumes are shown in one diagram.”

The different flow volumes are monitored by a total of 20 Sitrans Magflo devices. The data from the flowmeters are transferred to the central Brändle control and archived so that a mission report with all the relevant data can be created at the push of a button. The central panel at the rear also provides further information to the operator, such as a complete operating manual that can be opened as a PDF document. An additional Simatic Touch Panel is installed in the driver cab, from which vehicle functions such as the siren, opening and closing of the shutters, extension of the ladders, and lighting (including the light mast) can be operated and monitored.

All the vehicles are rigorously tested internally at Brändle on the test bench, which is also equipped with Sitrans flowmeters. Brändle also trains industry fire brigades, of course. “It is very important for us that the operators understand the vehicle,” Peter Brändle says. “Because the systems are very easy to operate and maintain, we were able to train three troops of the fire brigade at IntraServ in Wiesbaden, Germany, in only three days – including emergency operation and the internal service staff at IntraServ.”

Expert and reliable partner

Brändle has been working with Siemens as a supplier for the flow measuring technology for approximately 15 years. For the control and HMI, Brändle uses Siemens technology – from the small Logo controller to the 19-inch Multi Panel. “Siemens is an important partner that supports us with know-how and products for equipping our vehicles,” Peter Brändle explains. “Robustness and durability obviously play an important role in our vehicles. Are the components sufficiently immune to vibrations? What about their resistance to water? Siemens can answer all these questions and supply appropriately robust equipment with a high degree of protection.”

Andreas Meile, head of electrical engineering at Brändle, adds: “Here we benefit from the collaboration with Siemens not only in terms of spare parts availability. The devices operate very reliably – the flowmeters, for example, work for years with practically no faults. The name Siemens stands for quality and reliability and creates confidence with our customers. We also benefit from the Siemens systems in terms of service. For example, we use the TeleService module, which has practical advantages for our 24-hour customer service.” Brändle will continue to use Siemens know-how and technology for further developments, as Meile confirms: “I can well imagine that a wireless operator panel such as the Simatic Mobile Panel could be suitable for operating the fire engine monitor.”
Together with Hach Lange, Siemens equipped the sewage plant of the Wasser- und Abwasser-Zweckverband Werder-Havelland water and wastewater association, in Germany, with state-of-the-art measuring technology and liquid analytics.

The wastewater treatment plant of the Wasser- und Abwasser-Zweckverband Werder-Havelland was built in the 1980s and was recently brought up to the state of the art. The engineering firm SAG Abwasserreinigungs-Ingenieur-GmbH Sachsen headquartered in Schwepnitz, Germany was responsible for the entire modernization project of the plant including contruction, machine and electrical technology. The Promontan GmbH was responsible for the modernization of the electrical systems in the sewage plant. The engineering company Promontan designs, plans, builds, and modernizes electrical installations and provides qualified service and maintenance. The project also included the modernization of the measuring technology in the sewage plant. Promontan chose the robust, reliable Sitrans L ultrasonic level-monitoring instruments, which always supply reliable measuring results thanks to the patented Sonic Intelligence signal processing, as well as systems from the Siemens partner Hach Lange.

**Noncontacting and reliable**

Ultrasound technology is the first choice for level monitoring in wastewater applications because it is noncontacting. The Sitrans L Multiranger 100/200...
controllers for continuous level measurement with XRS-5 sensors are used in the plant for monitoring the rakes, in the pump shaft, and for level measurement of containers and tanks. The Sitrans L Pointek CLS200 capacitive level switches are in use as an additional protection against overfilling.

The ultrasonic measuring method is also used to measure the sludge level in the four tanks that operate according to the SBR (sequencing batch reactor) method. Sonatax sc sensors from Hach Lange control the sludge pickoff and prevent process faults such as sludge drift.

In some applications – for example, in the case of heavy foaming – ultrasonic measuring technology cannot be used, as the signal is not sufficiently reflected. In these cases in the Werder sewage plant, the level is determined by a hydrostatic pressure measurement with Sitrans P MPS instruments. Sitrans P 300 absolute pressure transmitters are used to measure the fan pressure of the fan stations of the SBR tanks.

With its wide scope of functions for level, volume, flow, and difference measurement, the Sitrans L Multiranger 200 is always able to handle the various tasks in sewage plants. The geometry of measuring channels and weirs is stored for the flow measurement of open gutters. The software also contains the geometry of most tanks, allowing the volume to be calculated from the level. By using two sensors, the level difference before and after the screen rakes is determined automatically.

Control algorithms for the management of up to six pumps are available for applications in pump shafts. In confined spaces and in the case of obstructive installations in the tank or shaft, automatic Sonic Intelligence interference echo fading and the narrow sound cone of the sensors enable reliable and reproducible results at all times. The outflow at the rain overflow basin can also be measured and calculated with the Multiranger.

An input for external analog and digital measuring signals is also available. The ultrasound sensors are designed in protection class IP68, and a flooding sleeve can be ordered additionally.

**Analytics solution reduces costs**

Hach Lange also provided the complete process water analytics for the sewage plant. Four ammonia and phosphate analyzers were originally planned for the four SBR reactors. Together with the equipper Promontan, Hach Lange implemented an alternative concept for this task, with considerable cost advantages: with a multichannel system with switching and purging technology, the analysis of the four SBR reactors can be carried out with just one ammonia and phosphate measuring instrument and an upstream Filtrax sample processing system. This reduced the maintenance and inspection costs to one-quarter of their previous level, in addition to the lower procurement costs.

The sewage plant is back in operation following the modernization, and the wastewater is now being treated in a large modern, state-of-the-art sewage plant.

Measurement of the ammonia concentration of the SBR tanks with Hach Lange Amtax sc

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**Technology at a glance**

Complete communication via Profibus

**Products from Siemens:**

- 12 Sitrans L controllers for continuous level monitoring:
  - Sitrans L Multiranger 100 with 1 ultrasonic
  - Sitrans L Echomax XRS-5 sensor each
- 1 Sitrans L controller for continuous level monitoring:
  - Sitrans L Multiranger 200 with 2 Echomax XRS-5 sensors
- 7 Sitrans L Pointek CLS200 level switches
- 4 Sitrans P300 pressure transmitters
- 2 hydrostatic Sitrans P MPS series pressure transmitters (well probe)

**Process water analytics from Hach Lange:**

- 5 12005-sc pH sensors
- 4 12005-sc RedOx and LDO dissolved oxygen sensors
- 3798-S sc conductivity sensor, Sonatax sc sludge level measurement instrument, Amtax sc ammonia analyzer, Phosphax sc phosphate analyzer, Filtrax filtration system, Nitratax sc nitrate sensor, Solitax sc solid measurement instrument, and Bühler sampler (one device each), and 2 sc100 and 4x sc1000 controllers with Profibus
Hach Lange recently presented its new equipment series for measuring pH, conductivity, and dissolved oxygen, which succeeds the Sipan 32 and Sipan 34 instruments for measuring these electrochemical parameters. The Sipan products were transferred to Hach Lange in 2005.

The new Si792/Si794 family from Hach Lange can be operated simply and safely. The intrinsically safe versions of the Si792X have ATEX Zone 1 and FM/CSA Class 1 Div 1 approvals. HART, Profibus PA, and Foundation Fieldbus are available as communication protocols in the Si792.

If intrinsic safety or bus communication is not required, the Si794 with a flexible power supply (20 – 253 V) is the right choice. The extended diagnostic functions for sensor and transducer (Sensocheck function) help the user monitor the safety of the measurement and the process.

The accessories catalog of the Si792/Si794 family offers a wide choice of electrodes and process connections for applications in ultra-pure water, all kinds of process liquids, drinking water, and wastewater.

The Hach Lange instruments are also sold by Siemens. Siemens does not manufacture its own products for liquid analytics; however, by partnering with Hach Lange, the company is able to offer its customers a complete portfolio for process water analytics for drinking water, wastewater, and industrial water.

All Hach Lange devices communicate via Profibus and can therefore be integrated smoothly into Siemens process automation systems.

www.hach-lange.com

Braumat Compact PCS 7 is successful at Lagunitas
Compact and Fully Automatic

The a-on AG company has recently delivered an automation solution for ROLEC Prozess- und Brautechnik GmbH based on Simatic PCS 7 Braumat Compact, which is used at the Lagunitas Brewing Company in Petaluma in California. The Simatic PCS 7 Braumat Compact process control system continues the success story at craft and specialty breweries in the United States. The new process control system is part of an extensive project with which Lagunitas hopes to increase both its productivity and its beer output. ROLEC supplied the equipment and automation technology for a 95-hectoliter multiunit brewing plant, including modern energy recovery systems in a brew sequence of 10 brews per day. A key requirement was fully automatic overnight operation of the brewing process, without personnel being present. Simatic PCS 7 Braumat Compact meets this requirement and enables complete control of the brewing process, from the malt handling systems in the silos to the storing of the wort in the fermentation tank, including the addition of the yeast.

This modernization has enabled Lagunitas to continue its growth strategy. The microbrewery Lagunitas, founded by Tony Magee in 1993, relies on innovative interpretations of traditional beer types and has been extremely successful with this concept. The company has increased its beer production to 60,000 hectoliters in 2007.

Siemens developed the Simatic PCS 7 Braumat Compact process control system especially for breweries like Lagunitas. Small and medium-sized breweries benefit from a low-cost automation solution for middle-range applications in production, in closed subprocesses, and in laboratories or technical center systems. Simatic PCS 7 Braumat Compact offers all the advantages of the Simatic PCS 7 Braumat system, such as a scalable system architecture, a high degree of system openness, and a flexible recipe system.

www.siemens.com/breweries
info

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events

Pharma-Forum 2009

Lean GAMP

Last spring, the Pharma-Forum was staged for the first time. More than 150 participants from the pharmaceutical industry and Siemens Solution Partners met in Muttenz near Basel, Switzerland, to discuss the growing requirements in the pharmaceutical industry. The meeting also included several lectures. Prof. Dr. H. Hensel from the Hochschule Harz University of Applied Sciences in Germany, for example, lectured on the changes between GAMP 4 and GAMP 5. This presentation was supplemented by lectures and best-practice examples from various Siemens Solution Partners such as Penta-Electric AG, CTE ControlTech Engineering, and Actemium Controlmatic AG.

Following the great success of the first forum, the Pharma-Forum 2009 is being held on March 31, 2009, in Muttenz. The event will be presented by Ms. Alenka Ambroz. The 2009 forum will focus on “Lean GAMP: More efficient verification in automation” and will build on last year’s lectures. In addition to the main speaker, consultant Dr. Torsten Schmidt-Bader, the three solution partners attending also in 2008 as well as Hans Meyer Engineering AG will make presentations.

Pharma-Forum 2009, March 31, 2009, Muttenz (near Basel), Switzerland

Detailed program and registration information will be available as of the end of January at www.siemens.ch/automation/events
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