

process news

The Magazine for the Process Industry

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SIEMENS

Chemical Industry

A New Perspective on Increasing Efficiency

Industrial Communication
WirelessHART
passes the stress
test

Process Control Systems
**Expert system for
cement production**



Siemens sets the standard for industrial control at the CNPC PetroChina mega refining and chemicals complex in Fushun

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One of the first and largest remote operation centers uses a Simatic PCS 7 remote operation and control solution

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Sitrans technology monitors critical process parameters in the steam cycle of a geothermal power plant

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“Progress needs chemistry.”



Miguel Fernandez
Head of the VSS Chemicals
Siemens AG

Chemistry – our life, our future. The United Nations International Year of Chemistry 2011 celebrates the achievements of chemistry and its contributions to the well-being of humankind. Mobile phones, healthcare products, baby diapers, safe drinking water – chemistry is everywhere. Chemistry will be key to making progress sustainable and to protecting resources for future generations.

Progress and growth, however, also require energy – so it is no surprise that innovation in the chemical industry depends on a reliable, safe, and economical power supply. Thus, new discoveries in the chemical industry have often been accompanied by innovations in electrical engineering. New or alternative resources, sustainability, and process efficiency may be today's buzzwords, but engineers have always worked on similar challenges. Electrical systems have long been responsible for electrolytic processes, for industrial furnaces, and for controlling and regulating drives and process devices. For more than 100 years, Siemens has been a close partner to the chemical industry. Our systems and solutions will not simply control processes, but also help increase productivity and efficiency. Whether it means implementing safe, energy-efficient process control in large refineries; upgrading legacy systems in ammonia production; or making biofuels an economically sound alternative to fossil fuels, we support our customers in preparing for future growth. I hope we can give you some valuable ideas with this issue of *process news*.

Enjoy the read!

Yours,

A handwritten signature in blue ink that reads "Miguel Fernandez". The signature is fluid and cursive, with a small flourish at the end.



■ **CNPC PetroChina Fushun Petrochemical Company, China**

On Stream and On Track for Success

Siemens sets the standard for industrial control at a mega refining and chemicals complex in northeastern China. The facilities belong to CNPC, China's most profitable oil and gas company.

Fushun, in northeastern China, is a city with a long history in heavy industries. Thanks to its local resources of coal and oil shale, Fushun was one of the first cities in China to industrialize, with factories producing oil- and chemical-based products, vehicles, and machinery. The factories were large, but they were traditionally organized. The Chinese economy's strong growth in the 2000s and the consequent demand for petroleum-based products and chemicals made it clear that a new class of mega-refinery and chemicals facilities would be needed.

In 2006 CNPC PetroChina decided to invest €2.4 billion to build a refining and petrochemical complex in Fushun, to be operated by the PetroChina Fushun Petrochemical Company. The complex planned by CNPC would become the largest refinery and chemical base in China's northeastern region. The facility can process 10 million tons of crude oil per year and produces 1 million tons of ethylene per year that is fed into the downstream polyolefin production.

CNPC wanted to achieve new levels of performance, efficiency, and safety with the plant. The entire complex would be highly automated and controlled from a single control room, making effective use of per-

sonnel. Latest-technology heat exchangers would be employed to extract waste energy from hot liquids and flue gases to power further processes throughout the plant, and new emphasis would be placed on plant safety and emissions. The search was on for an industrial partner to implement the automation and safety systems for this vast project.

A key question for Fushun Petrochemical in planning its new refinery complex was the control strategy to employ. The regulations for the operation of chemical plants in China are determined by the Chinese design institutes. The conventional approach to managing a chemical process was to have a safety monitoring system independent of the control system. Siemens had developed a new approach, however, with distributed process control integrated with the safety instrumented system (SIS) in a common platform. Siemens worked with the Chinese design institutes to apply the common platform approach to the production of chemicals. Following an 18-month technical qualification process and a tough competitive selection process, Siemens was chosen as the main automation vendor (MAV) in 2008. Siemens would provide a comprehensive combined distributed control system and SIS based on Simatic PCS 7.

CNPC

- ▶ Provides 40 percent of China's oil products
- ▶ Operates 26 refineries
- ▶ Primary crude processing capacity: 140 million metric tons per year
- ▶ Natural gas processing capacity: 2.5 million tons per year
- ▶ Produces organic and inorganic chemical products

Fushun ethylene and polyolefin complex

- ▶ 8 plants, 15 utilities
- ▶ Ethylene capacity: 800,000 tons per year
- ▶ Polypropylene capacity: 300,000 tons per year
- ▶ High-density polyethylene capacity: 350,000 tons per year



» **Siemens** and CNPC plan to continue this close collaboration and relationship in the future. Siemens will support us in bringing all the plants into operation by next year. «

Shi Yun, Maintenance Engineer, CNPC PetroChina Fushun Petrochemical Company

Controlling a 10-million-ton refinery

The new refinery complex would process primarily crude oil from CNPC's own oilfields in the Daqing and Liaohe oil regions to produce gasoline, diesel, jet fuel, and lubricants. The processes of chemical distillation, catalytic cracking, delayed coking, and hydrocracking would all be controlled by a distributed PCS 7 system with a central control room and 13 field remote rooms. The control system would employ more than 25,000 I/O points and the SIS approximately 9,000 I/O points. The vast array of

inputs would be interconnected with the Profibus DP and Modbus communication protocols. In December 2009, Siemens won a second contract – for the ethylene and polyolefin complex, which produces 1 million tons per year. Having proved itself in the refinery project, PCS 7 was again selected by Fushun Petrochemical as the control technology.

The ethylene and polyolefin facilities would be both massive and truly complex. The output would include ethylene, polypropylene, and high-density polyethyl- ▶▶



» **The Fushun million-ton ethylene project is extremely important for Simatic PCS 7, as it is a signal that Siemens has the ability to address the whole flow from refining to fine chemicals.** «

Xie Zheng, Process Automation and MES Manager, Siemens Ltd. China

» ene, and at the facilities' heart would be the ethylene cracker, where one of the most critical processes in the petrochemical industry would take place.

The awarding of the automation contract for the ethylene and polyolefin complex was an event of great significance for Siemens. The complex with the associated refinery was the largest integrated refinery and ethylene plant in the world to choose PCS 7 as the main automation system. It was an outstanding endorsement – by both Fushun Petrochemical and the Chinese chemical design institutes – of PCS 7 for use in highly sophisticated and hazardous chemical and petrochemical processes.

Again, Siemens was chosen as the MAV. The contract comprised a complete turnkey system, with



Monitoring all systems from a central control room significantly improves operational efficiency

Siemens providing the overall project implementation strategy, functional design specifications, hardware and software architecture, network construction, engineering design, configuration, and commissioning and integration of third-party systems. Siemens Industrial Automation Ltd., Shanghai (SIAS), was responsible for the engineering, hardware integration, software design, factory acceptance test, site acceptance test, training, and service.

The integration of the gas detection and SIS with the distributed control was a key factor in Siemens being selected. In China there is now strong pressure by the government for industrial plants to comply with safety regulations and to be greener – that is, to minimize liquid and flue gas emissions. The information on plant efficiency, profitability, and product



The automation solution

- ▶ Safety instrumented system
- ▶ Distributed control system
- ▶ Gas detection system
- ▶ Asset management system
- ▶ Operator training system
- ▶ Time synchronization server
- ▶ Central control room and 13 field remote rooms
- ▶ Access control
- ▶ Positioners and motors

Customer benefits

- ▶ Optimized factory resources and return on investment
- ▶ Reduced lifecycle cost
- ▶ Greatly elevated performance and efficiency
- ▶ Improved safety, reliability, stability, and flexibility
- ▶ High product quality
- ▶ Improved sustainability and eco-friendliness
- ▶ State-of-the-art technology fitting the requirements of a large-scale chemical complex
- ▶ Centralized control and management
- ▶ Siemens and SIAS chemical engineering project experience helped coordinate and manage the many design institutes and EPCs involved
- ▶ Synchronization of multiple plants, utilities, and assemblies
- ▶ On-time project development and construction



The integration of fail-safe and standard automation technology provided by Simatic PCS 7 supports increased reliability

quality supplied by PCS 7 provides plant managers with the tools they need to run their sites safely and to comply with all regulatory requirements.

Committed to success

Training is an area that demonstrates Siemens' commitment to both deliver a complete manufacturing process and ensure that the operator or owner can gain the maximum value from its investment. Training was provided both for the design institutes and for PetroChina Engineering. On-site training was provided for maintenance and repair personnel, and training for operating personnel was undertaken during commissioning. The project engineering, with a total investment of RMB 15.6 billion, will be completed in December 2011. The ethylene cracker is fully operational, and the refinery's delayed coking unit is in

commissioning, with the desulfurization and wastewater units to follow.

With the new ethylene cracker on stream and several other plants currently completing commissioning, the Fushun Petrochemical complex is on track to be the largest refining and petrochemical base in north-eastern China. ■

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■ Interview with Sven Seintsch, BIS Prozesstechnik GmbH

Fieldbus Systems: Evolution, Not Revolution

Media hype is telling us that wireless is the new fieldbus technology, and Ethernet is the fieldbus system of the future. We spoke to Sven Seintsch, head of the test laboratory at BIS Prozesstechnik GmbH in Frankfurt, about current demands, developments, and solutions for the process industry.



Sven Seintsch examines bus systems and devices for their application possibilities in process plants in the instrumentation and control test laboratory



» Don't believe anything that you haven't tested yourself. «

Sven Seintsch, an electrical engineer with a special degree in automation technology, has been working with fieldbus technologies for 12 years. After working for Hoechst and Infracore Höchst, he is now head of the instrumentation and control test laboratory at BIS Prozesstechnik GmbH in the Industriepark Höchst industrial complex in Frankfurt.

Allow me to ask you a personal question to start off. You dealt with bus systems in your PhD thesis. What do you find so exciting about them?

Sven Seintsch: When I wrote the thesis in 1998, we thought fieldbus systems would be standard in four or five years. That turned out not to be the case. Fieldbus systems still haven't been widely implemented. Technical developments, the growing performance capability and intelligence of the field devices, and their interaction with IT systems always lead to the question: how does that all fit in the process industry?

What special demands does the process industry make, and where are fieldbuses being used at present?

Sven Seintsch: Typically, a process plant is a one-of-a-kind unit with specific processes, standards, and media. Plants will be in operation for 15 to 20 years. Therefore, process devices must be upward and downward compatible. That is where I see the biggest challenge. Another critical issue is plant availability, and modern field devices can provide extended plant and system diagnostics for real-time evaluation. At the moment, only two fieldbuses are really relevant: Foundation Fieldbus and Profibus – with Profibus being the more comprehensive system that allows the complete instrumentation of a plant. Fieldbuses must provide communication and power supply on the same lines in open topologies and be able to link new field devices during ongoing operation.

What are the major concerns in the industry community?

Sven Seintsch: Studies comparing Remote I/O with fieldbus technology show benefits based on certain assumptions only – there are no actual figures. Also, there is a generation of senior engineers and operators that has grown up with 4-20 mA solutions, so introducing fieldbuses requires retraining. Proven solutions feel more comfortable because users know them and their specific issues.

How can manufacturers help?

Sven Seintsch: Above all, we need improvements in the area of interfaces and drivers for device integration. Fieldbus technology involves some fairly

complex procedures for this. What we need are tools that support this process through guided menus, and those tools should be a part of the control system so that plant operators can integrate new devices quickly and easily. Siemens already offers tools that support commissioning. Control system and field device providers should work together more closely. I would also like to see faster development of safety systems. Additional protocol stacks were released for the transmission of safety signals via Foundation Fieldbus H1 and Profibus PA fieldbuses, and the NAMUR recommendation NE 97 describes the appropriate topologies and SIL-capable fieldbus devices. However, the current portfolio of process devices for safety applications is still fairly narrow.

And the economic side?

Sven Seintsch: The diagnostic functions of modern field devices allow proactive and preventive maintenance, which reduces plant lifecycle costs and enables energy savings in the long term. These benefits are not available without fieldbus technology. On average, installation costs for fieldbuses are lower than for 4-20 mA solutions. By the way, first-generation bus devices such as those we have here in our laboratory also work in new systems, rarely requiring extensive integration efforts, and we can achieve long lifecycles and protect investments.

Where do you see additional benefits?

Sven Seintsch: Plant modernization projects are a good opportunity to deploy fieldbus systems. Users can become familiar with the technology and gain experience before they use fieldbuses on a larger scale. I do see wireless and Ethernet as fieldbus systems in the future, even though we have not yet resolved all the issues relating to these technologies. Wireless is an interesting concept for several applications and will certainly be used, but we are still a long way away from Ethernet as a fieldbus system for the process industry. ■

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■ **Salzgitter Mannesmann Stainless Tubes (SMST), Germany**

Setting New Standards

Salzgitter Mannesmann Stainless Tubes (SMST) standardized solutions at its four sites with a high-availability and flexible MES solution based on the ISA-95 standard and so reduced waste and increased production efficiency, as well as quality.



Salzgitter Mannesmann Stainless Tubes (SMST), headquartered in Mülheim an der Ruhr, Germany, is a worldwide leading manufacturer of seamless stainless steel and nickel-based alloy tubes and pipes that employs over 1,000 people. SMST has four production sites, each of which has its own area of expertise in terms of tube diameters, ranging from 6 to 250 mm: Montbard (France), Remscheid (Germany), Costa Volpino (Italy), and Houston (United States). Based on different processes, like hot extrusion, cold pilgering, or cold drawing, products are manufactured ranging from small instrumentation tubing up to large pipes with wall thickness up to 50 mm and up to 25 m in length. The materials range from standard austenitic stainless, duplex, and super-duplex steels to highly sophisticated nickel-based alloys, depending on the requirements for the application in terms of corrosion resistance; heat resistance; and high-temperature, high-strength materials. The products are exported to over 100 different countries for use within plants, products, and processes in industry sectors such as chemical and petrochemical, power generation, environmental technologies, oil and gas applications, mechanical and plant engineering, construction, and the automotive industry.

Due to historical reasons but also to differences in production processes and commercial orientations, the data from the shop floors of the four different plants were all different. The objective was to replace the different existing local systems with a common specific tool for shop floor operators and the availability of shop floor data. SMST was in need of a product-based solution that would support standardization and could be rolled out across the four sites, replacing the different existing systems. A core manufacturing execution system (MES) based on the ISA-95 standard would be ideally suited, providing a template that covered the different factories and at the same time offering the flexibility to accommodate plant-specific requirements. In addition, the implementation of such a high-availability solution was expected to help minimize waste and loss of material and increase production efficiency.

Easy handling and expertise favor Simatic

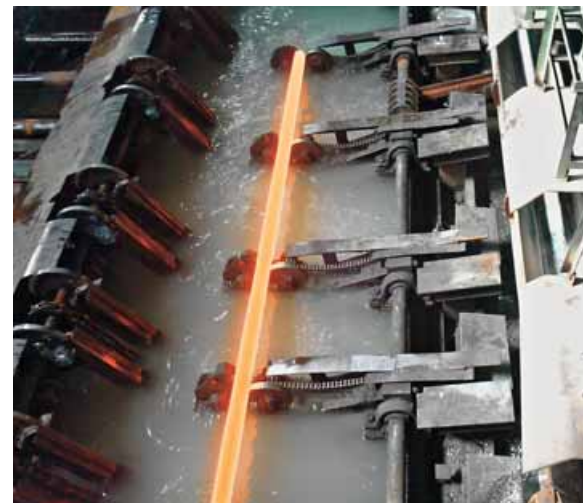
SMST opted for the Siemens MES solution Simatic IT, which is based on ISA-95 and, as an open system, makes it possible to a certain extent to carry out system changes without the assistance of a software engineer. Also, the MES includes the functionality to achieve integrated quality and offers the possibility

» **The challenge** to implement an MES enabled us to re-architect our four production systems in order to realize one common solution based on ISA-95 standards. In general terms this was a key factor in reducing cost, improving quality, and simplifying maintenance. «

Giacomo Rizzi, IT Manager, SMST

Operational achievements of the project

- ▶ Paper and error reduction: The screens were especially designed to directly provide the end users with all the needed information from the MES. This quick and easy access to key product and process data enforces adherence to correct manufacturing procedures and eliminates both recordkeeping errors and time-consuming reviews.
- ▶ Efficient data collection: The data collection features enable easy acquisition of shop floor data about process execution. The analysis of this feedback is used to improve the production processes.
- ▶ Improved quality control: The strong integration between MES and LIMS guarantees efficient quality control.



to generate certificates – a strong asset in this particularly regulated segment. Another decisive factor was the expertise of Siemens in both metals and MES, which made Siemens a strong partner for the realization of this MES project.

In a number of technical workshops, the specific requirements of SMST were mapped and taken into account during the functional analysis and the further course of the project. Overall, it comprised the implementation of full MES functionality (with the Simatic IT Production Suite) as well as the laboratory information management system (LIMS) Simatic IT Unilab at all four sites. Following the project kick-off in October 2008, the project went live successfully over six months between January 2010 and July 2010. Simatic IT Production Suite now covers all stages of production, extrusion, pilgering, and finishing. It offers the possibility to schedule operations; handle, merge, or split bundles of tubes; and handle the results of nondestructive tests, all the while keeping track of the production data related to these operations. Simatic IT Unilab manages the destructive tests and other lab-related data. The solution also includes Simatic IT Report Manager, which offers a user-friendly way to create reports

based on all data stored in Simatic IT. The integration and communication between the enterprise resource planning (ERP) system, MES, and LIMS is handled through the component called Data Integration Service, which also enables communication via XML files with shop floor equipment.

Successful rollout in six months

From the start, the project took into account the requirements of the various stakeholders in four different countries with four different cultures and local requirements related to specific products. The up to 200 screens that used to be in use in the four plants have now been reduced to 25, usable by all plants. The system is based on a common framework, which makes it configurable according to specific requirements and extensible in view of additional needs related to new products or equipment. The project was strongly focused on the use and creation of reusable assets, which reduce the overall cost of a system. ■

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■ Petrokemija d.d., Croatia

Passing the Nitric Acid Test

A fertilizer producer in Croatia brings a 1960s manufacturing process up to modern safety standards with Simatic PCS 7.

Petrokemija, the largest fertilizer producer in Croatia, is all too familiar with dangerous processes. Fertilizer manufacturing starts with methane and water. At its plant in Kutina, Croatia, Petrokemija has two production lines manufacturing a total of 810 tons per day of 100 percent nitric acid. The safety systems in the plant were originally installed in the 1960s and consisted of electrical-relay protection systems and transistorized alarm modules. These had become unreliable over time, and as the first phase of updating the entire plant, Petrokemija decided to replace the safety and alarm systems to bring the plant up to present-day safety standards. Petrokemija set about the task of replacing the safety systems in three phases: the

analysis phase, the implementation phase, and the operation and maintenance phase. In the analysis phase the existing and potential safety risks were identified. A specification was then drawn for the required Safety Integrity Level and for the measurable reduction in risk that the new safety system should deliver. From the specification, the logical safety system architecture was prepared, and this became the foundation for selecting the hardware architecture and related software to implement the safety functions.

The main tasks of Petrokemija's safety systems are monitoring all the important process parameters and promptly informing operators about potential dan-

The Petrokemija plant in Kutina, Croatia



gers that could lead to disastrous unintended consequences and hazards. These functions have been provided by the old alarm, protection (trip, interlocks, and emergency shutdown), and process control systems. In order to increase the safety requirements the customer decided to revamp and upgrade the existing alarm safety protection system with a new microprocessor system. A time slot for the modernization was scheduled for the migration to the new alarm safety protection system Simatic PCS 7. It links the functionality of classical distributed control and logical systems in a common hardware and software platform with integrated engineering tools and operator interface to meet minimum safety standards with Safety Integrity Level 2 (SIL2) up to Level 3 (SIL3) according to IEC 61508 and IEC 61511.

A state-of-the-art solution

For the engineering of the safety functions, Petrokemija used the Simatic PCS 7 process control system and the Simatic Safety Matrix. The Safety Matrix follows the cause-and-effect method defined by the American Petroleum Institute, an extremely effective procedure for the description of safety functions and for the definition of marginal and emergency shutdown conditions. The controller level was retrofitted with Simatic PCS 7 AS 417-FH systems to replace the original electrical-relay safety protection systems and the transistorized alarm systems.

Petrokemija's own engineers, who were supported by Siemens in Croatia, took on the design, installation, and programming of the systems. The 20 operators at the plant had no previous experience with computer-controlled safety and alarm systems, so training presented something of a challenge. Both the user-friendly interface of Simatic PCS 7, especially the safety protection cause-and-effect matrix, and Siemens' knowledge of the nitric acid production process contributed significantly to the successful outcome of the training program.



Petrokemija's engineers took on the design, installation, and programming of the systems

The Simatic Safety Matrix was programmed for all possible causes and effects, and in the process of commissioning, a verification system for all safety conditions was developed and tested against random hardware faults. The system commissioning was further accelerated by the use of Simatic ET 200M terminal modules. These simplified the wiring to field sensors and actuators and saved Petrokemija both time and expense.

Future extensions planned

The installation, testing, and training phases were completed in January 2011, and by the beginning of February both production lines were up and running with the new safety and alarm systems. The distributed I/O peripherals installed as part of the safety and alarm systems will be extended in the second phase of modernization. This will be the basis for eventually replacing all of the existing pneumatic control systems with computer-based control and information systems. The Simatic PCS 7 safety and alarm system is the foundation for the improvement and modernization of Petrokemija's entire production process – and the quality, reliability, and efficiency in the process. ■

Fertilizer process control expertise in the United States

Simatic PCS 7 was the system of choice for the largest producer of nitrogen chemical and fertilizer products on the US East Coast. The company needed to continue to modernize its process safety strategies with a focus on ammonia suppression. Working with the solution partner aeSolutions from Greenville, South Carolina, Siemens adapted the fire and gas control system, which runs on a Simatic PCS 7 F system, to meet application needs. For this project, Siemens leveraged proven solutions utilized in the oil and gas industry and also drew on expertise gained through successful support for the installed systems. The solution for ammonia suppression consists of a fail-safe Simatic PCS 7 automation system. The Simatic Safety Matrix was utilized to engineer the safety functions. Using standard technology, the customer will benefit from reduced training and expenses and can better leverage the installed base. The uniform solution also provides improved information availability and system testing capabilities, and it helps to reduce response times.

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■ Inbicon, Denmark

Turning Straw into Bioethanol Gold

Siemens helps a biofuel plant achieve the efficiency needed to turn straw into bioethanol and profits.

There is considerable interest worldwide in second-generation bioethanol plants. Most ethanol plants are first generation and use starch and sugar from sugarcane and grains. Second-generation plants use residual materials such as straw and wood. The Inbicon plant in Kalundborg, Denmark, is one of the world's first second-generation plants.

Inbicon A/S (Integrated Biomass Conversion) was founded in 2007 as an independent subsidiary of DONG Energy, Denmark's largest energy provider. Its refinery in Kalundborg is a demonstration plant that turns straw into bioethanol. The company has patented this process and developed special machines for processing the straw.

There was enormous pressure to build the plant on time. It was to provide fuel for the VIP and shuttle vehicles used during the United Nations climate summit in Copenhagen in December 2009.

Biofuels expertise

Siemens was the most important technology partner during the planning, construction, and commissioning of the plant. The main reason for selecting Siemens was the company's comprehensive range of solutions and tremendous experience in automation and electrical equipment for biofuel plants, says Benny Mai, vice president of scale-up and demonstration at Inbicon A/S: "When we awarded the contract, one of the decisive factors was that Siemens plays an important role in bioethanol plants of the first generation in the American market. The United States is the principal target market for our technology, so we are looking for synergies."

On being awarded the contract in July 2008, Siemens created a detailed plan of the power distribution,



All photos: Inbicon



» **The move from Simatic S7 and WinCC to the PCS 7 world took us into unfamiliar territory. Now one click is all it takes to connect a new motor. Once you are properly familiar with the principle, you can soon enjoy the benefits. «**

Peter Giversen, SCADA Engineer and Chief Engineer, Inbicon

control systems, and instruments to control and manage the plant. The modular design and plug-in modules allowed changes to be made easily and inexpensively as needs were updated.

For efficient operation, Inbicon requires precise process information. This information allows raw materials to be used sparingly; power to be used optimally; and a high-quality, reproducible end product to be produced. Temperatures, flow rates, fill levels, pressure, pH, and ethanol content are continuously measured. In total, 697 measuring instruments were required, with Siemens supplying the majority of the systems. A number of analytical devices complete the portfolio. Pre-configured measuring and control devices, coordinated with Profibus, saved valuable time during the installation and commissioning of the devices.

Automating the complex production processes was challenging. The Inbicon engineers did not have experience with the Simatic PCS 7 process control system but wanted to program the core technology themselves. This was possible thanks to close coordination with and support from Siemens. The factory acceptance test took place as scheduled in June 2009.

An innovative process with great potential

Inbicon's strength lies in its treatment of raw materials and its efficient handling of resources. Competitors use substances such as ammonia in production, but Inbicon works only with water, enzymes, and yeast. This is more efficient because it eliminates the cleaning process and prevents waste materials.

Straw is cut and then heated under pressure and broken down by enzymes. The molecular lignin melts during the heat treatment. This allows the enzymes to transform the cellulose fibers of the

straw into sugar. After cooling, ethanol is produced by adding yeast and is then isolated by distillation. Lastly, water is removed so the alcohol can be used as fuel. The result is bioethanol with a purity level of more than 99 percent. Four tons of straw are turned into 17,000 liters of bioethanol per hour in the Kalundborg plant every day.

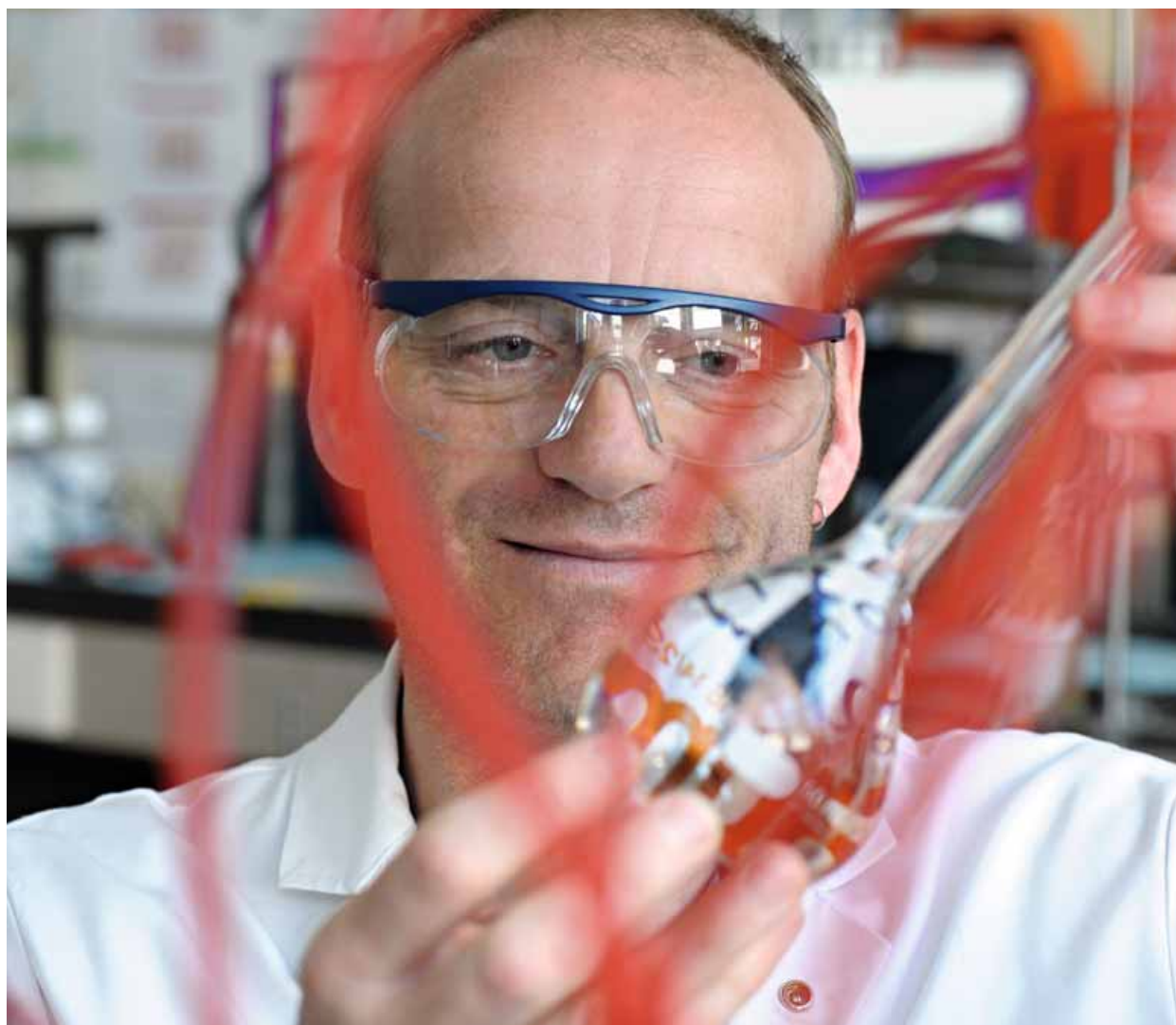
Key points

- ▶ Inbicon needed to build a second-generation demonstration plant in time for the UN climate summit in Denmark.
- ▶ High efficiency was a must to make the plant effective and profitable.
- ▶ Simatic PCS 7 helped Inbicon achieve its goals on time and within budget.
- ▶ The power distribution solution includes transformers, busbar systems, switchgear, motors, and frequency converters.
- ▶ 697 process instruments contribute to increased process safety and product quality.

Thanks to the good collaboration, the project was implemented in 18 months and met all the deadlines. In August 2010, the plant reached the scheduled production quantities of ethanol. Quotas of residual materials are also being met, namely C5 molasses, which is used to produce more than 11,000 tons of cattle feed annually, and 13,000 tons of lignin pellets, used as a combustible. ■

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All photos: Sasol Germany

Documented, GMP-conforming quality: Sasol Solvents Germany produces according to GMP guidelines

- Sasol Solvents Germany GmbH, Germany

GMP Quality

Sasol Solvents Germany has become one of the first chemical companies in Europe to receive a GMP approval for the production of its solvents and is therefore qualified as a supplier to the pharmaceutical industry.



“Introducing GMP has paid off”

Sasol Solvents Germany is the first chemical company in Europe to be able to supply isopropanol in the highest pharmaceutical quality – with the certificate, of course. According to Dr. Frank Allmüller, head of analytics and quality control, the introduction of GMP has been worth every cent of the investment.

“We see great opportunities in the pharmaceutical market and wanted to enter this market at the highest quality level right from the start. That was a strategic decision for the expansion of our business. To be optimally prepared for the audits, we worked in close collaboration with Siemens, a longtime partner of the pharmaceutical industry – and that paid off for us. We are certain that we received good consulting services, and the project team has created a strong quality management system. Despite all my experience with audits, I was still a little nervous before the first GMP audit, but we passed with flying colors. As the only producer of isopropanol compliant with ICH Q7 in the whole of Europe, we clearly have the edge on the competition. We have already been able to convince some well-known pharmaceutical companies with our pharmaceutical-grade IPA and have thus far come through their audits error-free.”

The GMP (Good Manufacturing Practice) requirements are internationally relevant especially in the pharmaceutical industry, where they define the standards for approved quality of processes and environments in the production of drugs and active pharmaceutical ingredients. However, partners and suppliers of the pharmaceutical industry – including those in the chemical industry – are increasingly required to obtain a GMP approval as well.

Strategic decision for GMP

Sasol Solvents Germany GmbH, with production sites in Moers and Herne, is one of Europe’s leading solvent manufacturers. One of the main products of the Moers factory is isopropanol (IPA), which is used in a large number of pharmaceutical products.

In order to enter the pharmaceutical market, the company wanted to attain the first pharmaceutical-grade IPA in Europe – the highest quality specification in the pharmaceutical industry in accordance with ICH Q7. The GMP requirements for the production of active pharmaceutical ingredients are harmonized internationally by the International Conference on Harmonisation (ICH). ICH Q7 defines the requirements and evaluation criteria of drugs for use in humans in Europe, the United States, and Japan.

In this context, Siemens, with its experience in many European pharmaceutical companies, advised and supported Sasol Solvents Germany GmbH as it pursued the GMP certificate. The main goals were the development of efficiently transferable processes and the reproducibility of product quality in the entire manufacturing process through defined inspections and continuous documentation.

Preparation for validation

The first step in the project was to determine the actual current condition of the IPA production plant, followed by a status analysis, which Siemens carried out together with Sasol. On this basis, the project team developed a recommendation for action that was implemented consistently across all processes and procedures. The main task was to compile all the GMP-relevant documents such as technical specifications, design specifications, risk analyses, and SOPs (standard operating procedures). The validation documents for the technical IT systems such as the LIMS (laboratory information management system) and PIMS (process information management system) were also created.

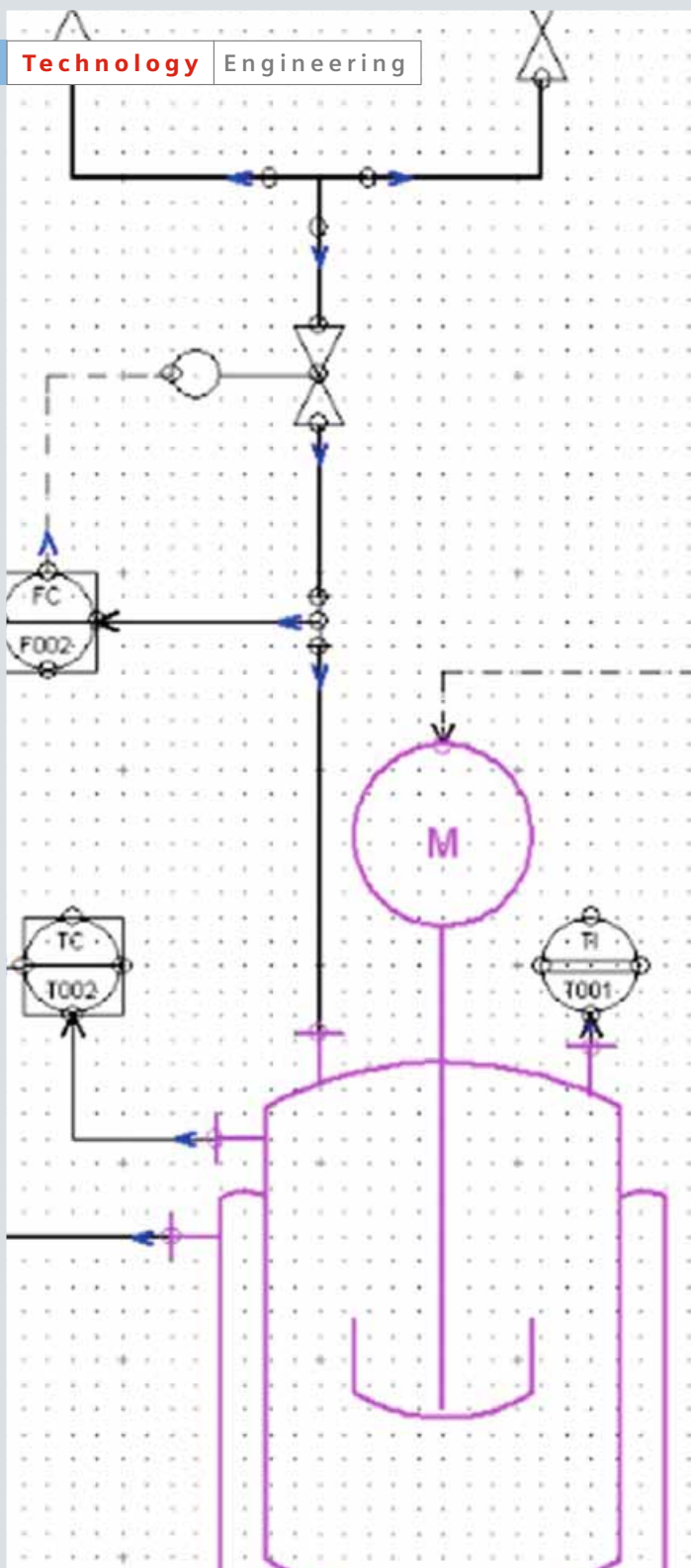
The most important success factors

By precisely identifying the parts of the production process that are relevant to the purity of the product, as well as the quality-relevant areas of measuring and control technology and the critical processes, the introduction of GMP was completed in just 18 months.

A decisive factor in the successful introduction and constant maintenance of GMP is the qualification of all departments, which heightens awareness for basic GMP conditions and embeds the GMP concept firmly in the minds of all employees – from the top-level executive to the machine operator. ■

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■ Cognis, Germany

The Future Is Now

With efficient data management, precise information can be obtained to optimize process plants and improve quality. These are the results of a change of the document management system to Comos software that Cognis initiated five years ago.

Cognis belongs to the BASF Group and primarily produces chemical additives, for example, for foodstuffs, cosmetics, and detergents. The company, which employs about 5,500 people and is the world leader in this field, produces 90 percent of its products from renewable raw materials. At its largest production site in Düsseldorf-Holthausen, Cognis operates a number of complex production plants that include high-pressure processing, distillation and cracking, hydration, ethoxylation, sulfonation, drying, and mixing.

These plants undergo constant modernization to continuously increase productivity, safety, and quality – and the modernization process gets more efficient with the quality and accessibility of the plant and process documentation and information.

Düsseldorf-Holthausen is the largest Cognis site



All photos: Cognis

» **The software is being improved continuously, benefitting the quality of our work.** «

Andreas Becker
Head, Tools and Standards, Cognis



Andreas Becker (center) and his team use Comos software successfully at Cognis

Objects instead of drawings

In 2006, Cognis decided to fundamentally change its planning and documentation system. The drawing archiving and information system used at that time was organized exclusively in relation to sections and required extensive manual work to generate information and make contexts transparent. After thorough evaluation, Cognis decided to replace the existing system with the innovative Comos software solution. The reason for this was, above all, the object-oriented design of the software that provides all the information on a uniform data platform and therefore enables total plant management. The changeover turned out to be a great challenge, as Andreas Becker, head of tools and standards at Cognis, remembers: "In the beginning, we often thought in terms of drawings and not of objects when structuring the data. Many of our employees had to learn the object-oriented structuring first. However, they did this fairly quickly, so we had already integrated more than 130,000 documents into the Comos database after a few months."

Intelligent database

The object-oriented structure of Comos led to a great improvement in procedures very quickly. But the learning among the software users also influenced this development. Becker adds: "The better the users' understanding of Comos, the more specific their demands on the software became. Software adaptations are made, for example, to run a specific query and thus generate valuable information. The software is being improved continuously, benefitting the quality of our work, and we can always rely on good support from Siemens."

A typical improvement that was achieved with Comos was the administration of approximately 3,500 different drives. Every motor is stored as an object in the database, and all relevant information concerning this motor is accessible with a few mouse clicks. If, for example, an existing motor has to be replaced but another motor type needs to be used as a replacement, little effort is required to check which specific properties a suitable replacement has to have.

Greater efficiency through transparency

"In addition to many small projects, we are currently working on the replacement of discontinued control systems. Up to 300 control loops have to be created for this, plus the plans that describe the disassembly as well as new distributor and outlet plans. By using Comos, we can now realize these plans much faster," Becker says when asked about the practical advantages achieved with Comos. He also refers to the standardized engineering that the software enables. The object-oriented structure considerably reduces error sources, for example, because information no longer needs to be taken from different drawings.

All the process plants in Düsseldorf-Holthausen are now managed with a uniform database that covers the various units and provides the latest data at all times. In other words, a much wider scope of functions and much higher-quality data management can be achieved without increasing the system costs. ■

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■ **WirelessHART**

Wireless Goes Process

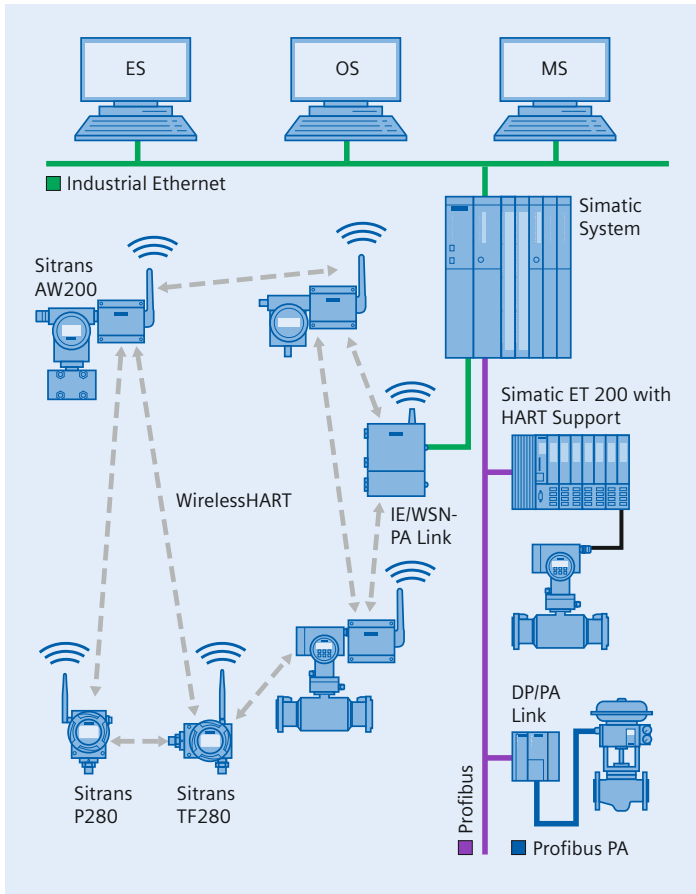
WirelessHART was tested under realistic conditions at BASF, with extremely positive results. This closes the last gap in wireless networking for process instrumentation.

Although GSM and Industrial Wireless LAN (IWLAN) are now in common use in many industries, WirelessHART is just beginning to be adopted as the first standard for the process level. It allows the exchange of process and diagnostic information as well as control signals between process devices and the master control system. The technology promises shorter commissioning times, more effective maintenance, greater flexibility and mobility, and therefore improved availability, production quality, and safety in plants.

However, users have justified doubts with regard to safety and availability. What if, for example, a pressure meter is connected wirelessly and the radio contact suddenly fails, and the pressure rises suddenly because a pipe is blocked? The consequences could be disastrous.

Rigorous testing

To assess WirelessHART, HCF (the HART Communication Foundation) and NAMUR (the international user association of automation technology in process industries) agreed to conduct a field test at BASF in Ludwigshafen, Germany. Devices from various manufacturers, including Siemens, were used in four pilot plants: a sewage plant, a water treatment plant, a reactor, and a recooling unit. The tests examined to what extent a wireless connection of sensors under different conditions – on rotating plant components, over long distances and missing



WirelessHART devices improve the performance of a plant and can be integrated easily and efficiently into Simatic PCS 7

cable routes, on difficult terrain – offer a reliable and safe option for process control technology. The results of this field trial offer reason for optimism: WirelessHART achieved good results throughout and especially in terms of availability, reliability, and coexistence with other wireless standards such as IWLAN. There is room for improvement in the implementation and basic applications.

WirelessHART – ready for operation here and now

Wireless industrial communication is already being applied successfully today. Siemens offers numerous products for this, from telecontrol (for monitoring and controlling geographically distant plants) and IWLAN to WirelessHART. The advantage of these systems is their wireless integration into the Totally Integrated Automation or Simatic environment by means of function block libraries. WirelessHART closes the gap in wireless networking for process instrumentation and is ready for operation following the successful “stress test” at BASF. ■

Wireless industrial communication

There are several standards for wireless industrial communication that differ in the technology used and the application possibilities.

- ▶ **IWLAN (Industrial Wireless Local Area Network):** industry-grade version of WLAN, with guaranteed data volumes for the deterministic transmission of process and control data
- ▶ **GSM (Global System for Mobile Communications):** most widely distributed mobile radio standard for telephony, data transmission, and short messages worldwide; extensions of the standard such as HSCSD, GPRS, and EDGE allow faster transmission of larger data volumes
- ▶ **HART (Highway Addressable Remote Transducer protocol):** global standard for data transmission between field devices and monitoring systems in real time by analog wiring
- ▶ **WirelessHART:** standard for wireless data transmission between field devices and monitoring systems in real time

In addition to the Sitrans P280 and Sitrans TF280 pressure and temperature transmitters, Siemens offers the following components for WirelessHART communication:

- ▶ **Sitrans MDS:** Windows application for the central provision of diagnostic information in systems without integrated HART communication
- ▶ **IE/WSN-PA Link:** link for management of the WirelessHART network and provision of the data and measured values of instruments in the field to master systems such as Simatic PCS 7
- ▶ **Function Block Library:** for integration of WirelessHART devices into Simatic PCS 7 and S7-300/400
- ▶ **Sitrans AW200:** adapter for integrating wired HART devices into a WirelessHART network

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■ **Linde Gases Division, Germany**

ROC around the World

Global control of plants? No big deal. In Leuna, Germany, the Linde Gases Division has established one of the first and largest remote operation centers for central control of air separation plants in Germany, Austria, Switzerland, and the Netherlands.

As one of the world's largest gas and engineering companies, the Linde Group employs approximately 49,000 people in more than 100 countries. The goal of the Linde Gases Division is to control all air separation plants worldwide with just eight remote operation centers (ROCs). The primary advantage of the ROC concept is the increased efficiency of plant operation. Special functions such as Automatic Load Control (ALC) and Linear Model Predictive Control (LMPC) allow continuous operation of the plants within the optimum working range, which increases productivity and saves energy. The central control renders time-consuming and cost-intensive on-site assignments superfluous, and the maintenance and shutdown of individual plants can be coordinated better. The

control center and distribution are under one roof, which pays off in terms of faster and more accurate information flow about parameters such as the product stock for all connected plants and quick response to inquiries from the individual air separation plants.

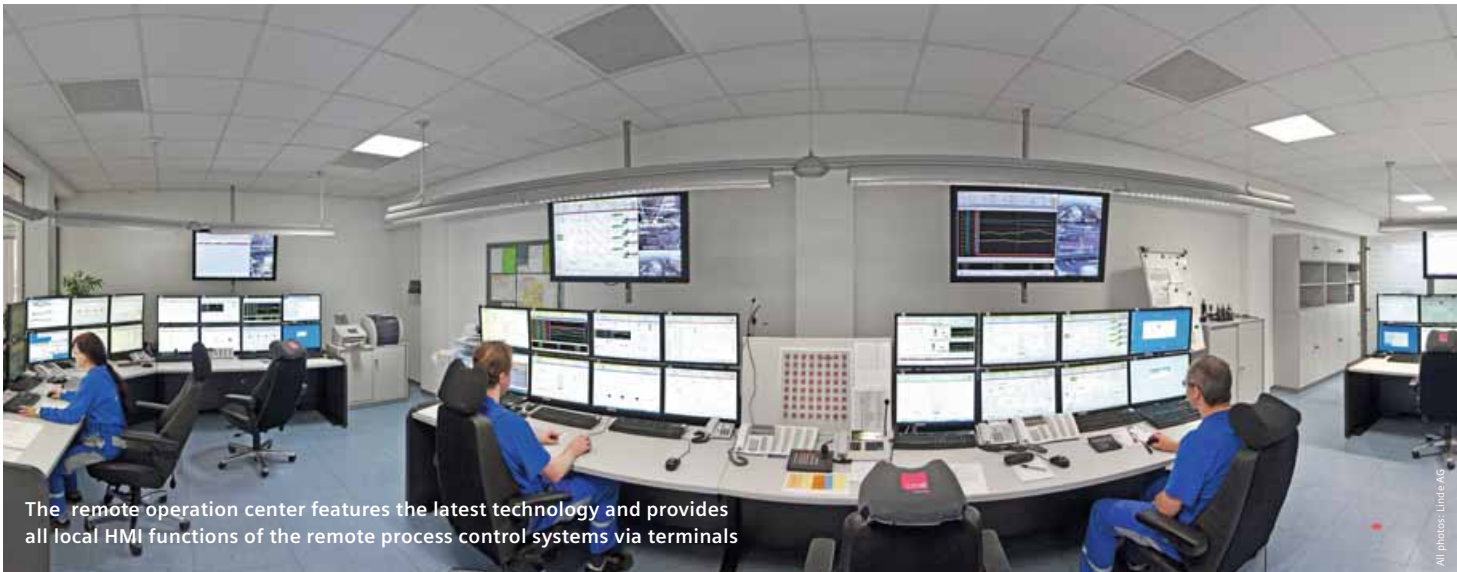
Global access to local operating stations

The ROC provides all local HMI functions of the remote process control systems via terminals. Simatic PCS 7 is used as a standard for the automation of air separation plants at Linde, so it was very important to Linde that Simatic PCS 7 could also provide appropriate remote functions and the necessary openness and flexibility. In addition to the key HMI functionality, issues such as network technology with the appropriate IT security (secure external access to a PCS 7 automation cell, an internationally valid network topology, etc.) and usability were important factors to be considered in a high-performance and reliable total solution. The greatest challenge was to operate with very narrow-band network connections. In some countries, connections must be set up with bandwidths of 64 k. There is no local operation on the operating clients in PCS 7 for this – the local clients are accessed by the ROC with Terminal Services (remote desktop protocol). The remote terminals require no special software. Remote access is possible directly via Windows, for example.

"The local personnel still look after the plant on the day shift," explains Dr. Joachim Pretz, ROC manager at Linde Gases in Leuna. He compares the solution with aviation: "Metaphorically, the operator and the local engineers are the aircraft crew and the ROC is the tower with the air traffic controllers, manned 24 hours, seven days a week."

» Within the framework of the ROC technology, Linde developed special requirements for process control systems that our suppliers have to meet in order for the systems to be approved for ROC operation. «

Wolfgang Suchanek,
IPC Platform Leader, Global Operations Linde Gases Division



The remote operation center features the latest technology and provides all local HMI functions of the remote process control systems via terminals

All photos: Linde AG

» **Siemens' support** for the Linde ROC project was exemplary. Siemens quickly developed a user-friendly, bandwidth-minimized, secure remote control solution for our distributed PCS 7 systems. «

Michael Schill, Head of Instrumentation Process Control & Technical Network, Region Continental & Northern Europe, Linde Gases Division

In the ROC, the operator “watches” over five air separation units with two monitors each. The CHIMS system from Siemens serves as a central reporting system in addition to the PCS 7 remote operation to provide a compact general overview of the plant status. The messages, alerts, and alarms of all the plants converge here so that CHIMS also represents a platform for the integration of other automation systems.

Innovation through partnership

Approximately one year after the project was initiated, the first plants in Schkopau, Hamburg, Salzgitter, and Basel have been integrated and are being controlled from Leuna. Another 70 are to follow gradually. “Technical concepts down to the plant level were discussed and implemented in regular meetings between Siemens and Linde. Siemens gave us excellent support during the introduction of the new technology,” says Wolfgang Suchanek, IPC Platform Leader, Global Operations Linde Gases Division. “We were able to complete the project on schedule. Siemens implemented our requirements and developed and improved new tools with us. We are currently testing the latest CHIMS version, and our knowledge from this is fed back directly into product development. That’s what I call a cooperative partnership,” states Pretz. ■



Simatic PCS 7 provides the appropriate control functions for remote access

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■ Südbayerisches Portland-Zementwerk Gebr. Wiesböck & Co. GmbH, Germany

Expert System Boosts Throughput

The Sicement MCO expert system optimizes the operation of Südbayerisches Portland-Zementwerk Gebr. Wiesböck & Co. GmbH and reduces both operator workload and energy costs.



Grinding is the number one power-consuming process in cement works

The grinding process accounts for almost 45 percent of total power consumption in cement works. Siemens developed the Sicement IT MCO (Mill Control Optimization) expert system to help mills achieve higher energy efficiency, productivity, product quality, and availability. Sicement IT MCO is based on components of the Advanced Process Control (APC) library of Simatic PCS 7. The expert system makes precise forecasts of the quality parameters from the mill, controls the mill according to the nominal values, and can

be integrated into an existing Simatic PCS 7 control system without additional hardware.

The first pilot project for the expert system was Südbayerisches Portland-Zementwerk Gebr. Wiesböck & Co. GmbH, located in the small town of Rohrdorf in southern Germany. Founded in 1930 by Georg Wiesböck and his brothers Ludwig and Andreas, it is today part of the Rohrdorf Materials Group with 40 production sites in Germany, Austria, Hungary, and Italy. Ball mills grind the raw material from local quarries for cement production. The raw meal is then fired to cement clinker, the basic material for all types of cement.

The most important quality parameter is the fineness of the raw meal. Previously, samples were taken hourly, analyzed in the laboratory, and used for process correction. Recently, however, the company decided to implement a new control system to record and analyze the data automatically and control the grinding process. Simple integration into the existing control technology, an increase in throughput, and a reduction in the operator's workload were further requirements for the new system.

System architecture and implementation

With the components of the Simatic PCS 7 APC library, complex relations can also be written mathematically and used for automatic, flexible plant operation. In order to master the complex control tasks within the grinding process, the optimized mill control has a neuronal soft sensor that measures the process input variables from which the MCO makes a fineness forecast. Model Predictive Control (MPC) reduces process fluctuations.

Optimized mill control: how it works

The new mill control operates in three steps: First the neuronal soft sensor measures nine process input variables and generates a fineness forecast. These process variables include the sifter speed, fresh product quantity, twist flap position, and representatives for the filling level of the mill (bucket chain flow, power of the mill drive, Electric Ear chamber 1 and 2) as well as the mill temperature and the selected recipe type. The particle size forecast is then compared with the laboratory values as a set-point parameter. The compared value for the particle size (quality) and the measured value grits (returned material) are the control variables of the MPC. The values are optimized by changing the batch feed and the sifter speed based on a predictive calculation of the appropriate control processes using a complete process model to shift the control variable as close as possible to the desired nominal values. This process yields external set points for the individual subcontrollers to optimize the future behavior of the plant over a specific time period.



A sensor measures the filling level in the cement mill

The Rohrdorf MCO system was implemented in three phases: The analysis of the plant and its existing control solutions in phase one were followed by comprehensive plant tests. After evaluation of the production data, Siemens modeled the neuronal soft sensor and the MPC system in the second phase. Software engineering and integration into the existing PCS 7 control system followed in phase three.

Convincing results

In comparison with the previous mode of operation of the mills, the cement works achieved a 5 to 8 percent increase in performance, and the investment paid off within three months. Moreover, the integration into the PCS 7 control system prevents additional service and maintenance costs.

The MCO system ensures the optimum quality of the raw meal as well as stable production conditions. The reaction time from the entry of a modification

at the system input to the appropriate response at the system output of the controlled system has been drastically reduced. The uniform grinding process increases throughput and relieves the workload of the operator. Energy consumption has been considerably reduced and the life of the plant mechanics prolonged. Following the excellent results of this project, Siemens has begun optimization of the other three mills. ■

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■ Simatic ET 200iSP

A Complete Intrinsically Safe and Fail-Safe Package

The Simatic ET 200iSP distributed system closes a gap in the distributed automation of process plants: new fail-safe modules expand the application possibilities of the I/O system to hazardous areas 1 and 21.

Safety and especially intrinsic safety play a major role in the process industry. Especially in industries such as the chemical, petrochemical, and oil and gas industries, there are often areas with an explosion hazard due to possible highly inflammable or explosive conditions. At the same time, however, users also want to integrate these areas – including the safety technology – into the control level through distributed I/O systems.

Closing the safety gaps

Until now, no appropriate intrinsically safe systems were available for this requirement. The Simatic ET 200iSP I/O system closes this gap. It is suitable for installation in explosive environments up to hazardous areas 1 and 21, and actuators and sensors can even be installed in area 0 or 20. Standard modules and safety modules can be combined as needed within an ET 200iSP system.

Independent of the hardware used (standard or fail-safe), the engineering is performed centrally in an engineering station with Step 7. TÜV-certified components are available for the fail-safe modules. The I/O system communicates uniformly via Profibus, and in the intrinsically safe area via Profibus PA. Safe and standard communication take place on one cable. There is no need for the additional Ex barriers that are otherwise usually required. Line diagnosis is also integrated directly into the system, so no additional monitoring inputs are required either. All messages relating to line and module diagnostics can easily be integrated into the alarm management of Simatic PCS 7.

Distributed and inexpensive

With the new fail-safe modules, safety-relevant applications such as ESD (emergency shutdown), boiler protection, and fire&gas systems can be set up in a decentralized manner even in areas with an explosion hazard. The integration of the barriers into the system simplifies not only the setup but also the implementation and verification of the safety func-



The Simatic ET 200iSP system supports any combination of safe modules and standard modules as well as configurations with flexible modular redundancy

Simatic ET 200iSP

- ▶ Suitable for installation in Ex zones 1 and 21
- ▶ 3 fail-safe SIL 3 Ex zone 1 modules available
 - ▶ 8-channel NAMUR digital input module
 - ▶ 4-channel digital output module
 - ▶ 4-channel HART analog input module
- ▶ HART transparent and hot swapping of I/O modules

tions. All these advantages, together with the distributed and compact structure of the ET 200iSP, simplify and reduce the costs of engineering and wiring the plant, easily and efficiently closing the gap in distributed automation. ■

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■ **BASF, Denmark**

State of the Art for Low Cost

Siemens helped BASF obtain all the benefits of a fully automated system by simply upgrading the company's metering system.

BASF is the world's leading chemical company, with approximately 105,000 employees and close to 385 production sites worldwide. The BASF portfolio comprises chemicals, plastics, performance products, functional solutions, agricultural solutions, and oil and gas.

The company's site in Ballerup, Denmark, which is part of BASF A/S, microencapsulates vitamins for use in the food and beverage industry. During manufacturing, vitamin oil is mixed with antioxidants in an oil vessel. After the ingredients are mixed, the oil is microencapsulated through an emulsion process in a sugar-gelatin solution in two spray vessels. The solution is then dried in a traditional spray-drying plant.

Precision solution for traceability

The oil flow between the oil vessel and the two spray vessels is measured by two Coriolis mass flowmeters from Siemens. Until recently, however, an operator needed to continuously monitor and control this oil flow to ensure that the flow velocity was not too high for the spray vessel and the dosing was correct.

Integrated and fully automatic

Today, the two Coriolis mass flowmeters still measure flow from the oil vessel to the spray vessels, but the old MASS 6000 transmitters have been replaced by new Siflow FC070 transmitters fully integrated into the Simatic S7 automation system via an ET 200M Profibus node. The old transmitters were easy to replace because the sensors and wiring were the same. All sensor-specific data transferred to the new transmitters, and there was no need for sensor recalibration. Now the flow control is fully automated, and operators no longer need to monitor flow velocity

Siflow FC070: main benefits

- ▶ Cost-efficient solution
- ▶ Direct system integration
- ▶ Fully automated process
- ▶ Reduced need for manpower
- ▶ Enhanced diagnostic possibilities



Siflow FC070 in the Simatic rack, fully integrated in the automation system via an ET 200M Profibus node

and dosing. If the flow exceeds the defined maximum flow rate, the pump velocity is automatically reduced until the maximum flow rate is no longer exceeded. The system has a fast and a slow mode, ensuring that the oil dosed to the two spray vessels is exactly the same.

All in all, with very little effort, BASF moved to a state-of-the-art solution and reduced the need for manpower while meeting requirements for quality, even when both spray vessels are in use. ■

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The Unterhaching geothermal plant produces electrical power from a low-temperature source through the Kalina process



The Sitrans F C flowmeter monitors the ammonia-water ratio in the steam cycle

■ Unterhaching Geothermal Power Station, Germany

Energy Mix

Small device, large contribution: in the Unterhaching geothermal power station, a Sitrans flowmeter monitors the correct ammonia-water ratio in the steam cycle and helps in the cost-effective exploitation of geothermal energy in an innovative power generation process.

The Unterhaching geothermal power station produces electricity and heat from the 120°C water in a limestone layer lying at a depth of approximately 3,500 m directly below the power station. Because the thermal water is not hot enough to be used in a conventional steam process, the Unterhaching plant uses the Kalina process (see box). In this process, the thermal water heats up an ammonia-water mixture that drives the turbine

for producing electricity. After heat exchange, the thermal water is pumped back into the ground through a second borehole.

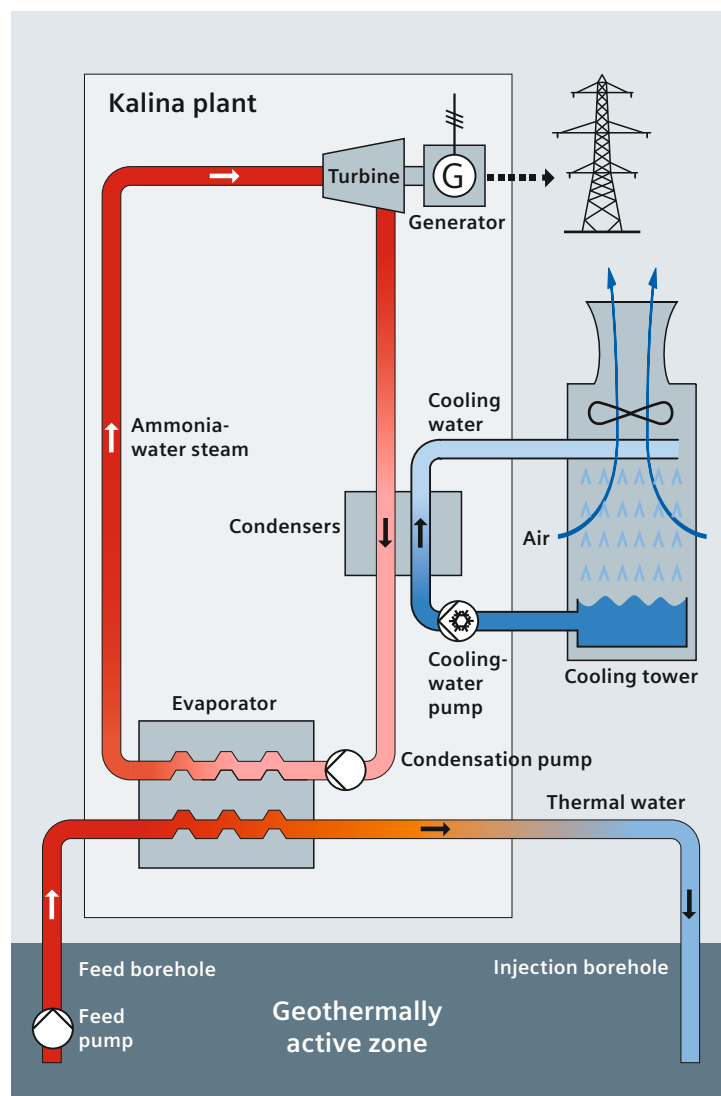
The perfect mix

The heart of the system is the steam turbine that drives the generator for power generation. Deviations in the mixing ratio of the ammonia-water mixture directly affect the efficiency of the plant.

The Kalina process in Unterhaching

The Kalina process is a heat-transfer process for producing steam at a low temperature level for power generation. A mixture of ammonia and distilled water, with a boiling point of 50°C, is used instead of thermal water. The ammonia evaporates at much lower temperatures, increasing the efficiency of the heat exchange. Especially with low-temperature sources like that in Unterhaching, a much higher conversion efficiency can be achieved in small steam-turbine power stations with the ammonia-water mixture.

In Unterhaching, the 122°C thermal water heats up the mixture in the evaporator from 55°C to 115°C. A pump increases the pressure of the working medium to approximately 20 bar. Residual liquid is separated in a high-pressure separator. The compressed and heated steam mixture is then fed through the turbine. The working medium leaves the turbine at approximately 7 bar, still as steam, and is cooled at a smaller heat exchanger. A low-pressure separator collects the remaining liquid, and a cooling-water system reduces the temperature of the steam until it condenses into liquid. After passing through a condensation tank, the mixture is compressed again to 20 bar and preheated at the smaller heat exchanger to 55°C before being fed back into the evaporator.



Process parameters have to be monitored and processed in real time to ensure a swift and targeted parameter correction, so the process has to be equipped with a suitable measuring device that is integrated into the plant's process control system, in this case Simatic PCS 7.

The mixing ratio of the two liquids in the pressure cycle should ideally be measured with a single measuring instrument that is inexpensive and accurate, and preferably requires little maintenance. For this application, Siemens proposed the Sitrans F C Coriolis mass flowmeter, which can also be used for measuring density. The instrument operates without wear and can be easily installed and engineered, as only one instrument must be integrated into the pipe. The reliability and accuracy of the measured values ensure efficient operation of the turbine and high economy of the total plant.

The Sitrans instrument determines the ammonia-water ratio through fraction measurement calculating the respective densities and masses from the known specific densities of the two components in the temperature range of the process. The Pt1000

temperature sensors built into the transmitter measure the exact temperature of the mixture for the temperature compensation. This measuring method achieves an accuracy of 0.15 percent for the determination of mass and density in an ammonia/deionized water mixture.

Sustainable and efficient

Thanks to the precisely measured values supplied by the Sitrans instrument, the turbine in Unterhaching can be operated reliably and efficiently, resulting in more economical power generation. The geothermal plant reliably supplies electrical power of 3.4 MW and is therefore a real basic load power station. At the same time, the power station reduces carbon dioxide emissions and makes an important contribution to climate protection and a sustainable energy mix in Germany. ■

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■ Four Roses Distillery, United States

Keeping Tradition, Moving Ahead

By migrating its process control system to Simatic PCS 7, Four Roses Distillery was able to maintain the traditionally superb quality of its bourbon while benefitting from all the features of a truly modern control solution.

Since the late 1880s, the smooth and mellow taste of Four Roses bourbon has been a favorite among whiskey lovers. Over the decades, the spirits distiller has seen numerous management and political changes – including being one of only six distilleries granted permission to operate through Prohibition to produce bourbon for medicinal purposes. In speaking with the people who work at the Four Roses Distillery in Lawrenceburg, Kentucky, it is clear that one thing has never changed – a passion for quality and pride in creating and producing the award-winning bourbon that is the legacy of founder Paul Jones Jr.

Ensuring uninterrupted production consistency and quality at the 24/7 distillery is the top priority for Ryan Ashley, Four Roses' director of distillery operations. He says that since 1999, the distillery has relied on an APACS+ automation system. Although the APACS+ controllers, I/O modules, software, and HMI all worked perfectly, the hardware and software would soon be phased out.

Upgrade for the future

The distillery recently began a migration strategy to upgrade to the Simatic PCS 7 distributed control system (DCS). In 2010, Ashley installed an APACS+ DP I/O Bus Link, which allowed Four Roses to upgrade its existing APACS+ controllers while continuing to use the remaining APACS+ I/O modules and field wiring. "By putting PCS 7 / APACS+ OS on top of the APACS+ controllers, we saved thousands," Ashley says. "We also cleared the way for the next phase, which would replace the APACS+ controllers with PCS 7 controllers."

Four Roses now has the enhanced process control capabilities of the PCS 7 DCS, including the flexibility and added capacity of multiple scan rates (up to 10 ms). The modernization also provides higher fault tolerances, flexible modular redundancy, improved safety (SIL 3 independent of redundancy), integrated asset management, an integrated safety fieldbus, and integrated Industrial Ethernet. Ashley, who also has received international awards for brewing beer, says that nearly every element of the distillation process is automated by the PCS 7 DCS because of the APACS+ DP I/O Bus Link upgrade. "We've been making the same bourbon since 1888, and we didn't want to change what worked in the past," Ashley says. "Some of our operators have been here more than 40 years. It was important that the changeover be a nonissue for them, and



we didn't miss a beat." Operators monitor and control the distillery process from one central control room and two workstations located at different levels of the facility. "The screens at each workstation are the same as before the APACS+ DP I/O Bus Link installation," Ashley says.

Benefits of latest, greatest DCS

The APACS+ controller configuration was transferred to the PCS 7 controllers using a controller migration tool from Siemens that helped Four Roses speed up the transition to get online using the more modern controller, PCS 7. This tool also eliminates manual steps, giving a more accurate configuration transfer. According to Ashley, the greatest benefit from the DCS upgrade is that the programming is much more user-friendly when it comes to finding data, making changes, or adding and modifying screens. "For me, not being a programmer, I can say we need a meter on this or need to graph this or go in and take a look

» **The whole crew at Siemens has been fabulous to work with. When we had an issue they were out here on-site troubleshooting, and the problem was usually solved that day. The people really made the difference.** «

Ryan Ashley, Director of Distillery Operations, Four Roses



The Four Roses Distillery in Lawrenceburg, Kentucky



The new Simatic PCS 7 system has improved engineering and operation

at the history of these specific items," Ashley says. "This allows us to fine-tune our quality and increase our production. It has also helped us keep our standards at the necessary level."

"While the fermentation process involves manually opening and closing valves, operators use the PCS 7 DCS to control the grain handling system, the mills, the cooker, temperatures, agitators, and pumps. Everything is tied in to the PCS 7 system," Ashley continues. "Just point and click. Put in your variables and you are off and running. The trending capabilities of the PCS 7 system are much more advanced than those of the APACS+ system. It is remarkably easy for me to dial in to the system from home and question why something happened or how it happened."

Partnership pays off

Ashley sums up the project this way: "The whole crew at Siemens has been fabulous to work with. We've had great feedback, communication, and customer service. When we had an issue they were out here on-site troubleshooting, and the problem was usually solved that day. The people really made the difference. The system worked perfectly before and it works perfectly now, but today we have the latest and greatest supported software. I don't anticipate that changing." ■

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■ T.I.M.S. Suite 2011

Keeping It Cool

The new T.I.M.S. Suite helps ensure that all refrigerated pharmaceuticals taken by patients will work as they should.

Although “cool chain” sounds rather like a ‘60s pop song, it is quite serious business. Twenty-five percent of pharmaceutical and biotech products need constant refrigeration to stay potent. The pharmaceutical cool-chain market has been increasing 10 percent per year, and, with the high value of pharmaceuticals, billions of dollars are at stake.

Keeping products within the right temperature range is the goal, so monitoring the temperature of the products during shipping is also a must. This offers some challenges. Temperature readings must be ignored until the temperature data logger is placed in the shipping container with the product. Once packed, the data logger must be readable from within the shipping container. During shipping, the data logger can be dropped, get wet, be x-rayed, and be subjected to magnetic fields. Once the product arrives, the data must be readable by both the shipper and the receiver, regardless what system the receiver is using. And the receiver must remember to return the data logger to the shipper.

A solution for temperature tracking

Siemens has developed a solution to handle such issues and more, with its Temperature Information and Management System (T.I.M.S.) Suite. The suite consists of two related applications, the T.I.M.S.

Operator and the T.I.M.S. Controller. The T.I.M.S. Operator operates the HFST-T109 (SensoTag) data logger with an integrated temperature sensor. It starts, stops, and configures measurements; stores, analyzes, imports, and exports measurement data; and displays and prints reports of recorded data in charts, curves, and so on.

Fully compliant with GMP (Good Manufacturing Practice) regulations, the HFST-T109 SensoTag data logger is equipped with an RFID (radio-frequency identification) interface. Therefore the logger can be handled like a common 13.56 MHz RFID transponder that allows data to be transmitted through packaging and liquids. A flashing LED signals the user if a temperature violation has been detected. Each logger holds its calibration data that is valid for three years where 3 years is also the battery life-time.

The T.I.M.S. Controller plans and monitors the logger logistics and quality of transport conditions. It manages transport data such as ID numbers and shipment type; plans transport details such as the number of devices per packet and the logger configuration; prints temperature monitoring sheets, return slips, and other relevant papers; automatically reminds receivers to send back the data logger if they have not done so; and reports management data.



The SensoTag data logger with integrated temperature sensor stores temperature and other data

Siemens AG

The T.I.M.S. Suite in action

The T.I.M.S. Suite was recently put to use by one of the world's largest diagnostic products manufacturers. Distribution is global, with transportation by air, ship, or truck.

Once the product is ready to be packed for shipping, the enterprise resource planning (ERP) system indicates the number of data loggers needed and their positions within the packaging, allowing packaging personnel to place the data loggers in predefined positions. When a box passes a specific conveyor position, the data loggers are automatically started. Before shipment begins, the shipper also inserts freight data into the T.I.M.S. data bank. This information includes transportation modes as well as an estimated time of arrival, which is used in a reminder system for the receivers, to ensure that the data loggers are returned. The T.I.M.S. Operator stores this information and also automatically sends an e-mail notifying the receiver when to expect the shipment.

A temperature monitoring sheet (TMS) containing these details is placed in the package along with the data logger. The TMS tells when a shipment has started – this is essential because all recorded temperature values before this time can be ignored. When the package is received, the personnel write the receiving time on the TMS. This date/time marks the changeover of risk from the shipper to the receiver.

Key points

- ▶ The market for refrigerated pharmaceuticals is worth billions, and protecting this investment is crucial.
- ▶ The T.I.M.S. Suite helps this effort by monitoring the temperature of refrigerated products during shipment.
- ▶ The T.I.M.S. Suite also connects shipping data to a management system that logs shipment and temperature details in a global network database available to both the shipper and receiver.

When the package is received, the T.I.M.S. Operator stops measurement, and the data are automatically stored in a network database. If the receiver is not connected to the network, the receiver can export the data from the data logger into a local version of the T.I.M.S. software. Based on the estimated time of arrival, the T.I.M.S. Operator also reminds the receiver to send the data logger back to the shipper. With the T.I.M.S. Suite, the customer now has full control and a continuous tracking and tracing option for its drug supply chain – a major benefit for both patient safety and manufacturer liability. ■

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Process analytics on the Web

Process analytics for biomass-to-liquid plants

Biomass-to-liquid (BtL) plants turn biomass into synthetic fuels. The world's first commercial BtL plant was constructed by Choren in Freiberg, Germany. Together with Choren, Siemens implemented a comprehensive process analytics solution that monitors the complex process. The solution is a model for similar applications. A detailed case study, which is available free of charge on the Internet, describes the specific requirements for process analytics in this process and presents the corresponding product portfolio and services. ■

You can download the PDF from the References area of the process analytics Web site:

www.siemens.com/processanalytics

Process analytics on the Web

Process analytics for ammonia production

Ammonia is an intermediate product in the manufacture of nitrogenous fertilizers. It is produced from nitrogen and hydrogen. Hundreds of ammonia plants are in operation globally, most of them using natural gas as feedstock and as fuel. Process gas chromatographs and gas analyzers are part of the standard instrumentation of fertilizer plants. Measurement results are essential to plant efficiency and product quality. A Siemens case study presents the requirements that process analyzers need to meet in ammonia and fertilizer production and discusses suitable systems. ■

You can download the PDF free of charge from the References area of the process analytics Web site:

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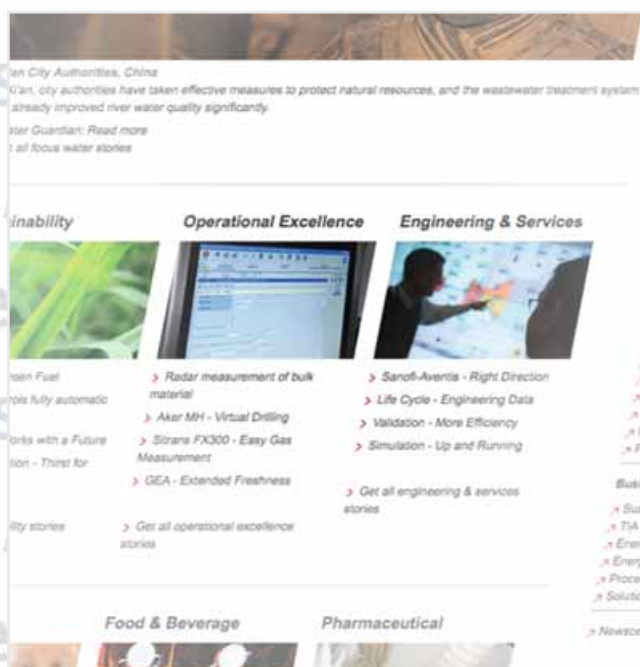
Process instrumentation

Web exclusive: Coriolis mass flowmeters pass Yara acid test

The Denmark-based company Yara distributes nitric acid – a hazardous substance that is both highly corrosive and expensive. A critical area within operations at Yara is the tanker truck loading. Recently, Yara implemented a flow-metering solution using Sitrans F C Coriolis flowmeters. The devices help Yara improve measuring accuracy and stability, resulting in time and cost savings. ■

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