Focus on the paper industry
The paper industry is exploring new ideas for sustained success in the digital age. Next to established markets, new business areas emerge and evolve: packaging materials, building materials, and wood-based chemicals. Supply chains become more complex and more interlinked. The cover photo shows two workers in a paper mill in China, one of the hot spots of today’s paper industry.
Photo: Qilai Shen/In Pictures/Corbis

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A growing world population with new lifestyles changes markets and requires a sustainable use of natural resources. The current changes in the paper industry demonstrate how to adapt to future situations. A decade after the digital shift, the paper industry has been subject to significant changes in the market. At first, there was a steep decline in traditional “analog” products such as paper for photo prints. Then the market for newspaper and office paper stagnated.

Paper is made from natural fibers that can be recycled and composted and that are increasingly sourced from managed forests. Market pulp and paper for packaging and tissue show sustained and strong growth. Byproducts in the wood and pulp industry – electricity, biogas, turpentine – are gaining in economic significance, as are both new applications for natural fiber in the chemical and textile industries and new technologies for producing biofuels, carbon, and composite materials.

If you want to succeed in this market, you need new ideas and the courage to invest in change. This issue of process news presents some aspects of the “new” paper industry. Companies all over the world are getting ready for tomorrow’s market requirements. Some of these ideas are quite extraordinary, for example a competition for future paper production technologies. Marco Mensink, director general of the Confederation of the European Paper Industry (CEPI), was one of the initiators of this “Two Team Project.” As a trusted partner of the paper industry, we were part of this project and contributed our technology expertise, for example, for the concept of replacing steam as a traditional energy source in paper production with electricity from renewable sources, and for new methods for process heat recovery. We are supporting our paper industry customers in their daily business with products, systems, and solutions that help make paper production more eco-friendly and efficient, with intelligent process control solutions and energy-efficient drive systems, integrated engineering solutions, and optimized plant design.

Dr. Heinz Felder from Stora Enso illustrates in an interview beginning on page 8 of this issue how companies will address these challenges. Join us on a journey through a changing process industry – enjoy the read!
Everything in a wood room revolves around chips: they are the end product that is transported to the chemithermomechanical pulp (CTMP) and sulfate mills to become pulp.
twenty or 30 years ago, the demand for paper was booming. The monthly accounting cycle in offices generated great stacks of computer reports, and at home people read paper books and magazines. Today, business reports are online and people often read from their tablets or phones. Stora Enso, a Finnish company based in Helsinki and number two in the world in pulp and papermaking, foresaw the trend back in 2006 and decided to refocus the company, turning a potential problem into an opportunity. The strategy would be to reduce paper production and invest in new growth areas such as renewable materials and renewable packaging. To service these new markets, Stora Enso needed to increase the efficiency and quality of its wood-chip production to better serve its pulp mills and paperboard-making facilities. The company decided to undertake a major expansion and modernization of its wood-chip mill at Skoghall in Sweden to bring it up to world-class quality and efficiency standards.

Skoghall: the world’s leading board mill

Skoghall Mill is an integrated mill employing almost 1,000 people. It takes in timber from Scandinavian forests and manufactures wood pulp, which is used for the production of paperboard. The mill produces the material for a large share of Stora Enso’s paperboard production for both liquid and dry foodstuffs. One in six beverage cartons in the world is made of paperboard from Skoghall Mill.

In 2009 Stora Enso embarked on a €90 million re-investment program named Wood 2012 to increase the mill’s storage capacity for incoming timber and to rebuild the wood room. Incoming timber is unloaded and stored in the wood yard. An enlarged wood yard would enable more wood to be brought in by rail, a more environmentally friendly transport solution than road, and also more economical, especially over long distances. In the wood room, incoming timber is cleaned and the bark is removed. Wood is then cut from the outer layers of the logs in the form of fine wood chips ready for pulping.

Although some modernization measures had been implemented in the wood room since 1971 when it was first built, critical equipment such as the debarking drum and overhead cranes were reaching the end of their service life. In addition, the wood room was too small, as it was capable of handling only 65% of the total wood requirements of the mill. An increased wood room capacity would reduce the need to buy in wood chips from third parties such as sawmills. New equipment would ensure better quality and consistency in the wood chips to be delivered to the pulp mills. Building a new wood room from scratch would also provide an opportunity to create a safer environment for the workforce, with lower dust levels and reduced noise.

Forty percent capacity increase

Skoghall Mill consumes about 2.3 million m³ of logs and sawmill chips per year. With the Wood 2012 program, the mill’s log chipping capacity would increase by 40%, to about 1.9 million m³ per year. The new 42,000-m² (about six football pitches) wood yard would be capable of storing up to 45,000 m³ of wood, corresponding to a full week’s production.

The location for the new wood room was to be in the Vidön industrial area, north of the Skoghall Mill premises. The building would include a de-icing system, a debarking drum, two chippers, and an area for bark handling. A 700-m-long conveyor bridge to be built between Vidön and Skoghall Mill would transport chips and bark to a new screening room in the mill area. In total, around 5 km of conveyor belts would be built. Three silos, each with a capacity of 2,000 m³, would be constructed to store incoming wood and bark.
25,000 m³, would together store sufficient chips for four days' production.

The project planning took place in 2009/10, with Siemens involved at a technical level from the beginning. In October 2011 Siemens was confirmed as the supplier for all the electrical equipment and systems for the project, and contracts were placed. Siemens would provide all the electrical equipment and automation, as well as building systems, engineering, and services. The project would involve a great many products and services, including Sinamics drives, Sivacon switchgear, and a Simatic PCS 7 process control system with Profinet communication.

Siemens faced a number of challenges at the beginning of the project. The contract was for a turnkey system to be produced to a fixed budget. The entire project had to be completed in 13 months. Siemens would need to work together with a consortium partner, NEA installation AB, on the dismantling of the 1971 wood room and installation of the new equipment. A significant amount of legacy process control equipment was to remain in place, and the new Simatic PCS 7 process control system would need to interface with it. This would require extensive programming and field testing to ensure seamless operation. To complete the project on budget and optimize the total cost of ownership, close cooperation would be needed between Siemens regional headquarters, Corporate Account Management, Siemens' technical team at the mill, the Stora Enso technical team, and Stora Enso headquarters in Helsinki. The project would be a benchmark for cooperation between the different groups, and further projects down the line would hinge on the result.

A key advantage for Stora Enso in selecting Siemens was that Siemens could provide the complete package at a competitive price. Also decisive was the flexibility of the latest-generation PCS 7, enabling it to be programmed to interface with legacy non-Siemens equipment. An important factor in the total cost of ownership was the demonstrably high reliability of Siemens systems, meaning minimal downtime or lost production and consistent top-quality output.

Complete electrical services and systems

The backbone of the project was power distribution to the entire site. Siemens installed transformers to step down high voltage from the mains power grid and distribute three-phase AC over cabling and busbars. Siemens provided all the lighting and advanced energy-saving building systems. Sipaper products and solutions for the papermaking industry were employed for the factory automation and systems. The factory automation was based on the Simatic PCS 7 distributed control system. Siemens intelligent motor control centers (MCCs), Simocode motor management devices, and Sinamics drives provided motive power. These products deliver maximum efficiency through continuously variable-speed control, ensuring that all machines, pumps, and conveyors consume only the power required at that instant. Siemens was responsible for the commissioning of the entire site and will provide a minimum of two years' maintenance.

June 7, 2011, marked the official start of Wood 2012, when Carl-Johan Albinsson, the mill manager, and Eva Eriksson, the county governor, together dug a spadeful of chips out of a symbolic pile of chips.
Everything in a wood room revolves around chips: they are the end product that is transported to the chemi-thermomechanical pulp (CTMP) and sulfate mills to become pulp. Construction of the electrical systems for Wood 2012 commenced in October 2011 and was completed within 12 months. Commissioning ran through fall/winter 2012, and the inauguration ceremony for the wood yard and wood room took place on schedule in March 2013.

Siemens is now working in close partnership with Stora Enso on exploiting biomaterials and on the development of innovative modular wood construction. One example is intelligent Siemens solutions for buildings in combination with Stora Enso’s CLT (cross-laminated timber) wood construction system.

“The project is critical to the continued development of the mill. It has provided a strong boost to production as well as improvements in the working environment and working procedures.”

Daniel Sahlén, Manager, Process, Quality, and Environment, Stora Enso

The wood yard and wood room at Skoghall have provided Stora Enso with the capacity it needed to expand into new markets. The planned 40% capacity increase has been delivered due to the high availability of the Siemens-equipped plant and the high flexibility and integration capacity of the latest generation of PCS 7. Consistent production of high-quality wood chips using the latest technology has put Skoghall Mill in a sound position to sustainably produce paperboard using wood from managed forests.
Interview with Dr. Heinz Felder, Stora Enso

A rethink for new markets

The paper industry is currently going through the greatest change an industry can imagine: its traditional market of newsprint and office paper is shrinking 5% every year. “It’s an irreversible trend,” says Dr. Heinz Felder, head of Group Investments & Capex at Stora Enso. We spoke to him about how his company is managing this change and which new markets are replacing its traditional areas of business.

Dr. Felder, the word rethink is prominent in your company logo. Is it just a slogan, or is there more to it?

Heinz Felder: The paper industry is fundamentally changing – not just in the United States and Europe, but also in China. The market is stagnating. As a company, we have to ask ourselves: Do we want to shrink with the market, or do we want to get into new markets with innovative ideas and products? That demands a new way of thinking in terms of what we do, what we see as our business – we need to rethink.

Where do you see opportunities for new products and ideas?

Heinz Felder: There are many areas of growth – for example, packaging, chemicals, and textiles. And if we look beyond fibers, trees are a source of many other chemicals with great potential: lignin, which we use to produce biological binding agents for chipboard, or raw materials, such as hemicellulose, which could form the basis for new biochemicals. In terms of our global activities, we also need to do some rethinking: Latin America is increasingly becoming one of our key markets for obtaining cellulose, the base raw material for our business. Beyond this, the important consumer markets, such as Asia and specifically China, where we are currently investing in a major factory for packaging board, are a key priority.

Does this change of focus also affect processes within the company?

Heinz Felder: Definitely. Paper manufacturers traditionally invest only limited resources in research and development. Our culture will experience a drastic change here – not only in allocating budgets and investments, but also when it comes to our employees’ qualifications. We will move with this shift in culture and expertise, while retaining our values. We are a company with a very strong commitment to the people who work for us. Nothing about that will change, even if our production is located in Uruguay or Pakistan. But our business is becoming more diverse and complex, and we need the right products, able employees, and, not least, appropriate technologies to meet this change.

So rethinking also applies to your own work?

Heinz Felder: My own biography does indeed reflect part of this change. I started in the paper business at Stora Enso, then became a plant manager in France and witnessed the growing pressure firsthand. I moved to purchasing in 2009. There I got to know and appreciate other parts of the company and the potential inherent in other countries. I was also personally involved in the upheaval, with strong growth in capital investment and projects. Rethinking is a natural part of my work, in almost every respect.

What requirements do you have of your partners and suppliers?

Heinz Felder: More than anything else, our capital investment must be designed to last, as we are still operating within a highly capital-intensive sector. We build a plant to last at least 50 years. The equipment will run 24/7 for many decades. Our suppliers must be
Stora Enso is currently building a major factory for packaging board in the Tieshangang Port Industrial Zone in China. The plant includes a state-of-the-art machine for producing board with a scheduled capacity of 450,000t a year. Stora Enso wants this project to help expand its excellent position in the Chinese packaging market. The plant uses only raw materials obtained from sustainably managed plantations located in the surroundings. Siemens is supplying the entire power distribution system and a large portion of the drive technology for this project. The automation technology is also from Siemens: the plant is controlled by the Sipaper DCS distributed control system. To produce energy at the plant, Siemens is supplying a steam turbine with an output of 59MW and automation technology based on Simatic PCS 7. Wide-ranging service packages complete the scope of delivery. The plant is due to start up in early 2016.

Are any technologies particularly important to you?

Heinz Felder: Electrical engineering and automation are central to our work. There’s practically no other industry with a similarly high density of technology as is seen in a paper machine. At the beginning of the process alone, we have to master 50 parameters in handling natural substances with high inherent variability. To do this, we need high-performance process control. The more global and diverse our plants become, the more important it is to incorporate process knowledge in other systems, so that we remain equally effective wherever we are.

What challenges does the future hold?

Heinz Felder: Sustainability is at the heart of our corporate success. We want to use a minimum of fresh water in our factories and achieve energy self-sufficiency. We are also working hard to lastingly reduce our specific energy consumption, in line with the targets of the Confederation of European Paper Industries. At the same time, we are continually optimizing and reducing our plants’ process energy consumption – not only by controlling pumps with frequency converters and deploying heat recovery measures, but also in relatively simple areas such as lighting. Suppliers like Siemens aid this process with appropriate solutions and products, and we have set aside a special investment fund so that our plants can take the necessary action. The results show that this investment genuinely pays off.

Dr. Felder, thank you for talking to us.
China can look back on a long history of paper. The invention of the material is attributed to a Chinese official at the imperial court in A.D. 105, and the first extant fragments of paper are also from China, interestingly dated nearly three centuries earlier. China’s modern paper industry, however, only got under way in 1992, when the People’s Republic began ringing in radical economic changes to modernize the country’s industries. In this process, the government implemented numerous wide-ranging reforms in state-owned businesses – including paper manufacturing.

The start of a boom

The paper industry in China had previously been dominated by large numbers of small factories, which were largely outdated and unproductive. At the time, the Chinese government designated the paper market as a key industry and put forward an objective to invest heavily and establish the country as the global market leader. Several large-scale projects were initiated to help develop the necessary expertise. The years 1993 and 1994 saw the start of a huge wave of investment, with Chinese paper manufacturers ordering two or three new machines, with investments totaling €200 million to €300 million annually. The investment paid off. In 2009, consumption of paper and cardboard in China reached 85 million t, making the country the global number one in market demand. Today, with almost 100 million t annual capacity, the country is the world’s largest producer of paper, board, and cardboard. Thus, in just 20 years, the country underwent development that elsewhere in the world took almost 100 years.
Fast-forwarding through the history of an industry, China’s paper sector has risen to become the global leader in a little more than 20 years. But while making their leap to the top, paper companies in China are having to contend with a structural shift in the global paper industry – shrinking markets for graphic papers, a growth in packaging, and new business opportunities for building materials and cellulose-based products are creating dynamism and tension in the sector. China’s paper industry needs the right ideas to ensure that these successful tigers in paper don’t become paper tigers.

Siemens in China’s pulp and paper sector

Siemens also looks back on a long history in China. Since 1995, Siemens has completed more than 360 pulp and paper projects in China and is number one in the Chinese pulp and paper industry. Its numerous references include equipping the world’s largest board-making machine with full drive and electrical engineering. The 408-m-long board-making machine at Ningbo Asia Pulp and Paper Co. Ltd. is the heart of the Ningbo Xiaogang Boardmill and was commissioned just 15 months after the award of the contract. Another major project involves the supply of electrical drive and automation technology for a new paperboard mill operated by Chinese board manufacturer Shandong Bohui Paper Industry Co. Ltd. Every year, approximately 750,000 t of cellulose-based board are produced here, making Bohui one of China’s largest board manufacturers. A further example bears witness to Siemens’ longstanding project cooperation success in China: equipping the world’s largest paper machine at Hainan Jinhai Asia Pulp and Paper. Since May 2009, this machine has been used to produce nearly a million tons of graphic papers every year.

Digitalization squeezes margins

Unfortunately, the global market for graphic papers is stagnating or even presently in decline. Newspapers, magazines, printing papers, and so forth are seeing a drop in demand due to new media such as the Internet, smartphones, and e-mail. These developments are having an impact on China’s paper industry – just 20 years after the beginnings of modern paper production, there are already surpluses in some areas, particularly in graphic papers for newspapers and other print products.

This decline is squeezing margins for manufacturers. New machines must therefore be able to produce more efficiently or otherwise focus from the outset on new market segments, such as packaging. Consequently, one of the biggest recent Chinese investments is in just this segment: in Beihai, Guangxi Region, Stora Enso is building a new paper factory for packaging board.

A look to the future

The industry is on fast-forward. The future of the Chinese paper industry remains exciting, and the question of what will follow the paper boom is already being asked. It may be assumed that as in Europe and the United States, China will see a trend toward new products and applications. Alongside packaging, these new directions include building materials, as well as completely new products obtained from the “raw material” of the tree, such as textile fibers, biological adhesives, and innovative microcellulose-based substances. Actively shaping this future means securing competitiveness in the long term – in China, too.

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Mr. Mensink, what was the motivation of the Confederation of European Paper Industry (CEPI) to initiate the Two Team Project?

Marco Mensink: CEPI is the European pulp and paper industry federation. We aim to ensure the competitiveness of our industry in Europe – and in order to do so, we need to address some very specific aspects of the European market: we have a complex regulatory environment, and especially the issue of energy and energy costs puts us under pressure. So reducing energy consumption and energy costs is essential.

So the Two Team Project is primarily about energy?

Marco Mensink: It is a bit more complex than that. Before we began thinking of this type of project, CEPI made the move to research ways that would help the industry meet the European goal of reducing carbon dioxide (CO₂) emissions by 80% until 2050. Plus, in order to motivate change in our industry and to improve our position in the market, we wanted to increase the value of our products by 50% at the same time. What we quickly saw is that meeting these two ambitious goals would not be possible using available technology – what we needed was nothing short of a radical shift in technology. To make things even more challenging, we also needed this shift to happen by 2030 in order to align our efforts with the investment cycle – one paper machine away from 2050. To achieve all this, we needed to change the way we innovate in our industry, including bringing in technologies and experts from other sectors. And then we came up with the Two Team idea.
And how did the Two Team Project promote innovation?

**Marco Mensink:** First of all, it pooled experts from many industries and research institutes in a team to break through traditional ways of thinking. Second, it created strong motivation through the element of competition: competitors in the market competed in the teams, and their reputations were at stake. This set-up really had people giving their best, leveraging networks, and pushing concepts in order to beat the other team. We had a tight schedule – one year – for the teams to present their concepts, and we had a jury, so it was both a game and a race to propose the best solutions.

Why not just pick experts from the paper industry?

**Marco Mensink:** To meet our goals, we needed to do something different – if the industry could create the right solutions from within, we would probably have them already. And looking at other industries really helped move things along – the finalists were inspired by biosciences, the food and beverage industry, and the textiles industry. And we needed a broader knowledge base to exploit the full potential of the concepts – for example, “100% electricity” (see sidebar), where the team member from Siemens was able to contribute Siemens’ broad technology expertise, enabling us to develop demand-side flexibility and storage and buffer solutions. Introducing this kind of knowledge and mind-set into the teams clearly helped create a very innovative, dynamic environment that was very beneficial to developing new ideas.

So you are happy with the results?

**Marco Mensink:** More than happy. Some of the concepts really are of a scale that can reshape the pulp and paper industry – we are talking about huge reductions in capital and operating expenditures and huge savings in energy consumption. And I’m not the only one who thinks the Two Team Project was the coolest project we’ve ever done here in Brussels – many large companies have already stated their commitment to promoting and developing the concepts by putting money on the table. There’s no better proof that what we’ve found really is considered the next big thing in pulp and paper. What we need to do now is make sure that we maintain the spirit of collaboration and innovation and that we provide a good environment for the further development of these ideas – and that is what we will be working on in the next two years.

Mr. Mensink, thank you for speaking with us.

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**Breakthrough technologies for 2050**

With the 2050 Roadmap to a low-carbon bioeconomy, CEPI outlined how the forest fiber industry is uniquely placed to contribute to a resource-efficient world. One key component of the roadmap is breakthrough technologies that will be required in order to be prepared for the future. These eight concepts made it to the final round of the Two Team Project.

**The winner: deep eutectic solvents**

Deep eutectic solvents (DES) that are produced by plants could help produce pulp at low temperatures and at atmospheric pressure. Using DES, any type of biomass could be dissolved into lignin, cellulose, and hemicellulose with minimal energy consumption, emissions, and residues. DES could also be used to recover cellulose from waste and dissolve ink residues in recovered paper.

**Flash condensing with steam**

In an almost waterless paper production process, largely dry fibers would be blasted into a forming zone with agitated steam and condensed into a web using one-thousandth the volume of water used today.

**Supercritical CO₂**

Supercritical CO₂ is widely used to dry vegetables, fruits, and flowers; to extract essential oils and spices; to decaffeinate coffee and tea; and to dye textiles. It could be used to dry pulp and paper without the need for heat and steam, and also to dye paper or remove contaminants.

**100% electricity**

Shifting to energy-efficient technologies using electricity rather than fossil fuels to generate heat will cut CO₂ emissions as the power sector moves to renewable energy. This concept could also provide grid buffer and storage capacity, storing energy as hydrogen or pulp.

**Steam**

Using superheated steam drying would help save energy, as most heat could be recovered and recycled. Steam will then be used as a fiber carrier for making and forming paper.

**Dry pulp for cure-formed paper**

In a papermaking process that uses no water, fibers are treated to protect them from shear and then suspended in a viscous solution at up to 40% concentration. The solution is then pressed out and the thin sheet cured with a choice of additives to deliver the end product required.

**Functional surface**

Greater added value can be unlocked with fewer resources by shifting to producing more lightweight products and selling surface area and functionality rather than weight. Advances in sheet formation and new cocktails of raw materials will lead the way to the lightweight future.

**The toolbox to replicate**

To preserve the great ideas that didn’t make it, a combination of process, material, and equipment innovations will be collected as a toolbox of stepping stones to 2050, which will help boost sector and investor confidence.

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In principle, the production of pulp and paper has employed the same process sequences for centuries. What has changed, though, is the degree of automation. Only the increasing use of innovative technologies can provide an effective response to changing circumstances and new challenges.

For more than 100 years, Siemens has been involved in all aspects of the pulp and paper industry – in drive and automation engineering, instrumentation and control technology, and power generation. Siemens repeatedly set standards and helped advance the paper industry by means of electrification, electrical drive technology, and automation with the Teleperm process control system, which was launched in the 1960s. Today, Siemens supports the industry with a Sipaper product portfolio adapted to the pulp and paper sector that includes process automation, drive technology, Advanced Process Control (APC) and IT tools, power distribution, quality control, and wide-ranging services. All this puts Siemens in a position to flexibly equip individual components in the production unit as well as bring entire pulp and paper production facilities up to the state of the art.

From quantity to quality

Until a few years ago, new machines and plants in the paper industry knew only one refrain “get bigger and faster.” Paper machines now have working widths of up to 11 m and are 100 m to more than 500 m long and around 15 m tall. Depending on the paper grade, they can achieve production speeds of 120 km/h and above. This makes it possible to produce up to 2,000 t of salable paper in a single day, equating to an area of approximately 15,000 m²/min. A number of units with no less impressive dimensions, such as the winder, are required to receive and process the paper continuously produced on the paper machine an average of 350 days a year. The paper machines consist of more than a hundred leading rolls for screens, felt, and paper web, as well as a large number of leading rolls for screens, felt, and paper web.
dryer cylinders that need to be moved. A thousand drives are therefore not an unusual sight in a paper factory. Size alone, however, is now no longer the decisive factor in the fiercely competitive paper market. Product diversity is increasing by the day, pushing the industry to employ modular systems built up from standardized units to enable more flexible and efficient use of production capacities.

**Saving resources, increasing efficiency**

Huge quantities of water for transporting the fibers are used in the process, while drying the paper requires large amounts of energy. As a paper factory’s electrical power demands are comparable to those of a small town, a combined heat and power plant for generating steam and electricity is usually an integral part of the plant. The pulp and paper plant typically offsets its considerable water requirements with an on-site water treatment facility. Even though recent years have seen major progress, the paper industry is the fourth most energy-intensive industry and the top user of water.

**Modular solutions for top performance**

Energy-efficient drive technology and control solutions that minimize resource use are therefore key aspects of efficient paper production. The modular Sipaper Drives system offers an optimum electrical drive solution for any requirement in paper production. Whether the need is for improved control engineering or more energy-efficient drives, the systems are optimized for maximum performance based on the modules. Speed-controlled drives with soft start-up, which reduce mechanical impact loads and line harmonics, can be installed, as can gearless motors for use in tight spaces. Sipaper APC provides an integrated software solution for model-based control to ensure optimized process management – and thus excellent quality with maximum cost efficiency.

**For ideally integrated processes**

Modern paper machines are usually operated using computer-assisted process control systems. Simatic PCS 7 enjoys broad use in this field. Modern online measuring equipment guarantees constant online control of base weight, paper web moisture, and other characteristics during production. Sipaper QCS (Quality Control System), based on Simatic PCS 7, is thus a key component of many paper machines and enables configuration of even, flat cross profiles and excellent longitudinal profiles – the prerequisite for optimum running and processing qualities when producing and processing corrugated cardboard.

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**Growing product diversity:** Alongside traditional pulp products – paper, packaging, hygiene products – the importance of products such as building materials is growing

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**Sipaper QCS**

Quality control system

**Sipaper Drives**

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**Packaging**

Carrier bags, food packaging...

**Hygiene products**

Toilet paper, paper towels, facial tissue...

**Visual print media**

Newspapers, booklets, magazines...

**Building materials**

Wood laminate, furniture, thermally modified timber...
Leading a successful enterprise sometimes implies choosing a different direction than others. Zellstoff Pöls AG, a Heinzel Group company in Austria, is the perfect example of this. Since late 2013, the company is producing a kraft paper called “Starkraft”, which is a typical specialty product. With its flexible and robust characteristics, Starkraft is ideal as gift-wrapping paper, in food packaging, for carrier bags, and in healthcare applications. For the company and its 400 employees, the new product is pointing the way to a bright and prosperous future. Whereas paper machines all over Europe are being shut down, the Pöls machine with the winged rhinoceros logo marks a strategic milestone for the Austrian company’s successful step into production for this niche market, which has projected European growth rates of up to 3%.

Deluxe investment

Kurt Maier, CEO of Zellstoff Pöls, and his team have achieved the seemingly impossible in pursuing this objective, by developing a paper machine that excels in every respect, the PM2. It is Europe’s largest and most modern machine of its type today and has

Zellstoff Pöls AG, Austria

Tough team for strong paper

A rhinoceros learned to fly in just 13 months. With the completion of the PM2, Europe’s largest and most modern kraft paper machine was put into operation in Pöls, Austria. It will be used to produce 80,000 t of kraft paper every year. The paper machine’s multimotor solution was realized using the Sipaper drives standard and Sinamics S120 converters.
a maximum annual output of 80,000 t of paper while using a third less specific energy than its predecessor, which itself could produce 14,000 t of paper a year.

State-of-the-art technology for absolute perfection

Zellstoff Pöls invested an impressive total of €115 million in the PM2 – the right business decision as it turns out, since the shortage of wood as a raw material has made prices increase in the meantime. “For us, this meant pushing even harder in the direction of end products than before,” says Siegfried Gruber, head of technical planning at Pöls. The machine builder Andritz supported Zellstoff Pöls during the planning and implementation of the new PM2. Siemens was responsible for the entire power distribution system and supplied the medium-voltage switchgear, distribution transformers, converter transformers, low-voltage switchgear, uninterruptible power supply (UPS) systems, medium-voltage and low-voltage motors, frequency converters, control equipment, machine-oriented control, and higher-level control system. Using the Sipaper Drives standard and Sinamics S120 converters made it possible to realize a multimotor concept for the paper machine. The power engineering is designed for an overall connected electrical load of around 19 MW.

Nothing ventured, nothing gained

After only 13 months of construction, the first reel of kraft paper was produced on November 10, 2013. The machine is not yet running at full load. With a projected annual output of 56,000 t (later increasing to 80,000 t), however, the Austrians are on schedule to achieve annual growth rates of up to 3%. “Despite its strength, the paper is incredibly thin and of exceptional quality,” says Gruber with delight when showing visitors his “baby,” which produces 1,000 m of paper every minute. At the same time, the machine is extremely energy efficient. The modern multimotor drive and the excellent design of the assembly units are helping the company cut around one-third of its annual specific energy costs. In total, some 200 largely frequency-controlled drives are used in the new machine. Synchronizing all these motors was one of the key challenges to which the project team responded with passion and success. Unlike with the old machine, it is now possible to recover the braking energy for use in the system, thereby reducing the machine’s energy requirements.

It really is true: a rhinoceros can fly. Especially if you have the right experts on your team. And this applies to the machine as well as its Starkraft paper. “The flying rhinoceros symbolizes the best of both worlds: our new paper is extremely resilient, and at the same time our high-tech plant makes it possible to produce a wide range of paper thicknesses, ensuring maximum flexibility for our customers,” says Werner Hartmann, managing director of the Starkraft business unit at Zellstoff Pöls, beaming with joy as he reports on Starkraft. Indeed, the PM2 is now a star in the world of kraft paper.

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ANDRITZ Oy, Finland

Beyond paper

With uniform engineering software to support its bidding and proposal processes and basic engineering, ANDRITZ Oy has achieved significant savings in time and engineering costs. This will help ANDRITZ maintain its competitive position as one of the three leading plant and process equipment companies for the pulp and paper industry and will enable the teams to better focus on their key expertise.
The ANDRITZ UT Uniform Engineering Tool

ANDRITZ introduced a shared engineering tool (Uniform Tool based on Comos) to facilitate the flow of information from process engineering directly into automation and mechanical engineering. The ANDRITZ UT project using Comos started in 2002. Since then, the company has handled more than 6,500 projects (offers and orders) with Comos, with more than 3,500 already in operation or finished.

From China to Europe to the world: paper has come a long way from being only something to write on. In fact, the main focus of many companies in the pulp and paper industry has shifted from printing paper to other applications, such as packaging materials, or even exploring chemical applications of pulp components such as lignin.

Key to surviving in this market is employing the latest technology to improve efficiency and quality. ANDRITZ PULP & PAPER, part of the Austria-based ANDRITZ Group, is a leading equipment and technology provider for the pulp and paper industry as well as in other industry sectors. ANDRITZ Oy, the Finnish subsidiary within ANDRITZ PULP & PAPER, is serving pulp and paper customers all over the world, from China to Europe and South America. “New mills are typically being built outside Europe at the moment,” says Ismo Lätti, of ANDRITZ Oy, “but Europe remains a key market, as we have a large installed base here and provide maintenance, repair, and overhaul to our customers.” Lätti is well aware that in order to remain competitive, the engineering teams need to do more than just provide innovative solutions for each specific customer request; they must do so in less time and with less effort.

In 2003, ANDRITZ decided to implement the Comos software at the group level for both plant design management and lifecycle management. Following a project aimed at streamlining engineering across all business areas of ANDRITZ, the company developed the ANDRITZ UT Uniform Tool for proposal and engineering processes (see box). This tool is based on Comos and helps engineering teams cope with ever-increasing workloads, growing plant and project complexity, and shorter engineering periods.

Lätti is the Comos administrator for ANDRITZ Oy Finland and was a member of a team that worked on the deployment of Comos in Finland. “When we decided to use this tool here as well, we were able to draw on the experience of our colleagues in Austria, which has helped a lot in the implementation,” says Lätti. “So we were able to start reaping the benefits right away. The pulp and paper industry is very cost-driven, and having a software solution such as Comos really helps a lot.”

During bidding and project acquisition, the teams at ANDRITZ use Comos to create presale projects based on existing subsets and templates. Having a very detailed and specific project specification early on helps ANDRITZ provide a more exact cost and time estimate and streamlines project execution. Once the contract is awarded, the teams can use the same data for the detail and basic engineering of the process functions, piping and instrumentation, and electrical and automation engineering.

A uniform tool for the entire lifecycle

“Comos is a tool that provides benefits not only for the engineering work but for the entire project lifecycle. This was very important to us, as we also provide lifecycle services for some of our customers. All in all, Comos really provides a very comprehensive offering,” Lätti says. “All engineering data are maintained in a single database, with automatic updating procedures, which helps improve engineering quality. We have received positive feedback from the automation team especially: for them, programming the control system is much easier now. The proposal process was streamlined as well, and Comos also helps us when we need to work in global teams.” These results from the teams in Finland are perfectly in line with the overall experience made using the ANDRITZ UT tool. The project has contributed to significant improvements in engineering efficiency, and evaluation of the ANDRITZ UT tool shows that between 1998 and 2007, Comos has contributed to 40% savings in process and automation engineering costs.

More applications down the road

With such excellent results, the teams at ANDRITZ are now evaluating additional applications for Comos. “Currently, we are also researching how we can benefit from Comos’ solutions for operations like 3-D visualization and maintenance, repair, and overhaul,” says Lätti. “Being able to provide visual information in 3-D with Comos Walkinside is an interesting option for project presentation – the customer will be able to actually see what the equipment looks like and not just view drawings and figures. And Comos MRO will be a useful addition to our service offering as well. So there is quite a lot to do – and that is another benefit of Comos: you have a lot of options and features, and that helps you improve quality and efficiency in all aspects of your project – not just the design and engineering.”

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Less is more

A new board mill is built to make lighter-weight linerboard using less raw material and at lower energy consumption with a complete Sipaper electrical package from Siemens.

Cardboard is a product we are all familiar with. Cardboard boxes are an essential element of modern commerce, both for bulk shipping and for deliveries of goods to consumers by online retailers. With the total usage of cardboard boxes so vast, there are very good reasons for reducing the environmental impact of cardboard production, and some papermaking companies have responded. One such company is Cascades Canada Inc., which invested in a new containerboard mill in the city of Niagara Falls, New York, through its subsidiary Greenpac Mill LLC. Built to supply new lightweight linerboard for the North American market, the production is based on 100% recycled scrap paper and cardboard as raw material.

Less weight, greater strength

The challenges Cascades faced in 2009 when it started the project were many. The company wanted to build a mill that would produce linerboard that was thinner than had been customary, with a basis weight of 126.9 g/m², but with greater strength and a better print surface quality – and be made from 100% recycled material. Cascades also wanted the mill to consume fewer chemicals, less water, and less energy per ton than previously.

The planned mill was to be very large. At a total cost of US $430 million, it would be capable of producing 540,000 short tons of linerboard per year on a 328-inch (8.33-m) roll. To equip the plant, two OEMs were chosen for the recycled fiber plant, including stock preparation and wastewater treatment, and for the 8.33-m trim machine.

The entire electrical package was awarded to Siemens, which collaborated with the two OEMs to equip the mill. The key argument in favor of selecting Siemens was the company’s track record with the Greenpac management in providing reliable technology via its Sipaper products and solutions for the papermaking industry. Siemens could supply the complete package, including power supplies, motor drives, control systems, process library, and management information system. This capability would lead to clear responsibilities and fewer interfaces with suppliers. Potential misunderstandings were avoided from the beginning, which helped bring the project to its conclusion within budget and on schedule.

Saving energy

A key contributor to the energy efficiency of the mill is the Siemens variable-frequency drives used on many pumps. The variable-frequency drives enable the pumps to run at precisely the flow rate and power level required. Previously, a pump running at a constant power input would have been used together with a flow-throttling valve. This set-up wasted power at any flow rate other than the rated maximum. Other energy-saving features in the mill include the use of dry-running turbo blowers, which provide 50% energy savings over conventional vacuum pumps. Fresh water is used sparingly,

“If you want to stay a leader in the market, you need better production assets. The mill has been designed to be one of the most energy efficient in the world, and this major investment will help keep the company in a leadership position in the containerboard industry.”

Maurice Plante, Vice President, Containerboard and Boxboard, Cascades Canada Inc
Siemens electrical package at the Niagara Falls linerboard mill

- Power transformers
- Power distribution system
- Sectional drives, including motors, gearboxes, infeeds, and inverters
- Single drives, including motors and converters
- Intelligent motor control centers
- Software libraries: Sipaper drives, Sipaper Distributed Control System (DCS), Sipaper Quality Control System (QCS) based on Simatic PCS 7
- Instrumentation equipment (Profibus PA)
- Service contract

The new mill was designed to be one of the most energy efficient in the world, using variable frequency drives on pumps and other efficiency measures to cut consumption significantly. The steam-generating plant in the corrugating medium mill was utilized to supply steam to the new linerboard mill. Siemens received the order for the new mill in early 2011; installation commenced in May 2011 and ran until July 2013. The many challenges of providing the drive and automation technology and power distribution system for the plant were all solved by good coordination and knowledge sharing between the OEMs, Siemens at corporate headquarters and at the local level, and the client. The result was that on July 15, 2013, the first 8.33-m roll was manufactured right on schedule.

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A process control system needs to meet different requirements: while the plant operator expects process safety, efficiency, and maximum plant availability, the most important aspect for the systems integrator is time-saving engineering that enables short project times, and the operator, finally, appreciates the convenience of an intuitive user interface.

Version 8.1 of the established Simatic PCS 7 process control system shows that Siemens has focused on precisely these three key concerns.

**Accelerated engineering**

Systems integrators today must manage with ever-shorter project times while still delivering a solution that passes the factory acceptance test on the first attempt. It is therefore helpful to have tools that allow work to progress efficiently and support smooth teamwork. For this purpose, PCS 7 offers the Simit simulation framework, which provides a precise reproduction of process behavior independent of the system itself. Additionally, the multiuser operator station engineering...
function is a particularly valuable asset for groups of teams working together on one project, as it dispenses with the coordination required between separate engineering teams. Numerous sources of error are eliminated, and the result is a lean, time-saving development process.

In the details, too, the latest version of PCS 7 offers outstanding benefits. Previously, only complete project planning updates could be loaded into the system, whereas now the developer can also upload a single modified program code. That is not just faster – it makes commissioning more flexible and efficient as well. The building block library has also been significantly expanded and now features predefined standard solutions for even more automation tasks. These solutions are continually evolving and thus guarantee unrestricted functionality.

**Intuitive user interface**

The key to ease of use is Advanced Process Graphics. This innovative interface is based on standard industry guidelines for displays that reflect the operator’s current task. Hybrid displays, trend curves, and spider charts allow an intuitive understanding of process correlations. The operator is given all the information needed for his or her decisions and thus can handle even complex processes at all times. Especially operator screens that present a large number of process values in real time benefit from the accelerated screen layout providing the required information much faster than before. This ensures reliable operation even in time-critical situations and substantially contributes to a safe process.

**Up-to-date without downtime**

Plant operators are extremely averse to process interruptions. For this reason, the latest version of PCS 7 enables updates during operation – from single building blocks to the CPU 410 system expansion card. PCS 7 Version 8.1 also supports different library versions. This makes rolling updates possible, resulting in greater flexibility and fewer standstills. PCS 7 Version 8.1 thus delivers system improvements to the plant operator faster, with no adverse effect on plant availability.

**Total visibility, total control**

The building blocks for condition monitoring represent a further step toward higher plant availability. They are already part of the PCS 7 standard library and allow the direct integration of diverse monitoring concepts for mechanical plant components into the control system. This obviates the need for the complex installation of additional monitoring systems. The integrated condition monitoring provides valuable information on the plant’s condition and forms the basis for preventive maintenance. Impending failure of mechanical components is identified in good time, allowing repair or replacement to be carried out during routine maintenance intervals. Unscheduled plant downtime thus becomes a rare exception. In brief, the new Simatic PCS 7 Version 8.1 brings major benefits in performance, efficiency, and user-friendliness.
The process industry has a reputation for adopting a wait-and-see policy when it comes to innovation – an understandable stance, as the stoppage of a process plant can have far-reaching consequences. That is why safety is paramount and availability the key to cost-effective plant operation. Progress, however, never sleeps, and the switch from analog to digital technology cannot be halted. In this context, the keyword for the process industry is Profibus, a technology that is the subject of controversy and is still seen by many plant operators as too complex and cumbersome.

Benefits from a holistic perspective

Connecting a field device to a process control system using a conventional 4–20 mA line is a simple affair. This connection, however, can do no more than transmit a single analog measured value; no accompanying status information is sent. In the event of a fault, an on-site technician is required to find the source of the problem. Similarly, device parameters can only be configured and modified on the device itself. The situation is very different if the same field device is connected using Profibus PA. Extensive information on the physical condition of the device can be retrieved alongside the actual measured data, thereby facilitating preventive asset management, as technical problems in a field instrument can be identified at an early stage and rectified in the course of routine maintenance. This means that the cause of the error is usually known in advance and does not require a time-consuming on-site search. Maintenance and repairs are expedited, making unscheduled plant downtimes a rare exception.

Project engineering made easy

The final field device equipment is frequently not yet known when a process plant is designed. Initial work is therefore independent of the actual devices to be used; the exact parameters are added later. For conventional devices, this means simply starting with a 4–20 mA analog signal, which must then be transformed for the digital world. The situation is similar for field devices with a Profibus PA interface. Here, the profile GSD defines an identical functionality for all devices. As a result, Profibus also enables a neutral plant design without knowledge of the field devices that will later be used.
When it comes to parameterizing the separate field devices, the benefits become obvious. With Profibus, this process does not require someone actually present on-site with a multimeter but can be conveniently and quickly handled from a remote location – quite simply, via the fieldbus.

### Standard addressing

Analog field devices must be separately connected to the process control system on dedicated lines. This involves a great deal of cabling and complex manual documentation. With Profibus, each field device is given a unique address. Software tools enable automated documentation and management of the parameters for each device. Because the addressing system is standardized, commissioning and device replacement are far simpler than in the analog environment.

### Configuration at a click

New or replaced Profibus PA field devices require only physical installation on-site. There is no need for time-consuming manual configuration. This is true not only during installation but also later, in the event of a replacement. On connecting, the device automatically logs onto the network with service address 126. Adding field devices via the service address ensures failure-free operation because this address cannot be used in the network configuration. The desired address is assigned via the bus – either from the control center or locally on a laptop. The device configuration stored at this address is then automatically activated and the field device is immediately ready for use.

It is true that the switch from conventional 4–20 mA analog technology to Profibus PA marks a shift in processes that have existed for decades; however, those who take this step will quickly forget the "old times," their limitations, and complex installation and service processes.
ocated in the town of Dupnitza, 60 km south of Sofia, the capital of Bulgaria, is a factory producing more than 6 billion tablets and capsules a year. This is one of the largest manufacturing sites of Actavis plc, a global pharmaceutical company based in New Jersey in the United States. Actavis markets approximately 1,000 medical products globally and has more than 30 manufacturing and distribution sites. The Dupnitza plant, with over 1,000 employees, focuses on bulk production and packaging of oral solid dosage (OSD) forms of more than 100 formulations in 200 potency variations.

Complex production environment

Tablets and capsules can be manufactured using a variety of processes. At Dupnitza, Actavis has dry blending (direct compression), dry granulation (roll compaction), and layering capabilities. Wet processes include wet granulation (high sheer or top spray granulation) and coating. Film, sugar, and functional coating can be performed in coating pans or in a continuous coating process. The large number of formulations and potency options coupled with the many different processes means that control of the plant presents a complex challenge.

Managing the plant had indeed been difficult because the vendors of the plant equipment had traditionally provided their own automation. This created islands of automation throughout the plant, which were difficult to integrate. However, when a large new production building, to be called T2, was planned as part of a major expansion in 2006–2008, Actavis seized the opportunity to rethink its automation strategy. After a full review of its automation needs at Dupnitza, Actavis made the strategic decision to have one integrated automation system for all major processing equipment. This also meant that With Simatic PCS 7, Actavis benefits from 100% reliable certification of data and archives for the complete site, including both preexisting and newly installed equipment.
the systems integrator had to upgrade and incorporate existing equipment such as fluid bed dryers and coating pans in addition to providing automation for new equipment. Actavis undertook a review of automation suppliers and system integrators to identify a company with both the skills to complete the task and a strong local presence in Bulgaria. Actavis selected Kastiva GmbH of Sofia.

Strict control of electronic signatures and records

Kastiva’s first task was to perform a detailed review of the system to be used. This was carried out together with Siemens Karlsruhe and resulted in the selection of Simatic PCS 7 with Simatic Batch. An important decision factor in favor of PCS 7 was its compliance with the US Food and Drug Administration requirements for electronic records and electronic signatures. Therefore, the very advanced Batch package and electronic batch records generated by PCS 7 offer a reliable solution for the strict environment of pharmaceutical production.

A joint project team was formed, bringing together both Actavis and Kastiva engineers. Actavis took responsibility for all the functional specifications, which were written to a Siemens template. Actavis also handled instrumentation, mechanical enhancements and refurbishments, and systems qualification. Kastiva was responsible for the project execution, installation, and commissioning with support from Siemens. Some of the original equipment vendors also participated with contributions from their process and safety experts.

“During the T2 project a number of decisions were made, but the selection of Simatic PCS 7 as the common platform was the most important from a strategic viewpoint and a key decision for the successful outcome of the project.”

Brandur Hauksson, Manager of Automation Systems, Actavis

Scope for expansion

The major items in the original equipment schedule included five fluid bed dryers and high-shear mixers, four tablet coaters, an environmental monitoring system, and various utilities such as cleaning in place (CIP) units, heating stations, mobile mills, and a solvent distribution and dispensing system. The T2 site has expanded significantly following the original automation system set-up, but all new process equipment has been purchased without automation and instead has been incorporated into the PCS 7 system. A major benefit of the PCS 7 system has been the central management of all recipes and process data. This is very important for compliance with 21 CFR Part 11, which imposes strict requirements on the control of access rights and data management such as audit trails and archives.

With the success of the PCS 7 system installation, the Actavis team at Dupnitza now plans to introduce electronic batch reporting for the complete site. An important element of the plan will be the bidirectional integration of PCS 7 and the manufacturing execution system (MES). This integration would normally be very time-consuming for multiple machines, but with only one system on-site and a harmonized data integration layer it should be a painless operation.
PT Evonik Sumi Asih, a specialty chemical company formed as a joint venture between Germany’s Evonik (75%) and Indonesia’s PT Sumi Asih (25%), is located in Bekasi, Indonesia. Established in 1997 and with a workforce of 80, the plant produces emulsifiers, secondary surfactants, emollients, conditioners, thickeners, and pearlizing agents for personal care products and household cleaners.

Growth triggers expansion project

From 2003 to 2012, the plant’s output increased significantly. This prompted a US $3 million expansion project, which was successfully completed in 2013. After extensive evaluation, Siemens was contracted for the automation project. “Our relationship with Siemens began in 2008, when we upgraded the manual control system to an automated one in the form of a Siemens SCADA/PLC configuration, WinCC/57-300,” says plant manager Sigit Tri Pramono. “We used Simatic Batch software installed on WinCC.”

A winning combination

Proven technology plus an effective three-way relationship between customer, vendor, and systems integrator helped ensure the success of a process automation project at this Indonesian specialty chemical plant.
When the plant was expanded in 2013, however, Siemens’ offering was centered around Simatic PCS 7 as a DCS (distributed control system) rather than a SCADA/PLC (Supervisory Control and Data Acquisition / programmable logic controller) solution, as the combination of Simatic PCS 7 with Simatic Batch provides a much more efficient solution. Another benefit of working with Siemens in this project was that there was a proven migration strategy to PCS 7 for the systems in the existing three reactors. Moreover, PT Evonik Sumi Asih already had an established working relationship with PT Simentari, which installs, repairs, and services Siemens equipment in Indonesia.

**Systems engineering**

With the control system supplied by Siemens Indonesia and implemented by PT Simentari, engineering work began in December 2012 and the solution was commissioned and completed in July 2013. The working system, PCS 7 V8.0 SP1, can be seen in the new control room that was included in the plant extension. At the reactor, process instrumentation includes seven temperature transmitters, seven level transmitters, five flowmeters, two pressure transmitters, and one pH transmitter. Actuated equipment includes motorized pumps, control valves, and on/off valves. These are all visualized as process objects on the PCS 7 OS client station in the control room. “The I/O count for the project was 82 digital inputs, 70 analog inputs, 61 digital outputs, five analog outputs, and five high-speed pulse outputs,” says PT Simentari project manager Adi Sujanto. Control system functions were developed with the aid of the Advanced Process Library (APL), the standard library within PCS 7 for performing automation and process control tasks, which is based on years of experience of configuration engineers and plant operators.

“With PCS 7, the integrated Simatic Batch in this project allowed the plant to start production much faster than would have been possible with a SCADA/PLC system,” says Sujanto.

**The partnership model**

“It has been six months and the system has not given us any problems. Ours is a 24/7 operation with two or three batch changes a day, so it is very important that we have a solid and reliable control system,” says Pramono. “If we encounter any technical issues, our primary point of contact is PT Simentari. They are only 18 km away and are quite responsive to our needs,” he says.

It is the relationship between Siemens, its Solution Partner, and the customer that has enabled successful implementation of many PCS 7 process automation projects. “This project for PT Evonik Sumi Asih is wonderful proof of our partner strategy,” says Markus Lade, head of process automation at Siemens ASEAN-Pacific. “Siemens provides the automation technology and the domain expertise, while the execution and after-sales service are performed by a local partner that can support the customer to the high level that we require and that is necessary for project success.”

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As one of the leading engineering companies in the oil and gas industry, Aker Solutions specializes in delivering complex project solutions for challenging environmental conditions. From its headquarters in Norway and a network of global branches, Aker Solutions provides comprehensive engineering services and is involved in the engineering design, maintenance, and renovation of complex industrial plants for its high-profile customers. Efficient data management and high data quality are critical in avoiding errors during the construction and operation of a plant and in ensuring that potential problems can be dealt with early. As the development of plants and installations becomes more complex and involves ever greater volumes of data, these challenges are increasing.

Continuous further development of the plant engineering concept

Aker Solutions has for decades employed innovative IT solutions in its plant engineering in order to stay ahead of these constantly growing challenges. These solutions are based on computer-aided engineering (CAE) software and have been developed continuously over many years. Today the company’s IT solution for plant engineering is in its third generation. In the first generation deployed in the early 1980s, the company used 2-D and 3-D computer-aided design (CAD) software in conjunction with a central documentation system. The second generation was based on a software tool designed by the company itself, which allowed all project data to be managed centrally. This concept followed an object-oriented approach and allowed structured, simultaneous engineering. In 2006, Aker Solutions decided to replace its own systems engineering software tool with a third-party system, Comos from Siemens. This software solution is a key component of Aker Solutions’ third-generation engineering IT solution.

Standard software solution as a data hub and planning tool

The Comos software solution forms the foundation of Aker Solutions’ project data hub and also delivers integrated engineering tools supporting key stages of the engineering life-cycle. Comos is based on a uniform data platform and an object-oriented approach. In this context, object-oriented refers to the holistic description of a component or object in a single entity in a single database. Numerous specific aspects of the various technical disciplines and departments form an overall picture for the specific component. Controlled cooperation

Aker Solutions, Norway

Conceptual excellence

A long-term plant engineering strategy supported by efficient engineering software products – that is Aker Solutions’ approach to the oil and gas industry’s demand for continually higher engineering quality and decreased execution time for project development. At Aker Solutions, nearly a thousand users work with the Comos software solution.
between the various disciplines and external companies is achieved through the working layer technology embedded in the software. The open software architecture also allows Aker Solutions to connect other software tools such as weight control software. Flexible bidirectional data exchange with the other software systems is possible via various interfaces. Thanks to these characteristics, the software represents the ideal answer for Aker Solutions, allowing the company to manage all the engineering data as a central project data hub. The software is also used as an engineering tool in the front-end engineering and design (FEED) phase and in detail engineering, for example, in the creation of piping and instrumentation diagrams (P&IDs) and in the electrical, instrumentation, and control (Ei&C) design.

**Tried and tested in practice**

Today, nearly a thousand users work with Comos software at Aker Solutions. This group is further expanded by suppliers and subcontractors who exchange their project data with the Comos project data hub. Significant numbers of FEED projects and multiple detail engineering projects have been executed. “With our innovative engineering concept and the use of the Comos software, we are able to perform work sequences simultaneously with higher data quality,” says Stein Schjerfe, CIO of the engineering division at Aker Solutions. Comos is the primary source for electronic data handover to owner-operators. But even with these good results, the company is already working on further developing its plant engineering concept, in which the Comos software solution will continue to play a key role.

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Exploiting potential for efficiency

Energy consumption at the Nordkanal central sewage treatment plant in Kaarst, Germany, was significantly reduced with a custom process automation solution based on Simatic PCS 7. The flexible, modular control system makes it possible to test new process variants at the membrane sewage treatment plant, thereby enabling continuous optimization of the plant’s operation.

The Erftverband flagship sewage treatment plant lies nestled among green meadows on the banks of the Nordkanal near the Dutch-German border. Those passing by the Nordkanal plant would never suspect that it has frequently been visited by experts from the United States, Japan, and China who are keen on getting an idea of tomorrow’s wastewater treatment. The sewage treatment plant is the first municipal membrane plant on this scale. Since its commissioning in 2004, the plant has been continuously operating with a single membrane.

Increased flexibility for process control

“This plant demonstrates that membrane filtration of wastewater, even on this scale, can work perfectly with the right process,” says Andreas Janot, who is responsible for the operation of the membrane sewage treatment plants at Erftverband. Together with Aquantis, a subsidiary of Veolia Water Solutions & Technologies, the Erftverband managers decided to modernize the plant using Simatic PCS 7. “Simatic PCS 7 offers a good, structured basis for programming, which makes it easy to expand or modify a plant,” explains Norbert Wegmann, head of automation at Aquantis. “We developed modules for the plant based on the PCS 7 style guide and used them to configure pilot solutions for the separate plant sections, which can then be easily integrated within the overall solution.”

“Cleaner water with less energy consumption is not a contradiction in terms – we can achieve both when we have good process control.”

Kinga Drensla, Technical Services Department, Research and Development, Wastewater Technology Section, Erftverband
Three Simatic Embedded Controllers run the plant

Alongside the system software, Aquantis also adopted a hardware configuration ideally tailored to the requirements of the Nordkanal sewage treatment plant. Three Simatic Embedded Controllers running the Simatic WinAC RTX software programmable logic controller (PLC) are responsible for controlling the plant.

Incorporating the new control system in the process data archiving and the operating data and fault signaling systems was also a simple matter: Aquantis uses a standardized interface for transmitting data to the Acron archiving system, while a Sinaut system manages the connection to Erftverband’s central systems. The results speak for themselves. In terms of energy consumption, the improved process control with PCS 7 led to considerable savings. In total, a reduction of around 20% was achieved.

New goals for research and optimization

“Our plant is also an ideal testing ground for a range of research projects,” says Kinga Drensla, who is responsible for wastewater technology research and development at Erftverband. “At present, for example, we are carrying out investigations for a publicly funded project to determine whether membrane sewage plants are capable of trapping trace substances and what level of hygienic requirements we can comply with. This will help determine whether membrane treatment of wastewater is a suitable technology for addressing a pandemic.”

Alongside such specific projects, the managers here naturally also continue to optimize regular day-to-day operation of the plant. Their work includes identifying aging processes associated with increased energy consumption, making it easier to identify when a component needs to be replaced. This improves no less than three aspects of plant operation: energy consumption, maintenance, and the efficiency of assets and capital investments. The next objective will be to step up remote maintenance and operations of the plant. Here, too, Erftverband, Aquantis, and Siemens are working closely together. “The issue of remote operation demands particularly close coordination of technology and staff – ultimately, it adds up to a new culture of plant operation. On this issue, again, we will be drawing on the technology and industry expertise of Siemens and Aquantis,” says Janot with a smile, obviously very happy about being a trailblazer in modern membrane sewage plants.

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Online survey by VDI/VDE GMA expert committee on virtual commissioning

Give us your opinion! What will simulation in process industries look like in the future?

How will the application of simulation change over the lifecycle of a process plant? The VDI/VDE GMA expert committee 6.11 on virtual commissioning, chaired by Prof. Dr. Mike Barth, has launched an online survey together with Mathias Oppelt (Siemens AG) and Prof. Dr. Urbas (TU Dresden). The objective of this survey is to assess both the current status and the vision of how simulation is applied in the lifecycle of a process plant. This will result in a technology road map for the application of simulation in the process industries, and you can influence the outcome of this road map by participating in this survey. All data are evaluated anonymously, of course. Please support this survey by contributing your expertise and your ideas for the future.

Be part of the survey and visit the following link (English language option available):
simulation-studie.de

Sitrain Solution Partner Program
Worldwide expertise

Solution Partners are an important pillar in Siemens’ range of services for the process industry. Siemens offers regular training courses that allow Solution Partners to stay up-to-date and continuously expand their know-how on the Simatic PCS 7 process control system. The range of services extends from refresher courses to intensive training. Sitrain trainers can be found around the globe – in Poland, Israel, and Canada, for example. They take in many regional impressions and contribute to making the training even more suited to the demands of the Solution Partners and the PCS 7 users in the region.

Read more about the Sitrain Solution Partner program online at siemens.com/processnews – or visit the Sitrain website: siemens.com/sitrain-solution-partner

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After almost two decades of huge investments, China’s process industries are maturing and entering a phase of slower but solid growth. In addition to a strong petrochemical base, increasing consumer spending creates growing demand for fine and specialty chemicals, and both domestic and global companies are investing in plants in that field.

Added stimulus is created by official initiatives that aim to encourage companies to invest in extending their value chains and competitiveness and create an industrial environment that promotes sustainability.

Recent projects that Siemens executed with partners in China reflect that trend. From a new plant for superabsorber polymers to solutions for emission monitoring, China’s process industries are readying themselves for sustained success on the global stage.

Learn more about these projects and the Chinese process industry market in the next issue of process news.

Learn how companies are implementing Siemens technology to increase their productivity, and browse through thought leadership articles on what drives the process industry today and what strategies can help address key industry challenges.

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Answers for industry.