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## GlassFocus 2016

Plant-wide automation and digitalization -  
the path to your company's success

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## Contents

Focus on digitalization	02-27
Plant operators	28-33
Equipment suppliers	34-47

# Focus on digitalization

# Networked means ready to work

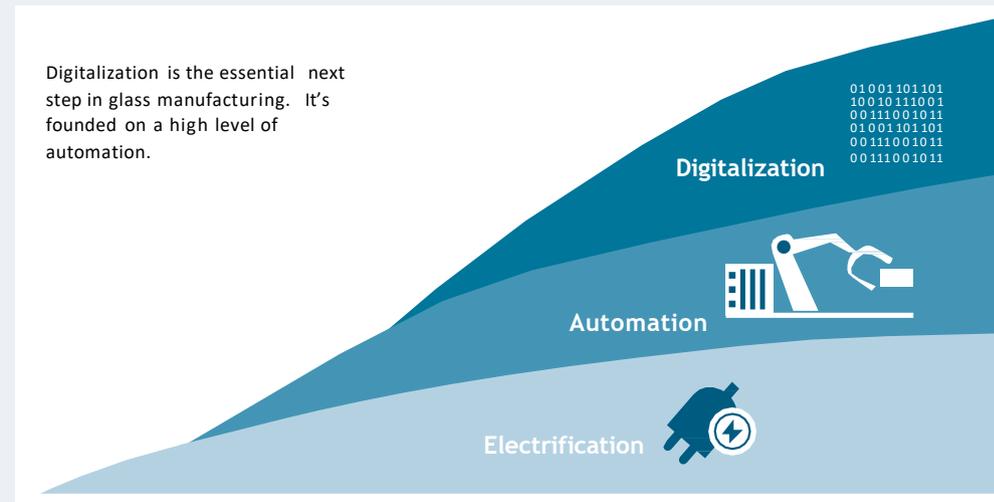
## Digitalization is opening up opportunities for the glass industry

As many plant operators know from their own experience, extensively automating a glass production plant promises sustainable success over the equipment's entire life-cycle. Now the industry is facing its next major change in business direction. If glassmakers are going to thrive in the world market, it is going to be more important to be able to generate, analyze, and utilize digital data from a vast range of sources – in systems planning, in construction and commissioning, during operation, and clear to the end of the lifecycle.

### The next strategic step

Regardless of the level of automation, every glass plant and equipment supplier is generating and collecting digital data. Until now, much of this information has been wasted. In order to optimize your plant, it is essential to assess all available data, combine it intelligently, and expand it using additional sensor equipment. Ideally, to achieve a "digital plant," a virtual representation of the plant section or the entire glass production plant – known as a "digital twin" – is built starting with the very first planning step. The digital twin makes it possible to steadily increase productivity and efficiency throughout the plant's lifecycle. There are many different scenarios that can be applied.

One thing is certain: Digitalization is the essential next step in glass manufacturing. Every company can profit from it, whether as an investor, glassmaker, equipment supplier, or systems integrator. The focus should always stay on the people, and the core organizers who will decide how the new technologies will be applied and used.



### The advantages of digitalization

#### For plant operators:

- Sustainable profitability, higher productivity, cost efficiency, and energy efficiency, thanks to
  - Greater transparency
  - Comprehensive planning
  - Reliable planning
  - Virtual commissioning
  - Malfunction-free operation
  - Avoidance of surplus capacity and bottlenecks
  - Faster product changes at the optimal time
  - Greater flexibility
  - More focused production to fit customers' quality requirements
  - Broader product range
  - Fewer rejects
  - Lower expenses for training
  - Optimized operation
  - Asset (performance) management
  - Resource optimization

#### For equipment suppliers:

- Simulation
- Safe, simple, low-cost remote maintenance
- Learning effects from field data
- Product lifecycle services and extended lifecycle services like modernization and update/upgrade services
- New business models based on performance guarantees

## Spotlight on digitalization

Digitalization means imaging the real world with digital data to mine the benefits. It calls for a comprehensive approach that includes all processes from the entire value chain. Digitalization can help the glass industry make its value-added processes faster and more flexible – in other words, it shortens time to market, increases flexibility and efficiency, and cuts energy consumption. At the same time, it safeguards or even enhances product quality. The talk these days is about the new stage in the evolution of production, what is known as Industrie 4.0: the networked company. Industrie 4.0 is driven by the digitalization of products, production, processes, and services. It's based on networking and communication as well as plant-wide automation. So the necessary data can be generated, gathered, centrally, and used.



All photos: Siemens AG

*“Digitalization can only go as far as people will go along with it.”*

**Oliver Krapp,**  
head of the glass business at Siemens

## A vision of digitalized glass production

The production plant's lifecycle can be subdivided into the following phases: product design, process and plant design, production system engineering and construction, operation, and services. At a digital company, these phases are no longer treated as a chronologically arranged chain of processes, but instead as a value-added process that delivers many forms of feedback to all phases. Data is gathered, transmitted, and analyzed at every phase – and that includes the relationships between the different phases.

At a digital company, all production steps and units are planned, tested, and modified with computer assistance. Long before the first glass melt, project designers develop a virtual reproduction of the plant. This digital twin enables them to determine in virtual tests whether the production system will meet the necessary requirements. The goal is to relieve the plant operator from going through the run-in phase for new equipment or product changes, so the plant can begin producing saleable glass right from the start.

This digital approach extends throughout the entire lifecycle. First, the system – or even parts of it – can be “commissioned” in a simulated environment. That makes it possible to remedy defects in the virtual system that would have involved unnecessary costs to correct in the physical system. After start-up, it protects the plant operator from unpleasant surprises, and essentially rules out the risk of delayed commercial operation.

In addition to commissioning, the operations can be simulated digitally, and Asset Performance Management can help glassmakers derive real-time transparency about production processes. That can extend the service life of the system components in a plant (assets), enhance the safety and availability of the plant as a whole, and help plan for necessary maintenance.

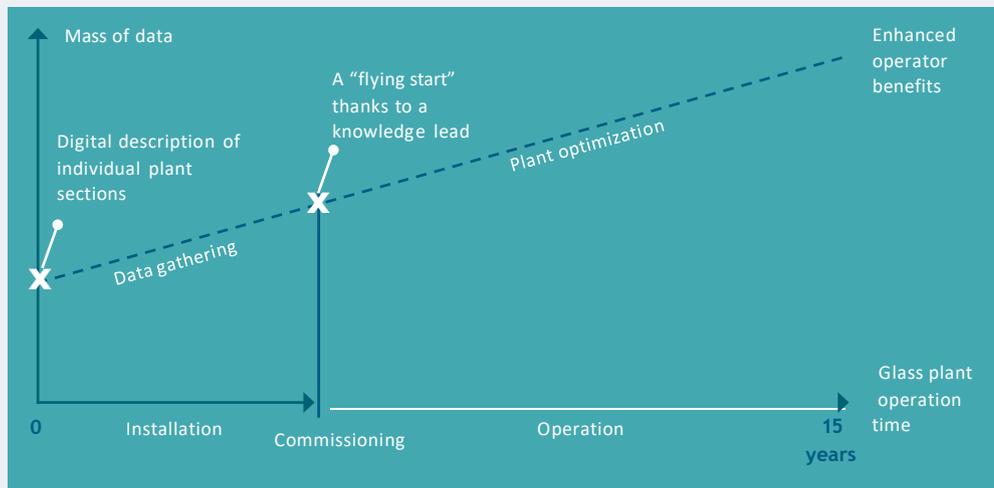
## How does it look in practice today?

Today many software solutions are not yet mutually compatible. It is not uncommon for data sheets to be printed out and input manually into a different system – a complicated process that tends to be prone to error.

Glass plants also have a large number of different systems from plant section manufacturers with their own individual solutions for automation, drives, instrumentation, switching equipment, and more. Digital production can't work with these “island” solutions. One of the biggest challenges is digitally combining the product design, the associated production systems and processes, plant design, and the actual glass production process itself.

Following the slogan “Ingenuity for life – Driving the Digital Enterprise,” Siemens is investing heavily in integrating hardware and software that will enable glassmakers to digitalize their value chain and merge real processes with digital ones. The “Digital Enterprise” solution can combine the planning and operations world to enable comprehensive plant management throughout a glass plant's lifecycle.

Siemens offers a portfolio of components. Its foundation is an integrated range of hardware, software, and services that make it possible to gather the vast quantities of



Digital data can be used to simulate commissioning – which makes it possible for the actual production system to get off to a “flying start.” During operation, the gathered data is continuously analyzed in order to optimize production.

data that the manufacturing process generates and put it to intelligent use – which makes it possible to digitalize the entire plant with an Integrated Engineering approach. All data is available centrally and in real time. That means users can use the identical virtual image of a system that was generated in the engineering process to simulate commissioning, operation, and maintenance, and to optimize them in real time. In other words, to make the transition from Integrated Engineering to Integrated Operations. Other elements that support a plant’s successful transformation into a Digital Enterprise are industrial communications networks, industrial security solutions, and data-based services.

#### Actual implementation

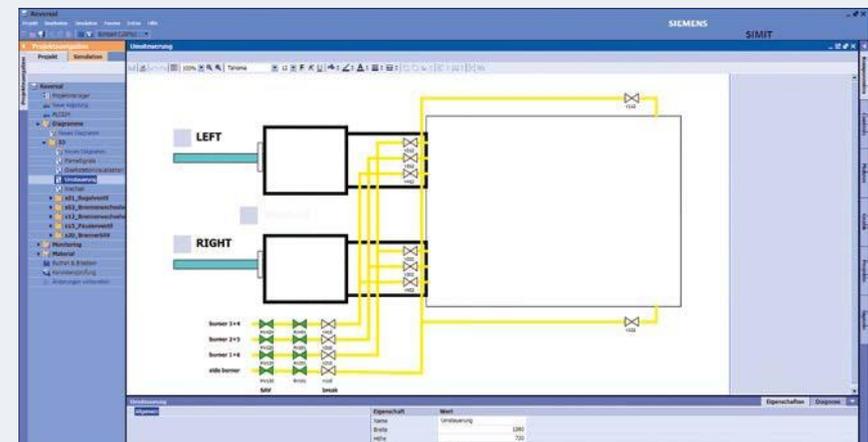
All equipment supplier work with computer assistance, and they develop valuable data in

the course of product and systems design. This data has been retained by the machine and plant manufacturer. The plant operator usually begins with no previous data generated prior to production start, but a digital data transfer – taking all relevant security issues into account (see box on page 9) – is conceivable: When plant operators buy the plant section, they can also buy the data and use it for the production phase. This “flying start” could significantly shorten time to market.

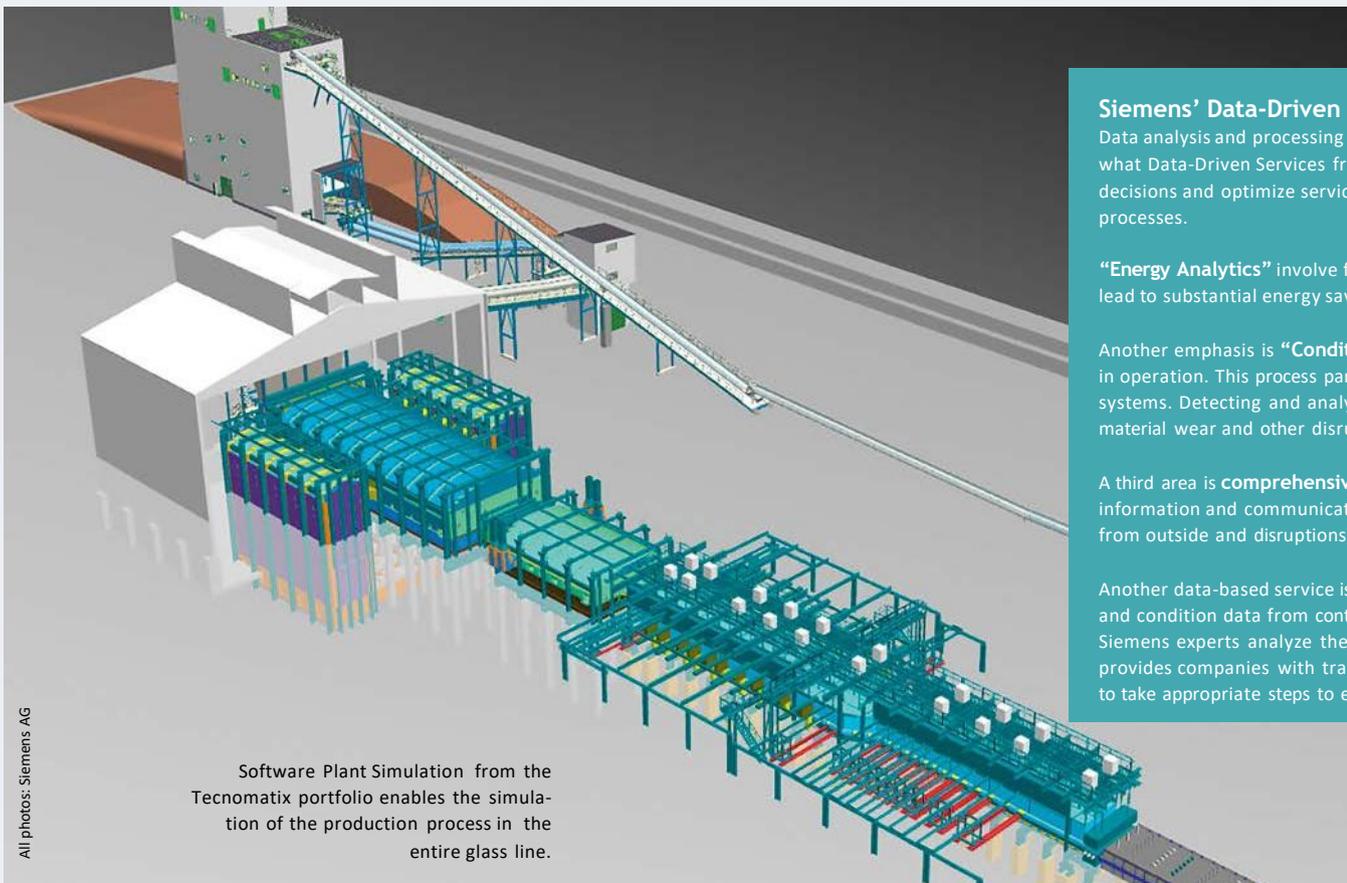
Planning tools generate large volumes of data that image the plant while the entire plant is still in the planning phase. The plant is simulated and tested virtually, for example, using Simit software. These findings can again be fully incorporated into the actual commissioning, enabling the plant operators to constantly expand their digital know-

ledge. The Comos planning tool provides the data foundation throughout the equipment’s lifecycle and feeds data to the digital twin. Analyzing the operating data in conjunction with data from commissioning and the design phase of the plant sections makes it possible to organize glass production more efficiently.

Take maintenance as an example. Historically, motors would undergo maintenance according to a fixed schedule. Now, significant wear factors like frequency ranges and ambient temperature can be recorded and updated continuously by means of the plant’s digital twin. This means that glassmakers can apply advanced data analysis procedures to predict when a component will fail. The glassmaker can service or change out the part at the optimum time and prevent damage and production downtime as part of a formal preventive maintenance program. Many OEMs are already offering this to customers as a service.



Simit makes it possible, for example, to simulate the control process for furnace firing.



Software Plant Simulation from the Tecnomatix portfolio enables the simulation of the production process in the entire glass line.

All photos: Siemens AG

### Siemens' Data-Driven Services

Data analysis and processing are what turns big data into smart data – which is exactly what Data-Driven Services from Siemens achieves. The goal is to support business decisions and optimize services on the basis of transparent production and business processes.

“Energy Analytics” involve focused data gathering and meaningful analyses that can lead to substantial energy savings.

Another emphasis is “Condition Monitoring,” which monitors systems while they’re in operation. This process particularly supports the availability of machines and systems. Detecting and analyzing the right data makes it possible to respond early to material wear and other disrupting factors as part of planned preventive maintenance.

A third area is comprehensive security solutions that reliably protect the full array of information and communication technology at industrial plants against cyberattacks from outside and disruptions from inside.

Another data-based service is “Control Performance Analytics.” It gathers process and condition data from control loops in the Simatic PCS 7 process control system. Siemens experts analyze the data and derive recommendations for action. This provides companies with transparency about their control loops and enables them to take appropriate steps to enhance efficiency, quality, and throughput.

### Step by step

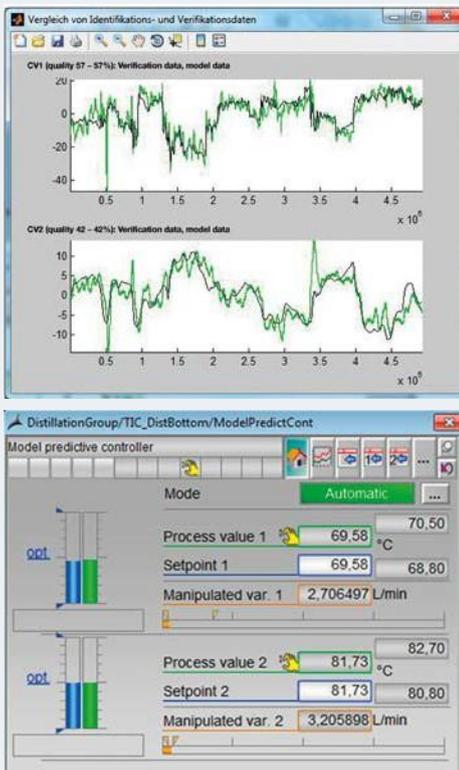
As sensible and useful as digitalization is, it is difficult to fully implement it in an existing system overnight. It is more effective to take small steps that promise success in the short term. It is conceivable that operators might choose one part of a system first, like the melting furnace. In a first step, they could use the digital data that the furnace sensors are already generating. In a second step, they could record and analyze an additional temperature or a pressure, and in a third step, they could connect this addi-

tional process information to a controller. Even if the additional temperature or pressure data is not crucial for the plant’s operation initially, it may help save energy or improve glass quality by maintaining constant temperature and pressure in the furnace. A small intervention or investment can yield tangible success, and that is how the plant can be gradually digitalized.

These scenarios make it clear that the intelligent factory of the future will not only enable greater flexibility and productivity,

but also provide more efficient use of energy and resource. Operations in a virtually tested plant run smoothly, preventive maintenance averts downtime, and rejection rates drop. The possibilities are significant.

Analyzing digital data can also help plant operators adapt quickly to market requirements, and make the right strategic business decisions. Product changes can be initiated at the right time, and be implemented quickly. For instance, a glassmaker can use Plant Simulation to simulate how



Model Predictive Control (MPC) in a process control system. Optimized control of furnace heating enhances energy efficiency and reduces wear.

different products can be produced most efficiently, or determine if there is value in manufacturing a new product in the existing plant. Producers can respond appropriately depending on market demand. Thanks to digital production systems and production data, it is possible to implement customer change requests on short notice, under control, in a reproducible manner, with documentation of systems technology at the right place and time in the process.

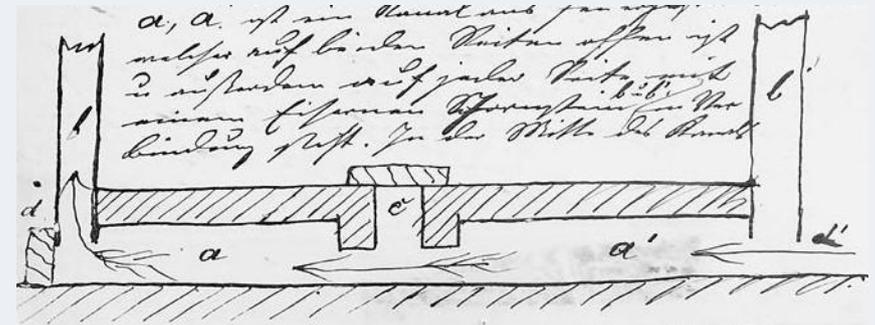
### Digital services

Digitalization also includes all services for customers, and therefore changes how equipment suppliers define themselves. Now OEMs can support plant operators better than ever in delivering the perfect glass for their customers – just in time, and at the lowest possible cost. These possibilities are creating new business models and customer relationships, as in preventive maintenance. With Lifecycle Analytics, Siemens offers an analytical software solution for remote preventive maintenance. It also makes it possible to define the operating data that can give manufacturers useful tips on how to improve their products and their production. Siemens supports equipment suppliers, and everyone involved in the glassmaking process can work together closely. Digitalization offers a significant benefit to all involved parties.

### New business models for OEMs

In specific terms, digitalization can mean that when plant operators buy from their equipment suppliers, they are not just buying the equipment but they are acquiring the associated planning and design data. Customers may not buy individual process operations, but rather production performance. They run the machines or process units, but they don't own them. The use of leasing models is prevalent in many industries. What's new is the potential for digitalization, which opens up new business models in the glass industry.

In the future the story wouldn't end with simply developing, making, and selling a furnace or cutter. Instead, the product would only be the beginning of the business model, because the equipment supplier would equip the product with sensors that would continuously record data and transmit it back to the



### Why do they call it Industrie 4.0?

The fourth industrial revolution was preceded by three other industrial revolutions founded on the invention of the steam engine, the electric production line, and the introduction of the computer. Friedrich von Siemens started the industrial revolution in the glass industry exactly 160 years ago by inventing the regenerative furnace in 1856.

manufacturer (also see information about MindSphere in the box on page 9).

Working in collaboration with the operator, manufacturers would gain deep insight into how plants operate. They can identify weak points and advise their customers accordingly. Intellectual property and expertise can be protected. New business models will emerge if the equipment supplier has digital data available. For equipment suppliers, it's an excellent opportunity to continually service and enhance their customers. Plant operators will also appreciate and benefit from the digital value added and be willing to pay for it.



Siemens AG

***“Digitalization starts when the first person in the chain works with a computer.”***

**Oliver Krapp,**  
head of the glass business at Siemens

Just to clarify further, here is an example of preventive maintenance from another industry: The Siemens Mobility Data Service Center in the Munich suburb of Munich-Allach monitors hundreds of trains worldwide and also gathers data. The Siemens experts can predict malfunctions on the basis of changes in temperature, rotational speed, or vibration in the axle bearings and order maintenance on the trains before they get stranded en route. This help from Munich keeps high-speed trains like the Velaro E between Madrid and Barcelona on time 99.9 percent of the time.

### Looking outside the box

Pioneering companies have already discovered these “disruptive” business models for themselves in other industries. Rolls-Royce is selling propulsion, instead of turbines, to airlines and calls the concept “Power by the hour.” Machine builder Kaeser is offering compressed air instead of compressors: It bills only for the cubic meters that the customer actually consumes.

Transferred to the glass industry, scenarios like these could be conceivable: billing for batch output instead of the batch-making equipment. Kilometers cut instead of the cutter. Smelting power instead of smelters.

In this last instance, the smelter manufacturer would guarantee that the plant operator gets the required smelting power at the agreed quality. It can promise this because it can be certain from digital data and virtual tests that the furnace can be operated at optimal efficiency. It is also conceivable that the furnace supplier might offer customers efficiency-enhancing upgrades. It can develop them because remote monitoring enables it to analyze data from the furnaces in operation, and see where there is potential for optimization. An additional service might be to offer end customers remote control of the smelting process.

### Using data strategically

If you want to stay ahead of the competition, you need to make entrepreneurial decisions at the right time – and digitalization is providing new and compelling opportunities to support them. You have to get the right data from various sources continuously, in real time, and analyze them. For that you need intelligent sensor systems, standardized communication among the various systems, and central archiving in a database – all of which are components of the concept of plant-wide automation. This is the foundation of all the scenarios described here, as well as for the vision of Industrie 4.0.

Most of the IT solutions needed for this vision are already available today. Yet a lot of interfaces still need to be defined and standardized. Siemens provides support from its portfolio in every area, so that plant operators and providers can master the transition to Industrie 4.0. Comos makes it possible not only to plan the entire plant in terms of process engineering, but also to set up and manage the database for the digital twin – a database that will also have a wide variety of other uses later on. For example, Simit and Comos Walkinside are useful for virtual commissioning and plant simulation, including training the operating personnel. The Simatic PCS 7 process control system has engineering interfaces that constantly gather and expand the digital data from these and other tools. Simatic PCS 7, in turn, is the interface to the higher-level systems like manufacturing execution systems (MES), management information systems (MIS), or enterprise resource planning (ERP).

When it's not a matter of designing a complete plant but planning and designing plant sections and products, the Digital Enterprise Software Suite offers a comprehensive portfolio of consistent software tools. The heart of the software suite is Teamcenter, Siemens' platform for collaboration. It provides the foundation for all the mutually compatible programs and tools from the Siemens Digital Enterprise Software Suite throughout the plant sections' lifecycle. In the development phase, this includes software programs from the Product Lifecycle Management (PLM) portfolio, which can be used to develop and optimize new products virtually. They include the Tecnomatix development program and the

### Security a top priority

Many equipment suppliers and plant operators have understandable concerns about the security of digitalizing processes and releasing data to partner companies. Even in a networked online world, business and product secrets must be securely protected. Many strategic ideas for the future won't be implemented without cybersecurity. Siemens offers its customers comprehensive security solutions and a secure infrastructure for Internet-based communication. "Plant Security Services" help minimize risk. This holistic approach is based on the latest technologies and on applicable security regulations and standards. Threats and malware are detected quickly, weak points are analyzed in detail, and appropriate and comprehensive security measures are initiated. Continuous monitoring provides plant operators with the

greatest possible transparency about the security of their industrial system, and therefore optimal protection for their investments at all times. "MindSphere - Siemens Cloud for Industry" provides an open cloud platform. Data is hosted on servers at SAP computer centers in Germany, where all customers are covered by the same rigorous security and data protection standards. An on-premises solution is envisioned for the future, when data will remain at the customer's site and be processed via MindSphere remotely. In addition to these technical features, it's very important for MindSphere users – whether they are plant operators or equipment suppliers – that whoever produces the data still owns the data. Only the owner can decide what data will be transferred to MindSphere and who can access it.

NX CAD tool. During the actual production phase, the automation tools based on Totally Integrated Automation (TIA) enter the picture.

Another tool's strengths come into play when digital information from the entire plant is going to be processed for various target groups during operation: XHQ Operations Intelligence filters and processes a vast range of technical and business data from a plant or a company's production chain. Operating staff and managers can watch the plant's performance in real-time and compare it against business targets. That enables users to make informed decisions about plant performance and necessary measures regarding plant availability. The close integration of Comos Plant Lifecycle Management solutions and the Simatic PCS 7 process control system means that real-time information is jointly shared.

### Digitalization: a necessity

Digitalization is the most effective strategy for improving your competitiveness. It will soon be a necessity in many industries including in the glass industry. Digitalization enables companies to make decisions quickly and knowledgeably, with an unheard-of level of quality based on facts. This taps new opportunities for optimizing the cost of operations throughout a plant's lifecycle. There's an important message that needs to be heard in all discussions of digitalization and Industrie 4.0: Digital data will be used only as far as people want it to be used. On the path to creating the Digital Enterprise, it is crucial to have every employee on board – because they are the ones who have to work with the new tools and systems. So it is always advisable to ask for ideas from within your own company and thereby encourage your own team to accept change.

“A source of ideas and solutions, and a trendsetter”



Dr. Bernd-Holger Zippe, Chairman of the VDMA Glass Technology Forum, a department within the VDMA Construction Equipment and Building Material Machinery Industry Association (VDMA-Fachverband Bau- und Baustoffmaschinen).

**Dr. Bernd-Holger Zippe, Chairman of the VDMA Glass Technology Forum, thinks the German mechanical engineering industry is well equipped for the digital age.**

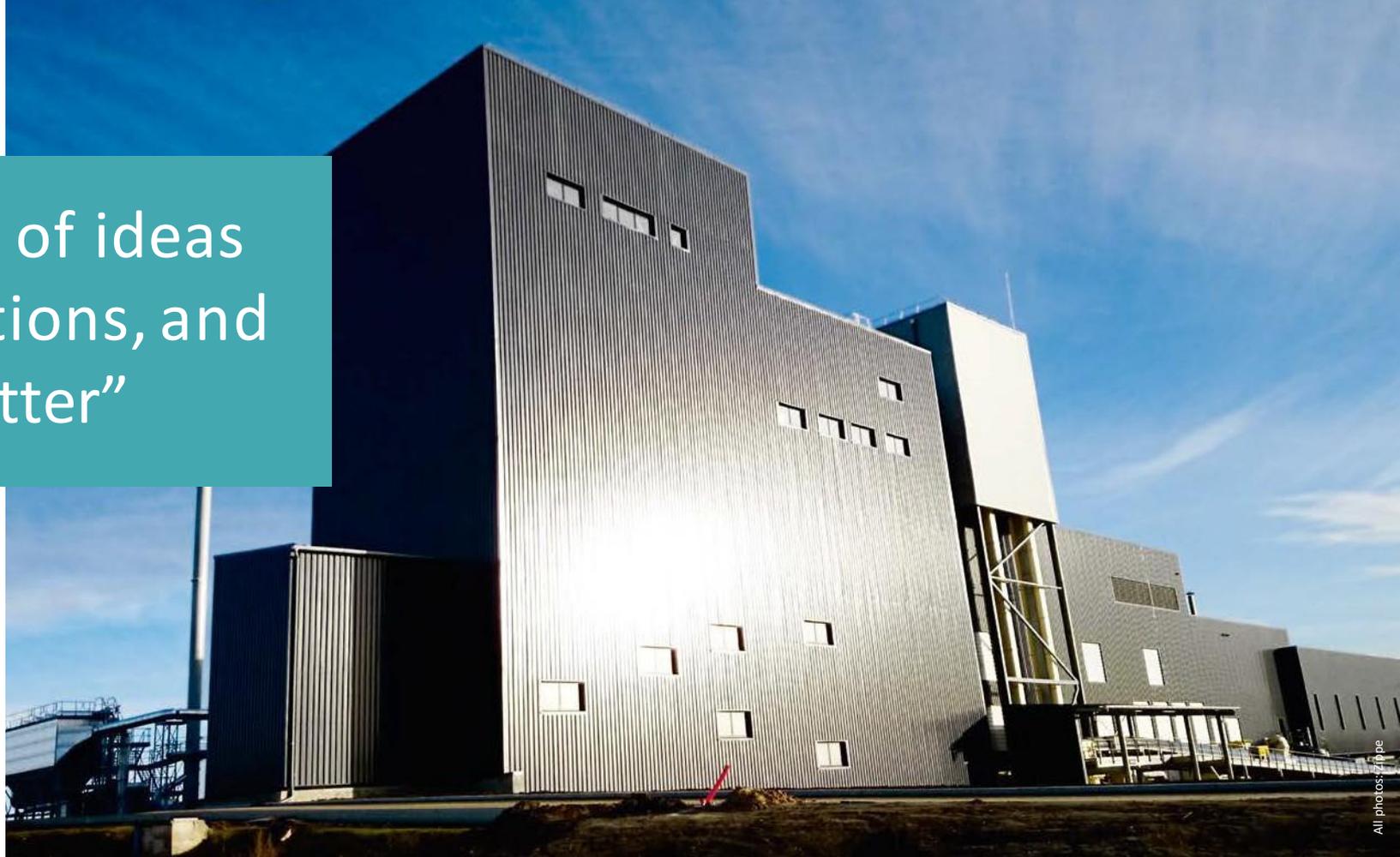
**Dr. Zippe, how important is digitalization to the Glass Technology Forum?**

**Dr. Bernd-Holger Zippe:** We are deeply involved in this area. All of the control systems used by all our member companies operate on a digital basis. And for the glass industry, networking individual production sequences within a glass foundry will become more and more important. Of course, this isn't completely straightforward when it comes to the suppliers to the glass industry, since almost every supplier company has its own control department and thus also its

own control philosophy. So it's important to find appropriate, practical approaches in this area. Approaches that will provide an end-to-end control solution and an end-to-end flow of information.

**Where do you see digitalization providing the greatest added value for mechanical engineers in the glass industry?**

**Dr. Zippe:** I think the greatest added value for our customers will lie in the fact that networking will enable different areas of the plant to communicate with each other. Our



member companies, Zippe Industrieanlagen for example, have already implemented this approach by putting in place the plant-wide automation concept. With this system, data can be exchanged between different business areas to optimize processes, save energy, or improve product quality.

#### Can you offer some examples?

**Dr. Zippe:** Targeted monitoring can reveal if one particular machine is using more power. The cause could be a worn bearing, which will cause power consumption to increase. The appropriate countermeasures or preventive maintenance can help deal with problems like this. Or to take another example, targeted information from the batch house and preheating can flow into the control system at the melting end. The data of interest here are the batch and cullet ratio and the batch temperature at the inlet. Staying with the batch houses for a moment, the proportioning time is always an important aspect. Monitoring the proportioning assemblies makes it possible to recognize and rectify any negative trends at an early stage, such as lengthy proportioning times or problems with raw materials. Interpreting all this data properly lets us always be sure we have set the best plant run times and parameters for proportioning.

#### Do you think digitalization may even lead to new business models?

**Dr. Zippe:** I'm absolutely certain of it. With regard to the plant-wide automation concept, for example, service providers function as system integrators. Interfaces will have to be defined here, to make it possible to combine projects by the various OEMs to form a multi-project. There is a greater need for a qualified solution provider at this

point. Likewise, customers can be offered an evaluation of the recorded data. Following a detailed analysis, process parameters can be improved to help increase quality, while saving both time and power. Networking, for example, also makes it possible for our member companies to provide support for customers by connecting to the control system using remote access (VPN).

#### What are the main challenges that still have to be overcome?

**Dr. Zippe:** I see the digital transformation as extending from more efficient engineering to plant manufacture, not just in implementing projects for our customers. As I understand it, digitalization and Industrie 4.0 also relate to the different divisions in-house. Mechanical and electrical engineering of glass industry systems, for example. In these areas, the engineering tools are growing closer and closer together. More efficient interfaces ensure that data and information are available across divisional boundaries. End-to-end consistency of engineering data prevents extra work and increases efficiency. And digitalization and simulation can enable the initial results to be viewed right at the development stage, or will let you take early corrective action at the engineering end.

#### What role do you see for Siemens in digitalization?

**Dr. Zippe:** I look at Siemens as a supplier, a source of ideas and solutions, and as a trendsetter. Our member companies are already using software tools for project development. Without these tools it would be much harder to achieve plant-wide automation, for example. Standardized interfaces for different OEMs make it easy to

share data and to have visual access to other areas within the glass works.

#### What would you like Siemens to provide in the future?

**Dr. Zippe:** I would like Siemens to take its range of products and services further and continue developing innovative engineering tools. Our member companies are always interested in using solutions that will help them implement glass industry projects with a high level of efficiency. From a sales aspect, there needs to be a greater awareness of the need for innovative solutions among our end customers. Integral solutions and the networking of individual plant areas have not yet developed into a comprehensive standard. This is where I would like Siemens to provide support.

#### Dr. Zippe, thank you for the interview.



VDMA member companies are already using software tools for project development. Without these tools it would be much harder to achieve plant-wide automation.

# Glass Futures – the name says it all



Glass Futures

Alistair Wallace,  
CEO of Glass Futures.



British Glass

Dave Dalton,  
CEO of British Glass.

**The ambitiously conceived “Center for Vitreous Materials” in northern England will seek to virtually simulate the entire glass manufacturing processes - creating a blueprint for other industries as well.**

**Mr. Wallace, as CEO of Glass Futures you are literally designing the future of the glass industry. What exactly is your plan?**

**Alistair Wallace:** Over the coming five years we will be building a campus in northern England following the theme of “Glass Futures.” On 4.5 hectares of land, four Centers of Excellence will be established that will be managed by Glass Futures and operated with the help of selected industrial partners. One will be dedicated to research and development, another to education and training, one will

be for production, and the fourth for virtual simulation and augmented reality.

**Mr. Dalton, as CEO of British Glass you are presumably enthusiastic about these plans?**

**Dave Dalton:** Definitely! Some €130 million will be invested over the coming years that will generate benefits for the entire glass community worldwide. What’s more, about 150 jobs for highly qualified workers will be created, which is important for Britain’s domestic glass industry. We’re eagerly

All photos: WilkinseyEye



### A closer look at digitalization

The people responsible for the “Glass Futures” project would like to be the first industry in the UK to virtually simulate entire production processes. Siemens technology will provide the basis for exploring every possibility that virtual and augmented reality can offer.

looking forward to applying the concepts of Industrie 4.0 to the glass manufacturing industry here in the UK.

### What will be the future centerpiece of the campus?

**Wallace:** The centerpiece will be a fully functional, industrial-size furnace that anyone can rent for research purposes. On a smaller scale, we will also be constructing production buildings for special glass, fiberglass, hollow glass, and float glass. Ideally, research outcomes will quickly produce prototypes that, in turn, will promptly turn into mature, market-ready products.

**Dalton:** While we’re aware that some manufacturers have their own research facilities, the needs-based provision of this kind of opportunity is something unique that promises to be very much in demand. Moreover, it’s the holistic approach of the campus that will promote and advance the industry: We’ll be sharing and disseminating production, technology, and management expertise.

### How did you actually come up with the idea for “Glass Futures”?

**Dalton:** It was at the end of 2012 that we originally started giving some thought to how specialized training programs for the glass industry could be established in the

UK. We thought about a “Glass Academy.” At that time we also sought advice from Siemens, and at meetings it quickly became apparent that we could actually go for something bigger – and that’s how the idea for “Glass Futures” came about, a Center of Excellence for glass manufacturers and their customers that would simultaneously be attractive to scientists and academia.

**Wallace:** Siemens really inspired us with their vision for the glass industry. Because ultimately, the technological horizon is not yet in sight – we can still make a lot happen, both for and within the sector.

### How is Siemens involved in your project, specifically?

**Wallace:** Siemens is our technology partner, and therefore acts as a door opener for others. It’s helpful for us when we can proudly declare to potential partners that Siemens has also promised us financial support.

**Dalton:** Right now we’re discussing what concrete things Siemens can do to lend us more support – for example, with automation and drive technology and in the fields of building services technology and traffic management, and also with training.

**Wallace:** For example, we’re working with Siemens UK to perform “audits” that will help us find out how Siemens equipment,

technology, and expertise can be used to reduce CO<sub>2</sub> emissions in future production processes.

**Dalton:** The support Siemens is providing has been invaluable to us. We’ve managed to save about nine months of valuable time just through their consulting, support, and many insights. We also find their corporate culture very refreshing because our contact people there are always sharing their visionary ideas with us and giving us ongoing encouragement.

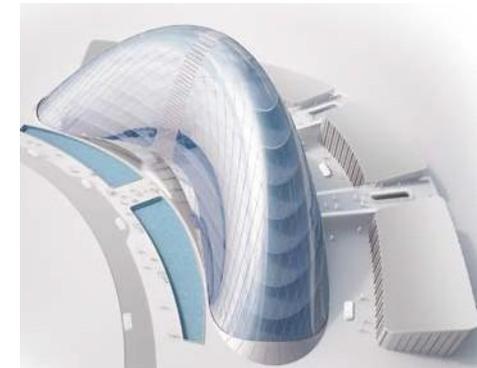
### What will the Center for Virtual Simulation and Augmented Reality be all about?

**Wallace:** That is our most ambitious sub-project. We want to be the first industrial sector in the UK to virtually simulate entire production processes. Based on Siemens technology, we’re banking very heavily on the possibilities of virtual and augmented reality.

### And when will construction of the campus begin?

**Dalton:** Optimally, we hope to start this year. But even if construction of the buildings is not completed, we’ll begin work in 2016.

**Mr. Wallace, Mr. Dalton, thank you very much for speaking with us!**



Glass will also play a leading role in the buildings’ architecture in terms of design, functionality, and sustainability.

### Partners for “Glass Futures”

As of today, the following business enterprises and organizations have already pledged their support: Siemens, Guardian Industries, the University of Leeds, and British Glass. Others will follow soon.

# Premieres and prizes with the Panther project

System integrator A&E Engineering and Siemens provided plant-wide automation for the most advanced glass veil line at Owens Corning (US) and introduced Simit for simulation and training purposes. Siemens was given the Value Creation Award for its work on the project.

When the subject of the Panther project comes up, everyone involved goes into raptures. There's a lot to celebrate: The construction of the most advanced glass veil line at Owens Corning involved numerous premieres and prizes. The new facility in Gastonia, North Carolina, also serves as a center of excellence for Owens Corning's glass-reinforced nonwoven materials business in North America. The plant produces a thin sheet of glass-reinforced material, called veil, which is used in cushioned vinyl flooring, suspended ceilings, gypsum wallboards, and carpet tiles. The company is based in Toledo, Ohio, and specializes in insulation, roofing, and fiberglass composites.

a range of international OEMs and define programming standards. Other milestones included the completion of Factory Acceptance Tests (FAT) in June 2015 followed by the manufacture of the first veil materials by Owens Corning in February 2016. "The most important element was the close professional collaboration across national and local boundaries," says Chip Brown, Senior Project Manager at A&E Engineering, looking back at the project.

## Efficient simulation and training with Simit

At an earlier stage of the project, Owens Corning had opted for a Siemens solution based on Simatic S7-400F PLCs and the Simatic WinCC/Siemens Industry Library for the graphic representation component. An overarching Profinet network was designed and implemented using Scalance switches.

## System integration on a global scale

As system integrator, A&E Engineering was first engaged in August 2014 to coordinate

Owens Corning built its ultramodern glass veil production system in Gastonia, North Carolina, and equipped it plant-wide with hardware and software from Siemens.

To facilitate the precommissioning tests for the programming and graphic representation, a test system was set up at A&E Engineering with four Simatic S7-400 PLCs with a fail-safe CPU 416F. These were interconnected with each other and the OS server using a Profinet network. The OS server was also connected to a number of operator stations to display and test the user interface. The Simit simulation framework was used for basic I/O simulation with custom charts for easy manipulation of the variables as required.

A&E has learned from other customer projects that Simit is invaluable for discovering and rectifying problems in addressing, programming flaws, graphics malfunctions, and basic configuration errors – all in a relatively safe environment where corrections can be easily made. “Furthermore, when used in conjunction with client-observed Factory Acceptance Testing, conflicts and errors in the basic functional requirements can be discovered early and fixed quickly,” says Brown, who headed the Panther project for A&E Engineering. “That would all take four to five times as long during the actual commissioning process in the field.”

Simit also plays a very important role in user training. Owens Corning wanted a training system that was self-contained and capable of mimicking dynamic process conditions as closely as possible. Simulation

### Value Creation Award for Siemens

Owens Corning honored Siemens with the Value Creation Award, which is given only to suppliers that provide measurable added value with their products and services. This project involved plant-wide automation, the use of Simit, coordination between OEMs, and “the impressive services from Siemens” – in conjunction with Siemens Solution Partner A&E Engineering.

“narratives” were developed and programmed in Simit. The goal was to have a user sit at a computer viewing the same graphics used in the real environment and interacting with identical versions of the real PLC programs. The user would be able to go through the same start-up procedures and witness the realistic dynamics of the glass veil process. The operator also asked for additional specially designed user screens for training purposes. Users can select any one of 10 unknown process “disturbances” that are introduced into the system via Simit, and they are then required to identify the nature of the “disturbance” and take the necessary corrective action.

To accomplish this, A&E provided a Simit solution in conjunction with the new Virtual Controller (VC 3.0). This enables a PC to be used instead of actual PLC hardware, with the real PLC program being loaded onto the VC. Simit is directly connected to the VC and makes the necessary I/O functions available.



Owens Corning is based in Toledo, Ohio, and specializes in insulation, roofing, and fiberglass composites.

*“Simit proved to be a highly efficient process simulation tool for precommissioning, factory acceptance testing, and training, and therefore is a success factor for us. We will be sure to use Simit for all projects like this in the future.”*

**Wim Weeres,**

Technical Director for the nonwoven business at Owens Corning



The manufacturer uses the Simit simulation framework for process simulations. It allows them to identify errors in addressing, programming, graphics, and basic configuration at an early stage, and it also provides intensive training for users.

# Full speed in the digital transformation



All photos: Fuyao



Norbert Geisinger,  
CEO of Fuyao Europe GmbH.

**How the largest Chinese automotive glass manufacturer, Fuyao, is accelerating its global growth with highly automated and networked systems. An interview with European CEO Norbert Geisinger.**

**Mr. Geisinger, the Fuyao Group is rapidly increasing the pace of its global expansion. Can you list the most important milestones over the past three years?**

**Norbert Geisinger:** That's right: In 2013 we opened the first factory for completing automotive glass production outside China, in Kaluga in Russia, and then another in Dayton in the US in 2015. This year we've acquired an 85,000-square-meter site near Heilbronn.

**Can you reveal any more details at this stage?**

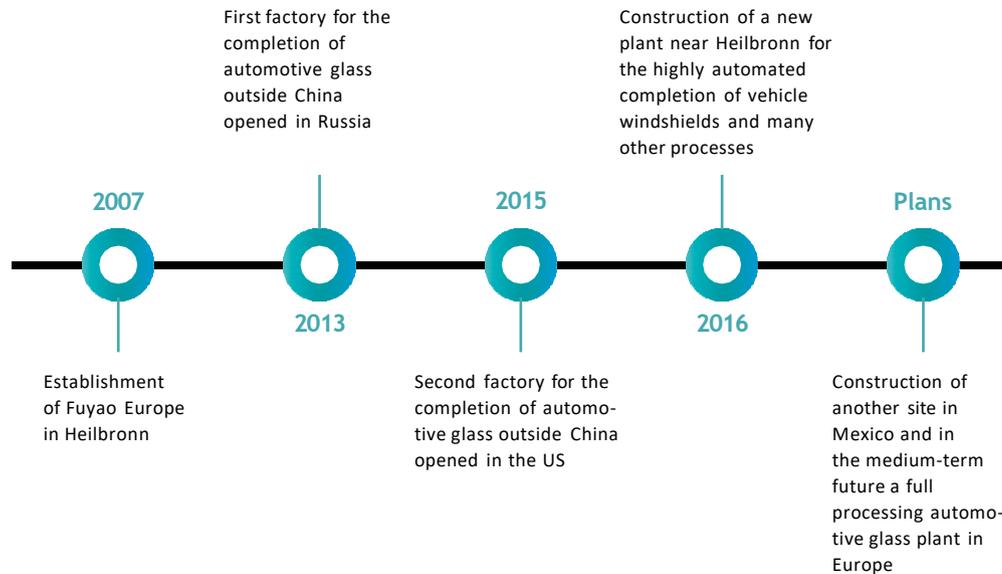
**Geisinger:** Starting in October we'll be building a new plant there for the comple-

tion of vehicle windshields in a highly automated process. It will also perform overmolding of side windows with TP/PVC and encapsulation of glass sunroofs with polyurethane foam. If everything goes according to plan, we'll be able to put the plant into operation in October 2017. Our production and storage area will then total approximately 40,000 square meters.

**How important is this major expansion of the German location for Fuyao?**

**Geisinger:** Germany is definitely the most important market for Fuyao in Europe, which is why we set up Fuyao Europe in Heilbronn back in 2007. Right now we're

## Milestones and plans at the Fuyao Group



utilizing a total area of about 15,000 square meters for the manual completion of vehicle windshields; the planned enlargement of the site is therefore substantial. However, I must be clear that our market share in Europe is still very low, but we aim to reach 20 percent in the medium term.

### As a Chinese company in high-tech Germany, you will certainly attract attention ...

**Geisinger:** Yes, in the positive sense. Our German customers in particular will very much welcome this step. And for us it's a very important strategic project.

### What about digitalization?

**Geisinger:** In the new building we will implement everything that is currently feasible and practical in alignment with Industrie 4.0.

### What expectations do you have?

**Geisinger:** A lot: Thanks to digitalization we will be able, for example, to trace our products. Our production processes will also be significantly optimized. Basically, in the future we'll be able to interconnect and control our process with the appropriate tools. We'll be able to access all essential factory data from anywhere, and planning reliability at Fuyao will increase significantly.



### Digitalization under the microscope

The Fuyao Group will implement everything that's currently feasible and practical in alignment with Industrie 4.0 at the greenfield plant near Heilbronn. Siemens will partner with the company in factory planning and networking.

### How can Siemens partner you along this path?

**Geisinger:** In Siemens we see a highly competent partner that is extremely experienced in virtually all areas. That's why Siemens will partner with us in the areas of factory planning and networking. The issue of plant-wide automation is of great importance to us.

**Mr. Geisinger, thank you very much for speaking with us!**

# Solid reasons for digitalization



Jarmo Näppi,  
Vice President of Glass Technology  
at Lahti Precision.



## How Jarmo Näppi is getting the Finnish batch-house specialists at Lahti Precision in shape for Industrie4.0.

**Mr. Näppi, the glass industry has a rather conservative reputation. How are you approaching the issue of digitalization?**

**Jarmo Näppi:** You're right: Like other traditional industries, the glass industry takes a bit longer to pick up on and embrace new technologies. But if we can demonstrate that operating costs can be significantly reduced over the lifecycle of a manufacturing facility, then there will be no getting around digitali-

zation. That's why we want trailblazers that others will follow.

**It feels like the right moment has come. Would you agree?**

**Näppi:** Definitely: because even individual components are being designed as smart devices. No longer are process control platforms the only systems that are able to communicate their status; networked sensors

and actuators can do this as well. Entirely in keeping with the Internet of Things, our customers will soon be able to access our scales data from a cloud service.

#### How will this change your business?

**Näppi:** As a fairly small company, we are agile and can quickly assimilate new technologies and transfer them to our core business. And we're in the thick of an ongoing transformation that will undoubtedly change our business. It's possible that everything in the future will shift more toward service provision.

#### How would that look?

**Näppi:** For example, our customers could view important performance parameters online, regardless of location or time of day – even from mobile devices, if secure data transfer is ensured.

#### How is Siemens supporting your efforts?

**Näppi:** As a Solution Partner of Siemens, we're of course always keeping pace with the newest trends, and we greatly appreciate sharing ideas and information with Siemens and its other Solution Partners. Even more important for us, however, are the training courses and product presentations by sales. Since the early 1990s it's been a pleasure to be able to count on Siemens to help us meet our glass customers' needs, relying very frequently on automation and control systems as well as drives, converters, and field devices from Siemens.

#### What is it, generally, that makes you opt for Siemens?

**Näppi:** When you invest in Siemens technology, you're investing sustainably. For me personally, I value the availability, reliability,

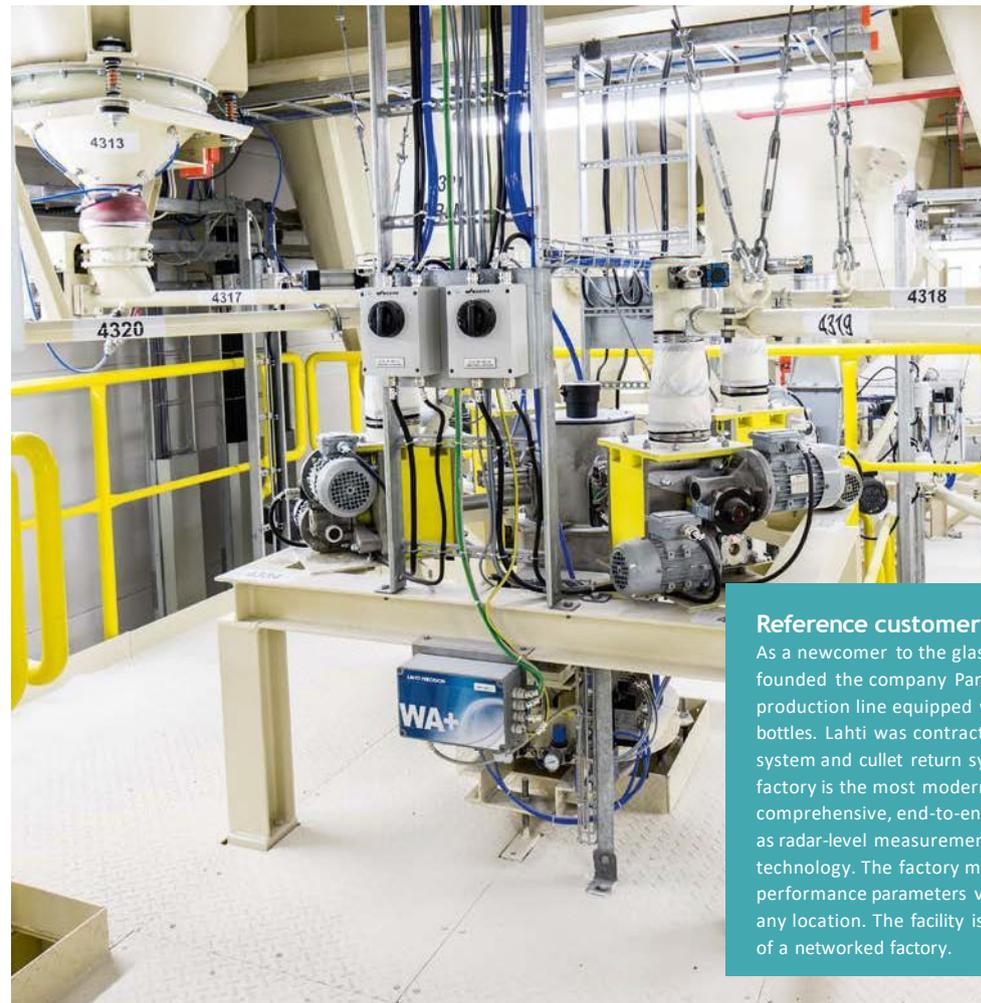
and coverage. What's more, the Finnish Siemens team provides us with excellent support in a spirit of partnership.

#### What would you like to see in your future collaborative efforts?

**Näppi:** The best thing Siemens could do would be to continue offering state-of-the-

art platforms and components for demanding automation projects. It's therefore my wish that Siemens continues to invest in R&D, as they've been doing all along, while leaving room in the market for customer-oriented niche solution providers like Lahti Precision.

**Thank you very much, Mr. Näppi.**



Lahti Precision is a Finnish company specializing in bulk materials handling that employs a workforce of 150. The firm's core competencies include materials dosing, weighing, and mixing as well as handling and services. Lahti's customers originate not only in the glass industry: The gypsum, cement, and other process industries also strongly value Lahti as one of the world's leading vendors of house-batch, gypsum, and cement handling systems.

#### Reference customer Park Cam

As a newcomer to the glass industry, the Ciner Group in Turkey founded the company Park Cam and established a complete production line equipped with two furnaces for making glass bottles. Lahti was contracted to supply a batch-house processing system and cullet return system. The highly productive glass factory is the most modern of its kind in Turkey, benefiting from a comprehensive, end-to-end automation and drive solution as well as radar-level measurement methods based on Siemens technology. The factory management and owner can access all performance parameters via a cloud service at any time and from any location. The facility is considered to be an exemplary model of a networked factory.

# Successfully entering new territory

All photos: Rumans Photography

**Gallo Glass was the first place that the Sorg Group implemented a solution for plant-wide automation based on Simatic PCS 7, and their initial experiences with Simit were excellent.**

The total package tipped the balance: To modernize its plant during operation, the US glass manufacturer, Gallo Glass commissioned EME Maschinenfabrik Clasen GmbH to plan and upgrade the batch plant and parts of the cullet return system at its glass bottle production facilities. Because these projects are always accompanied by an automation system, Siemens also participated as a longtime supplier for the Sorg Group. "What was probably decisive was that, with the batch plant from EME and the melting tanks from its sister company Nikolaus Sorg, we were able to supply core technology from a single source," explains Roger Knüttel, Manager of the Control Engineering Department at EME. "This



For the first time, the US company Gallo Glass chose the plant-wide automation concept from Siemens for the conversion of its plants.

meant one interface less and a seamless automation concept."

### **Gallo Glass implements solution for plant-wide automation for the first time with Siemens**

With the now completed upgrade of the batch plant at the glass production facilities located in Modesto, California, EME was able to go one step further on behalf of its customer and implement an end-to-end, cross-supplier automation system based on the Simatic PCS 7 process control system. "The switch to Siemens was new territory for Gallo Glass," says Knüttel, stressing the importance of the project. It was a complex task, especially since there are several hundred different combinations and transportation routes that the batch can follow within the batch plant and on its way to the melting tanks. With the Siemens Siwarex U and Siwarex FTC weighing modules, it was also possible to integrate weighing applications directly into the automation system.

### **Redundancy for greater flexibility and operating reliability**

Originally, the four melting tanks in operation were supplied by two batch plants, with the tanks assigned to a specific plant. This meant a relatively high deployment of staff to operate the two plants. With the new

solution, the demand on the operators is significantly reduced because the new system, including the control system, is fully redundant: weighing, mixing, and transport to the tanks. The result is a tremendous increase in flexibility and operating reliability at Gallo Glass.

### **Virtual commissioning with Simit**

In addition to its first-time use of Simatic PCS 7, EME also successfully premiered Simit. "The Gallo Glass plant is so complex that Simit was essential for us for conducting tests and evaluations. It optimized our engineering and substantially shortened the commissioning time," says Knüttel. "We're positively astounded by the simulation platform."

### **Praise from all sides**

Gallo Glass's converted plant has now been in operation since August of 2015, and the company has been impressed by EME's consulting, project planning, and implementation services. The excellent support throughout all project phases was especially important to the plant operators, a compliment that EME gladly passes on to Siemens: "Siemens' products and especially its support are exemplary; there isn't a competitor that comes anywhere close," says Knüttel.

# “High level of trust”

Roger Knüttel from EME Maschinenfabrik Clasen GmbH, on the benefits of digitalization - based on the example of Simit.

**Mr. Knüttel, when was your first encounter with digitalization at EME?**

**Roger Knüttel:** In 1994 the Sorg Group – and therefore we at EME – became the first to recognize the possibilities and implement the philosophy of plant-wide automation in the glass industry. We’re still committed to this philosophy today, and we operate accordingly. I would say that plant automation based on this principle is one of EME’s distinctive characteristics.

**What are the areas where you think the principle of digitalization especially pays off?**

**Knüttel:** In virtual commissioning and plant simulation with Simit. But we also benefit from the template-supported automated planning of plants using modern control systems like Simatic PCS 7 and Simatic S7 with Simatic WinCC AS-OS transfer.

**Can you quantify the added value?**

**Knüttel:** With Simit, we’re able to test our plants and put them into virtual service beforehand, with no mechanical or electrical hardware involved. Faults are detected and corrected and the actual commissioning time at the building site is significantly reduced. Thanks to Siemens’ modern development and project-planning environments, we can plan and test plants in about one-

third of the time. Just 15 years ago it took us three times as long.

**What else impressed you about Simit?**

**Knüttel:** In addition to faster commissioning, it was the obviously higher engineering quality, lower costs, reduced risks, and the fact that we could use Simit to train customer personnel.

**Do you see even more potential for plant-wide automation?**

**Knüttel:** Our main focus is on the plant-wide automation of batch plants and melting tanks – but we’re also interested in integrating other parts of the glass factory at the customer’s request.

**That must be difficult sometimes, isn’t it?**

**Knüttel:** Ultimately, it all depends on economic factors as well. We have to find the areas that make economic sense and offer the user added value.

**How can Siemens best support you in this?**

**Knüttel:** With good consulting and support services and intelligent, networkable products. And by continuing the intensive, productive collaboration with our automation experts. Siemens is definitely a key supplier for EME. Choosing an automation



EME specializes in the networking of batch plants and melting tanks.

platform and making it your standard requires a high level of trust and a mutual partnership.

**What would you like to see from Siemens in the future?**

**Knüttel:** As a Group and world leader in automation solutions, Siemens should respond even more vigorously to market demands and convert them into new products – entirely in line with Industrie 4.0. I think it’s important that Siemens understands the demands that the batch process places on automation, which the experts at EME are extremely familiar with, and work with EME to further optimize the specific solutions.

**Mr. Knüttel, thank you for speaking with us.**

## Digitalization up close

Thanks to Siemens’ modern development and project-planning environments, EME plants can be planned and tested in about one-third of the time compared to just 15 years ago.



All photos: EME

Roger Knüttel, Manager of the Control Engineering Department, has been with EME since 1992 and established the Control Engineering Department there.

# More transparency on the scales

Requirements for a  
modern weighing  
solution in the age  
of digitalization.



The answer to increasingly networked production: the new Siwax WP521ST electronic weighing module from Siemens.

Weighing and metering technology plays an important role in batching plants, from the vehicle weigh bridge through static weight measurements of silos, and metering the batch in the mixer to recording and controlling delivery volumes on conveyor belts. In addition to the usual requirements for measuring technology and reproducibility specific to scales, it's also necessary to guar-

antee high operating reliability and simple operation. These functions are usually addressed by autonomous systems that are connected to the process controller via many different interfaces. However, in the age of digitalization, factors like the consistency of hardware and software, standardization of components and tools, and flexibility play a central role. As a result, they are increasingly

crucial in the choice of an appropriate solution architecture.

## Automation with integrated weighing and metering technology

As a specialist in automation technology, Siemens views the weighing process as an integral component of the control system and offers a comprehensive range of



With its Siwax portfolio, Siemens meets all the requirements of a modern weighing solution in the age of digitalization.



Seamless integration in the Simatic PCS 7 control system with the Siwax functional modules.

hardware and software: the Siwax product family. It is fully compatible with the Simatic automation system, and the advantages are self-evident. Direct incorporation in the system for end-to-end communication makes additional interfaces unnecessary and allows simple scalability and expandability of the weighing system: for example, for the implementation of additional control functions on the scales. The use of standard modules as well as standard software guarantees an open-concept, standardized operation and straightforward handling. Construction, function, and cross-series compatibility follow the Simatic philosophy and provide high plant availability. Tailored, low-cost system integration is made pos-

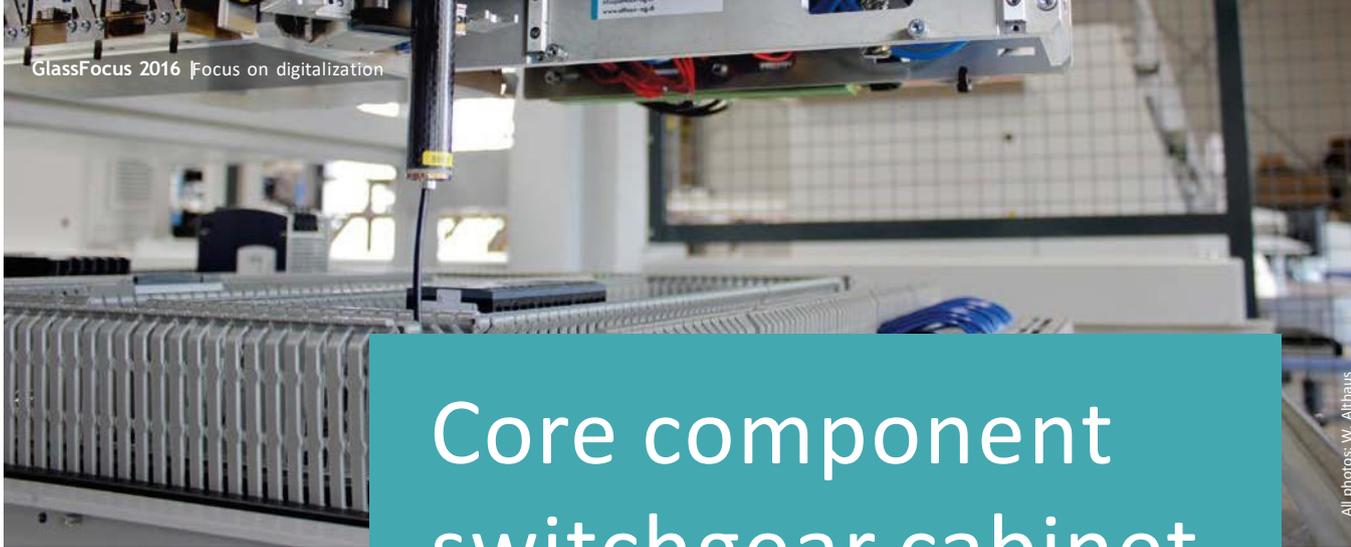
sible by existing, multilingual standard modules. This shows how the conceptual integration of weighing technology in modern automation systems plays a strong role in boosting the company's success on an ongoing basis.

#### Transparency anywhere at any time

In addition to the Simatic bus, the RS485 and Ethernet interfaces offer more options for visualizing multiple weighing modules on a touch panel, or even independent of location via the new Sm@rtServer concept. This enables mobile, location-independent monitoring and operation of all parameters and functions stored on the panel via the Sm@rtClient app on a smartphone or tablet.

#### Siwax complete portfolio for weighing and conveyor technology

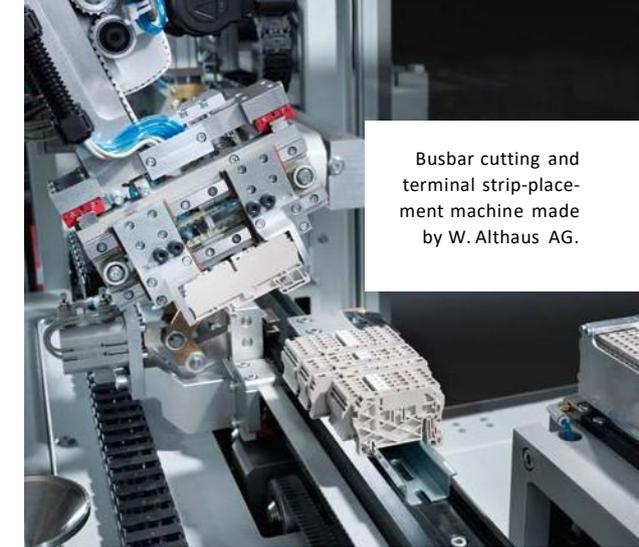
Siemens has marketed components and solutions for weighing systems for more than 50 years and has built a comprehensive portfolio: load cells and built-in units form the basis of every weighing device. The broad spectrum of Siwax weighing electronics meets virtually every requirement, either integrated in Simatic S7 or PCS 7 or as a stand-alone weighing terminal, in a compact or higher-performance version. Belt scales, weigh feeders, and solids flow meters cover the full range of continuous weighing processes.



First wiring robot worldwide at W. Althaus AG.

# Core component switchgear cabinet

All photos: W. Althaus



Busbar cutting and terminal strip-placement machine made by W. Althaus AG.

*“Smart manufacturing offers us and all other small and medium-sized automation specialists a great opportunity to become a smart value-added partner instead of a contract manufacturer that can be substituted and replaced.”*

Walter Althaus,  
Managing Partner of  
W. Althaus AG

Siemens Solution Partner Althaus in Switzerland has made a name for itself as an automation specialist in the glass industry.

W. Althaus AG is a family business in Switzerland that was established in Aarwangen in the Canton of Bern in 1968 and now has more than 100 employees. Its core expertise is in the development and manufacture of products ranging from straightforward electrical controls to complex automation solutions – including for the glass industry. As a full-service company, Althaus offers a wide range of services comprising consulting, engineering, system delivery, switchgear cabinet construction, installation support, commissioning, and training.

### Switchgear cabinet as core component

“A switchgear cabinet is the core of a system, a machine, or a building. That’s why we attach considerable importance to pro-

viding our customers with expert and initial system-neutral consulting, analyzing the requirements in detail, planning the project carefully, and setting high quality standards for products, processes, and materials. We also aim to achieve a visually appealing, compact, yet easily accessible switchgear cabinet solution,” states Managing Partner Walter Althaus.

### Fully automated processes

For its flexible and customized switchgear cabinet production operation, Althaus relies on fully automated processes with optimally adapted depth of production. “The high degree of automation enables us to achieve very high and consistent quality under competitive conditions,” says Althaus. By

creating the first wiring robot in the world, Althaus has been breaking new ground in the automation of switchgear cabinet construction. Examples of applications include float glass plants (modernization measures and new plants) and glass processing plants.

### A Siemens Solution Partner - with conviction

Many years of experience in the glass industry using Siemens products and solutions – including the automation system Simatic S7, the visualization system Simatic WinCC, and the motion control system Simotion – motivated Althaus to become a Siemens Solution Partner. Althaus describes it in a nutshell: “From our viewpoint, Siemens’ product range, consistency, and support add up.” He continues, “Our customers report that what they appreciate about Siemens in particular is the consistency of the solution, from the drive to the visualization.” Ultimately, the people who are profiting from this interaction between Siemens solutions and the in-depth planning and engineering expertise of Althaus in the glass industry are exactly the right ones – namely, the customers.

## “Smart manufacturing offers a huge opportunity”

Walter Althaus on the potential of digitalization from the point of view of an SME and system integrator.



**Mr. Althaus, if smart manufacturing is the recipe, what ingredients are needed?**

**Walter Althaus:** To begin with, digitalization of data and information is a basic requirement. However, digitalizing data consistently over the entire vertical and horizontal process chain is also crucial.

**Wishful thinking or reality?**

**Althaus:** From what I observe, this finding is gaining increasing acceptance among glass producers, plant equipment suppliers, and also system developers. This shared understanding increases the possibilities and accelerates the trend.

**What possibilities do you mean?**

**Althaus:** Smart manufacturing offers us and all other small and medium-sized automation specialists a great opportunity to become a smart value-added partner instead of a contract manufacturer that can be substituted and replaced. That's because

all players can now network more effectively so that we can implement larger, more efficient, and higher-quality solutions.

**And the actual value added from this?**

**Althaus:** We become more competitive across all important parameters: costs, efficiency, flexibility, and finally, quality.

**Can you offer any concrete examples?**

**Althaus:** Digitalization makes our engineering faster – and also, for example, our switchgear cabinet production – so that our customers can in turn use this extra time to order from us at shorter notice or even request just-in-time deliveries.

**What else could be possible?**

**Althaus:** Think of digital manufacturing documentation and production data. Thanks to this data, we can also process last-minute change requests from customers in a controlled and transparent way, and

create documentation systematically at the right places and at the right time – with no loss of quality whatsoever.

**In what specific ways can Siemens support you in this transformation?**

**Althaus:** With its innovative product range! To me, this includes technology, design, and the availability of digital data and information – because this is the only way that products can be optimally automated. And finally, our success is critically dependent on qualified contact partners with which we continually exchange ideas.

**Mr. Althaus, thank you very much.**

### Siemens products and solutions in service

Althaus is firmly committed to system neutrality. Based on its great experiences over many years, Althaus is happy to use the following products and solutions from Siemens:

**Automation system**  
Simatic S7

**Visualization system**  
Simatic WinCC

**Motion control system**  
Simotion

**Industrial switchgear technology**  
Sirius and Sentron

**Frequency converters**  
Sinamics

**Power supply**  
Sitop

# Production on demand

The engineers at Grenzebach have come up with the idea of a mobile and flexible branch line and are eagerly awaiting market feedback.

The high-tech company plans, manufactures, and delivers complete plants for the production and processing of flat glass with industrial-grade automation equipment for process monitoring and quality inspection.



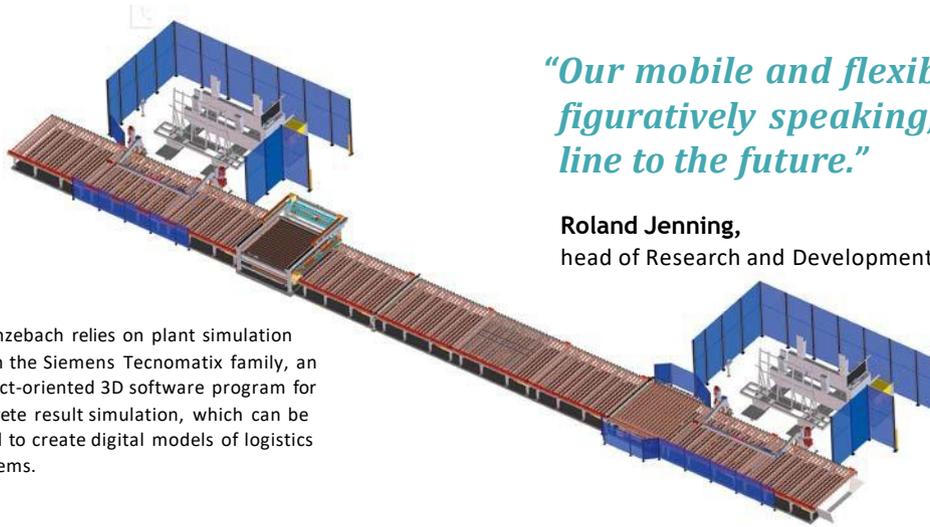


Roland Jennings, head of Research and Development at Grenzebach.

*“Our mobile and flexible branch lines are, figuratively speaking, a promising direct line to the future.”*

**Roland Jennings,**  
head of Research and Development at Grenzebach

Grenzebach relies on plant simulation from the Siemens Tecnomatix family, an object-oriented 3D software program for discrete result simulation, which can be used to create digital models of logistics systems.



Industry is undergoing a period of transition, and Grenzebach has traditionally played a very active role in furthering new trends. The high-tech company plans, manufactures, and delivers complete plants for the production and processing of flat glass with industrial-grade automation equipment for process monitoring and quality inspection. The Bavarian company was quick to take on board the mindset behind Industrie 4.0. For example, it has been simulating its plants for many years and is a pioneer in the sector. Roland Jennings, head of research and development, relies on plant simulation from the Siemens Tecnomatix family, an object-oriented 3D software program for discrete result simulation, which he and his colleagues can use to create digital models of logistics systems. These models can be used for running “what if” scenarios without affecting existing production systems. These models are already employed in planning at Grenzebach long before the actual systems are

installed at the so-called cold end of the glass production line. With these analytical tools it is possible, for instance, to identify bottlenecks and analyze different production scenarios and optimize them directly.

#### **Innovative idea of a mobile and flexible branch line**

With their latest study for the glass industry, the enterprising plant equipment suppliers are hoping to arouse the interest of customers at glasstec 2016 in a mobile and flexible branch line. “The requirements of flat glass manufacturers are changing in ever shorter cycles. For example, new cars are always coming on the market, and this calls for innovative car windows,” explains Jennings. Because float lines now can operate 24 hours a day for more than 15 years, they can only produce glass panels in a limited range of sizes, which must be known at the time of construction of the plant. To enable glass manufacturers to react spontaneously to new requirements,

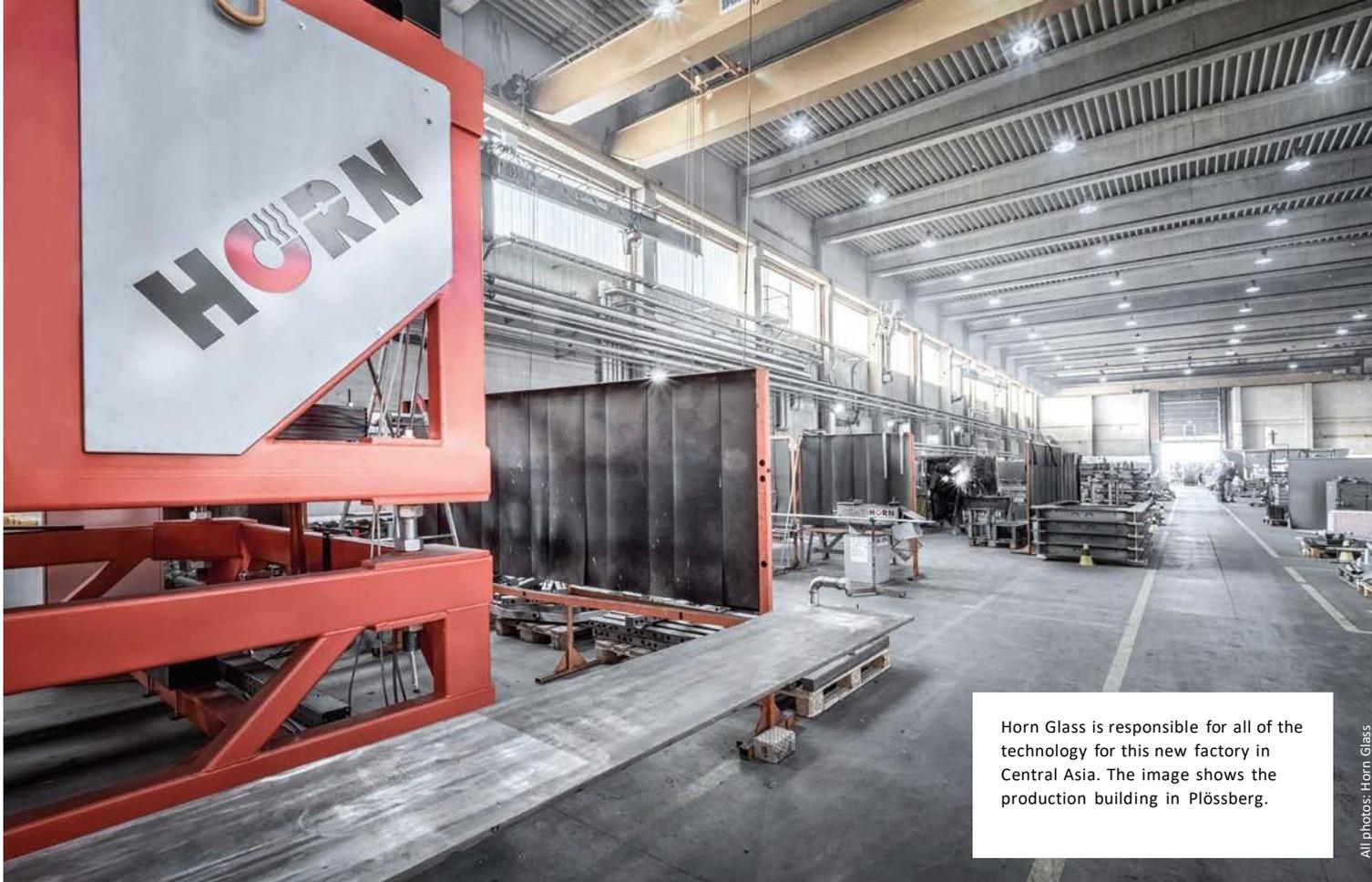
Grenzebach is now developing a concept for a mobile and flexible branch line. “Mobile and flexible means that it easily fits in a container and can be attached and dismantled again without difficulty,” says Jennings, describing the concept. One of the technical requirements for this is plug-and-play automation. Once again, Siemens is involved with Profinet, the market-leading Ethernet-based system. All modules, and therefore the mobile and flexible plant components, have a standard and intelligent interface and are mutually self-configuring. Automatic network configuration of the pre-programmed add-on plant section is effected through neighborhood detection in Profinet. The master computer automatically recognizes the new branch line and its properties, and can output the new glass formats as the objective. “Our mobile and flexible branch lines are, figuratively speaking, a promising direct line to the future,” says Jennings, and he is looking forward to the market’s feedback.

#### **Digitalization under the microscope**

As a solution provider, Grenzebach has already created the basis for networked and smart machines, including reliable, plant-wide automation. The company’s recipe for success is its many years of process and control expertise in conjunction with the expertise of partners like Siemens.



# Plant operators



Horn Glass is responsible for all of the technology for this new factory in Central Asia. The image shows the production building in Plössberg.

All photos: Horn Glass

### Horn Glass Industries AG

From a basic operation to a globally successful technology provider for glass melting processes: Melting units and special systems are now sent out to glass manufacturers worldwide from the company's base in Plössberg. With 300 employees and over 125 years of experience, Horn Glass is a preferred system solution partner for some 440 customers in 61 countries worldwide. The associated plant, with its fossil-based heating technology using gas or oil, electrical control systems, and customer-oriented services, round out the overall package.

## Record order from the Caspian Sea

**Horn Glass has been engaged by general contractor Tepe to fully equip a huge float glass and container glass plant in Turkmenistan.**

Glass production for an entire country: that's what the largest order in the history of Horn Glass amounts to. At the beginning of this year, Horn Glass, based in Plössberg, Germany, was awarded the contract by

Turkish general contractor Tepe Türkmen İnşaat ve Ticaret to act as technology supplier for the construction of Turkmenistan's first glass factory. Turkmenistan, on the Caspian Sea, is investing in the new

construction to supply the entire country with float glass and container glass in the future.



### Siemens technology used in the project

- The shielding gas mixing station became host to a challenging application, in which Siemens Calomat devices are used to perform continuous measurement of hydrogen and inert gases. These are very reliable in operation and provide very good measurement values.
- Siemens is also a dependable partner for field instrumentation when it comes to equipping the new factory.
- Powerful Siemens industrial PCs used in all the business areas of the new factory form the basis for the Simatic PCS 7 process control system.
- Switches with a diagnostic capability that cover the process level in combination with the latest Simatic S7 410H controllers will be used for communication via Profinet and Profibus.
- To minimize assembly and wiring effort, the Simatic ET 200iSP decentralized peripheral system provides an economical solution for this explosion-risk zone. The fail-safe, modular periphery is particularly flexible in its engineering, requiring minimal input.
- Switchgear from Siemens, redundant power supply units, and drive technology using Sinamics G120 and G150 frequency converters round out this all-encompassing application.



Constructing control cabinets at Horn Glass for the Tepe project.

### > Horn to supply all technology needs

Ekaterina Firsova, head of department for float glass at Horn Glass and project contact person for Turkmenistan, is as proud as the rest of her colleagues: "We are responsible for all of the technology for this new factory in Central Asia. From the sand and raw material preparation systems to the batch house, melting assemblies, and tin bath to the glass processing units, in addition to storage technology. And we're also the preferred supplier when it comes to the power systems." Anything that Horn is unable to design and build itself, it buys from selected partners like Siemens or

Zippe. Horn will also be responsible for providing technical training for future employees in Turkmenistan.

### Huge capacities cover country's needs

The container glass plant is expected to be in operation by September 2017, with a planned annual output of 95 million bottles, which equates to a daily capacity of 50 metric tons. The lines are designed to accommodate the needs of the pharmaceutical and beverage industries. The float glass plant will be in service from the fall of 2017, with a target daily output of 250 metric tons, or eight million square meters of glass

annually. The clear and colored glass produced by the factory will be used mainly for architectural purposes.

### Plant-wide automation from Siemens

As usual, Siemens is also on board on the basis of a contract with Horn. Plant-wide automation from Siemens enables all the different automation solutions in the project associated with the different machine and plant units to be integrated into an overall system covering the entire value chain. This complete, modular system brings together automation, drive, instrumentation, and power technology.

Stephan Meindl,  
CEO of Horn Glass Industries AG.

## “Two stable pillars”

**Stephan Meindl, CEO of Horn Glass Industries AG, comments on market developments and the company’s strategic response.**

**Mr. Meindl, you have been in your current position since 2015. What are your main concerns right now?**

**Stephan Meindl:** When I analyze the market, I am convinced that, more than ever, Horn Glass needs two stable pillars now: container glass and float glass.

**Which developments underlie that viewpoint?**

**Meindl:** Take the foodstuffs industry, for example. Luxury and quality are high on the priority list again, and so too is glass packaging. That’s why we would like to consolidate our market share for glass furnaces in our existing markets while breaking into new ones.

**And how is the second pillar looking?**

**Meindl:** Because there are only a few companies around the world capable of making turnkey float glass plants available, we are very positive that we will also enjoy growth in this difficult segment. A further plus is that we develop and manufacture furnaces, tin baths, and automation solutions ourselves. These are the aces in our hand as we seek to win plate glass companies with a global ambit as customers, and expand our global locations in the process, while continuing to rely on strong partnerships.

**What experience have you gathered during the relatively short time with the Siemens portfolio so far?**

**Meindl:** I have been familiar with Siemens products for a very long time now. From our perspective, comprehensive, plant-wide automation has proven to be highly efficient and convenient. Coordinating and optimizing processes within a single, universal, proven system is naturally faster and easier than with heterogeneous solutions with components from a wide variety of manufacturers.

**Mr. Meindl, thank you for the interview.**



This is the first time that a glass production facility is being built in Turkmenistan. The giant float glass and container glass plant will begin operations in the fall of 2017.

## Building special-purpose solutions from standard components

**Schott AG uses the Simatic S7-1500 controller integrated into the TIA Portal, including the decentralized Simatic ET 200SP peripheral, for its cutting-edge manufacture of ultrathin glass.**

Schott is a leading international technology group that specializes in specialty glass and glass-ceramics. With more than 130 years of experience in development, materials, and technology, the company offers an extensive portfolio of high-quality products and intelligent solutions. Schott is therefore an innovative partner to many industries, including the household appliance, pharmaceutical, electronics, optics, automotive, and aviation industries.

### **Requirements of ultrathin glass**

One of Schott's current fields of research and development is ultrathin glass. In manufacturing this type of glass, everything depends on accuracy, reliability, and speed,

all of which Schott prefers to achieve through the use of well-known automation technologies and standard solutions. And the systems must be able to tolerate a harsh environment, where electromagnetic compatibility is a must.

### **Using standard components**

To meet Schott's quality standards, the measured data must be detected quickly and reliably. Measuring devices with a fast oscillation of up to 100 Hz are used for this purpose. To meet this requirement, Siemens uses the Simatic S7-1500 controller with the AI 2xU/I 2-/4-wire HS analog input module and the AO 2xU/I HS analog output module as standard components of the new Simatic

The production of ultrathin glass is one of Schott's future-oriented fields.

ET 200SP to build a function generator with a fast output rate of 35.7 microseconds. With the oversampling function, the analog output module is able to transmit all calculated measured values from the Simatic S7-1500 to the Profinet controller in chronological order and to subsequently output them in the peripheral module clock-synchronously and at consistently equal intervals within a Profinet transmit cycle. The main advantage of oversampling is that a fast CPU cycle is not needed to output the chronologically high-resolution measured values. Siemens also meets the company's requirement for electromagnetic compatibility with Simatic ET 200SP.

### **Smooth interplay between team and technology**

"We have benefited enormously from Siemens' innovative products and technological expertise," says Schott's project manager, adding, "This holds true for the TIA Portal, with its maximum engineering efficiency, the new Simatic S7-1500 controllers, and the Simatic ET 200SP I/O system. Siemens' product managers and regional consultants have given us such good advice that we were able to meet our strict requirements with standard components while optimizing costs – and we did this in the shortest possible time."



## Measurable successes

### Ardagh utilizes radar technology for optimized level measurement of the cullet silo.

Recycling raw materials is of great importance in the production of glass. The German subsidiary of the Ardagh Group at the Bad Münden location feeds more than 50 percent scrap glass from its own production cycle and recycled glass from consumers into the production of new container glass. The cullet silo acts as an important buffer for the production of the mixture that is fed continuously to the glass melt. With a height of approximately 19 meters and a six-meter diameter, the silo has a large enough capacity to resupply the production plant for more than two weeks.

#### Faulty full and overfull sensors

The full and overfull sensors originally installed developed faults due to the harsh

deployment conditions that are the result of the highly abrasive material and mechanical stressing. Because Ardagh had already had good experiences with Siemens measuring technology, the faulty point-level sensors were replaced with a new filling-level technology operating at 78 gigahertz. Marcus Mai, who is responsible at Ardagh for the technical maintenance of the supply area, easily installed the Siemens device himself and was impressed by its plug-and-play functionality.

#### Sitrans LR560 radar-level transmitter

The Sitrans LR560 radar-level transmitter can now continuously determine the filling level of the cullet silo over the entire silo's height. High-frequency microwave offers unique measuring properties, even with difficult



The Sitrans LR560 radar-level transmitter can reliably and continuously determine the filling level of the cullet silo over the entire silo height.

*“We’re very satisfied with the solution and will continue to rely on the good advice, rapid support, and reliable technology provided by Siemens in the future.”*

#### Marcus Mai,

responsible for technical maintenance of the supply area at Ardagh Glass GmbH

materials like broken glass, and prevents wear and tear caused by the glass fragments thanks to its contactless mode of operation. The scavenging air port, provided as standard, has also been used to prevent condensation forming on the sensor. The continuous filling-level signal is visualized on an on-site display, which is included in the delivery scope and is integrated in the control system of the cullet system. The ascertained bunker volume can be used for controlled discharging, especially during maintenance work; this represents an enormous improvement in the process. Mai sums it up: “We’re very satisfied with the solution and will continue to rely on the good advice, rapid support, and reliable technology provided by Siemens in the future.”

#### The Ardagh Group in Germany

The Ardagh Group with Ardagh Glass GmbH operates a total of eight container-glass production plants in Germany. Huge numbers of glass containers are manufactured there day in and day out for the beer, sparkling wine, wine, and food segments, among others. The Bad Münden location with 160 employees specializes in pharmaceutical, chemical, and specialty containers made of glass. Roughly 300 million glass containers are produced annually on three production lines, which represents an annual capacity of 40,000 tons.



# Equipment suppliers

# Masters of glass processing

**Chinese glass processing specialist NorthGlass can produce very large-format bent glass in its tempering furnace - in world record-breaking dimensions.**



The bent-glass panels that the Chinese company NorthGlass can produce in its glass tempering plant, developed in 2013, boast impressive dimensions unmatched to date anywhere in the world, with lengths of 18 meters and a bending radius of 3.50 meters. And that's with a deviation of  $\pm 0.1$  percent on the straight edge and duplicated accuracy on the arc edge of  $\pm 0.1$  percent. On top of that, the company has managed to reduce its energy consumption by 50 percent compared to previous solutions. These large-format products are used for glass facades, for example, at the headquarters in the US of the world's most famous electronic brand.

## **Siemens involved since the company's foundation**

NorthGlass has notched up total sales of nearly 4,000 glass-tempering furnaces on the global market in its more than 20-year history. It manufactures at five locations in China, which makes it the largest company

in the world that provides both processing machinery and glass products. Tempering systems for flat and bent glass are among its most important products. According to the company's own information, NorthGlass enjoys the world's highest sales volume of tempering furnaces.

The high-tech company has worked in collaboration with Siemens ever since its beginnings. It uses the state-of-the-art automation engineering framework TIA Portal with communication via Profinet technology in the newly developed device. These technologies allow NorthGlass, by its own account, to achieve reliable quality and improve its efficiency. "Siemens operates all over the world, it has substantial capacities, and it always finds great solutions for our industrial machines," says NorthGlass General Manager Gao Li, explaining the company's choice. The Siemens products that NorthGlass buys most are Simatic S7-300 controllers, converters in the

Sinamics series S120, G120, and G130, Simotics 1LE motors, and Sirius industrial switchgear.

## **New coater based on the Simatic PCS 7**

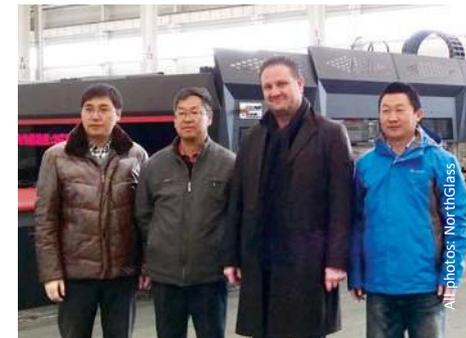
NorthGlass not only specializes in tempering furnaces; it is also one of the world's largest manufacturers of coaters. There are more than 20 low-emissivity coating lines made by the Chinese manufacturer in service around the world. In this area, too, the company relies on automation technology from Siemens. For example, in the Chinese province of Hebei, a new coater is currently being developed based on the Simatic PCS 7 process control system and Simatic S7-400 automation devices. Simatic WinCC and other SCADA technology from Siemens are also being used.

## **Processing as well as production**

NorthGlass has long been an established name in glass processing technology, but it has also been a manufacturer in its own right for some time. Siemens is following this development with great interest and will continue to provide the company with advice and practical support for all its innovations, as it has been successfully doing all along. It will help NorthGlass master all its challenges in the areas of automation, drive and visualization systems, instrumentation, and industrial switching technology, including corporate information systems.



At the 2015 China Glass exhibition in Beijing: In the background is the electrical cabinet of a T-series furnace designed and manufactured by Siemens. From left: He Yuankai, Vice General Manager at Siemens Limited of China; Gao Li, General Manager of NorthGlass; and Li Deming, Senior Manager at Siemens Limited of China.



From left: Han Yonggang, Siemens Limited of China; Wu Qiang, NorthGlass low-e coaters chief engineer; Heinz-Josef Lennartz, Siemens Deutschland; and Zhao Wu, Siemens Limited of China, at the NorthGlass production site in China, Luoyang City.



At the end of February 2016, the Chinese Ruiben Investment Group decided to work with numerous German specialists in the glass industry on four special float glass projects.

## First choice among thin-glass float plants

**JSJ Jodeit and GFT have signed a collaboration agreement to position themselves as the first independent suppliers of float glass plants for thin glass.**

Two German machinery manufacturers, JSJ Jodeit (JSJ) and German Floatglass Technology (GFT), have been combining their expertise in a close collaboration for over two years. As a result, they have been operating successfully on the market as the first independent suppliers of complete float glass plants for thin glass. With years of application experience in the process automation of float glass plants, Siemens has come on board as a preferred partner.

### **Complete core technology in the melting area**

For both JSJ and GFT, their exclusive and close collaboration is far more than a convenient partnership. The companies are an excellent match both in terms of their orientation and their size. In addition, they share a common philosophy. Both are innovative and collaborative players that offer their customers complete solutions and services from a single source, especially in

the flat glass industry. "In the field of float glass plants for thin glass, we're the only companies in the free market that offer the entire core technology in the melting and forming area," says Dennis Schattauer, managing partner of German Floatglass Technology GmbH, as he describes the unique selling point of the collaboration. Both companies see themselves in the roles of coordinator, consortium leader, and even general contractor, depending on their

customers' requirements. Experience shows that plant operators and investors prefer to look for complete turnkey solutions, not just individual disciplines. This is another argument in favor of the collaboration, particularly because conventional general contractors typically only provide planning services and not the actual value creation.

### Interfaces to Siemens

Depending on the scope of the project, JSJ and GFT bring other close partners like Siemens on board. "Siemens in particular is our first choice when it comes to projects involving automation and drive technology, electrification, instrumentation, and even the supply and auxiliary systems in the glass factory," says Dr. Harald Jodeit, managing partner of JSJ Jodeit GmbH, speaking as a representative for the collaboration. And

they provide tailored solutions for the thin glass field that JSJ and GFT can integrate in their portfolio. "That's just one side of the coin, however. Siemens is more than just a component supplier. We and certainly the glass manufacturers value the solutions and systems expertise at Siemens," explains Jodeit.

### First reference project with the Ruiben Group

The collaboration has already delivered its first successes: At the end of February 2016, the Chinese Ruiben Investment Group decided to work with JSJ and GFT. JSJ will handle the overall coordination for four special float glass projects and will supply the melting furnaces and batch plants (in collaboration with Zippe). GFT was commissioned to provide the float bath technology

***"We're proud that we've been able to win over so many leading German companies for equipping our new production facilities in the Chinese glass sector. That represents a milestone in the industry."***

**Zhou Zhijian,**  
Chairman of Ruiben Group

that will be used in the new production facilities. With Umicore (platinum systems), Pennekamp (Iehrs), Grenzebach (cold end), and Siemens (plant-wide automation), the Chinese investor is also relying on other German specialists in the glass industry.



The ceremony to mark the project launch took place in mid-April.



Dr. Harald Jodeit and the JSJ employees benefit from the company's technical center for research and development at the headquarters in Jena.



## Two partners, one goal

**RoviSys is one of the leading system integrators for automation solutions in the glass industry in North America and beyond - thanks in part to its partnership with Siemens.**

Despite wishing to grow independently, the American system integrator RoviSys still prioritizes its close cooperation with Siemens. As a Siemens Solution Partner, RoviSys supplies the glass industry with sophisticated and innovative solutions for process automation, all the way to plant-wide automation. Together, the two companies bolster each other's strong position in the market.

Though just a small city, Aurora, Ohio, has earned an enviable reputation in the North American glass industry. And with good reason: Aurora is home to the headquarters of RoviSys, one of the leading suppliers and service providers for process automation. Founded in 1989, the company employs some 450 staff members at four US sites and

in Singapore. RoviSys not only supplies the glass industry but is also active in markets such as life sciences, chemicals, metals, packaging, and the food and beverage industry, as well as in the energy sector. To offer its customers the very best solution for them, RoviSys deliberately avoids committing to particular manufacturers, and instead works with a variety of technologies and platform specialists. "Our clients use our solutions to monitor and control their core processes. That's why it is essential that they have the freedom to choose the best available technologies and solutions with alternatives for support and upgrades. In short, they want open systems. RoviSys was founded to fulfill those needs," says John Hall, Director of Business Development at RoviSys.

**Solution Partner for nearly a decade**  
Despite this independence, RoviSys has fostered close and lasting relations with leading product and service suppliers, and with Siemens in particular. RoviSys has cooperated with Siemens for over 20 years and has been a Solution Partner since 2006. "What won us over was the breadth of technology available, their scalability, and flexibility, with the potential to provide plant-wide automation. We recognize Siemens as a world leader in the automation industry. And not only are Siemens products and solutions available worldwide, so too is the support," says Keith Bagarus, Director of Global Glass Automation.



All photos: RoviSys

***“Our close partnership has gone from strength to strength. Working together has enabled us to make a success of a number of projects and convince clients of the benefits of automation solutions based on Siemens’ portfolio.”***

**Keith Bagarus,**  
Director of Global Glass Automation at RoviSys

### Controlling machines and plants

In projects for clients in the glass industry, RoviSys therefore uses a wide variety of Siemens products, for example Simatic controllers from the Simatic S7 range for controlling machines and plants. Simatic S7 controllers are fully scalable, meaning RoviSys can install them in individual machines and entire plants alike. The higher-performance controllers build on the functionality of less powerful controllers. Users benefit from uniform handling as well as a high degree of efficiency in engineering, operation, maintenance and migration. With standardized interfaces, the controllers are compatible with products from other manufacturers – which allows the independence RoviSys finds so important.

### Visualizing processes

To monitor automated processes, RoviSys uses the process visualization system Simatic WinCC. It provides complete SCADA functionality in Windows, and is also fully scalable – from single-user to multiple-user systems with redundant servers and cross-

location solutions including web clients. One of the special features of Simatic WinCC is its total openness. It can be readily used in combination with standard and user programs, creating HMI solutions that precisely meet practical requirements.

### Plant-wide automation with Simatic PCS 7

The process control system Simatic PCS 7 has also become a first-choice solution in RoviSys’s projects. Simatic PCS 7 controls subprocesses as well as entire production processes, from batch processing all the way to the cold end. It even ensures connection of the supply systems. For the glass industry, plant availability is paramount. With its intelligent redundant concepts, Simatic PCS 7 enables uninterrupted operation. The system also shortens engineering and commissioning times considerably, and simply makes businesses more profitable. “We particularly value the modular design and compatibility of solutions from Siemens. For example, Simatic S7 controllers and the process control system Simatic PCS 7 utilize the same basic components, which simplifies servicing,” says

Keith Bagarus. Finally, RoviSys also uses Simatic IT, an advanced manufacturing execution system with high scalability. This makes production particularly efficient and transparent, ensures quality, and accelerates time to market. Precisely what the glass industry needs to react rapidly to the changing requirements of the market.

### All-around product expertise

Siemens not only provides Solution Partners like RoviSys with the products they need, it also contributes the necessary expertise to utilize and market them. Each year, a number of training sessions are organized to facilitate this. Siemens specialists regularly bring engineers at RoviSys up to date on the latest product developments so that RoviSys can also obtain certification as a Solution Partner for new solutions. Account Manager Bob Ziembra visits RoviSys at least once a month to discuss ongoing projects.



As Director of Global Glass Automation at RoviSys, Keith Bagarus is a valued contact for Siemens in the glass industry.

# Tuned for high performance

**With Siemens at its side, Bottero is continually upgrading the automation of its laminated glass lines, making them significantly more productive and flexible.**

The Italian Bottero Group is one of the world's leading providers of complete solutions for the glass industry. Bottero recently implemented one of the most productive and flexible laminated glass lines on the market on behalf of a well-known European manufacturer. The main applications are structural glass, safety windows and doors, and anti-intruder and bullet-proof glass. The composite film used is made of polyvinyl butyral (PVB) with characteristics including varying levels of thickness, color, and acoustic insulation.

***“A sheet of plate glass measuring six by three meters is processed in less than 40 seconds, which is very fast. Normally that would take a full minute.”***

**Marco Guarguagli**, automation manager in Bottero's Flat Glass Engineering Business Unit.

## **Fully automated high-performance line**

With Siemens' help Bottero has fully automated the line, which has resulted in extraordinarily high performance: “A sheet of plate glass measuring six by three meters is processed in less than 40 seconds, which is very fast. Normally that would take at least a full minute,” says Marco Guarguagli, automation manager of Bottero's Flat Glass Engineering Business Unit.

This high productivity is the result of a variety of mechanical improvements and a fully automated, integrated overall process: from charging various glass qualities through washing at throughput speeds of up to 26 m/min to joining different and even multiple PVB films. When trimming the films, the line adjusts automatically to the glass format and film type(s). A precisely operating infrared furnace and gentle nip rolls create optimal conditions for the calendering process. Each heating element is controlled individually via



Bottero's newest gantry stacker can stack to both the air and tin sides of the glass, and is currently the most productive and flexible on the global market.

a static relay, which also minimizes energy consumption. In a final stage, an automatic stacker unloads the autoclaves and creates packets optionally with or without spacers.

The fully automated line is not only high-performance, it can also be deployed very flexibly for manufacturing different products in small batches, with practically no downtime for retooling.

## **In line with Siemens**

Bottero is truly working in line with Siemens on this order. The Italians now rely completely on the engineering framework TIA Portal and the latest-generation controllers and drives. A total of six Simatic S7-1500s communicating via Profinet and a Simotion controller, as well as Sinamics converters and Simogear geared motors, ensure fast, problem-free processes – and optimal connections to upstream and downstream sections of the plant.

The latest generation of Bottero's automation system uses state-of-the-art Siemens automation technology throughout.

# Cost-optimized edge grinding

**Benteler relies on decentralization with the TIA Portal, making its glass edge-grinding lines more cost-efficient and fit for the future.**



Industry insiders know that the globally operating Benteler Group has a German subsidiary in Bielefeld that specializes in the manufacture of glass processing machines, among other products. For example, Benteler Maschinenbau GmbH produces fully automatic, modular production lines for loading, cutting, breaking, grinding, and drilling both flat and curved glass of practically any type. The company has long relied on control and drive technology from Siemens.

## **Putting edge grinding to the cost test**

To ensure that the company can keep pace with the global competition, Benteler recently put its edge-grinding lines to the test – both in their entirety and especially their automation concept and components, thereby generating significant savings potential. One of their key solutions was the consistent decentralization of the control

and drive technology. This meant dividing the previously central control cabinet, which was up to seven meters long, into smaller control cabinets and implementing a universal automation concept in the TIA Portal. In addition, the company switched to the latest generation of Simatic S7-1500 controllers, decentralized the Simatic ET 200SP peripheral modules, and cost-optimized the drives in the modular Sinamics G120 and S110 series for specific applications. This includes installation on the up to 14 machining units for grinding, seaming, and polishing on the loose and stationary sides.

What all components now have in common is universal communication via Profinet, including the upstream and downstream machines. The decentralized field bus-based approach shortens cable lengths, simplifies and speeds up the installation, and minimizes EMC-induced interference.

“A key aspect of the new approach is the convenient and, above all, consistent remote service for all components,” says Andreas Lütke, who heads the software engineering group for glass technology e-design at Benteler in Bielefeld.

This new approach was implemented using, among other devices, Profinet-capable Simatic TP1500 Comfort Panels with Touch Display. It enables the production lines to be operated and monitored – and therefore diagnosed – from Germany over a virtual private network (VPN), just as they would be on-site. “This allows us to localize and clear faults quickly, which helps keep productivity high,” Lütke says. Using the latest components from Siemens gives users the requisite future and investment security, because spare parts will be available for many years to come.

Among other products, Benteler Maschinenbau GmbH produces fully automatic, modular production lines for loading, cutting, breaking, grinding, and drilling both flat and curved glass of practically any type. The company has long relied on control and drive technology from Siemens.



All photos: Forvet

For many years Forvet has favored the use of Siemens automation technology, and the company always develops efficient, cost-optimized solutions with the help of Siemens as its equipment supplier.

## Complete processing under one roof

**Forvet integrates a variety of processing steps under the umbrella of Simotion, thus reducing their footprint while increasing quality and yield.**

In Forvet's broadly diversified machine and system portfolio for special applications in glass processing, innovation is always needed somewhere. Recently, the focus was once again on processing flat glass. Glass factories that manufacture flat glass usually consist of various machines for loading, cutting, polishing, drilling, milling, and washing. The company, which is based

in Volvera near Turin, has now combined all these steps in a single production line of modular design known as Combiflex, and has put them all under the control of a Siemens Simotion D445.

**Greater efficiency on a smaller floor area**  
First, this integration reduces the floor area required, which is a more important factor



The Italian company Forvet is renowned for its machines used in flat glass processing.

in glass production than in other sectors due to the typically constricted space conditions. Second, horizontal processing also promotes higher quality and productivity compared with vertical processing. Processing a sheet with maximum dimensions of 1,500 x 3,000 millimeters takes approximately three minutes.

### **Complete automation from Siemens**

For many years Forvet has favored the use of Siemens automation technology, and the company always develops efficient, cost-optimized solutions with the help of Siemens as its equipment supplier. In this particular case, the straightforward CNC functionalities required are implemented throughout in the Simotion motion control system, which coordinate the interaction of Simotics S-1FK7 servomotors via Sinamics S120 series converters. In addition, Sinamics V70 servo drives are used for the standard positioning functions. A robust Simatic industrial PC overlays the system. Thanks to end-to-end Profinet communication, the line can be readily expanded if necessary in the future.

# Sharing a path to success for 10 years

The global success enjoyed by container glass machines from Sklostroj is based in part on 10 years of collaboration with Siemens.



The strategic decision by Sklostroj in 2006 to develop its own drive and timing control system based on established, standard Siemens automation components marked the beginning of the collaboration between the two companies. To start with, Sklostroj – a well-known Czech manufacturer of individual section (IS) machines and equipment for container glass manufacture – worked alongside a local Siemens Solution Partner.

An innovative step toward the second-generation SDT-10 in 2010 was achieved through a direct collaboration between Sklostroj and Siemens. Since then, the drive and timing control system has been used in all machines built by Sklostroj, and is also sold as a stand-alone solution – both as a replacement for retrofitting work and in new machines from other manufacturers. The core components are the drive-based motion control system Simotion D, the Sinamics S120 modular converter, and

Simotics S server motors. Fail-safe operation (up to performance level PLd) is provided by a decentralized Simatic F CPU, which is incorporated into the overall concept via Profinet with isochronous realtime (IRT), together with fail-safe Simatic ET200S peripherals on the individual sections. With this foundation, Sklostroj produces individual automation concepts for highly productive IS machines with four to 12 production sections, or tandem machines with up to 24 parallel sections.

### Fully coordinated automation

Sklostroj's most sophisticated comprehensive solutions for the hot end include all units needed for the forming process: servo feeder (plunger, tube, shears) and servo IS machine (gob distributor, section mechanisms, pushers, transfer units, cross conveyors, and stackers). With a typical 12-section ISS machine in triple-gob operation, up to 13 Simotion systems via 120 Simotics servos

guarantee that all plant components work together perfectly: fast and with a high degree of repeat accuracy, ensuring maximum productivity and quality.

For the first time, Sklostroj has also integrated the control system for the annealing lehr into the drive and control system at the hot end, in order to combine as many process parameters as possible in recipes and manage them with the control system. That makes handling even more convenient and job change even easier and safer, since more and more parameters can be automatically set and adjusted, minimizing human error.

Another good reason that Sklostroj prefers Siemens components is because spare parts are readily and quickly available locally – including for end users – anywhere in the world.

For 10 years Sklostroj has equipped all its glass container manufacturing machinery with automation technology from Siemens.



All photos: GPS

Synchronization of multiple servo axes of an IS machine in the micro- and millisecond range.

# Hardware and software from a single source

as well. The development of novel solutions and projects also forms part of the innovation-driven collaboration between the two companies. One of the results is the compact system Timer&Drive, which was specifically developed for comprehensive control and monitoring of IS machines. This is a definitive innovation for the container glass sector and is still unparalleled in its reliability, ergonomics, user-friendliness, and price. "The development of this control unit is in line with our requirement to offer machines with optimal software and state-of-the-art hardware at the lowest possible price," explains Themann.

### Integrated or stand-alone solutions

The innovative system can be integrated in all IS machines, not just in those made by GPS. "Our system is more of a module that can be integrated in existing machines according to specific requirements," says Themann. "This means that it's energy- and cost-efficient – and therefore absolutely in the interest of our customers." The individual components of the new GPS controller, for example, the proven Siemens solutions Logo, Simatic S7, and Simotion, are also suitable for small controllers, and are therefore a good choice.

## GPS and Siemens - innovation drivers for the container glass industry.

### GPS Glasproduktions-Service GmbH

GPS designs state-of-the-art IS machines for the container glass manufacturing industry worldwide. The company, headquartered in Essen, works with its clients and customers to develop tailor-made solutions. GPS has won over prestigious customers in the container glass industry thanks to its high quality, process reliability, efficiency, and environment-friendly machines.

Glasproduktions-Service GmbH (GPS) can look back on over 90 years of corporate history. Today, under the management of CEO Rolf Themann, GPS is an independent manufacturer of ultramodern IS machinery for the container glass manufacturing industry. As a former subsidiary of Saint-Gobain Oberland AG, GPS has the expertise and experience to identify the needs and requirements of the container glass sector and to develop customized solutions. In the age of digitalization, a full-service offering always includes the corresponding computer tech-

nology and software. With Siemens, GPS has found the ideal partner for precisely this sector. For the past two years, GPS has been equipping its IS machines with control and monitoring systems from the integrated technology company.

### Perfect interoperation of machine and control system

Siemens supports GPS as its go-to partner for technical issues and as a reliable supplier and provider of training courses on many different subjects – not just in Germany but worldwide



IS machine for the production of bottles and jars in all shapes and sizes.



# Flexibility in IS machines

All photos: Heye



## Heye International GmbH

With more than 50 years of experience, the Obernkirchen-based company Heye International GmbH is a world-leading equipment supplier to the container glass industry. Over the past few years, Heye has continually strengthened its position on the market through the systematic implementation of a sustainable growth strategy.

### Heye uses the Siemens Simotion motion control system for assortment operations in the narrow-neck press and blow process.

The production of small-batch quantities and the changes of container type this entails has always posed a problem for the hollow glassware sector because the IS (individual section) machine has to be stopped completely and reconfigured. In addition, the entire production run must be reorganized for the type changeover, which considerably reduces efficiency and productivity. Heye International has developed a solution for this problem that it has now extended to the narrow-neck press and blow process as well.

#### Flexibility for different bottle shapes

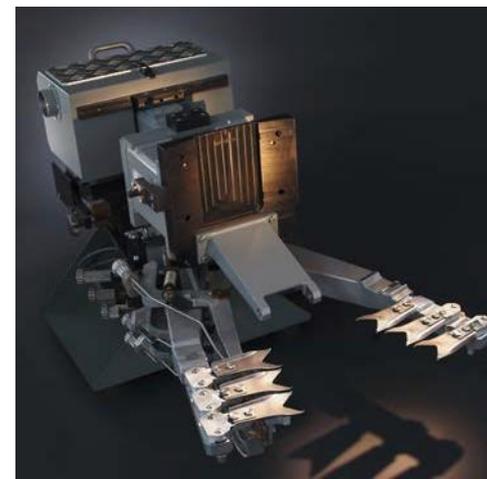
The core element of this recent innovation is the Heye servo drive control unit that is based on the Siemens Simotion motion control system. In conjunction with the servo plunger and dual-motor shears from Heye, gobs of different weight can be sheared off and dis-

tributed to the IS machine's individual stations. Some of the special features of the servo drive controller are its reproducible motion profiles and the easy integration of additional servo axes. It can also be employed for all sizes and types of feeders and achieves production speeds of up to 250 cuts per minute.

#### Initial applications in NNPB lines

With the Heye solution for assortment operation already in service in large numbers of plants, the company has now also acquired its first customers who are employing this solution in the narrow-neck press and blow production process (NNPB). In the NNPB process, a specially shaped plunger is used, as the name suggests, to enable bottles to be produced with a narrow-neck mouth. In a Heye customer reference plant, for example, 280 g and 304 g containers – or alternatively, 256 g and 280 g

bottles – can be manufactured simultaneously on one machine. With the Heye solution, every last drop can be used so there is no glass wastage. The time expenditure for the necessary conversions is also significantly reduced. "This is an innovative solution for which there is market demand. It shows that our engineers have the right feel for what will bring real value added for the container glass industry," says Wilfried Seidensticker, Product Manager at Heye International. He adds: "Siemens has always been our partner when it comes to innovative control and drive technology."



The Simotion-based Heye servo drive controls a plunger (above), dual-motor shears (left), and other hot-end components quickly and precisely.

Efficient solutions for glass production like this fully automatic carousel-type press line represent Waltec's core competency – all built around automation and drive technology from Siemens.



## The fully electric path to the future

**Precision, compactness, low maintenance expenses, and outstanding energy efficiency are all the encouragement Waltec needs to go fully electric by converting the last of its nonelectric drives.**

Waltec Maschinen GmbH is a leading maker of complete production lines for glass manufacture, focusing on carousel-type machines for pressing, press-blow, blow-blow processes, and centrifugation. Precise motion control on fully automatic press lines starts with metering the glass out with maximum accuracy. That's why for many years Waltec has been relying on automation and drive technology from Siemens for its feeders, which consist of plungers and cutters. A special feature of these feeders is their plungers, which are driven by highly

dynamic and extremely low-wearing linear motors. Waltec builds carousel-type machines with up to four press cylinders, each supplied by its own plunger and an individual volume of glass.

### **Servo pump rather than valve hydraulics**

For the actual press process, too, dynamics and precision are essential to product quality and output. To ensure the maximum possible energy efficiency, Waltec has been using a servo pump solution from Siemens since 2012. It governs the hydraulics using

the speed, torque, and direction of rotation of a servomotor, which uses energy only when needed for the press cylinder. There are no loss-producing valves throughout the entire drive train, and the large oil tank has been replaced by a compact pressure accumulator. In practice, this provides energy savings of up to 80 percent compared to a traditional solution.

### **Powerful and accurate timing for the rotary table**

A high-torque segment motor minimizes time delays while turning the rotary table. Waltec now has the option of installing standardized, gearless, backlash-free Simotics T direct drives from Siemens. Like the other motors, they're also driven by a Siemens Sinamics converter.

### **On the road to the fully electric machine**

Simpler electric drives are sometimes used in materials handling. Many auxiliary axes (for example, for opening press molds) have previously been pneumatically operated. Waltec intends to switch to an increased use of compact electric cylinder units in the future in order to further reduce energy consumption and maintenance expenses. Combinations of Simotics S-1FK7 synchronous servomotors and SKF spindle units are ideal for this purpose, preferably in a space-saving parallel arrangement. Another economical option for a wide range of tasks is the decentralized Sinamics G120D converter with a Profinet connection – which is standard with Siemens components – with integrated safety functions. With these innovations and Siemens at its side, Waltec is well on the way to having a system in place that is almost entirely electrically driven.



Unlike conventional valve hydraulics, the servo pump directly transmits the energy from the drive motor to the hydraulic press cylinder. In other words, the servomotors provide only the energy that is needed for each phase of the press process.

# Running even truer

**A buffer capacitor from Siemens has helped Olivotto improve the energy efficiency and performance of its rotary-type glass press machines.**

Italian manufacturer Olivotto is an important international partner to the hollow glass industry that specialized at an early stage in rotary machines for glass blowing, pressing, and spinning. Numerous acquisitions have made Olivotto more than just a machine supplier – it can now offer its customers in the glass industry complete lines and turnkey systems.

## **Powerful and energy-efficient**

Because Olivotto is constantly alert to ways of making its machines both powerful and energy-efficient, it has chosen to work with Siemens as its project partner. When it comes to machine automation, the first choice is the Simotion motion control system with the Sinamics S120 drive system. Its chief advantages are its extremely precise motion control and modular structure that can be perfectly adapted to the application in question – and the way it helps minimize power costs. To expand the range of opportunities still further, Olivotto has now devel-

oped a new concept that will reduce power consumption still further.

## **The challenge: rotary glass press machines**

The engineers always faced a challenge when it came to rotary press machines. With up to 1,800 kg, these machines carry a very high load. During each cycle, the load has to be rotated by 30 degrees within 0.3 seconds, requiring precise acceleration and deceleration. Olivotto previously dealt with this requirement using a torque motor on a Sinamics S120 system comprising an active line module (infeed) with power of 250 kW and a 200 kW motor module as the power unit. The active line module had to be so large to be able to deliver the energy the motor needed for acceleration.

## **Buffer capacitor provides desired effect**

The new concept enables the machine to temporarily store the energy generated during the decelerating process and then

use it during acceleration, thanks to a Siemens buffer capacitor connected to the DC link (600 V). In this way, Olivotto can now choose a much smaller Active Line Module (55 kW instead of 250 kW), since the machine now needs the mains power primarily for the pressing process. “We have cut our power costs by a lot, since the rated power consumption for the entire machine is now only 100 kW instead of 300 kW,” says Stefano Triolo, Chief Automation Engineer at Olivotto. “The capacitor brings our effective power consumption down to just 14 kW.”

Thanks to buffer capacitors from Siemens, Olivotto has reduced the effective power consumption of its new rotary glass press machines to only 14 kW.

Because Olivotto is constantly alert to ways of making its machines both powerful and energy-efficient, it has chosen to work with Siemens as its preferred project partner.

