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GlassFocus 2018

Looking ahead: Join us on the
journey to the digital enterprise

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Build your smart future

There are six strategic pillars on which the digital enterprise stands.

What are the prerequisites for a successful digital transformation? When conducting research for the ninth issue of the biannual trend and reference brochure

GlassFocus 2018, it became clear in our discussions that software tools alone don't lead to success. Instead, there are six strategic pillars on which the digital enterprise of

the future will stand. In the pages below, let yourself be inspired by how pioneers in the glass industry are building their smart future.



Foresight: Awareness of the key competitive factors in the glass industry over the next five to 10 years. Each company's individual digitalization strategy will need to be drafted by those on the CxO level, and they will need to lead the way in putting it into practice.



Investment sense: Willingness to plan and make strategic, targeted future investments today.



Expertise: Establishing teams of experts who have mastered the tools of the trade in the glass industry and enthusiastically develop their digitalization skills.



Corporate culture: Appreciation of courageous colleagues and their commitment to tackling future digital issues; generating an atmosphere of change across hierarchies.



People: Employees who have a passion for industrial digitalization, including on the personal level, and are motivated to shaping the future. Transformation processes always challenge employees to go the extra mile.



Partners: Experienced companions and consulting teams that possess interdisciplinary knowledge. They combine their glass and cross-industry knowledge – from raw materials to the finished product – with expertise that ranges from the field and automation levels to the process control and corporate management levels and their specific IT requirements. And they also offer in-depth knowledge of lifecycle integration on both the product and system levels.

Focus on digitalization

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Industry kaleidoscope

Siemens asked decision makers in the international glass industry about their strategies for the digital transformation.

Adrian Curry
Managing Director at Encirc



“We’re very pleased to jointly develop our strategic partnership with Siemens. We’ll certainly achieve a new level when it comes to digitalization and technologies in our company.”

With two locations in England and Northern Ireland, Encirc is one of the few companies to cover the entire value chain of container bottles for the food and beverage industry, from design and production to filling and even comprehensive logistical solutions. In a bid to increase its market share of roughly 30 percent in Western Europe, Encirc will invest in the conversion of its furnaces at both locations in the coming years. Encirc has about 1,200 employees who produce more than 2.7 billion glass bottles and containers per year.

Future-directed and together

In order to ensure that all innovations are developed using cutting-edge digital technologies from the outset, Encirc (which has been part of the Vidrala Group since 2015)

entered into a strategic partnership with Siemens last year. The agreement is based on three pillars:

- 1.** Developing and delivering innovative Siemens solutions and products for all Encirc locations
- 2.** An energy partnership that helps Encirc significantly reduce its emissions
- 3.** Implementing a comprehensive digital transformation project

The collaboration is initially in place until 2022. Siemens is especially pleased that it can contribute its capabilities in the critical future topics of digitalization and emissions reduction. ▶

Reinhold Gietl

Plant manager at Pilkington Deutschland AG
in Weiherhammer



“The ability to simulate automation for training purposes and emergency scenarios could be very interesting for us.”

Dr. Jens Schulte

Member of the Management Board of Schott AG
is responsible for information technology and other duties



How important is digitalization for glass-makers like Schott?

The specialty glass industry where we operate hasn't yet been exposed to disruptive changes in the

customer interface. Our products are customer-specific and application-specific materials, components, and solutions. Therefore, they can't be digitalized or distributed as standardized products from a market platform. However, we see enormous digitalization potential in production, research, and development, and administration. Key areas include the "smart factory" in hot forming, AI-supported material development, and the automation of administrative processes with robotic process automation.

What specific challenges do you need to overcome?

First of all, we need to create awareness within our company of the fact that digitalization in the above-mentioned areas is relevant for us and isn't limited to consumer goods industries. Therefore, we need to upgrade our capabilities through training and recruitment. Although Schott is an analytically strong company, we lack specialized expertise in the area of artificial intelligence, for example. In addition, we have to expand our external network. That's why we joined

“Siemens plays a crucial leadership role in the development of concepts and standards for the digital factory.”

the world-renowned technology initiative SmartFactory^{KL} at the German Research Center for Artificial Intelligence (DFKI) in Kaiserslautern in November of 2017. We're also active in various specialist groups and are working with some of the top companies in the field of digitalization. All this will make Schott even more agile, open, and resourceful.

What role do you see Siemens playing in this context?

As an important industrial enterprise, Siemens plays a crucial leadership role in the development of concepts and standards for the digital factory. Schott sees Siemens as an important partner in production automation. We follow the developments at Siemens in the field of digitalization with great interest.

How can Siemens help you in your digital transformation?

Siemens can help us define future architectures for infrastructure and applications and show us solutions for making the leap from our status quo to our goals. Conversely, Schott's perspective as a customer could perhaps inspire one or more developments at Siemens. Siemens is a good, highly professional partner for us.

Murat Ardic Yilmaz

Strategic Planning & Portfolio Management Director
at Şişecam



“Because Siemens itself is a major user of Industrie 4.0, Şişecam can benefit from the experience in joint transformation projects.”

Mr. Yilmaz, how do you define digitalization at Şişecam?

For us, digitalization is about creating a cross-process awareness of digitalized methods and technologies and then implementing them.

We're also aware that digitalization opens up new business opportunities for us and inspires innovations. We've already laid the foundation with integrated automation, and now we want to exploit further all opportunities using big data analyses – in production, marketing and personnel, procurement, and logistics. Clearly, this also involves a cultural transformation within our company.

What challenges do you see?

I think the biggest challenge is the necessary cultural changes. We need to be willing to do things differently, to improve day, by day and to become better and better. On the business level, we need a comprehensive approach to our digital transformation – a clearly defined vision supported by strategies and activities

that are appropriate for us. Only then can we set the proper priorities and allocate resources company-wide.

How can Siemens support you?

Siemens is very familiar with the process industry and with glass and knows all the requirements. We've long valued Siemens as a competent provider for automation and drive technology and much more. Because the company itself is a major user of Industrie 4.0, we could benefit from its experience in joint transformation projects. We are currently using some of the Siemens solutions. In the future, we can collaborate even more closely to accelerate the ongoing digital transformation at Şişecam. We can exchange benchmarks and best practices, develop ideas together, and move closer to formulating a comprehensive digitalization strategy.

Géraldine Seynaeve

CEO of CNUD-EFCO-GFT



“We already have concrete plans to work with Siemens as a preferred partner as we proceed down the path to the digital factory. As a world market leader in annealing lehrs and tin baths, CNUD-EFCO-GFT needs integrated engineering to develop a fully automated float-bath solution. This is our primary strategy for the future.”



Stephan Meindl
Management Board Chairman of
Horn Glass Industries AG



“The company has taken all the automation and process integration steps with Siemens.”

Mr. Meindl, how does digitalization affect suppliers of complete glass production systems like Horn Glass?

It has become a central feature of our engineering. The technologies of Integrated Automation and Integrated Process Control are already being used in large parts of our process technology production systems. We'll extend these structures to all plant components, including the entire periphery. We place the highest priority on data security, for our sake and the sake of our customers.

How will your company change as a result?

We'll get our entire supply spectrum – all the machinery and equipment – ready for system integration. To realize this, we need to further optimize our process engineering and process data in real time. Horn Glass plans to continue on this innovative and solution-oriented path. This will allow us to become a provider of complete process solutions, and that's an important step toward extending our market leadership position.

What steps have you already taken?

Our process control solutions already offer all options for real-time data capture and archiving. Using standardized OPC-UA solutions, this data can be made available for overarching production data collection.

How can Siemens assist you in this transformation?

Thanks to our longtime partnership with Siemens, we've already taken all the automation and process integration steps. We intend to overcome all our future challenges by relying on the proven collaboration between Siemens, Horn Glass, and our customers.

Dr. Philipp Zippe
CEO and Managing Partner of
Zippe Industrieanlagen GmbH



“Developing specific approaches for Industrie 4.0 applications in a workshop with Siemens.”

Dr. Zippe, what “digital helpers” have caught your eye in recent months?

We’re always looking out for added value for our glass customers with all the Industrie 4.0 applications. That’s why it was so great that we were already able to develop specific approaches in a workshop with Siemens. It was quickly apparent that the MindSphere IoT operating system is an interesting option for Zippe. This reliable industry solution lets us provide our customers with cloud-based apps. What’s crucial is that our customers are able to derive the greatest possible benefits from the applications: more productivity, increased energy efficiency, and better predictive maintenance, just to name three examples. We liked the Siemens approach of working together to develop and use apps that also bring concrete improvements to our customers.

Do you already have specific app ideas in the back of your mind?

We’re curious about the existing demo MindApps. The applications in question ensure transparency for the assets configured in MindSphere. Specific parameters can be displayed, such as when a plant exceeds process parameters. Particular actions can also be defined based on these parameters. But because MindSphere is an open platform, we can also program the results developed in the workshop at any time as individual Zippe solutions, and it doesn’t take a lot of time and effort.

Jian Wang
Vice President at Qinhuangdao Glass Industry Research
and Design Institute



Ms. Wang, what new stimulus for the glass industry is currently coming out of China?

The “Made in China 2025” official national strategy sets forth ambitious goals. It will be accompanied by a tremendous growth in digitalization in China that will also revolutionize the traditional glass industry.

How far has China come so far?

Although most glass manufacturers have automated their factories, these are often isolated solutions. Consequently, our goal as a research and design institute as well as EPC contractor for engineering, procurement, and construction is clearly defined. We want to help our customers link everything together from the field and automation levels to the process control and corporate management levels. Siemens can provide us with

valuable services in its role as strategic partner in terms of both our national and our international market activities. We want to strengthen both.

“Siemens as strategic partner for national and international market activities.”

Can you give some examples?

Our institute has already been working closely with Siemens for more than 20 years. We value Siemens both as a contact and for the quality of its solutions.

I’d especially like to mention the project that we recently collaborated on for the Indian float glass manufacturer Gold Plus Glass. For the first time, we implemented plant-wide automation based on the Simatic PCS 7 process control system. It was a genuine milestone as well as an important prerequisite for further digitalization.

Good advice on the path to digital production

The Siemens digitalization consulting concept follows distinct principles.

1



Consulting instead of dictating

Network with others, develop through collaboration, and respond to “It won’t work” with “There’s no such thing!” With these principles as the starting point, Siemens wants to invite all stakeholders in the glass industry to embark on the exciting journey of digital transformation. The customer-specific teams don’t provide standard recipes: Instead, they determine the ingredients and the amounts that will satisfy each specific entrepreneurial taste. The Siemens experts contribute the “culinary art,” including workshop methods and tools that have proved their worth in pioneering industries along with the interdisciplinary knowledge of their team.

2



Analysis instead of solicitation

Siemens is convinced that a comprehensive approach to digitalization has the most sustained and positive impact. It starts with a complete analysis that ensures that subsequent solutions will be optimally adapted to the specific needs and scope of the company. A non-Siemens-specific, product-neutral, customer-oriented strategy is a top priority. In the kickoff workshop, therefore, the goal is to listen carefully to the individual issues that are troubling each company. What are its challenges? What are its business objectives? With this as their basis, the Siemens experts analyze the internal processes, the IT and operational technology (OT) infrastructure of plants and machines, and the level of automation, and use that information to identify potential for improvement.

3



Specifics instead of excess

The team then creates a digitalization road map containing customer-specific, prioritized activities for the coming years that includes a schedule and information on technical feasibility. One of the priorities might be, for example, to develop the level of automation to such a high degree that all requirements for additional networking and virtualization are met. To give the company clarity from the very start, investment and ROI calculations are also part of the road map. The transformation process can then be implemented by the company itself or with the help of partners.

4



Experimentation instead of overexcitement

Transformation has many times brought great success – as it did in 1847, when Werner von Siemens dramatically accelerated the transmission of messages with the pointer telegraph. The inventor translated an idea into a technology that turned out to be revolutionary and led to the founding of Siemens’ corporate history. Benchmarks like these are admittedly high. But those who don’t just allow digitalization to happen but rather actively shape it usually start with a small, significant project that’s easy to implement. And if it develops over time into something extraordinary, it’s all the more gratifying.

“Our focus is always on the employees”

As CEO of Steklarna Hrastnik, the premium Slovenian packaging glass manufacturer, Peter Čas is pursuing a people-centered digitalization strategy.



All photos: Siemens

Mr. Čas, what attracted you to the job at Steklarna Hrastnik over a year ago?

Peter Čas: When I started here in August 2017, I was very impressed with how truly and consistently the employees are at the center of all strategic considerations. I immediately felt comfortable with this approach and continue to practice it.

How does this manifest in a typical workday?

Čas: First of all, it shows in our good working conditions, high level of appreciation, continual training, interdivisional and cross-hierarchical cooperation, and attractive tasks as part of Industrie 4.0. This is our basis for successfully meeting the challenges a premium niche supplier faces in the age of the digital transformation.

What are these challenges?

Čas: Our customers expect us to deliver the highest quality. After all, we're primarily known for the unparalleled purity of our glass. Our long-term customers include renowned global corporations, brand owners, distributors, and retail chains such as Bacardi Martini, Hennessy, Heineken, Villeroy & Boch, Sainsbury's, and many more. Seventy percent of our production involves the manufacture of specially shaped bottles for the spirit and perfume industries that are highly sophisticated in terms of design and the quality of the glass, and 30 percent is of high-end glassware like drinking glasses. Our main market is Europe. Because we manufacture approximately 200 new products per year in the ▶

area of glass packaging alone, and because the quantities are small compared with factories designed for mass production, we have to be extremely flexible.

What other basic conditions characterize your business?

Čas: Despite the many type changeovers, we have to serve our customers quickly. They have to be able to rely on receiving premium-quality products within about eight weeks of their initial order. That's why we develop our designs at such an incredible speed – or else adopt them from the customer – then manufacture product prototypes, and start production immediately. Operational excellence is our highest priority. We have

to be able to reproduce top quality, which sometimes includes refining and decorating the bottles in-house.

The order books are full, so you seem to have made the right changes...

Čas: We're convinced that entrepreneurial success and saving resources can go hand in hand. That's important to our customers and to us, and we've developed many programs on this basis. In recent years, we've managed to save 16 percent on energy, produce 30 percent less waste, consume 55 percent less water, reduce both NOx emissions and dust emissions by 75 percent, and reduce our CO₂ emissions by 35 percent. This has resulted in significantly better working conditions in the factory and a higher quality of life for the local population. We have a close connection to this region. We employ 700 people in four-shift operation, 30 percent of whom are residents of Hrastnik.

How does all this affect economic development in terms of numbers?

Čas: Taking all these factors into account, our revenue has grown 50 percent since 2009. In 2010, we were still 5.4 million euros in the red. At the end of 2017, we realized a profit of 7.7 million euros. Hopefully, that's just the beginning of a positive long-term trend.

What makes you optimistic?

Čas: The fact that we made the most important decisions early on. In 2016, we started developing preliminary ideas for a smart factory. In the spring of 2018, we worked with Siemens to fine-tune these models and elaborate a comprehensive digitalization strategy. We couldn't have done it alone. And without Siemens, we also would have made a few mistakes in the implementation. We closely scrutinized four or five companies and finally chose Siemens for digitalization consulting. It wasn't an obvious choice: Until that time,

we'd primarily valued Siemens for its role as a component supplier for automation and drive technology in our plants and machines.

What tipped the scales?

Čas: Several factors. First of all, we found Siemens' consulting approach to be the most professional and suitable for us. The team presented a clear plan of how they would analyze our internal processing, the IT and operational technology (OT) of our plants and machines, and the level of automation. On that basis they would systematically derive our potential for improvement – consistent with our business objectives and all within a period of just a few weeks. The human element was also key. I was impressed by the fact that all the members of the consulting team personally introduced themselves here. Each individual is an expert in their particular area: As a team, their expertise is unique.

What exactly did you consider to be unique?

Čas: Siemens was the only provider to introduce an entire team of people who had glass and industry-wide expertise from raw materials to the finished product, and they combined it with skills extending from the field and automation levels to the process control and corporate management levels and their specific IT requirements. Add to this an in-depth knowledge of lifecycle integration on both the product and plant levels.

What was the most valuable result for you?

Čas: Seeing how enthusiastically people worked together to achieve something fantastic in a short period of time. We learned so much from one another. I attended three days of workshops to learn how to make strategic decisions more quickly and to further elaborate the appropriate course of action. The most valuable result was the digitalization road map that was part of the report. It's an impressive work, the equivalent of a



“The most valuable result was the digitalization road map that was part of the report.”



doctoral thesis in its scope and depth, but at the same time highly practical.

Can you share the contents of this road map?

Čas: Generally speaking, we now know the measures we'll be implementing: when, and with what priorities, how all the activities are interrelated, what we'll be required to invest, and when the investments will be amortized. We now recognize 10 concrete projects, four of which are top priorities and have already been elaborated in detail by Siemens. Specifically, we'll be investing about 13 million euros in 2018 alone. According to the road map, our first step will be to concentrate on our OT network, Scada integration, a new MES system, and ERP system integration. In about five years, we'll

have become a smart factory in the best sense of the word, in that we'll be able to demonstrate better processes and results thanks to automation and digitalization. We currently have a large number of data silos and automation islands, a low degree of networking, and there are no shared data models from design to outgoing finished products. In addition, all the digital assistants should make our employees' lives easier.

How are your employees responding to these changes?

Čas: Very positively, because we emphasize the benefits and we actively involve employees in development, including in the workshops with Siemens. Once we've networked the machines, the next step is to

network the employees. Everyone should collaborate in flexible teams, each focused on the customer order. This cooperation is a huge gain.

What kind of support do you offer?

Čas: In addition to in-house training courses on the digital transformation, our biggest asset is mentoring. We currently have 75 "pairs" who empower each other. The younger employees learn from the more experienced employees, and vice versa. Department X learns from Department Z. This makes Steklarna Hrastnik an even more desirable employer, which is sure to expand its expertise. In any case, we need another melting furnace, if not a new factory in Europe.

Thank you, Mr. Čas, for your insights.

Putting digitalization to work

Thirty-year-old Jaša Polutnik is a prime representative of the digital transition at Steklarna Hrastnik. The mechanical engineer is project manager of the investment team and has co-led workshops with Siemens on behalf of the company.

Jaša Polutnik is a dynamic individual with a down-to-earth approach and boundless enthusiasm for his company and its growth. “What manufacturers of mass-produced glass products can do, we’ll also be able to do as a niche supplier,” says Polutnik. After completing his studies five years ago, he immediately joined Steklarna Hrastnik and began tackling future-related topics as a project manager. Equipped with an automated, digitalized factory, he hopes to achieve a pack-to-melt ratio on the same scale as mass producers – in other words, the highest possible ratio of final packed glassware to initial glass melt. This requires that process parameters be completely under control and transparent. Polutnik provides an example: “Currently, you don’t know if you’ve made mistakes at the hot end until two hours later at the cold end. In the future, we want to be able to act immediately using smart calculations.”

It’s a tremendous challenge, given that there are about 200 new products each year. “We’ll manage it with the right technology,” says the engineer, smiling. “And Siemens will be a

valuable partner for us, especially in the area of automation.” In addition to the pack-to-melt ratio, the improvements initiated are aimed at improving working conditions. Packaging robots were brought in to ensure that employees will no longer have to lift or pack heavy bottles. “Employees are then free to concentrate on quality control. High-quality, premium bottles require some 20 inspection steps,” explains Polutnik. He’s convinced that “at this stage of development, the technology is not yet able to reliably perform quality inspections of specially shaped articles.”

Another example involves the IS machines. Today the molded parts need to be lubricated by hand after each process. The job is performed in a very hot area of the plant with strong odors and is sometimes less than safe. Here as well, a lubricating robot will be able to relieve the employees, who can then assume more comfortable inspection duties at the cold end. “I could give you lots more examples of how we’re putting digitalization to work. Come see us again soon, because our story isn’t finished yet.”



“Currently, you don’t know if you’ve made mistakes at the hot end until two hours later at the cold end. In the future, we want to be able to act immediately using smart calculations.”

“Siemens speaks the language of SMEs”

Herbert Köhler advises Frerichs Glas as a member of its management, and provides personal insights into his decades of working in the glass industry.

Mr. Köhler, what would you say are the main characteristics of successful, far-sighted investments in developing large projects?

Herbert Köhler: It’s crucial that the objectives at the start of the project should match the results at the end of the project. Investments are especially far-sighted when, even years later, they yield very good results or even better results than planned. That was the case, for example, with the float glass project at f | glass in Osterweddingen, which I handled as a managing director at the time. About 10 years ago, in just 15 months of construction, we built one of the most up-to-date, energy-efficient float glass plants in the world. Siemens technology has played a key role in that success right down to today – especially the Simatic PCS 7 process control system. But it’s not just the economic factors that make for a successful project...

What other “recipes for success” are essential?

Köhler: I think you need honesty, clarity, reliability, perfectionism, defined goals, and a team spirit. You can get the best results only with a strong, carefully selected team. And that team also includes high-performance supplier partners like Siemens.

What challenges do these strong teams have to manage today?

Köhler: Possibly being able and willing to carry out changes in the shortest possible times. Any company, if it’s going to be successful into the future, has to succeed in getting broad acceptance for innovative

technologies – both inside and outside the company. Digital developments are advancing at a pace nobody has ever seen before. The challenge of getting the entire company to “go along” with that is massive. Industrie 4.0, with all its facets and challenges, is just one example. Doing business with sustainable success calls for an all-around approach like “FG2018” at Frerichs Glas.

What outside stimuli strengthen companies in such situations?

Köhler: As a businessman and consultant at a medium-sized business, I find it reassuring and helpful if we can draw on the resources of a global corporation like Siemens. I’ve been working with Siemens closely and in depth for more than 15 years now. Siemens has often been a “door-opener,” especially to cultural groups we’re not familiar with.

How has the collaboration experience been for you?

Köhler: I personally find working with Siemens a trusting, goal-oriented experience. That’s a gain for me, my customers, and my company. Siemens, and especially its employees, can provide everything we need. It may be hard for some to imagine, but Siemens also speaks the language of SMEs – small and medium-sized enterprises. I’ve repeatedly found people at Siemens whom I understand, and who understand me. So I’d say collaboration with Siemens is incredibly good.

Thanks very much for the interview, Mr. Köhler.



Herbert Köhler

A defining experience: building the float glass plant at f | glass. Herbert Köhler (l.) and current Saxony-Anhalt State Prime Minister Reiner Haseloff at the cornerstone-laying ceremony in Osterweddingen, mid-2008.

About Frerichs Glas

Frerichs Glas, with over 200 employees at two locations, is one of Northern Germany’s leading plate glass and plastic finishing specialists. The medium-sized company, headquartered in Verden, was established back in 1876 and has been managed by the Cordes family for more than 100 years. The company has been headed by Simon Cordes and Dr. Jan Wennemer since May 2018. Its innovations include insulating glass for integrating glass and transparent media façades, energy-saving glass, sound-reduction glass, self-cleaning glass and security glass, all-glass installations, shower glass, custom and mass-produced parts made of acrylic glass and polycarbonate for the machine construction industry, and special glasses such as Cleverglas, a full-surface LED-illuminated glass.



Family Firm 4.0 – in all its variety

Unlike a great many family firms of its size, Frerichs Glas has developed a strategic plan for the digital transformation – and laid the groundwork to make that plan a reality.

All photos: Frerichs Glas

Would you care to share the secret with our readers about how a classic medium-sized company is becoming a company where paper will soon be extinct?

Dr. Jan Wennemer: (laughing) Well, paper is a symbol of how we'll be digitalizing everything that it makes sense to digitalize over the next few years. Our future digital factory will be working "analog-free" in everything – planning, receiving, production, packing, logistics, and all the rest.

Simon Cordes: And since we're taking this all-around approach, we're looking forward to not just our new digital plant, but to a Frerichs Glas where quality management, controlling, and HR can also be handled largely paperlessly.

Your "FG2018" strategy stands for that entire concept. What have you defined as its cornerstones?

Reinhard Cordes: If our house is going to be stable for the future, we have to lay some important founda-

tions first. For one thing, by 2020 we'll be expanding our working space for production and administration by about half, to make sure we have the basics in the first place to improve our workflow.

Wennemer: After all, what good would digitalization be if we were just to turn a less-than-optimal process into a less-than-optimal digitalized process?

Simon Cordes: So it's not about enlarging and expanding, per se – after all, Frerichs Glas's business is based on innovation and quality, not on bulk. On top of that, we stand out for flexibility down to batch sizes of one, along with short turnaround times.

Wennemer: That means that in the new spaces we'll be sure to invest only in machines and systems that save us from having a patchwork of interfaces. We're looking for a higher-level automation solution based on Simatic controls, so we'll also be choosing our machine suppliers so that we can network everything ▶



Owner Reinhard Cordes (l.) is very pleased that since the start of May, Frerichs Glas has been managed by two digitally proficient managers – his son Simon (center) and Dr. Jan Wennemer (r.).

seamlessly. On top of that, all our systems will be cloud-compatible. The cloud is our future – everything will get more efficient, better, faster, and more secure, we all agree on that. And we need to take the controls we already have and make them workable for the network, and then quickly establish connectivity.

What other changes will you be initiating?

Reinhard Cordes: We've already made one of the most important changes. The younger generation took over the helm at the beginning of May. Very well trained, smart, enthusiastic people between 30 and 40 who can now work together to shape the future. We older guys will be stepping back, but we'll be around to help in word and deed anytime the next generation wants us.

Simon Cordes: We have an exciting time ahead, because digitalization is something that we younger folks have been taking for granted for most of our lives. And that's another important prerequisite for a successful "remodeling" of our corporate culture and structure.

Wennemer: The change of generations is a sign of foresight. Now we can pursue the transformation – and model it in our own conduct – more vigorously than ever. After all, the question of management culture and corporate culture also includes our hope that we can arouse the whole staff's enthusiasm for digitalization and bring them along on this exciting journey. Working the ultramodern way will also mean we need to get more mobile and more transparent. Data will be downloaded in real time, so it will be available faster, and also in a more reliable form than on a piece of paper.

That's easy to say...

Simon Cordes: We certainly have to learn that kind of frankness and admit to one another when we've made

mistakes – because they'll be visible at the click of a mouse. So we'll become a learning organization that continually improves – and that, we hope, will be fun rather than scary. Everybody should get actively involved, they should speak up when something occurs to them that could be improved.

Reinhard Cordes: The benefit will be immense, because we'll be able to respond immediately to real-time data, for example by intervening preventively in production. Transparency will be automated as we go along and learn. So for that we absolutely need a shop floor management system.

What other homework is there to be done?

Wennemer: We need to take a very close look at lean management. Our goal is to avoid any pointless expenditures. That goes for space, time, labor, and a great deal more. The point is that we should digitalize our processes under optimized conditions. We calculated out that from the time when goods are received to when products are shipped, theoretically we have 1,900 different ways of adding value – and out of those, we're taking advantage of barely 1,000 a year. We'll be able to control that complex work much better digitally. Today we're trying to get the overview without support. In cutting glass alone, optimized controls could realize a great deal more potential.

How will you make sure you have the expertise on hand for such a many-faceted job?

Reinhard Cordes: First of all, our new management is very well trained for innovative entrepreneurship. Jan Wennemer, for example, earned his doctorate in mechanical engineering and business engineering at Darmstadt Technical University with a dissertation about lean production. My son has picked up the right business-administration skills, including on an international basis. And that's just two examples.

Individual consulting from Siemens on the joint path to a digitalization road map

Simon Cordes: For new hires as well, we have to pay more attention than ever to making sure that in addition to training in their specific field, they also have digitalization skills. If they don't, we'll have to offer appropriate coaching and training in-house.

Wennemer: We're also making use of the extensive knowledge at German universities, especially the process learning plant at Darmstadt TU.

Reinhard Cordes: And Siemens will also provide us with new impetus as a partner.

What kind of impetus is especially valuable for Frerichs Glas?

Reinhard Cordes: I've known Siemens for more than 20 years now, and have found their team very dedicated and motivated. But what's much more crucial is that our contact people are experienced and skilled in every important field. They know their way around matters of hardware and software both, and they're at ease with Industrie 4.0 questions for all sectors, especially in plate glass processing. Digitalization at Siemens is always based on their core competences in electronic controls, electrification, and automation, as



Frerichs Glas is one of Northern Germany's leading plate glass and plastic finishing specialists.

well as the latest data transfer methods. Those are absolute necessities for taking the next step forward.

Wennemer: I like how the Siemens team thinks so systematically and in such structured terms. And that they listen carefully. They don't hand us prefabricated concepts – they give us custom advice instead. Specifically, one way Siemens helped us was with a clean analysis of our processes. They used demo applications to show us examples of how our grinding and drilling machines affect throughput for the entire fabrication system. Simulating the processing of an order with Siemens' Tecnomatix plant simulation software provided valuable information. In follow-up workshops, we then worked out a digital road map together that covered all the topics we've discussed here.

Simon Cordes: So if we talk again a few years from now, you'll see the results – a smart company, digital through and through.

Many thanks for such intriguing insights.



A photograph of two men in a server room. One man in a dark suit and red tie is pointing at a tablet held by the other man. The background shows server racks with glowing blue lights and digital data overlays. The overall scene is futuristic and tech-oriented.

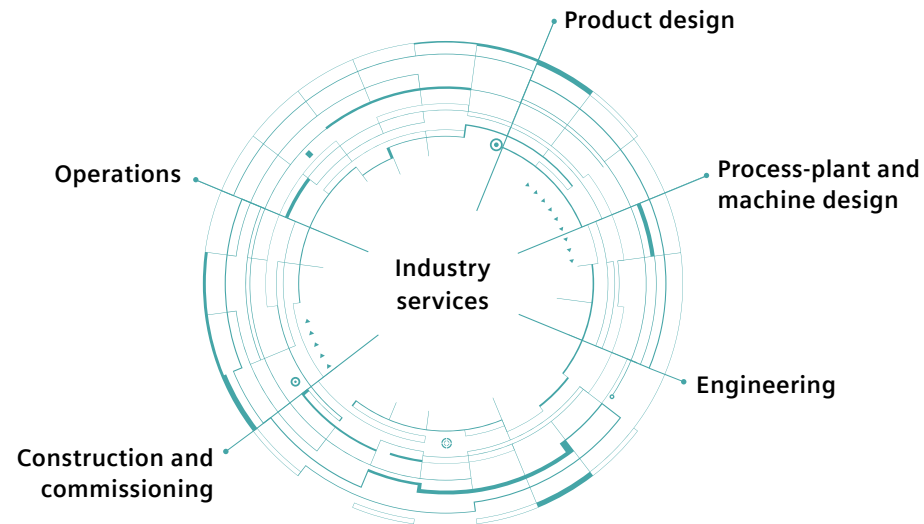
Integrated solutions throughout the entire plant lifecycle

The entire range of options for glass manufacturers and suppliers.

In the glass industry, digitalization is the most effective strategy for overcoming future challenges. It supports an unprecedented quality of decision-making – fast, well-founded, and fact-based – and

provides a solid foundation for systematically optimizing plants at any time throughout the entire lifecycle. It benefits manufacturers and suppliers equally. Here's an overview of the most important elements.

The circle is complete: Siemens offers a totally consistent data model



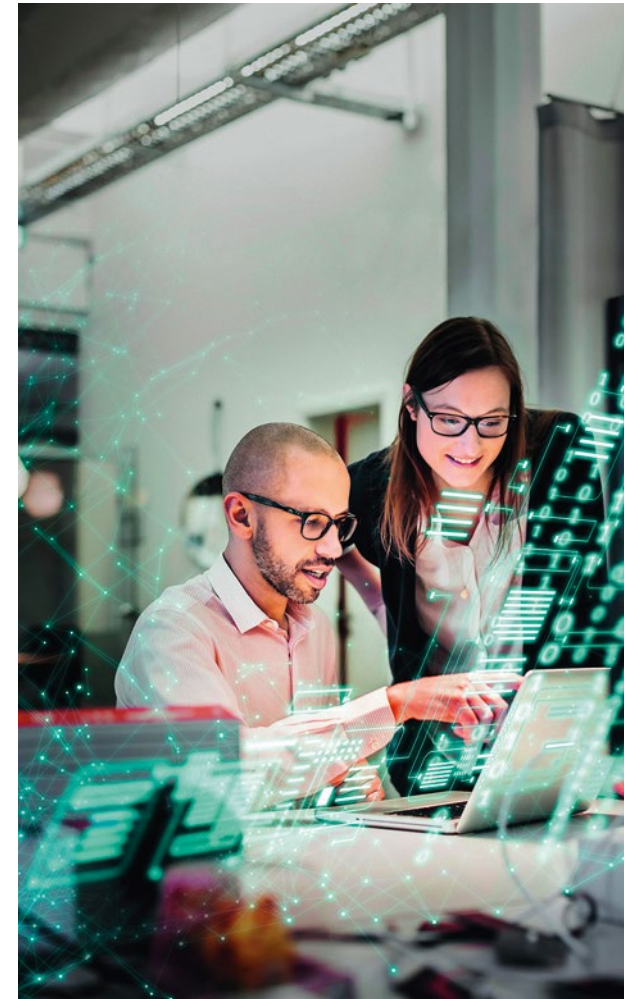
Integrated engineering

Comos is the central data platform used in the process industries, and allows all the plant manufacturers involved in a plant project to work on a common data model. With a single mouse click, all automation-related data can be transferred directly from Comos to the Simatic PCS 7 process control system, saving valuable time that would normally be spent configuring the automation structures.

Large sections of the plant model for the Simit simulation software can also be generated from Comos. In this way, all automation and control functions can be tested and potential faults corrected prior to the actual commissioning. Once data is recorded in Comos, it can be used in multiple configuration segments without having to be re-entered. This means that the engineering segments

that are normally performed sequentially can largely be executed in parallel, saving time and expenses and increasing engineering quality. Integrated engineering results in a virtual model of the plant – the digital twin.

Siemens offers the NX Mechatronics Concept Designer (MCD) for validating new machine concepts when developing new machines in the discrete segment of glass production. The machine's kinematic CAD data can also be used for virtual commissioning, which can be performed either with a real controller (HiL – hardware-in-the-loop) or with a virtual controller (SiL – software-in-the-loop). PLCSIM Advanced and the TIA Portal engineering framework can be used to generate these virtual controllers for the purpose of simulating physical components as well as for comprehensive function simulations.



Smart brownfield concepts

A digital twin can also be generated for existing plants. This can be useful for tasks like implementing fast and efficient training and modernizations. Preparatory measures on the path to the digital factory can also be adopted during ongoing operation.



Integrated operations

“Integrated operations” is what Siemens calls the continuation of integrated engineering into the operating phase. With the aid of an integrated digitalization offering comprising hardware, software, and services, the huge quantity of data generated during production can be recorded, processed, and intelligently utilized. The most important prerequisites are the systematic recording of process, plant, and machine data and the integration of data from a variety of levels from the field to management.

Thanks to simple communication between the Simatic PCS 7 process control system and the Comos MRO (Maintenance, Repair & Overhaul) software solution, maintenance and repair measures can be performed more quickly in order to significantly improve plant availability.

In addition, the existing digital twin of the plant can be used to train plant operators without affecting the real plant. Different ways of operating the plant can also be simulated and tested without interfering with the production process.

On the corporate management level, the XHQ Operations Intelligence dashboard solution is a valuable application for the operating phase. It supplies relevant, system-wide data and KPIs in real time, individually adapted to the customer. This could be an overview of especially costly assets and even comparisons of different plants at multiple locations worldwide.

Digital applications for the glass industry

MindSphere is an example of an open, cloud-based IoT (Internet of Things) operating system. It is the basis for industrial applications and data-based services both from Siemens and from third-party providers – for example, in the areas of predictive maintenance, energy data management, and resource optimization. The usual server-based applications also continue to be available.

Optimized operations

Control Performance Analytics: Optimally set control circuits

In the process industries, some 50 percent of all control circuits are still not operating at the optimum settings. Control Performance Analytics (CPA) can help. With the aid of this cloud-based service, data from the process can be automatically analyzed using algorithms and provide the user with instructions on how to set the control circuit parameters – (e.g. in order to improve process stability).

Process Event Analytics: Efficiently optimize the alarm system

The MindSphere application Process Event Analytics (PEA) serves to continuously monitor and improve alarm systems in the process industries. By combining IEC62682 and EEMUA191 standards with innovative analytics, PEA can efficiently identify improvement measures. PEA requires no additional manuals or training and relies on the simple pay-per-use model.

Overall Equipment Effectiveness: Visualize overall equipment effectiveness

The OEE app displays and visualizes overall equipment effectiveness – as a product of availability times performance times quality – on desktop PCs and mobile terminals.

Preventive maintenance

Fleet Manager: Make assets transparent

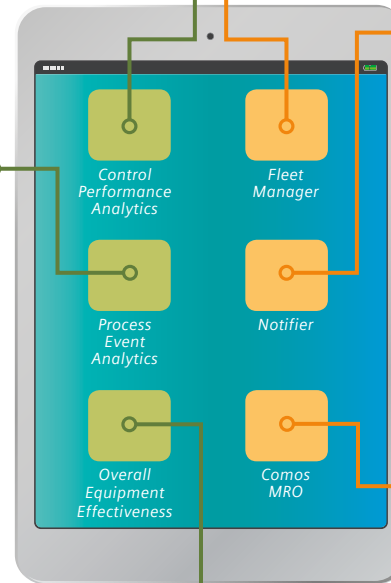
This app ensures the transparency of assets configured in MindSphere. It displays specific machine parameters such as limit violations and also defines specific actions based on these parameters.

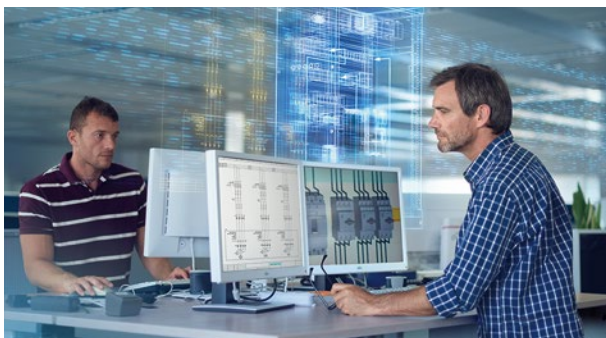
Notifier: Send automatic notifications to mobile terminals

On the basis of rules, faults and other important events involving a machine or plant are sent via WLAN to connected mobile devices (e.g. smartwatches or smartphones). Operators or service technicians are thus notified ad hoc, independent of location, and can immediately respond to the event. In addition to this local version, a MindSphere app is currently under development that also enables connection via a cellular wireless network.

Comos MRO: High plant availability thanks to integrated maintenance and data consistency

During plant operation and when changes occur, Comos MRO (Maintenance, Repair & Overhaul) supports the asset lifecycle with access to all maintenance-related information, including via mobile terminals. This includes installation location, electrical wiring, and all maintenance documentation.





Integrated services

The digital transformation of service is a top priority for Siemens – without neglecting traditional support services. The new “style” entails a broader understanding of service. According to a Gartner study, 75 percent of all companies across industries will have undergone a digital transformation by 2020 – but the survey reveals that only 30 percent will also create added value for their customers. The question of what the real gains will be is more pressing than ever before. Based in large part on its exchange with partners in the glass industry, Siemens is convinced that digitally based service offerings can provide a powerful boost. In addition to standard industry services, the task now is to precisely define “as a service” and combine it with what’s tried and tested.

The best of both worlds

The scalable Simatic Virtualization as a Service solution that’s already available unites the best of the traditional and smart worlds. In addition to maintaining the hardware platform, maintenance and support of the installed software components is crucial for minimizing the lifecycle costs of a PC-based control system. The comprehensive service concept exploits the potentials of digitalization in order to virtualize the entire system. This encompasses services across the entire lifecycle, including optimally compatible, preconfigured, and pretested software and hardware components – from a single source.

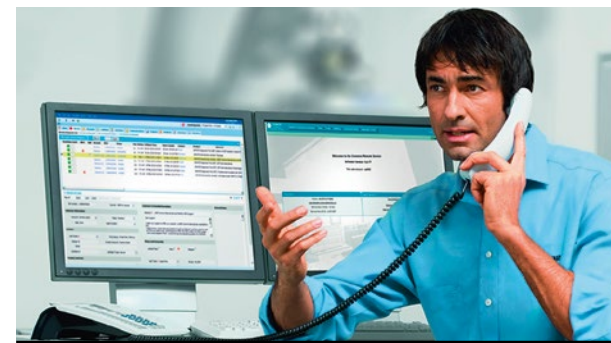
Simatic Virtualization as a Service includes the setup of the virtualization server, configuration of virtual machines (VMware), installation and configuration of the operating system, and turn-key installation of the Simatic software. Users will also continue to benefit from comprehensive support for all their technical questions on the function, application, and handling of their system components – throughout the lifecycle of the virtualization system.

Traditional model

Standard services will remain as important as ever. The demands and requirements of running a glass plant are highly specific, especially for a service life of 15 years or more, and the traditional service requirements are equally individual. Siemens works closely with customers to establish a strong foundation for:

- Investment protection
- System availability
- Modernization and service costs
- Obsolescence management
- Migration cycles and upgrades
- Transparency and traceability
- Documentation reliability and quality management

Here’s a concrete example: A modular and individually configurable lifecycle services contract for the Simatic PCS 7 control system results in a reduced total cost of ownership (TCO) and predictable maintenance and modernization costs. It ensures serviceability and long-term availability of spare parts as well as optimized plant availability.



Thinking ahead means retrofitting

When glass production plants have rendered faithful service for many years, it’s time to start thinking ahead. Because these plants often operate under extreme conditions, preventive measures are essential. So it’s a good idea to subject production processes to a meticulous inspection well in advance, even when critical processes are still running reliably.

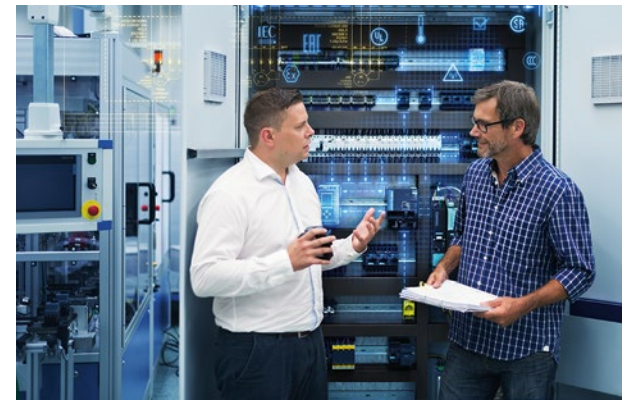
Siemens’ strengths lie in proactive services that keep plant availability high. For example, older drive technologies used in the plant can be proactively identified and replaced with up-to-date drive solutions. An example from the hot end: It’s essential that the furnace charge runs smoothly. This can result in relatively high maintenance expenditures over many years – especially when spare parts can be more and more difficult to procure. This is the time to take action!

As part of a retrofit project for a renowned glass manufacturer, Siemens was commissioned to replace, commission, and test a large number of electric drives and their associated safety systems as a preventive measure. The project also included reprogramming the control system to adapt to newer communication standards. The always reliable Simovert Masterdrives were replaced by the successor products Sinamics G and Sinamics S. Siemens successfully completed the project in just three weeks – and will continue to stand by the customer with advice and assistance in the future.



Smart control cabinet engineering

Virtual planning and digital processes throughout the entire lifecycle create previously unimagined competitive advantages for control cabinet manufacturers.



Control cabinets are the core of every plant, and today the planning and engineering of control cabinets is already fully supported digitally. The digital workflow has numerous advantages. Tasks that used to be performed successively can now be done simultaneously, dramatically reducing project time.

Digital twin in control cabinet engineering

A digital twin allows engineers to virtually double-check almost every step of their plans. This saves time, ensures quality, and reduces engineering costs: for example, when changes that will have an impact on subsequent steps in the workflow can be simulated virtually beforehand.

An added bonus: Thanks to digitalization in control cabinet engineering, all the data is reliably and permanently stored and made available, from technical product data and simulation data to analysis and diagnostics data.

Every process step can be digitalized

The digital workflow in control cabinet engineering includes three major process steps: mechanical design, automation, and electrical design. Mechanical design determines the actuators and sensors that will be used in production. In automation, the control and communication components are selected and the process logic is programmed. And finally, in electrical design the

switching and protection components are defined in the circuit diagram and the mechanical setup of the control cabinet is planned. For each of these process steps, efficient software tools are available for optimizing the progress of each individual phase.

There's great potential in the transition from one project phase to the next. Thanks to the digital forwarding of reliable data, the effort necessary for data collection and for subsequent changes is reduced. Siemens supports control cabinet manufacturers with software and interfaces to build an end-to-end digital workflow, not only in control cabinet planning but also throughout the cabinet's entire lifecycle.

Integrated engineering for all phases of a plant's lifecycle

The selection of the appropriate engineering tool is crucial for efficient, high-quality engineering. Siemens has developed its own approach to customizing based on experience acquired from numerous projects for customers around the world. The customizing workflow covers the full range of engineering tasks.

This starts with process development and basic and detail engineering, and includes the handover of all design data to the plant operator. The data is then available for the entire lifecycle of the plant. During the design phase, the data is accessible to all the departments involved. The Comos planning tool ensures the consistency of all the data throughout all phases of the lifecycle.

The engineers involved have reliable access to the design data at all times and from any location via a terminal server. After plant handover, maintenance activities can continue to be scheduled and coordinated with Comos in order to minimize plant downtime.

The digital workflow in control cabinet engineering includes three major process steps: mechanical design, automation, and electrical design.

Simocode pro goes MindSphere

With OPC UA communication from the Simocode pro motor management and control devices, switch-gear are transformed into providers of valuable information for Industrie 4.0. Enormous volumes of measured values, status reports, and diagnostic information from the motor are systematically communicated via Industrial Ethernet to precisely where they're needed. This means that the information can even be made available in cloud-based solutions like Siemens' MindSphere – with no need for intervention in process procedures.

Open, vendor-independent communication

Via Profibus, Profinet, EthernetIP, or Modbus, Simocode pro offers flexible and powerful communication interfaces for automation systems as well as operating and monitoring systems. These systems can access all important operating, service, and diagnostics data from Simocode pro and are also able to transfer control commands. This makes it possible for the motor management system to direct information from the control cabinet right to where the data is processed: directly on-site in the control and instrumentation technology.



Zippe relies on in-house solutions – in close collaboration with Siemens

Zippe provides control cabinet solutions tailored to batch, silo, and cullet plants to be used as central control systems. In assembling its cabinets, the supplier uses only high-quality components from system partners like Siemens. "What sets us apart from the competition is the fact that we manufacture control cabinets in-house and test the control systems and automation and process control technology ourselves, all the way to the output terminal," says Joachim Ullrich, who heads the control system manufacturing unit at Zippe. "Many companies can't offer such consistency."

Beyond component quality

However, Siemens components aren't the only things in high demand. So are consulting services for (digital) control cabinet manufacturing and special requirements. "For example, whenever we have country-specific requirements and questions about standardization or important changes, we can always rely on Siemens," says Ullrich. Siemens was recently able to give the supplier important advice on an inquiry from the United States during an on-site workshop. "We went through it and discussed everything, from the offer phase to technical implementation to commissioning, so that we were able to make a perfect, country-specific offer," Ullrich says.



Well-equipped for the industry of the future

As Chairman of the VDMA (Mechanical Engineering Industry Association) Glass Technology Forum, Egbert Wenninger wants to give new impetus and tools for equipping the factories of the future.

“The Glass Technology Forum is systematically tackling all issues relating to digitalization.”

Mr. Wenninger, what's the temperature reading on the industry thermometer?

Egbert Wenninger: The temperature is currently very pleasant. At the end of 2016, the glass industry experienced a turnaround, the demand for glass products started to climb, and the indicator at the time was clear: rising glass prices.

What effects did this have on international markets?

Wenninger: Take glass production, for example. For some time now, China has been making an extremely large number of very long-term investments in its plants. From façades to vehicle windows, they're turning to German mechanical and plant engineering to equip their factories. It's been shown repeatedly that reliable quality made in Germany is more than ever the top choice for these significant investments.

What can your association do to keep it this way?

Wenninger: All of the member companies have to strengthen one another. One of my most important short-term goals is to recruit 10 to 15 new companies for the association. Joined together under the powerful umbrella of the VDMA, we can, for example, stake our claim in important markets like China.

What other arguments will you use?

Wenninger: For instance, our association is systematically tackling all issues relating to digitalization. Topics like data security, big data, and connectivity are currently high on the agenda of seminars and workshops. Our members inspire one another, demonstrate best practices, and share their valuable experiences. Each meeting is held at a member company or at the VDMA in Frankfurt – we couldn't be any closer to the future than that.

Siemens is a relatively new member of the Glass Technology Forum. What input would you like to see there?

Weninger: It's extremely valuable for the 60 primarily small and medium-sized German glass machine and plant-building companies to learn about practical, valuable cloud applications. Members also appreciate their Siemens colleagues for their digital expertise. The importance of the consulting aspect alone can't be overestimated. For example, when it comes to areas like data security, Siemens has highly developed concepts that they are more than welcome to present again and again. That issue is simply too important to have it appear only once on the agenda.

In addition to the wide-ranging expertise, the Forum also provides access to the VDMA network. What added value does this offer?

Weninger: The VDMA offers numerous services. For example, it collaborates extensively on standardization issues – and so is helping shape Industrie 4.0. All the member companies benefit. The association also advises its members in the area of internationalization and shares its expertise with companies that need to draft international contracts.

The next meeting of Forum members will be in November, hosted by Hegla. Will you be welcoming 10 to 15 new members?

Weninger: That's the goal. Even if they aren't new members by then, I'll invite companies to attend our meeting as guests to draw inspiration from the topics and people.

We wish you much success, Mr. Weninger.

Brief profile

Egbert Weninger, 52, has been Senior Vice President of the Glass Business Unit at Grenzebach Maschinenbau GmbH in Asbach-Bäumenheim, Germany, since 2017. After graduating as an electrotechnical engineer from the Technical University of Munich, he worked as a project engineer at Pfister Systemtechnik GmbH in Augsburg for two and a half years starting in 1992. He joined Grenzebach Maschinenbau GmbH in 1995 and remained for the next 17 years, first serving as Vice President of Sales Glass Technology and later as a member of the Management Team. In 2012, he became Managing Director of EME GmbH in Lohr, before returning to Grenzebach as CSO in 2016.

Weninger has been involved with VDMA's activities since 2009. Since 2011, he has been a Member of the Board of the Glass Technology Forum and its Chairman since October 2017. From 2010 to 2012, he served on the board of the Photovoltaic Production Resources working group. Since 2009, he has also represented the VDMA on the glasstec Advisory Board.



Perfected on the digital twin

Grenzebach introduces a new tin-air speed stacker – the first to be virtually optimized.

Grenzebach

Industry 4.0, digitalization, big data, and smart data are nothing new for Grenzebach. Among other things, for many years the high-tech company has been simulating the flow of material in complex plants for manufacturing and processing flat glass, so that it can be sure of the design before the plant is built and commissioned. Grenzebach relies on the Plant Simulation 3D software from Siemens, its preferred

supplier of control and drive technology. With its Grenzebach Application Server, the company also provides an IIoT platform for the data-based optimization of its systems. Grenzebach and Siemens are on the same wavelength when it comes to many areas relating to digitalization, and they continually apply their expertise synergistically to generate innovative solutions.

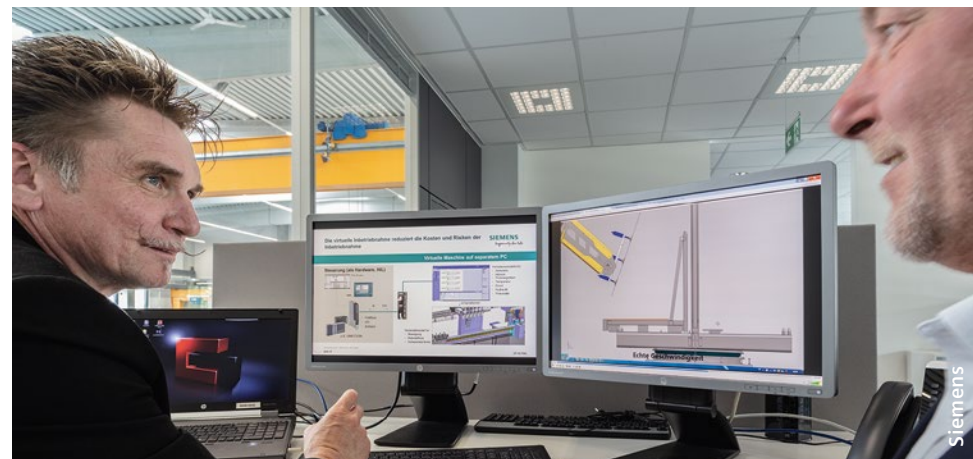
Innovative 3-axis fast stacker

This was the case with the development of the new tin-air speed stacker for stacking all types of glass sheet. Unlike the existing solutions, the innovative 3-axis fast stacker can pick up glass sheets from the tin side or the air side and immediately place them vertically on a glass rack – and it does it quickly, at a rate of up to 20 times per minute, which means about a 30 percent higher

On the same wavelength when it comes to digitalization:
Roland Jenning (l.) and Werner Ohnesorg, Sales Engineer at Siemens.

“This initial project has already proved that the digital twin saves both costs and development time and helps minimize risks.”

Roland Jenning, head of Innovation at Grenzebach



stacking rate than the previous technology. This makes the innovation the highest-performance stacker in its class on the market.

The foundation of the stacker is a new servomotor-driven swing-arm stacker design with two synchronously operated articulated arms and a pivotable suction frame at the front end. This means that the suction frame level can be made to traverse a freely definable trajectory from a horizontal orientation to practically any angular or stacking position. The design covers a stacking depth of about 900 millimeters, eliminating the need for a linearly backward indexing glass rack – which in turn saves investment costs at the customer end.

Siemens was involved in the development project from the very start and assisted the Grenzebach engineers with developing the concept and selecting suitable control and drive technology. A Simotion D445 motion controller with a Handling Advanced universal library plus modular Sinamics S120 converters and Simotics S servomotors are responsible for controlling, or rather calculating on the fly, during operation.

First-time generation of a digital twin

The new approach placed higher demands on motion

control and collision detection than classic stackers. “Also, in order to come to grips with potential kinematic singularities similar to those of an articulated-arm robot, we decided to build a digital twin first,” says Roland Jenning, head of Innovation at Grenzebach. What they built was a virtual mechatronic model of the stacker that could be simulated and optimized in detail on a PC. Specialists from Siemens contributed a mathematical model for Simotion.

The digital twin was created using the NX Mechatronics Concept Designer (MCD) software from Siemens, based on Grenzebach’s mechanical 3D design. This design was entered into MCD as a Step file and supplemented with relevant properties including mass inertias, dynamic threshold values, and interfering edges for collision detection to create a kinematic model that can be graphically animated. The first motion control program for Simotion had already been created, so it was possible to prepare for virtual commissioning at an early stage. This parallelization of formerly sequential development steps is a tremendous time-saving benefit of the digitalized approach.

Simulated with hardware-in-the-loop

A hardware-in-the-loop setup was chosen to realistically simulate the programmed motion sequences on the

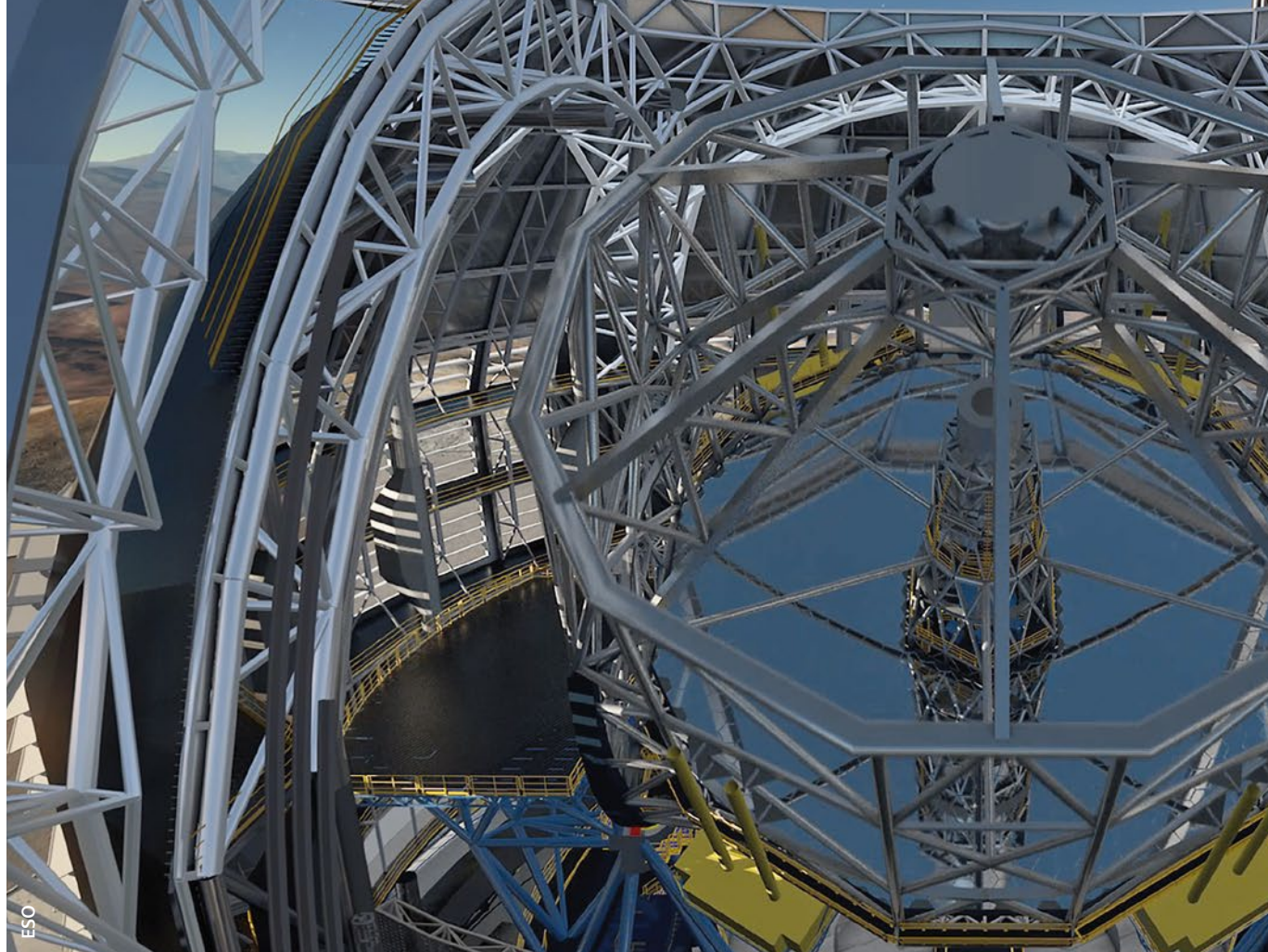
digital twin. For this, the designated Simotion CPU is connected to the kinematic model in the Mechatronics Concept Designer via a Simit simulation unit, and actions, reactions, and signal propagation times are parameterized in a behavior model. This makes it possible to emulate the interaction among all the participants connected to the Simotion CPU via Profinet. The program can then be tested as usual using the Simotion Scout engineering program, with MCD graphically animating the resulting traversing motions and Simit indicating errors. This allows any vulnerabilities to be visualized in three dimensions and sequences to be successively optimized – all without manufacturing a single component or having to alter it multiple times. Finally, a largely fault-free program is transferred to the first real machine. Overall, the actual commissioning time and time to market were reduced to a significant degree.

“This initial project has already proved that the digital twin saves both costs and development time and helps minimize risks,” says Jenning. And the digital twin’s usefulness doesn’t stop there. Once it’s been generated, it can also be used to virtually simulate and verify future changes or sequences for new rack / product versions in advance – without interfering with ongoing production.

Glass manufacturers

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Right on target

In the Schott glass-ceramic production facility, Simatic PCS 7 takes highly precise temperature measurements during creation of the world's largest telescope.

In producing this mirror substrate, Schott relies on its long-term partner Siemens and the Simatic PCS 7 process control system to run its new, second melting tank for producing Zerodur.

The world's largest optical telescope is being built on Mount Cerro Armazones in Chile: the European Extremely Large Telescope. Owned by the European Southern Observatory (ESO), the enormous telescope relies on a five-mirror design: one giant main mirror measuring 39.3 meters in diameter and four more mirrors as reflectors. The Schott technology group is a partner in this major project. The manufacturer of specialty glass was asked to cast and grind three of these huge reflector mirrors, which measure up to four meters in diameter. Schott uses a special glass-ceramic (Zerodur) as the mirror substrate.

Special glass properties

The special feature of the glass-ceramic is its extremely low thermal expansion coefficient, a key property for deploying the mirror substrate in Chile. In principle, the material doesn't expand even if significant temperature fluctuations occur. This results in extremely sharp telescope images for studying unexplored worlds.

Challenging temperature measurement

The Schott production facility based in Mainz, Germany, laid the groundwork. To avoid stress cracks, the specialty glass had to be heated and cooled over a very long period of time during the production process – to temperatures that had to be set precisely to the third decimal place over an extremely broad range of temperatures. In producing this mirror substrate, Schott relies on its long-term partner Siemens and the Simatic PCS 7 process control system to run its new, second melting tank for producing Zerodur. What's special about this approach is that until now Schott



Building the mirror substrate for the world's largest optical telescope: The photo shows the mold being opened in the Schott cooling hall.

had to maintain an additional temperature measuring system in its existing plants, which results in hardware, engineering, and handling costs.

Perfect solution

Siemens used a module of the Simatic ET 200SP peripheral system to meet these requirements. In addition to measuring voltage and current, the modules also cover resistance, RTD (resistance thermometer), and thermocouple measurements. Two developers from Schott and Siemens first tested the plan's fundamental feasibility under lab conditions. In the development department responsible for Simatic PCS 7, Siemens then programmed a new module specifically for this application. Schott was very pleased that Siemens was able to seamlessly implement this extremely challenging, highly precise temperature measurement with its process control system. The two partners have now brought scientists one step closer to studying unexplored worlds.



Raise your glasses!

In 2018, Gallo Glass celebrates its 60th anniversary and looks back with pride on its development. Siemens has also contributed to the success story with its process control system.

Gettyimages/zoranm

A company's successes are often better understood in retrospect, and anniversaries can be an excellent opportunity for a company to review its history. When North American glass facility Gallo Glass celebrates its 60th year, there are sure to be many milestones that contributed to making this famous manufacturer of wine and spirit bottles what it is today. When it was founded in 1958 by Ernest and Julio Gallo in Modesto, California, a new era in bottle making was

launched. From the very start, Gallo Glass was able to meet production needs while minimizing the impact on the environment. As early as 1961, the company commissioned a second melting furnace, which continued to be supplied by only one batch plant. When Gallo Glass needed a third furnace in 1970, the batch house had almost reached its limits. When a fourth furnace was added in 1972, a second batch house was finally acquired.

Growing environmental awareness

In the 1980s, society experienced a renewed awareness of environmental matters, which led Gallo Glass to make its processes even more efficient and resource-saving. At that time, the company invested in triple gob coolers, designed smaller bottles, and converted from mechanical to machine-aided time control. The next milestone occurred in the 1990s, when Gallo Glass became one of the first glass packaging companies to

“Thanks to the integrated solution and the expertise of the batch systems engineering company, the Simatic PCS 7 process control system also found its way to Gallo Glass.”

Mo Mashinchi, project manager at Gallo Glass



install natural gas / oxygen furnaces to minimize NOx emissions. An automated electrostatic filter unit was installed to significantly reduce particulate emissions.

At full capacity

The lack of redundancy was problematic for Gallo, because high availability with a simultaneous increase in capacity was essential. Operating the two batch plants also required a relatively high deployment of staff. The first immediate action on the part of the company was to consolidate its two raw-material silos. Then, in 2014, Gallo Glass commissioned EME GmbH to plan and upgrade the batch plant and parts of the cullet-return system so as to guarantee maximum redundancy and enable predictive maintenance. At the same time, Gallo ordered new melting furnaces from EME's sister company Nikolaus Sorg, meaning that the core technology was supplied from a single source – with all the advantages in terms of quality and interfaces. Gallo Glass also decided to use melting furnaces with the latest oxy-fuel technology.

Premiere of Simatic PCS 7

“Thanks to the integrated solution and the expertise of the batch systems engineering company, the Simatic PCS 7 process control system also found its way to Gallo Glass,” recalls Mo Mashinchi, project manager for the

bottle maker. This was no small feat, given that it was the U.S. market. Another first: The control system's standards, standardized libraries, comprehensive functionalities, and modular engineering enabled EME to implement an end-to-end automation solution at the hot end.

Complex upgrade phase

The recent 18-month upgrade also proved to be a complex task. In addition to a cold furnace repair, it involved expanding and integrating the cullet plant, including the belt loading station. The cullet plant was integrated into the batch-house controller during operation. “It was sort of like open-heart surgery in which additional controllers were embedded,” says Mashinchi. “There were no major interruptions during the upgrade. We were able to continue producing millions of bottles a day. And now, for the first time, we'll be able to prevent future failures through predictive maintenance – that was extremely important for us.”

The desired effect

“We're extremely satisfied with Siemens and have excellent relationships with our colleagues there,” Mashinchi adds. “The implemented solution is environmentally sustainable and has given us the desired increase in efficiency and availability. And thanks to

system redundancy, we were also able to expand our capacities. As an added bonus, the technologies were developed in such a way that it's theoretically possible to add two more melting furnaces.” Meanwhile, Gallo Glass was able to achieve higher annual production volume – with no end in sight. So everything's ready for the anniversary. Raise your glasses!

For the sake of the environment

- Gallo Glass was the first industrial enterprise to rely on oxy-fuel technology in container glass production, reducing its NOx emissions by 80 percent.
- The company is the largest user of recycled glass in California, using 50 percent recycled glass in its batch.
- The bottle maker reuses 95+ percent of its daily service water.

Always prepared for the future

Why the Pilkington plant in Weiherhammer has relied for decades on Siemens to upgrade its automation systems.

Pilkington in Weiherhammer

In Weiherhammer in Germany's Upper Palatinate, two lines produce flat glass primarily for the construction glass sector using the float glass method. In an online coating process during the float glass process, products like thermal insulation glass, self-cleaning glass, and special low-iron glass for solar applications are produced. The Weiherhammer plant employs a workforce of about 470. The curved panes of glass for the Apple headquarters in California, for example, came from the Upper Palatinate.

All photos: Pilkington Deutschland AG

At the end of June 2018, the triad of site acceptance test, tempering, and commissioning marked the successful finale of the 100-day cold repair of production line 2 in Pilkington's Weiherhammer plant located in Germany's Upper Palatinate. "This was an enormous feat. In peak periods, as many as 200 external workers joined forces with our colleagues, working around the clock to ensure that we'd be able to resume production on schedule," says plant manager Reinhold Gietl, taking stock of the positive results. "Of our 470 employees, everyone was involved either directly or indirectly, from the gate to production." The technical area in particular was completely integrated.

A break after 2.5 million tons of glass

A total of two lines at the plant produce float glass using the float-glass method, primarily for the construction glass sector. Line 1 continued production during the "break" for "float two." Until the current cold repair, the line's melting furnace had served reliably for 10 years, 365 days a year, around the clock. The numbers speak for themselves: Over the years the output added up to 2.5 million tons of glass, with up to 810 tons per day manufactured. That corresponds to 250 million square meters of construction glass that's four millimeters thick, or a glass strip 3.5 meters wide and 75,000 kilometers long – almost long enough to go around the world twice.

Weiherhammer is the plant with the most sophisticated product range in the NSG Group. There's a demand for glass from 0.75 to 19 millimeters thick and in lengths up to 16 meters. That's why "float two" had to be refurbished much sooner than is often the case. The last tank cycle lasted 17 years: In 2008, it set an internal company record for service life. The production process was stopped as planned in mid-March and the tank was drained. It took three days for the 1,600-degree glass melt to drain and cool down, accompanied by loud hissing and whistling.

"Cycle companion" since the plant was founded

Siemens has been a constant companion of the tank cycles since the plant was founded in 1979. Pilkington



Precision landing: Between March and June, the 570-meter-long production line 2 in the float plant was shut down and completely rebuilt.



has counted on automation systems from Siemens on both its lines from the very beginning: first using Teleperm M as a process control system, and then later using the successor, Simatic PCS 7. In the current cold repair, the last three remaining Teleperm M systems were replaced in line 2. Although the system was still operating very reliably, this final retrofit was necessary because spare parts were only available to a limited degree. "With the change to the PCS 7 process control system, we're very confident that we've made a future-proof investment in float line 2," says the plant manager.

Gradual conversion on their own

Pilkington can now rely on the decentralized process control system from Siemens to ensure a consistently



high flat glass quality throughout the plant, because the control system monitors and ensures precise compliance with all parameters during the float process. Intelligent controls also help conserve energy and minimize harmful emissions. With PCS 7, Pilkington benefits from a technical foundation that takes into account the steadily growing requirements for efficiency, resource conservation, and environmental sustainability. At the same time, the open system architecture realized with PCS 7 permits a high degree of flexibility and represents the optimal basis for future technical expansions. At the customer's request, for example, the old peripherals and IO systems will continue to be used. Pilkington can then gradually convert the IO modules to up-to-date modules on its own as desired.

"With the change to the PCS 7 process control system, we're very confident that we've made a future-proof investment in float line 2."

Reinhold Gietl, plant manager at Pilkington Deutschland AG in Weiherhammer

Hand in hand: automation and project planning experts

More than 20 companies were involved in the cold repair of production line 2, many of them from the region. "Our central engineering department from Pilkington worked closely with the Siemens specialists and the plant employees from Weiherhammer to replace the control system. The combination of automation and project planning experts worked perfectly," says Gietl. "Our intensive collaboration with Siemens has proved itself over many years and ensures that a project as complex as this one can be optimally implemented, especially in such a short period of time," he affirms. For example, the extensive preparations facilitated the actual commissioning on-site and secured the agreed-upon deadlines. Before the systems were delivered, employees also performed a factory acceptance test at Siemens in Karlsruhe. Soon thereafter, the time had come: Pilkington was able to start up its melting furnace again as planned and begin the next tank cycle.

Plant and equipment manufacturers

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Multiple keys to success

In the largest project in the company's history, Horn Glass and partners have equipped the largest glassworks in Central Asia and recently handed it over on a turnkey basis.

Horn Glass: from the machine to the overall project

Horn Glass is a growing global designer and provider of complete glass-melting technology from a single source with headquarters in Plössberg, Germany. Its products include machines like batch chargers and top-roller machines as well as heating equipment, tin-bath roof heating, and electric boosting. Project planning experts at Horn Glass can also design and deliver all of the auxiliary equipment down to the latest detail. Most important, Horn Glass has made its name as a technology supplier that manages complete projects and can integrate all partners and interfaces.



Horn Glass is a technology supplier for the construction of Turkmenistan's first glass production plant.

It's finally done. After about two years of intensive work, Horn Glass handed over the new state glass production plant to Turkmenistan's Ministry of Industry on a turnkey basis in spring 2018. The long-standing Siemens partner was looking back on the largest order in the company's history, which required that its specialists give their best. Commissioned by the Turkish general contractor Tepe Türkmen Insaat ve Ticaret, Horn Glass acted as the chief technology supplier for the construction of Central Asia's largest container-glass and float-glass plant. The project scope included not just the delivery of all process equipment and its installation but

also commissioning all the systems and overall system-wide management – in conjunction with managing partners and suppliers – along the entire process chain. "The fact that we've already accumulated over 130 years of ongoing expertise in the area of glass-melting and glass-production plants and have always positioned ourselves globally was of tremendous help to us during this major project," says Ekaterina Firsova. The technology and industry expert has been Head of the Technological Glass Plant Business Unit at Horn Glass for about one year. "The customers appreciate that we're their partner both for individual machines and entire projects."

First local glass production

The new glass factory, located 25 kilometers north of the Turkmen capital Ashgabat, now supplies practically all the container glass required by the country's food and pharmaceutical industries. The float-glass output is also massive by local standards: The systems are designed for an annual output of roughly four million square meters of transparent glass, one million square meters of tinted glass, 300,000 square meters of hardened glass, 100,000 square meters of laminated glass, and 400,000 square meters of the highest quality double-glazed windows. Firsova is impressed: "The optics of the glass already correspond to the European quality standard, meaning that the products will sell rapidly on the local market." Until now, Turkmenistan had no access to local glass production facilities. With the new factory, Turkmenistan can significantly reduce its imports of container glass for the food and beverage industry. An annual production of 95 million bottles is planned. The amount of local raw materials used will also increase over time from 70 to 100 percent. ▶



The amount of local raw materials used will increase over time from 70 to 100 percent.

Batch plant from Zippe

The container-glass line alone is a prime example of the close collaboration between Horn Glass and its selected partners. Zippe delivered a new batch plant for supplying two glass furnaces at a rate of 50 tons per day for the container glass furnace. The batch plant is designed as a tower with storage capacity for four days. The raw material silo is fed mechanically by bucket elevators and large bags. In the mixing plant, which comprises a total of three mixers, one mixer is permanently assigned to each furnace. The third mixer acts as a stand-by for both furnaces (container glass and float glass). Cullet storage is also located in the batch plant. Cullet feeding, crushing, storage, and weighing take place separately for float and container glass. Cullet weighing and feeding are performed by weighfeeders in a sandwich process. The scope of supply also includes hot and cold cullet recycling for the container-glass furnace comprising downspouts, chain conveyors, primary crushers, and conveyor belts.

Recuperative furnace with two forehearth

A recuperative furnace with two forehearths processes the raw materials for the container-glass line. The furnace was designed by Horn Glass and incorporates the latest technological solutions. It's equipped with an auxiliary electric heater, which permits an additional 15 tons of glass to be melted per day. A system implemented for measuring process parameters and controlling them during automated operation plays a key role in organizing the technological processes and ensuring a stable glass-melting process.



Operators value the plant-wide integrated automation based on the Simatic PCS 7 process control system.

Higher-level process control system for the container- and float-glass lines

Turkmenistan isn't the only place where Horn Glass – a long-term Siemens partner – offers its customers optimal technology from a single source.

"Glass manufacturers and general contractors benefit from the long-term collaboration between Horn Glass and Siemens – not just because we're a well-coordinated team, but also because we can

offer technical solutions from a single source. In our projects, we use the entire range of Siemens products in the areas of process control technology, automation and drive technology, process

“In our projects, we use the entire range of Siemens products in the areas of process control technology and automation and drive technology.”

Markus Frank, Head of the Electrical Department at Horn Glass

instrumentation, industrial controls, and power supply,” says Markus Frank, Head of the Electrical Department at Horn Glass. Because Horn Glass served as a technology supplier in the Turkmenistan project, it made sure when selecting its partners and subcontractors that all the systems and machines already supplied had compatible Siemens interfaces or were supplied with Siemens components.

As a result, the selected Simatic PCS 7 process control system can now demonstrate its strengths all the more in the new factory as a plant-wide and end-to-end automation system. What is unusual is that it’s used for both the container-glass and float-glass lines. The user-friendly system ensures uninterrupted operation, consistent product quality, low plant costs, and, last but not least, more energy-efficient and low-emissions production.

The shielding-gas mixing station also became host to an advanced application. Siemens Calomat devices are used to perform continuous measurements of hydrogen and oxygen. They’re not only extremely reliable in operation but also provide very good measurement values.

The entire power supply was implemented by a Turkish Siemens partner. The network includes all

components, from the transfer substation and medium-voltage distribution system to the main low-voltage distribution systems. For the low-voltage switchgear, Sivacon-S8 cabinets were installed. A complete Siemens solution was also chosen for the transfer substation.

Switches with a diagnostic capability that covers the process level combined with the latest Simatic S7 410H controllers are used for communication via Profinet and Profibus.

To minimize the assembly and wiring effort, the Simatic ET 200iSP decentralized peripheral system was selected. It’s also an extremely economical system for this explosion-risk zone. The intrinsically safe modular peripheral is especially flexible in its engineering, requiring minimal input.

Siemens was also a dependable partner for field instrumentation when it came to equipping the new factory.

Switchgear from Siemens, redundant power-supply units, and drive technology using Sinamics G120 and G150 frequency converters round out this all-encompassing application in Turkmenistan.

Other proven partners

Partners of Horn Glass also developed and delivered the systems farther down the container-glass line’s process chain. For example, the IS machines are from Bottero. Products are transported, quality-controlled, and packaged at the cold end of the line using systems and machines from European manufacturers like Emmeti and Iris.

“We’ve built the line in such a way that it immediately operates at maximum efficiency and reliability,” says Firsova. It takes 14 days to heat the furnace to its operating temperatures to the point where glass flows. Test production started with 0.33- and 0.5-liter bottles. The glass-molding machines were then configured so that they now deliver high-quality products for the market. Specialists from Horn Glass coordinated all the work of the partner companies on two lines, from heating the furnace to the ongoing packaging of end products. They also trained local personnel.

Looking ahead

Horn Glass’s job doesn’t end with the successful handover of the factory. Over a period of one year, the process engineers will assist personnel with production on-site and thoroughly train the employees in charge. “The goal is to teach them to master the new technologies down to the last detail so they can manage production on their own,” Firsova explains.



For the past year, Horn Glass has been training factory personnel on-site.



Setting new standards with clever concepts

Zippe is implementing customer-specific, automated, and highly efficient batch and cullet plants worldwide – as demonstrated by the examples of Vetri Speciali in Italy and Industria Vidriera de Coahuila in Mexico.

“Both projects demonstrate that networking is progressing rapidly and that Industrie 4.0 is an integral part of today’s automation solutions from Zippe.”

Joachim Ullrich, head of the Control System Construction Department at Zippe

As a longtime partner, Zippe Industrieanlagen GmbH in Wertheim, Germany, has comprehensive expertise when it comes to Siemens control systems. Regardless of whether the customer chooses a Simatic PCS 7 process control system or a Scada solution based on Simatic WinCC combined with Totally Integrated Automation, Zippe generates solutions precisely tailored to the customer’s needs based on established standards. This is confirmed by several recent projects.

For plants of any size

For many years, Siemens controllers, drive technology, HMI systems, and sometimes even measurement technology have composed a sort of in-house standard for Zippe plants of all sizes. Recently this has come to include the latest generation of Simatic S7-1500 Advanced Controllers as the foundation for more complex batch house control systems.

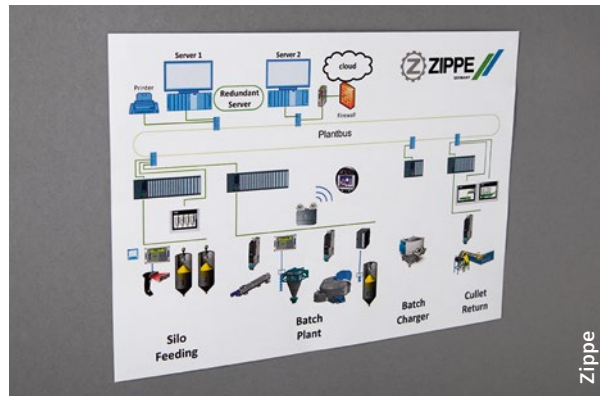
Vetri Speciali: Special glass made in Italy

The same applies to a successfully completed project for Vetri Speciali. Vetri Speciali is both the name and the product line of this globally active manufacturer of hollow glass containers for special applications based in Trento, Italy. Zippe implemented a batch plant for the Italian company with raw material feeding and a premix plant, including a cullet-return system with a scraping conveyor and glass level controller. The glass specialists from Wertheim, Germany, were also responsible for the control systems, including the commissioning of the electrical systems and start-up of the plant.

“The operator chose a Siemens solution because it seamlessly connects the automation level and – with WinCC – the Scada level, supports the latest operating concepts, and provides the high level of system performance desired,” says Joachim Ullrich, head of the Control System Manufacturing Unit at Zippe.



Simatic S7-1500 Advanced Controllers from Siemens have become established as the foundation of more complex automation solutions for Zippe batch plants.



Overview of the network structure.

Integration à la Industrie 4.0

Redundant servers guarantee high availability and allow batch-plant, silo-feeding, and cullet-return system operation to be centrally coordinated from the furnace control room. In addition to the PC-based control stations, the cullet plant can be monitored locally by means of Simatic touch panels.

Along with Siwax weighing systems from Siemens, Zippe also installed its own weighing indicators that were specifically developed for the glass industry. Both systems transmit the weights of raw materials and cullets as well as data from mixer and check scales to the central control system. Thanks to the precise electrical activation of the dosing equipment, dosing is accurate to within one gram.

Filling-level sensors from Siemens' Sitrans family continuously determine the filling level of the silos and transmit the analog measurement signals to the Scada system via the SPS. Frequency converters and bar code readers for silo selection can also be easily integrated. Simatic MP277 IWLAN V2 Mobile Panels also proved their worth as flexible operating units in the field from the very start. In many applications, tried-and-tested Scalance W788-1 Industrial Ethernet access points ensure a stable Industrial Wireless LAN and connection to the control system.

Industria Vidriera de Coahuila: Batch plant in Mexico

Based on the same successful concept, Zippe built, fully automated, and networked a new batch plant in the northern Mexican city of Nava, about 30 kilometers from the Texas border. The plant is operated by Industria Vidriera de Coahuila (IVC). The glass factory produces bottles exclusively for the company's own large brewery that's located next door. The new turn-key batch plant from Zippe reliably feeds a furnace that produces 560 tons a day. The equipment suppliers also delivered cullet-return systems for two more new melting furnaces.

Separate Simatic S7 controllers coordinate operation of the batch-plant, silo-feeding, and cullet-return systems. Here again, two redundant WinCC servers and several decentralized Simatic Comfort Panels ensure reliable operation and maximum availability. At IVC, a Simatic Mobile Panel supports mobile operation and monitoring in the area of the weighing systems. Scalance access points from Siemens ensure optimal wireless network coverage. Totally networked weighing indicators can be accessed from stationary operating stations and mobile panels: for example, to calibrate scales on-site or to diagnose them remotely.



Zippe designs and implements batch and cullet plants of any size worldwide and has always relied on Siemens for its automation.

Transparency in the network

Siemens' integrated automation is the backbone of highly productive, flexible, digitalization-ready laminated glass lines from Bottero.

Bottero consistently automates its laminated glass lines using Siemens controllers and drives and now also implements data management in line with Industrie 4.0.

With support from Siemens, the Italian Bottero Group has once again innovated its laminated glass lines for the production of various types of structural and safety glass. Improved productivity and flexibility are now supplemented by a comprehensive data management system in line with Industrie 4.0 that makes operation even more transparent and therefore more efficient.

Cycle time under 40 seconds

Bottero laminated glass lines are known for their high yield, which guarantees a fully automated, integrated overall process. It begins when various qualities of glass are loaded by two stackers and continues with washing and finally the joining of different and even multiple PVB films. When trimming the films, the line automatically adjusts to the glass format and film type. A highly precise infrared furnace and gentle nip rolls create

optimal conditions for the calendering process, in which individually controlled heating elements minimize energy consumption. This allows 6 x 3 meter glass panels to be processed in less than 40 seconds – at least one-third faster than using a traditional process. An automatic stacker unloads the autoclaves and creates packets optionally with or without spacers. No operator interventions are necessary and on-the-fly product changes can be performed throughout the process, making the production of small batches extremely cost-effective.

Focus on data management

To provide operators with even more support for process optimization and quality assurance, Bottero has also implemented comprehensive data management. A variety of process and quality data is constantly being acquired and stored centrally in an SQL database,

which allows the process sequence for each individual glass panel to be tracked and traced. The data can be transferred either to the operator's IT system or to a local or higher-level cloud like Siemens' MindSphere and analyzed offline.

Integrated automation and networking

Bottero now relies completely on the TIA Portal and the latest-generation control and drive technology. Six Simatic S7-1500s communicating via the Industrial Ethernet – five of which have a fail-safe CPU – and three Simotion controllers, various Sinamics converters, Simotics S servomotors, and Simogear geared motors typically ensure fast, problem-free processes. End-to-end communication via Ethernet and Profinet – mostly using Industrial Ethernet switches in the Scalance X series – also integrates upstream and downstream sections of the plant.

Glass processing on a new level

Bovone makes robotic glass processing economical, fail-safe, and more transparent and efficient via the cloud.

Some time ago, the Italian global supplier Elettromeccanica Bovone automated the handling and transfer processes on its edge-grinding and processing machines with robots. Now the company has developed a cost-efficient solution for integrating all the machines and robots, improving their operation in general and their safety in particular. It uses fail-safe Simatic S7-1200 Basic Controllers on the machines and networks these machines using Profinet with a fail-safe CPU in the form factor of the decentralized peripheral system Simatic ET 200SP. The decentralized F-CPU coordinates interactions between machines and robots and, among other things, provides safety light curtains, doors, and gates for fail-safe processes. It also performs the central function of bundling machine and product data for an ongoing optimization process.

Via IoT gateway to MindSphere

The machine and robot controllers supply relevant data like cycle time, speed, quantities, motor output, and motor temperature, while Energy Meters record energy consumption. The individually configurable data can be collected in a local database and transferred to a cloud-based system for analysis and monitoring.

Bovone is one of the important machine builders in the glass industry to use the MindConnect IoT2040 gateway from Siemens for gathering data via different

protocols, preprocessing it as needed, and transferring it to MindSphere. The rugged top-hat rail device is easy to configure and commission and transfers the encrypted data via a secure Internet connection.

In this way, operators can enjoy the benefits of Industrie 4.0 with minimal investment and installation costs: for example, to optimize processes, track production data, and establish preventive maintenance processes.

Because it all fits together

One reason the machine builder prefers Siemens automation technology is because all the components – and now tailored applications (MindApps) as well – are available from a single source. This means that seamless interaction is a given, from engineering to service. Siemens has helped the Italian company select appropriate components for efficiently performing sophisticated tasks. The resulting benefits are also confirmed by initial feedback from actual practice.

Bovone integrates the interaction of its processing machines with robots and uses Simatic F-CPU's to make it economical, fail-safe, and more efficient via the cloud.



Fully automated from flat glass to finished product

Complete, compact, and highly flexible: Forvet uses Simotion and Simatic to further integrate flat-glass processing.

Over a dozen process steps, 37 controlled axes, and 10 patents are all combined in a very limited space. Forvet, the Italian manufacturer of specialized machines, is continuing to push the integration of various processes for flat-glass processing. The latest result is a modular Combiflex line that combines grinding, polishing, drilling, notching, countersinking, water jets, round corners, engraving, mitering, washing, and drying processes in an even smaller floor area of barely 33 square meters. A robotic loader and unloader are located upstream and downstream, resulting in a highly flexible, fully automatic overall process with no operator

intervention from the flat glass to the finished product. Siemens control and drive technology custom-adapted to the plant's applications coordinates and visualizes these processes, as it has done for many years.

Flexibility meets productivity

According to Forvet, the Combiflex is the only machine in the world that covers so many different product / market segments, including shower doors, furniture glass, mirrors, kitchen splash backs, structural, façade, and architectural glass, and partition walls – while always yielding a high production volume.

Task: complete flat-glass processing


Solution: Combiflex with Simotion and Simatic comprising:

- Loader
- Edge-grinding machine
- 3-axis CNC processing
- Drilling and milling station
- Water-jet cutting system
- Washing machine
- Unloader

The work cycle is completely automated: The controller detects the format and thickness of the incoming glass (up to 1500 x 3050 x 19 millimeters), sets all the assemblies according to the "formula," monitors the tools and glass corrosion, controls the feeds, and compensates for tool wear. During transport, up to five workpieces can be processed simultaneously. For example, a 10-millimeter shower door can be completely processed in less than 200 seconds.

Everything under one roof

The straightforward CNC functionalities are implemented throughout in the drive-based Simotion motion control system, which coordinates the interaction of Simotics S servomotors via the Sinamics S120 series modular converters. Sinamics V70 servo drives are also used for standard positioning functions – right down the line and, for the first time, with 37 controlled axes in the system. A rugged Simatic industrial PC for order processing and process visualization overlays the system. "Siemens is one of the few equipment suppliers that can handle the complexity of the hardware and software on our Combiflex lines," says Sebastiano Bisotto, project and automation manager at Forvet. The scalable output of Simotion and Simatic, the modular design of the Sinamics drive system, and the consistent, end-to-end Profinet communication leave room for future extended functions.

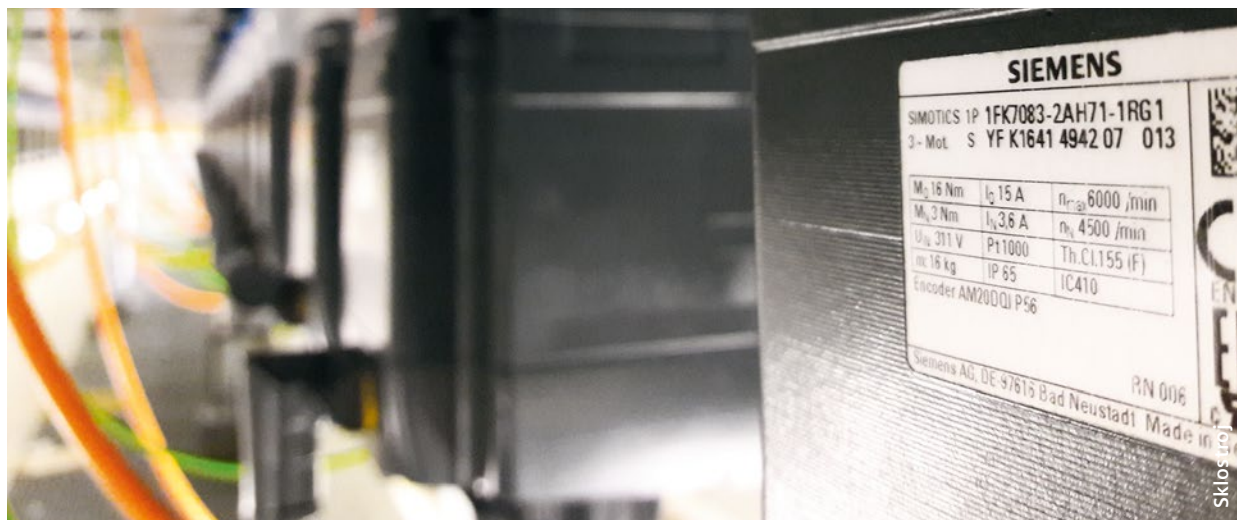


"Siemens is one of the few equipment suppliers that can handle the complexity of the hardware and software on our Combiflex lines."

Sebastiano Bisotto, project and automation manager at Forvet

Collaborating on glass container production

Container-glass machines from Sklostroj with the latest control and drive technology from Siemens are optimally prepared for digitalization.



Sklostroj consistently relies on control and drive technology from Siemens: In complex 12-section ISS machines, more than 120 Simotics S servomotors now ensure seamless interaction among all the components.

Sklostroj, the well-known Czech manufacturer of container-glass machines, has been relying on Siemens control and drive technology for 12 years, with major successes worldwide. Sklostroj markets the drive and timing control system that it developed with Siemens to other manufacturers, including as a stand-alone solution. ISS (individual section servo) machines equipped with this system are the state of the art in terms of automation technology and, thanks to their openness and performance, are perfectly equipped for the digital future of glass production.

For motion control, Sklostroj uses the drive-based Simotion D motion controllers, which sometimes coordinate far more than 120 Simotics S servomotors and various auxiliary drives via modular Sinamics S120 converters. This guarantees an optimal interaction among all the axes in the forming process, both on the servo feeder and on the ISS machine itself. Higher-level and safety-related sequences are controlled by a decentralized Simatic Fail-safe CPU in conjunction with fail-safe ET 200SP peripherals on the individual sections.

Individual solutions based on proven standards

Using these proven standard components developed in the glass industry, Sklostroj develops custom automation concepts for highly productive ISS machines with four to 12 production sections or tandem machines with up to 24 parallel sections.

The latest developments are standardized interfaces for connecting a swabbing robot and exchanging data with higher-level systems. This meets all requirements for the ongoing data integration of Sklostroj machines and optimization of processes in line with Industrie 4.0.

Production changeovers with just a few keystrokes

To make machine handling as easy and safe as possible, the manufacturer also tries to combine related parameters in formulas and manage them in the control system. This allows more and more parameters to be automatically set and adjusted, and production changeovers can be reduced to just a few keystrokes – which also minimizes operator errors.

From the very start, the guaranteed worldwide availability of spare parts was an important motive for the collaboration with Siemens. And for more than 12 years, the operators of Sklostroj machines have also benefited from the on-site supply in emergency situations. In the age of digitalization, these processes can also be optimized even more with preventive and predictive service concepts.

About Sklostroj

The global company Sklostroj Turnov CZ, s.r.o., or Sklostroj for short (from the Czech words *sklo* for glass and *stroj* for machine), was established in 1950. The Czech manufacturer of container-glass machines and equipment has been a private company since 1994 and currently employs about 200 people.



“With the sophisticated control technology from GPS and Siemens, our customers can save valuable time and money.”

Rolf Themann, Managing Director of GPS

Partners driving innovation

GPS and Siemens provide IS machine control system of tomorrow – including for industry leaders in Asia.

IS machine manufacturer Glasproduktions-Service GmbH (GPS) is always looking for the best solutions tailored to the individual needs of its customers. Innovative and high-quality hardware plays a key role here, as does perfectly coordinated software. At GPS, customers get both from a single source.

IS machine specialist meets hardware experts

With Siemens, GPS has a partner on board that can help set new standards when it comes to IS machine control systems. From the concept phase to initial testing of the system, these two innovation drivers complement each other exceptionally well, since GPS can rely on proven, advanced, and compact hardware and monitoring system for its IS machines. The result of the innovative coalition between GPS software and Siemens hardware is a system that not only works together efficiently but is also user-friendly.

Control system also convincing in practical testing

Numerous customers have been able to experience this firsthand. For example, GPS recently supplied five new hot-end lines to a glass producer in Asia – all equipped with a customized control system made by GPS and with Siemens hardware components. In addition to the price-performance ratio, GPS also excels with its sophisticated module features. The control system is based on standard elements from Siemens that can be rapidly delivered worldwide. As a result, there is less downtime in the event of hardware failures, and the customer can always count on local support from GPS and Siemens. Also, special modules are no longer necessary, because the control element combines essential sub-areas of the machine in a single control system. This makes control and handling of the entire production process much more straightforward.

About GPS

GPS designs state-of-the-art IS machines for the container glass manufacturing industry. The Essen-based company (Germany) works with clients and customers to develop customized solutions. GPS has won over prestigious clients from around the world with its high quality, process reliability, and efficiency.

A flexible assortment

On its path to becoming a smart glass factory, Heye is relying on high-performance Simotion motion control and the TIA Portal

Lighter, higher-quality, more economical: Competitive pressure in hollow-glass and container-glass production is intensifying and demands that machine and plant builders be highly innovative. Heye International has recognized the opportunities of Industrie 4.0 and supports production using tailored solution concepts. The smart glass factory of tomorrow will be digitalized and – wherever it makes technological and economic sense – automated. The relevant offerings extend from engineering to the service partnership and are supported in the productive core by three pillars: smart data (consistent integration of quality and production data), smart machine control (from Advanced HMI to high-performance motion control), and smart process control (with closed control loops for perfect containers).

Faster type changeovers

The Heye servo-drive control unit is a key quality and productivity element of smart machine control. The servo-drive controller precisely coordinates the dynamic interaction between the dual-motor shears, servo plunger, and other components. In just fractions of a second, gobs of different weight can be sheared off and distributed to the IS machine's stations. The control unit comprises a Simotion D435-2 motion controller, for controlling the motion of a scalable number of axes, plus a Simatic TP1200 Comfort Panel, for creating and managing reproducible motion profiles. These profiles are easy to generate on-site and play a significant role in shortening changeover time – and therefore increasing flexibility, which is absolutely essential for small and medium batch quantities. The unit can be deployed

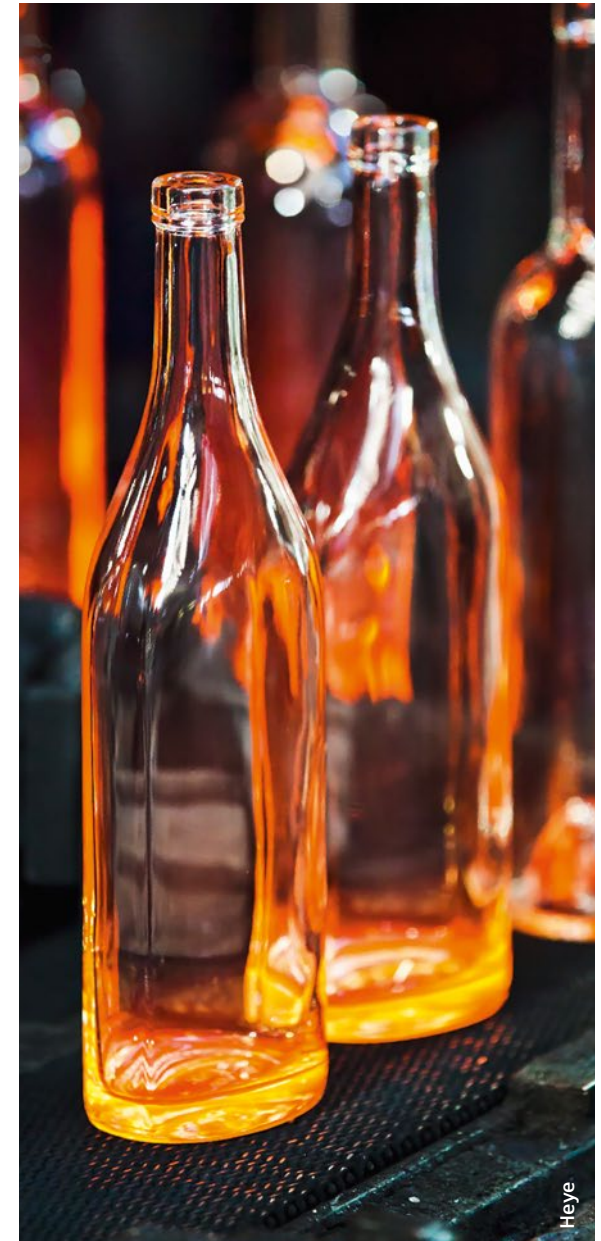
in all sizes and types of feeders and achieves production speeds of up to 250 cuts per minute without losing a single gob of glass.

Success all down the line – and into the future with the TIA Portal

The Heye solution for fast type changeovers has become one of the company's most successful products and has also established itself in the narrow-neck press and blow (NNPB) process. "It allows us to confidently meet the precise needs of the container glass industry," says Wilfried Seidensticker, Product Manager for hot-end solutions at Heye International. Thanks to the integrated engineering of both motion controllers and HMIs by the Siemens TIA Portal, Heye can save time and money in its development department. "Both we and our customers are optimally prepared for the ongoing integration and digitalization of process steps."

About Heye International

The Obernkirchen-based company (Germany) is one of the world's leading equipment suppliers to the container-glass industry, with over 50 years of experience. With its digitalization measures, Heye is paving the way for users of its machines and systems to implement the smart plant, which will secure its customers' and its own position on the market.



The Heye solution for assortment operations (different containers on one machine) has become one of the company's most successful products.

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