

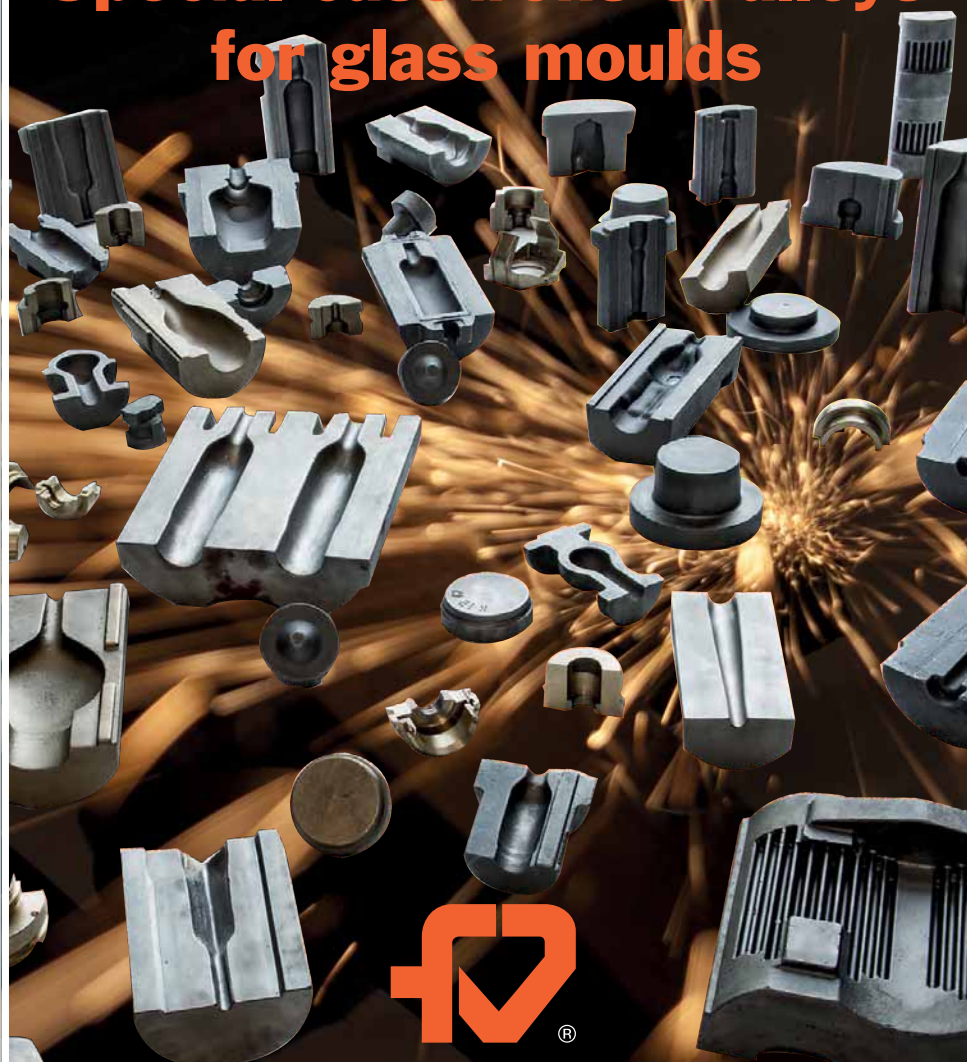
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YEAR 33 • ISSUE NO. 4/2020

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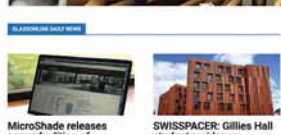
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OMS GROUP

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OMS Group is a world leader for end-of-line packaging of palletized products for all market sectors. In addition to Italian headquarters, the Group also has 12 subsidiaries based in Italy, Europe, North and South America, Asia and Oceania.

Established in 1949, OMS has a long-established tradition of designing and manufacturing strapping, wrapping and hooding systems. Reliability, experience and flexibility are three important characteristics that enable OMS to respond to today's market demands, from the simplest strapping machine up to the most sophisticated packaging plant as well as complete packaging lines for the hollow

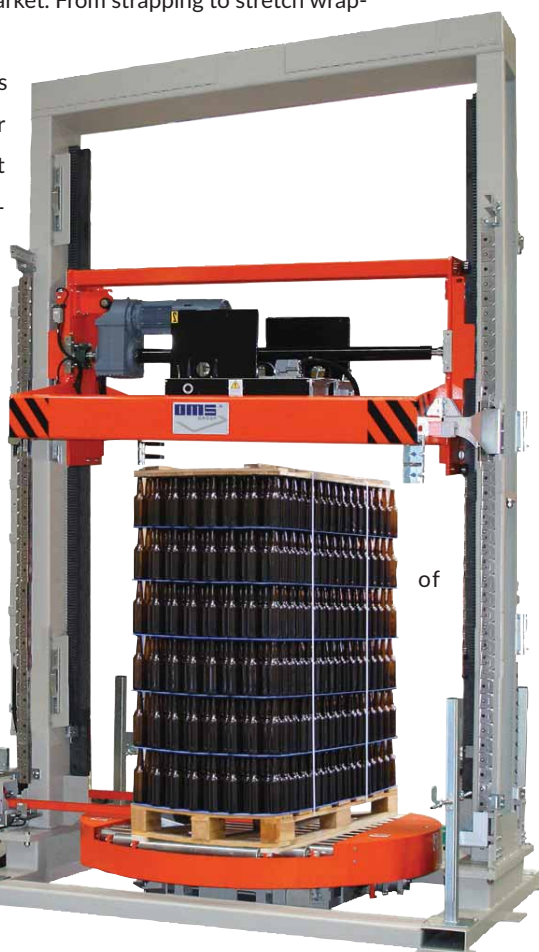
glass market. From strapping to stretch wrap-

ping and shrink hooding.

All this has been made possible thanks to the OMS 'many years' experience in this market, along with a vast number of tailor made solutions specifically studied for its customers. The important results achieved by the company have to be credited to the now third generation of businessmen who have continued to be involved closely with the market, with the vision of a future characterized by innovation and continuous improvement.

With a constant attention to new technologies and market demands, all OMS models are designed to interface with customers' networks in accordance with the Industry 4.0 protocols, to provide all the necessary data to verify and monitor the entire system as well as collect production data.

In order to be ahead of times, OMS is now living a new phase transformation to strengthen its current position in the market and become even more globally focused.



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GLASSTEC 2020 edition postponed



The effects of the Coronavirus have now also impacted **glasstec 2020**, which will be postponed to 15-18 June 2021.

In view of the continued uncertainties in terms of travel restrictions and quarantine provisions in the core target markets Messe Düsseldorf has opted in favour of these new dates in close coordination with the trade fair's advisory board and all partners involved.

The trade fair was originally planned to take place 20-23 October 2020. Messe Düsseldorf is already busy cooperating with the associations to offer digital service formats for 2020 with the aim of bringing customers and exhibitors together and digitally place the information and ranges available at glasstec at the disposal of interested trade visitors on the original trade fair dates. Further details will follow shortly.

Egbert Wenninger, Chairman of the glasstec advisory board and Chairman of VDMA's Glass Technology Forum, said, "The economic crisis caused by the Corona pandemic has also hit the glass industry and its machinery and equipment manufacturers hard. Many companies are forced to switch to crisis mode and put all investments – including trade fair participations – to the test to mitigate possible negative economic impacts. Potential travel restrictions and the protection of visitors' and exhibitors' health will have an impact on visitor numbers."

"A smaller glasstec 2020 with markedly fewer visitors would in our view not do justice to the trade fair. glasstec has been and will be the most important global event for the glass industry, mechanical engineering and skilled crafts; and since it should continue to be that way we decided to postpone. In 2021 we expect a strong glasstec with high international attendance, ideally in perfect sync with a phase of economic recovery after Corona."

Commenting on the re-scheduling Dr. Overath, Director General of the Federal Association of the Glass Industry (BVG e.V.), said, "glasstec is the leading trade fair for glass. It thrives on the international cross-section of its visitors and brings together people from throughout the world with a passion for the material that is glass. Many companies and visitors, however, will

abstain from participating this year in the face of the Covid-19 pandemic and/or heavily cut down their engagement at the trade fair for economic

reasons. We therefore back the decision taken by Messe Düsseldorf to not hold glasstec this year. glasstec should be postponed to a point in time where glass rather than the Coronavirus is centre stage."

Skilled crafts also support the decision to postpone the trade fair to the coming year.

Michael Wolter, the Federal Guild Master, said, "For potential exhibitors the many uncertainties still associated with glasstec 2020 result in unreasonable risks in view of the required trade fair planning and the associated investment. This is why we welcome a postponement to 2021 with the aim of then being able to do justice to the glasstec brand. This is entirely in the interest of exhibitors and trade fair visitors."

Thankful for the cooperation of all partners in this special situation Werner M. Dornscheidt, President & CEO of Messe Düsseldorf, commented, "In close consultation with the industry associations, major exhibitors as well as many other partners, we have succeeded in agreeing on these new dates. We are happy to help all parties involved reliably plan with this joint decision. Needless to say, we are also in close contact with the hospitality sector and all other industries and trades affected by the re-scheduling with a view to coming up with viable solutions."

Dornscheidt added, "The safety and health of our visitors, exhibitors and employees will, of course, also be our highest priority at the upcoming event. Appropriate precautions are being developed and taken in partnership with our conceptual partners (the Mechanical Engineering Industry Association VDMA, the Federal Association of the German Glass Industry and the Federal Guild Association of the Glazier Trade). The Düsseldorf Exhibition Centre continues to be characterised by a high degree of hygiene as well as good medical care for the upcoming fairs in autumn 2020. We are closely monitoring current developments and are in direct contact with the authorities for that matter. This ensures

that any new findings are exchanged quickly and measures can be adapted."



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CINER GLASS

Glass container plant for UK



Turkish company Ciner Glass has announced that it aims to open its new glass container plant in Ebbw Vale, UK, by 2023, with full production starting the following year.

A scoping report, which is usually submitted before a formal planning application, has been presented to Blaenau Gwent Council.

The plant would also have a warehouse facility on the Rassau Industrial Estate, as well as two furnaces, two buildings to process recycled glass and a 75 metre chimney, according to the Local Democracy Reporting Service. The report, which examines potential environmental impacts, said the development would be a "typical feature" of the industrial character of the area, but the "tall structures" would have an impact on views, with the Brecon Beacons 500 metres to the north.

Ciner Glass is part of the Ciner Group, one of the largest Turkish industrial groups, with activities in mining, energy, glass, chemicals, media, maritime, tourism and other business sectors.



WWW.CINERGROUP.COM.TR/EN/GLASS-AND-CHEMICALS

TIAMA

Successful commissioning of IQ Scan at Siam Glass Rojana

Siam Glass Thailand, an affiliate of Osotspa Co, has installed a **Tiama** IQ Scan system onto four lines in its Rojana plant. The installation was successfully completed early 2020.

The Thailand energy drink market leader, along with its own container supplier, has chosen a Tiama solution to monitor its new glass factory performance. To meet the increasing demand, Osotspa recently opened this new glass factory with world-class technologies that help lower costs, enhance production capacity and are eco-friendly.

With more than 30 years of experience in information system solutions for the glass industry and more than 70 plants equipped worldwide, Tiama with its IQ Scan is helping to improve efficiency and operations by monitoring the plant in real time. Siam Glass currently uses Tiama IQ Scan at management level, hot end, cold end, but also in Quality and Moldshop departments.

The commissioning was also possible thanks to Tiama local presence in Thailand with a Customer Support team, based in Bangkok. with five after-sales engineers fully dedicated to the region's market. This team, staffed by French and Thai nationals, is part of Tiama mission statement to provide its customers with rapid-response technical service.



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ENCIRC

900 tonnes/day container glass furnace under construction

Encirc has announced that it is building an incredible 900 tonnes per day container glass furnace – the largest in the world – at its plant in Cheshire, UK.

This significant investment will include an extension to the existing facility and a substantial increase to the company's glass manufacturing capability. Included will be the world's first Industry 4.0 production line, providing unparalleled versatility and flexibility in container glass making.

A ground-breaking *Bucher Emhart Glass* end to end 12-section quad gob line will set the standard with regards to machine learning combined with agility in manufacturing.

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GLASS SERVICE

New furnace for SibSteklo

SibSteklo has announced that it plans to begin construction of a new furnace in 2020, however, due to the introduction of restrictive measures against the spread of COVID-19, the deadline has been postponed to October.

Design was entrusted to the Italian company **Glass Service**, while experts from the UK, Germany, the Czech Republic and Turkey were invited to oversee the construction work. Five glass-forming machines will be installed and the capacity of the company should increase up to 720-740 million while improving EBITDA results and aiming to 1,250 billion RUB next year, increasing profitability and efficiency at the same time.

Sibirskoe Steklo OOO (**SibSteklo**) thanks its team, customers and suppliers for helping to achieve great results in 2019. After years of investments, quality increase and building an excellent team, company output has increased from 470 million to 597 million glass



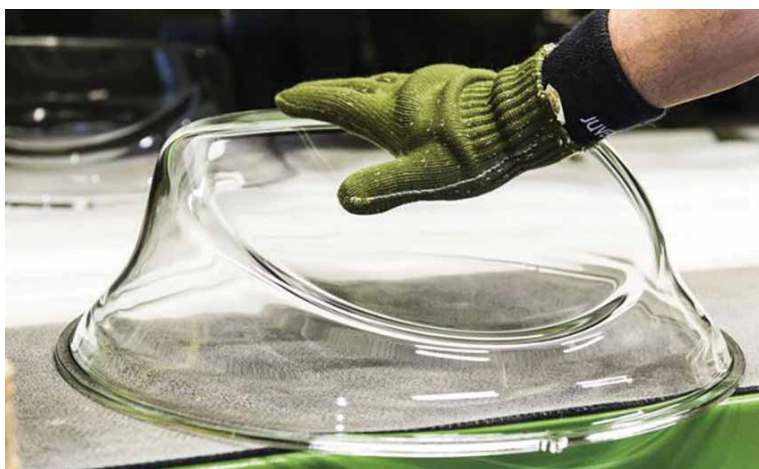
containers – coming from 340 millions bottles produced in 2014.

Revenues rose from RUB 2.8 billion to 3.68 billion and, in addition, in 2019, Sibsteklo achieved savings in fuel and energy resources and improved the organization of the glassmaking process.

The EBITDA of the glass container business in 2019 was RUB 750 million – 42% higher than in 2018.



WWW.GLASSSERVICE.IT/EN



PANERATECH

SmartMelter® supports reliable production at Vetrerie Riunite

Vetrerie Riunite Group, a leading Italian company in the manufacture of hi-tech, high-quality and design glass, took precautions to ensure furnace reliability amid COVID-19 with SmartMelter® inspection.

Because hot spots had been observed in the throat area of the furnace, Vetrerie Riunite contacted PaneraTech to determine the condition of the sidewall and throat refractory for overcoat optimization. They found that PaneraTech is still supporting glass manufacturers globally despite travel restrictions, and that a technician was already based in the area. An inspection was scheduled quickly.

The results of the SmartMelter® inspection confirmed that some additional cooling measures were necessary on the

throat. The report showed the cover block residual refractory thickness to be less than 40 mm in the thinnest areas, with the majority of measurements showing < 50 mm residual thickness.

Within one week of SmartMelter® reporting, the cover blocks were cooled with compressed air and water and overcoating was installed.

"We have had to make changes to our operations like everyone else," explained Giuseppe Velli, Plant Manager at Vetrerie Riunite. He continued, "However, the importance of plant safety and furnace reliability does not change. SmartMelter® inspection gave us the information we needed to

continue operating safely and to prioritize repairs."

"Our field engineers are based in various locations around the world, which means one might actually be local for the plant," said Yakup Bayram, CEO of PaneraTech. He added, "Our Certified Partners, such as Fosbel, expand that global reach even further. We also offer virtual guidance to companies who have decided to scan the furnace without bringing an outside technician into the plant. With so many ways to support our customers, they don't have to worry about not getting the help that they need."


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Glass Industry Directory 2020

The **GLASS INDUSTRY DIRECTORY** is a unique international annual guide which gives a complete overview of international glassworks and suppliers involved in hollowware and special glass manufacturing.



CONDAT

What's new in lubrication?

CONDAT develops solutions that allow to increase productivity and reduce oil consumption all whilst guaranteeing safety for personnel and respect for the environment.

The most recent new entry from CONDAT R&D labs, the CONDAGLASS

370 is a graphite swabbing lubricant. Its new formula allows easy lubrication of all kind of bottle shapes, including spirit bottles (heavy gobs) and cosmetic containers (requesting high cleanliness). Developed to remove automatic reject after swabbing, CONDAGLASS 370 can save 2 to 3 bottles every 30min, meaning millions of bottles can be recovered every year.

High-performance, CONDAGLASS 370 also generates low quantity of residue resulting in cleaner molds that can last longer. Icing on the cake: its viscosity enables easy handling and manual swabbing by operators.

Altogether, CONDAGLASS 370 allows manufacturing savings and improves working conditions for your staff.

For maintenance needs, CONDAT offers high performance lubricants. Thanks to its many years of expertise in high temperature fluids, used for example in steel and aluminium industries, the company understands the challenges and issues encountered in an extremely hot work environment.

New GLASS HTS 250 IS is a 100% synthetic oil dedicated to central lubrication of I.S. machines with high flash point.

Already approved by both glass plants and OEM's IS machines, this lubricant has performed with the following unique benefits:

- Low evaporation



- High thermal stability
- Low oxidation

Excellent lubricating properties

This product is available with a fluorescent dye that reflects easily under a UV light, allowing maintenance to detect machine leaks very quickly.

All these benefits result in a lubricant consumption reduced up to 50% compared to a standard mineral oil. Completely free of heavy metals, chlorine and solvents, the GLASS HTS 250 IS also reduce fire risks; it specifically targets keeping lubricating budgets under control with lower cost and emphasizes production floor safety without compromising productivity.



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STOELZLE MASNIERES

New decoration process: Tigital

Tigital is an eco-responsible decorative transfer composed of powder inks, which has been developed in collaboration between *TIGER Coatings* and *Stoelzle Glass Group*.

Tigital has the same environmental characteristics as Quali Glass Coat 2.0 (QGC 2.0). It is applicable on all types of substrates (bare glass, lacquered and QGC 2.0). It can be applied on all types of shapes, especially cylindrical shapes. Like Quali Glass Coat 2.0, the mechanical resistance and the printing quality of a new level of detail and fineness allows to obtain an aspect never before achieved.

This decoration process saves 85% CO₂ compared to conventional screen printing, is completely solvent-free and allows to decorate even small batch production.



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ZIPPE

Double-turnkey project for Wiegand-Glas completed

Wiegand-Glas is one of the leading container glass manufacturers in Germany producing more than eight million glass containers daily in its four plants for the beverage and food industry. Here the executive management sets on tradition and modern technology at the same time and also considers sustainability as an important component of its business policy.

For Wiegand-Glas in Steinbach am Wald (Bavaria), the batch house which ZIPPE delivered was put into operation just recently. Now the recyclable material silo plant has also been fully commissioned.

This project is an outstanding example for the further use and treatment of created 'waste material' which arises during glass manufacturing or respectively of its recycling.

In Wiegand-Glas recycling plants, created glass powders are collected and transported by the corresponding pneumatic transport system into the according storage silos. Consequently these dusts are loaded on trucks by loading equipment and a large platform scale and are then delivered to the customer for further processing (for example the construction sector). This innovative project enables the re-use of waste material in an ecologically-friendly manner and paves the way for similar projects in the future.

ZIPPE Industrieanlagen GmbH designed, planned, and constructed this extraordinary plant, especially custom fit to the requirements of Wiegand-Glas Steinbach am Wald.



WWW.ZIPPE.DE



TECOGLAS

New Project Manager appointed

Tecoglas, a member of *The TECO Group of Companies*, has announced that Ondrej Bunda has been appointed Project Manager.

Following the retirement of Ondrej's predecessor Garry Fisher, Ondrej's new position will see him directly manage glass plant installation projects from early development through to project completion where he will be responsible for project scheduling, technical and budget evaluation, as well as construction co-ordination. Ondrej originates from the Czech Republic where he received his Masters' Degree in Structural and Transportation Engineering from the Czech Technical University in Prague.

Mike Davies, Tecoglas Managing Director, said, "Ondrej started his career with Tecoglas in 2017. His initial position of Structural Design Engineer coupled with him assuming the role of acting Project Manager during a recent major furnace re-build has given him an ideal platform from which to learn the technicalities of building glass furnaces from both a design and build perspective. "Ondrej has worked hard to prove his ability to lead others, manage projects well and maintain high customer satisfaction throughout every process. These attributes have made Ondrej a natural successor to the Project Manager position in which we wish him every success." As part of the TECO Group, Tecoglas, along with *Toledo Engineering Co Inc.*, and *KTG Systems*, can offer total furnace capabilities in glass furnaces of all types with KTG Engineering supporting this activity as glass plant equipment manufacturers. *Zedtec* are the TECO Group specialists in forehearth and working end technology. *EAE Tech* provide high quality industrial automation engineering services and custom control systems. The TECO Group has been designing, building and modernising for the world's primary glass manufacturing industry since 1927.



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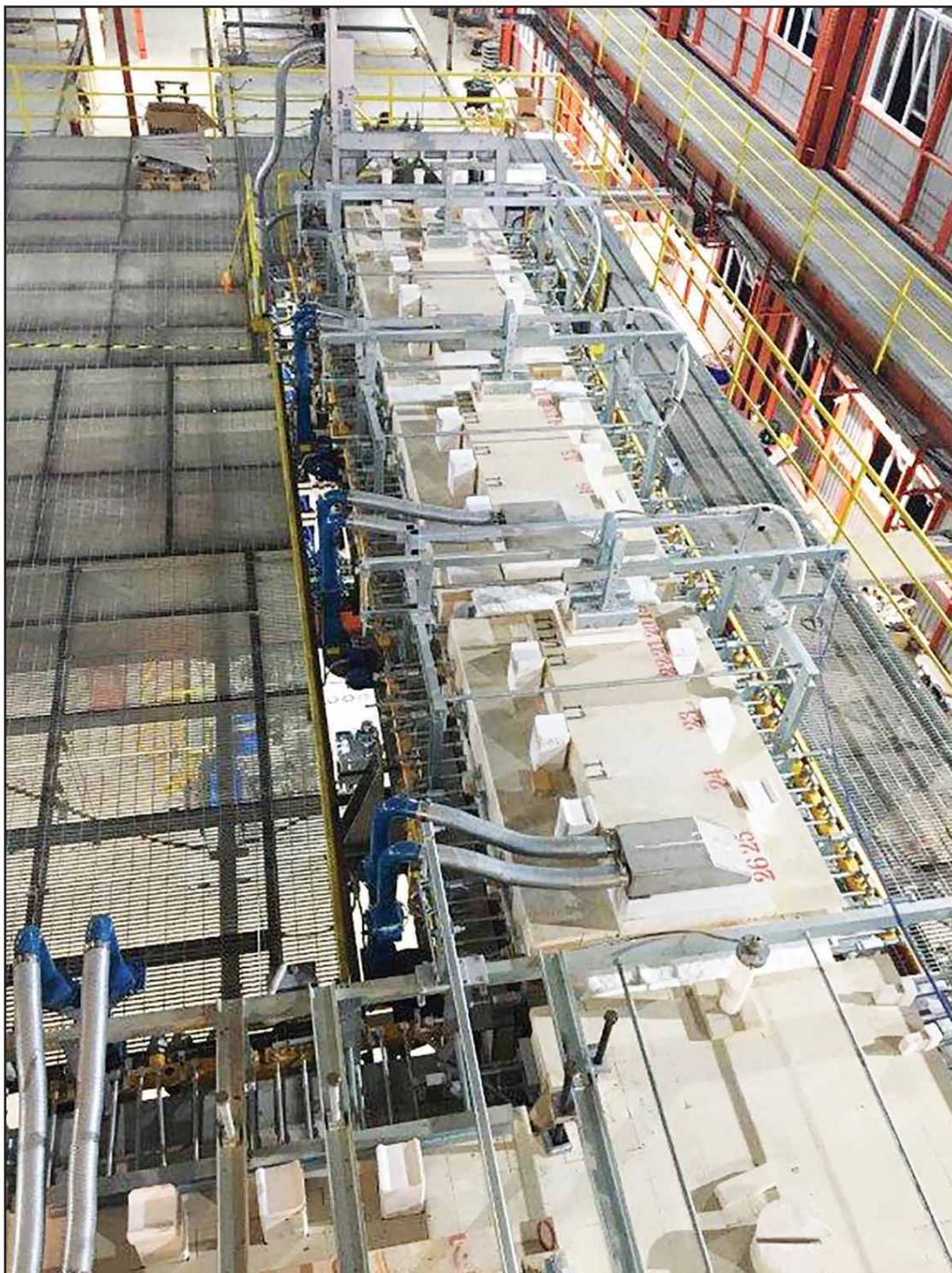
REVIMAC

One project for two leaders

During the first quarter of 2019, Revimac signed a contract with leading Japanese furnace designer *IHARA FURNACE Co. Ltd.* for the supply of a complete and fully automatic glass conditioning system, to be installed on a new 200 TPD melting furnace at *PT Farmarindo Jaya* (Indonesia). The complete system is made up of one working-end (distributor) and three forehearth. The project was jointly managed by Revimac and **Fusiontec**. Revimac as project manager, system designer and supplier of the complete firing and cooling equipment, temperature detection instrumentation, supervisory and control system. Fusiontec as designer and supplier of the complete set of refractory materials. The reliable and technically advanced control system, the power-packed Revimac Forehearth Control System (FCS), was combined with the Fusiontec newly designed superstructure to ensure the customer with the optimum glass conditioning.

FCS control includes:

- control cabinet with twin CPU and dual Can-Bus channel for data transmission, to ensure complete reliability and the automatic switch-over in case of failure;
- user-friendly touch screen operator interface, available



for technologist and operators to control all the data and process information of the forehearth;

- Revimac proprietary software, that enables to control



Refractories specialist :

- Forehearth and working-end
- Furnace bottom paving
- Feeder expendables



Revimac

Botterogroup

- Re-manufactured IS machines
- Ware handling equipment
- Glass conditioning system



Three axis Servo-Stacker RSS 100 :

- Speed up to 22 cycles/min.
- 90° rotation for quick bar change
- Self-learning function
- Automatic speed and phase adjustment



each zone of the forehearth, as well as left and right sides independent firing;

- Production Recipes, process information and alarms/ logs stored in the memory.

The distributor and the three forehearth feature several control zones, each one equipped with optical pyrometer, and three-levels thermocouples installed in the equalizing zone, which measure the glass in different layers to monitor thermal efficiency.

The automation system manages heating by means of gas fired burners, or cooling by means of individual fans according to the temperature profile set-up.

The entire conditioning system was successfully installed and commissioned under the supervision of Revimac's service team.



WWW.REVIMAC.COM



BUCHER EMHART GLASS

Internal management succession

BUCHER
emhart glass



Matthias Kümmerle

Martin Jetter has been division president of **Bucher Emhart Glass** since January 2006. In parallel, until 2013 he managed the automation company Jetter that he had founded himself. Bucher Industries acquired a stake in Jetter in 2005 and took over the company in 2013.

As development partner and manufacturer of the control systems, Jetter had been familiar with the technology of glass forming machines for a long time, he led Bucher Emhart Glass with great commitment and visionary strength. This enabled him to convince customers of the superior system solutions for glass container production. On this basis, a partnership with the world's largest glass container

manufacturer "Owens-Illinois" (O-I) was established in 2013. A further milestone was the acquisition of the Chinese market leader Sanjin in 2011, which was followed by continuous modernisation of the company.

Mr. Jetter also always supported and motivated his employees – even in difficult times. It is therefore no coincidence that he will be able to hand over the management of the division to an internal successor at the end of 2020, as a part of a long-term planning.

47-year-old Matthias Kümmerle has been found to be a highly qualified internal successor to head Bucher Emhart Glass. He studied mechanical engineering at the ETH in Zurich and after completing his doctorate at the EPFL in Lausanne, he worked for three years as R&D project manager at Bucher Emhart Glass before completing an MBA at IMD. He then worked for Hilti in Liechtenstein and in China. Since 2011 he has been Head of Technology at Bucher Emhart Glass. In this function, he is responsible for driving innovation projects forward. He plays a key role in implementing the "End to End" strategy that forms the basis for the division's current and future success. Mr. Kümmerle is very familiar with the Bucher Emhart Glass organisation. He is a dual Swiss and German citizen, is married and has three children.

WWW.EMHARTGLASS.COM



Martin Jetter

FORGLASS

4.0 technology in scraping conveyors



Forglass, the leading batch plant and furnace technology supplier is at the forefront of innovative progress. The company's robust R&D department, in collaboration with The Main Mining Institute in Katowice, AGH University of Science and Technology in Krakow, Poland and other prestigious technical universities, have developed an impressive array of innovative technological solutions for both batch plants and furnaces.

In the pursuit of maximising production and minimising costs for its clients, and even more importantly to improve safety, Forglass developed an 'intelligent' scraping conveyor, aptly named SmartScraper. Equipped with innovative Overload Protection System (OPS), the design uses electronic sensors to continually monitor the working conditions of the conveyor, diagnose problems and react instantly to changes in operation. The machine's built-in intelligence allows it to slow down or stop before its elements are damaged, including the protection system itself. Additionally, when connected to a comprehensive array of sensors (e.g. temperature, working speed or efficiency), SmartScraper allows detailed analysis of its performance to avoid future malfunctions. And that's smart. Forglass has already delivered a number of SmartScrapers to their clients' factories, including packaging, float and glass fibre production facilities. The feedback has been overwhelmingly positive, so Forglass has decided to offer SmartScrapers equipped with OPS as the only option in the company's family of scraping conveyors.

WWW.FORGLASS.EU/EN



VP ACADEMY

VPFlowScope flow meters & VPVision now featured

VPInstruments, manufacturer of leading flow metering equipment for easy insight into energy flows, provided a major update for the VP Academy, VPInstruments online e-learning platform. The update features the addition of the VPFlowScope DP, VPFlowScope Probe and the VPFlowScope In-line product range.

The VP Academy enables you to learn at your own time and pace. Both fundamental steps and in-depth knowledge of the VPInstruments' products are provided on the platform. This online learning environment is especially designed to make instructions and information as easy and as effortless as possible. Therefore, information and instructions are provided in text, visuals and videos.

With this extension, the VP Academy features now all VPFlowScope flow meters and our VPVision energy monitoring solution.

The VPFlowScope® product family measures compressed air or other industrial gases, like nitrogen, oxygen, helium and more. The VPFlowScope flow meters provide insight from supply to demand side, in saturated and dry air, and can be



used for mobile or permanent measurements. The VPFlowScopes all incorporate the 4-in-1 measurement principle: (bi-directional) flow, pressure, temperature, and total flow.

- **VPFlowScope DP** - The patented VPFlowScope® DP enables you to take measurements in the discharge pipe of a compressor under 100% saturated conditions. Combine the VPFlowScope DP with a power meter and measure compressor efficiency.
- **VPFlowScope In-line** - The VPFlowScope® In-line is the ideal flowmeter for point of use consumption measurement. It is perfect for smaller diameters where it produces all the data you need to optimize your compressed air consumption.
- **VPFlowScope Probe** - The VPFlowScope® Probe is the measurement tool for dry compressed air and other technical gases like nitrogen, carbon dioxide and argon. The VPFlowScope Probe measures thermal mass flow, pressure, temperature, and total flow simultaneously.

- **VPFlowScope M** - The VPFlowScope® M is the next step in gas measurement. Unlike traditional flow meters, the VPFlowScope M consists of a Transmitter and the patented VPSensorCartridge® which reduces recalibration to a simple exchange.



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EME

Installations in Central and South America

EME has successfully upgraded the Chilean batch plant of *Verallia*, the third largest global producer of glass packaging for food and beverages. The upgrade was required due to a capacity increase of one furnace; a key criterion in the project was the identification of bottle necks resulting in extended cycle times and the creation of solutions to reduce them.

An extensive audit to determine the best opportunities for the upgrade and modernization of the existing batch plant resulted, amongst other things, in the exchange of several dosage devices in order to achieve the desired capacity as well as optimization of the weighing accuracy, installation of additional precision scales for the weighing of the extra raw materials, bigger mixers, installation of new batch transport systems and the extension of the existing cullet return system.

The implementation of these measures was realized under running conditions and full operation of one furnace, as a consequence, it was necessary to guarantee uninterrupted batch delivery at all the times during the upgrade.

EME has also commissioned the second EME Batch House, including automatic cullet return system, for Mexican con-



Industria Vidriera de Coahuila, Piedras Negras plant

tainer glass manufacturer *Industria Vidriera de Coahuila* (IVC) at their plant in Piedras Negras.

After installation/commissioning of the first Batch Plant in 2012, EME delivered the second Batch Plant in 2019 and commissioned it successfully before the COVID-19 pandemic.

IVC's new Batch Plant supplies batch for furnace 5, and possibly furnace 6 with a total capacity of 950 tpd in flint and amber glass production.

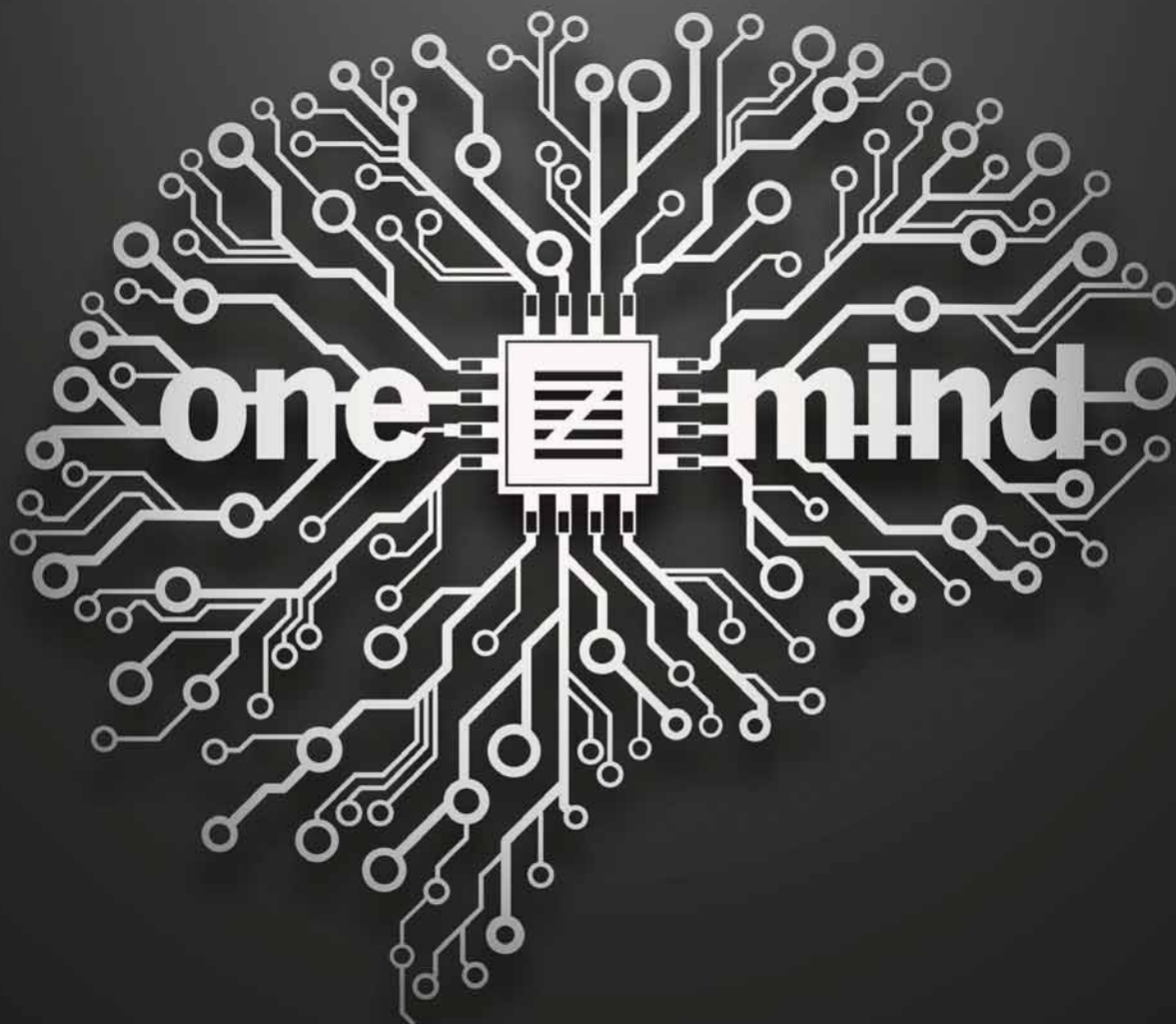
The EME design integrated economic concrete silos with a head house in steel, state-of-art equipment, engineering and fabrication allows high efficiency of the batch plant.

Raw material charging, weighing, mixing and batch transport is controlled from a specialized EME control system.



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Chilean batch plant
of Verallia



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Glass ampoules for high-quality cosmetics

Glass ampoules in cosmetics have many applications: they are suitable for high-quality elixirs and serum products for face, eye area, décolleté, hair, hands and feet and contain corresponding active ingredients. Numerous active ingredients can improve the appearance of the skin, for example retinol, collagen, hyaluronic acid and vitamins are among the classics when it comes to sustainable beauty care for the skin. Active ingredient or

beauty applications are reliably and germ-free packaged in glass ampoules.

"Many of our customers package their sophisticated and high-quality cosmetics, beauty and wellness products for greater well-being and care in our glass ampoules," said Nicola Balena, Vice-President Global Business Management Cosmetic Moulded Glass at Gerresheimer. "Gerresheimer offers a wide variety of glass ampoules from 1 – 30 ml in Type I or III white and amber glass."

Whether they are called active ingredient, beauty, face, vitamin and care ampoules: ampoules are considered the most effective packaging solutions for nutrient boosters for skin and body care. Because the small, glass, airtight bottles contain optimally packaged, highly concentrated active ingredients that often impress with an immediate effect on the skin shortly after application. They are often used as quick help for the skin in need of special care, but in smaller doses they can also enrich the daily beauty routine.

Most ampoules for the cosmetics industry are emetic ring ampoules. The starting material for the production of ampoules is thin-walled type I or type III borosilicate tubular glass. From the tubular glass the ampoules are produced by forming. The forming is carried out almost without tools by flame and drawing. On the machine first the bottom is formed and then the spit, onion and constriction. Then the



ampoule is separated from the glass tube and at the same time the bottom of the next ampoule is formed. The forming process is followed by the application of code rings, breaking ring or OPC point. The ampoule is then relaxed in the oven at approx. 600° Celsius and – if present – the colour of the coding, break ring and lettering is baked in.

Gerresheimer is the market leader and expert for ampoules made of glass and produces large quantities of them for the pharma and cosmetics industry. They have been proving their worth in medicine for parenteralia since the 17th century, but only industrial production made their use in large quantities possible. Today, they are also used in the field of high-quality care and cosmetics to store elixir and serum products with high-quality active ingredients for numerous cosmetic applications, which serve to sustainably care for and improve appearance. Gerresheimer manufactures ampoules for the world market at plants in Europe, America and Asia.



WWW.GERRESHEIMER.COM/EN

BUCHER EMHART GLASS

Smart Feeder - a fully closed loop controlled feeder system

MULTI ARTICLE SETUP

While multi gob weight production was already supported on a basic level by the first FlexIS controls generation, the current FlexIS generation, with its newly built User Interface, supports a true multi article setup. On this basis, a further supportive tool, the Multi Gob Application (MGA) was integrated into the controls system.

The MGA allows the operator to define a desired sequence of gob weights and then calculates the optimal settings for the feeder. This may sound easy, but changing the feeder settings for one gob can influence the previous or the next one in the cutting sequence.

The MGA algorithms provide a solution to this problem, no matter how the weight sequence has been defined by the operator. This is already a great help, but still requires a certain number of weighing to fine-tune the result.

Automatic weighing could resolve this issue while additional gob measurements would also be welcome. To meet this need, Bucher Emhart Glass (BEG) is currently developing the Smart Feeder product, which is a fully closed loop controlled feeder system to form the desired target gobs, including gob weight, length, shape, and tilting control for each individual section. The BEG GobRadar will serve as the gob sensor for the Smart Feeder system. (Figure 1)

Since releasing the news about the GobRadar - a camera-based gob observation and measurement system - in 2019, Bucher Emhart Glass has continued to develop this system, along with the FlexIS generation, with the aim of providing an automatic setup of all relevant gob forming parameters to form and maintain the desired gob sequence for production.

GOBRADAR - PURE GOB WEIGHT CONTROL

BEG's inspection capability at the hot- and cold ends was expanded in 2019 with the acquisition of Symplex Vision Systems. The GobRadar system, a member of the vision systems family, is

installed under the gob shearing system to provide real time gob information, such as: gob weight, length, diameter, 3D shape, gob tilting angle, gob drifting, and gob temperature for each individual cut. The GobRadar system itself

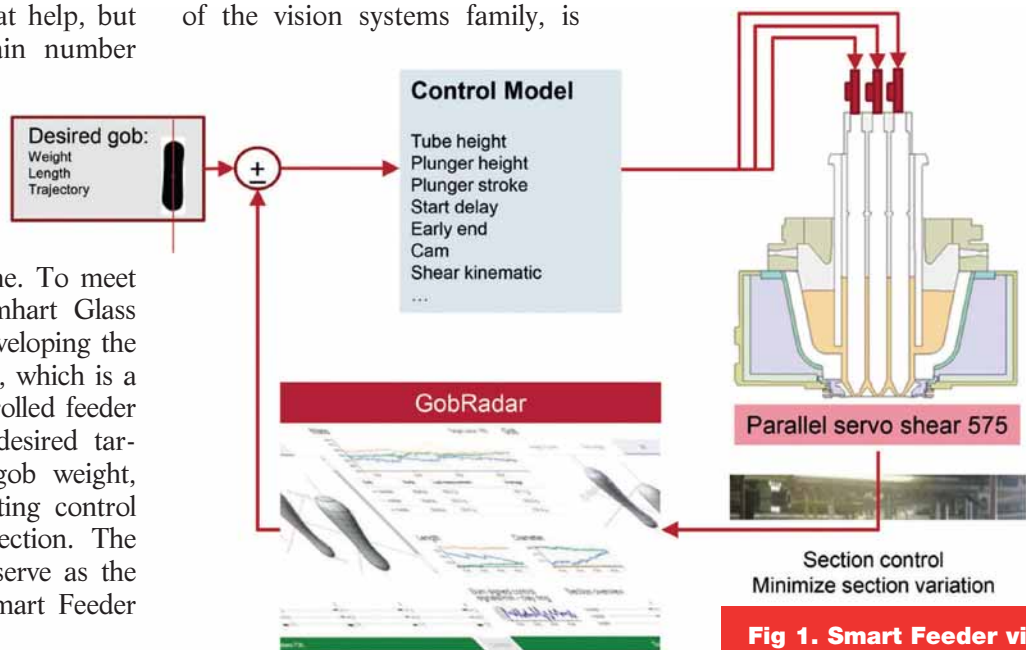


Fig 1. Smart Feeder vision including Bucher Emhart Glass hardware products.

MULTI-GOB APPLICATIONS

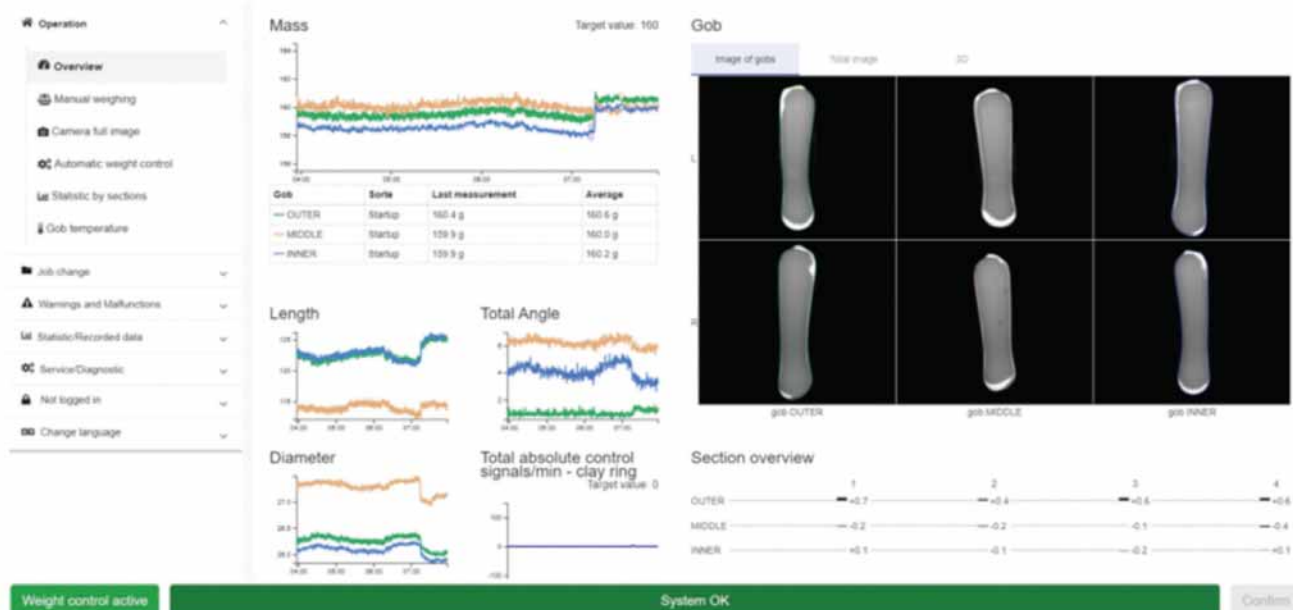


Fig 2. GobRadar user interface showing gob weight, length, diameter, tilting angle, tube and feeder plunger heights and gob shape images.

offers the capability of pure gob weight control by means of tube and feeder plunger height adjustment and works with a user-friendly interface. (Figure 2)

By providing the needed real time feedback of gob weight, length, shape and tilting for each individual cut, the GobRadar system advances the Smart Feeder development.

AUTOMATIC GOB WEIGHT AND LENGTH CONTROL

A mathematical model was developed to correlate gob parameters (gob weight, length, ...) with feeder control parameters (feeder plunger motion, tube height) and shear control parameters. The model has been implemented into the FlexIS user interface to setup multi gob weight production. The operator can type in a target gob weight for each section and the MGA determines a feeder parameter preset to achieve the target weight sequence. By providing

the actual gob weight, the MGA can further fine tune the feeder setup to maintain the desired gob weight over time.

With the integration of the GobRadar into the system, the MGA receives the gob measurements cut by cut and can carry out the fine tuning automatically

and continuously.

The MGA system requires some model calibration procedure during which the user needs to grab bottles/gobs to perform measurements and input the gob information into the model. This is a somewhat time-consuming step in the original use

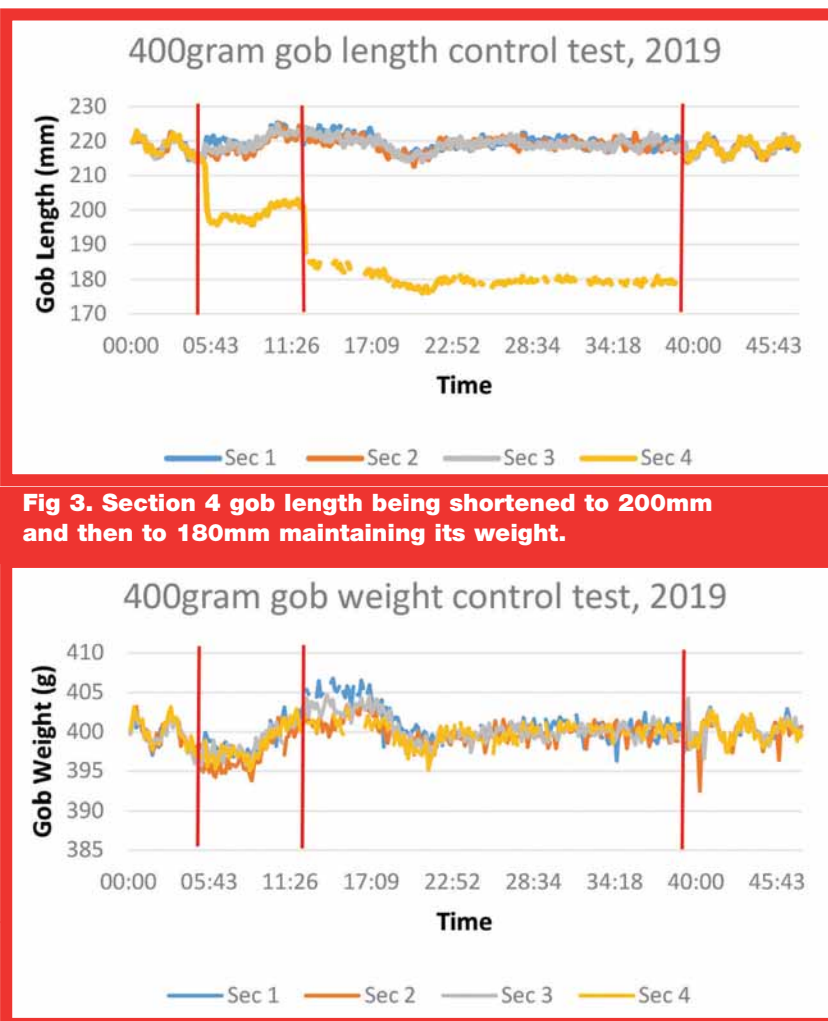


Fig 3. Section 4 gob length being shortened to 200mm and then to 180mm maintaining its weight.

of the MGA. The GobRadar's auto measurements will greatly relieve the operator from the bottle grabbing and weighing work and reduce the calibration time.

The control model was recently expanded to include gob length control in addition to gob weight control capability. The GobRadar measurements are now fed back into the control algorithm to fully close the gob weight and length control loop for each cut.

A series of trials on BEG's research machine and in-field production validate the Smart Feeder control capability on gob weight and length control. Figure 3 shows a closed loop gob length control test on the four-section research NIS machine. The gob weight was maintained at 400g for all sections. The gob length of section 4 was set to 200mm and in a second step to 180mm while the other three gob lengths stayed at 220mm.

Figure 4 presents a field trial of gob weight control. Section 9 and 10 gob weight and length were set to 506g and 131mm. On all other 8 sections, the gob weights and lengths were kept at 496g and 128mm. The various test results show that the Smart Feeder control can achieve the desired gob weight and length for each individual section and maintain the target gob weight and length precisely.

SMART FEEDER VISION

The goal of the development of the Smart Feeder is to provide an automatic setup of all relevant gob forming parameters to form and maintain the desired gob sequence for production. This includes stable gob weight, length, shape, dropping etc. for both single weight and multi weight production.

The useful potential of the entire BEG product range is far from exhausted. In addition to the already running gob weight

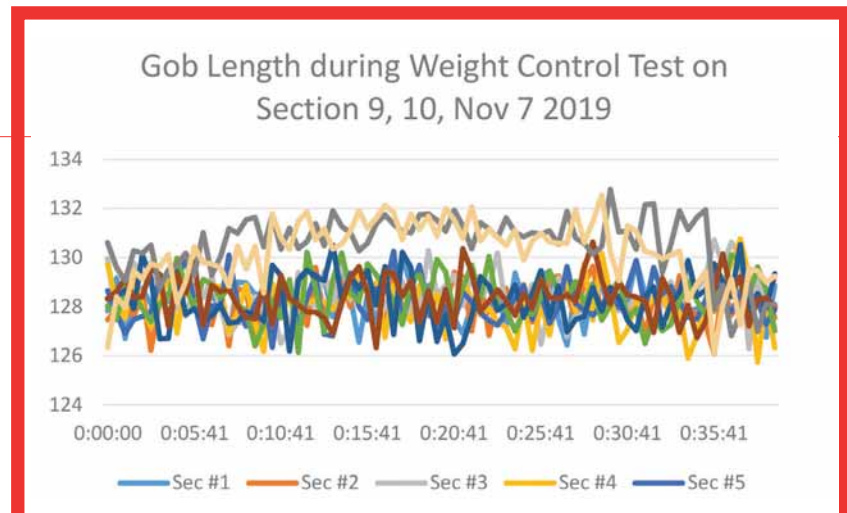
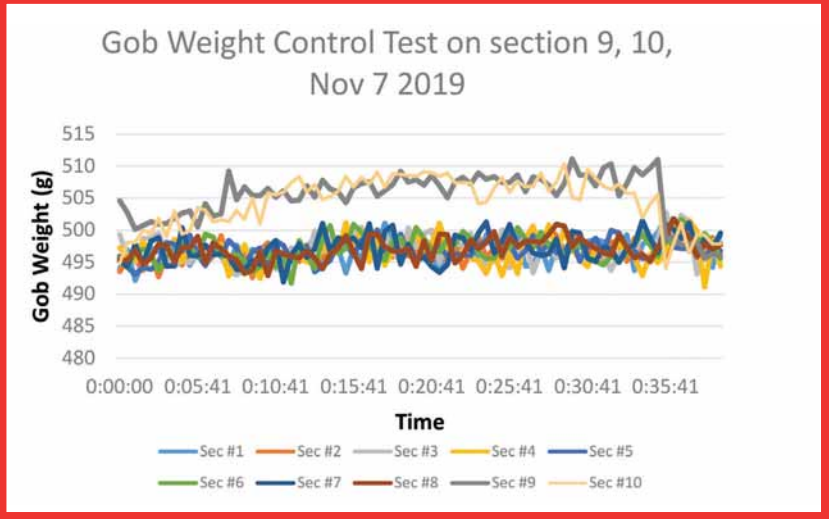


Fig 4. Section 9 and 10 gob weights were set to +10g compared to the others. Their length was set to +3mm compared to the others.



and length control, further functions are on the development list:

- Monitoring and uniforming of the gob length/shape also on the blank level by processing signals from the BlankRadar.
- Automatic compensation of the tilting of each gob (thicker/thinner) by influencing the shear parameters.
- Achieving a similar gob shape as with the last good run of the same production.
- Extension of the achievable range of double- and triple gob multi weight production by the Individual Needle Feeder.

In conclusion, the Smart Feeder is a fully closed loop controlled gob forming system, which will also serve as an information source within the End-to-End concept. The basic principle of a viscometer is somewhat similar to the feeder with its tube and plunger mechanism. When the

information of the gob characteristics measured by the GobRadar is connected with the 9-point grid history data of the forehearth and tube/plunger height settings, changes in glass viscosity can be detected. Awareness of these changes allows to adjust the forming process and gob shape accordingly, and to proactively counteract defects. ■

BUCHER
emhart glass

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STOELZLE GLASS GROUP

Inspection and cullet technology: saving space, guaranteeing speed, reliability and flexibility

Stoelzle Glass Group has been known for its know-how and excellence in the manufacturing of high-end packaging glass for more than 200 years, thanks to continuously updating its locations to keep up with market demand.

In this article, we speak to two of the companies involved in the recent upgrade of Stoelzle's Oberglas premises in Austria, where Heye inspection technology and Forglass cullet technology are being used.

In its position among the leading producers of high-end glass packaging worldwide, glass containers manufactured by the Stoelzle Group are used by the pharmaceutical, spirits, food, perfumery and cosmetic industry in a huge variety of different designs and sizes. These sectors demand precision and perfection for the containers their products are contained in.

This means that the production of these containers must be upgraded and updated. A recent example of how Stoelzle does this

is Stoelzle Oberglas location in Austria, where Heye inspection technology and Forglass cullet technology are being used.

HEYE STARWHEEL INSPECTION MACHINE

Stoelzle Oberglas has been successfully operating the latest glass container inspection technology from Heye International for more than one year: The SmartLine 2 starwheel inspection machine combines speed, reliability and flexibility to deliver accurate results.

SmartLine 2

SmartLine 2 is the latest generation of Heye's starwheel inspection machine series. Developed and manufactured at Heye International's dedicated Cold End Centre in Nienburg, Germany, SmartLine 2 glass container inspection equipment can be configured in several different ways, with up to six inspection stations available. The Nienburg facility employs a team of experts and features a modern production layout. Importantly, the centre is close to the Ardagh

Group's Nienburg glassworks to undertake essential testing work.

Flexible inspection options

Among the SmartLine 2's highlights are faster job changes thanks to the equipment's improved design and accessibility, the potential to use existing tooling sets and its enhanced user interface. Full data connectivity to all plant information systems is possible, with easy integration into existing lines. As well as featuring the latest non-contact inspection innovations, the equipment benefits from outstanding control reliability to avoid downtime.

Depending on the customer's requirements, various container characteristics can be checked:

- tightness;
- finish diameters;
- container height;
- finish and shoulder checks;
- bottom and heel checks;
- body checks;
- wall thickness inspection (non-contact);
- defects on the finish surface (LOF - line over finish);
- out-of-round, body diameter;





- mould number reading (dot code and alphanumeric);
- dark check inspection.

The latest non-contact inspection features are also integrated, as well as a self-learning system for camera-based check detection by Ranger 2.

Three SmartLine 2 machines for Stoelzle

Feedback generated from Heye International customers has confirmed the SmartLine 2 equipment's robustness and reliability. Stoelzle Oberglas in Köflach, Austria, that was the first glass plant to implement this new generation, is very satisfied with the benefits of the new SmartLine 2. After its launch at glasstec 2018, the company purchased three machines that run reliably and safely. "Knowing that the SmartLine 2 was brand new, we trusted in the compe-

tence of Heye. Our long-term and proven partnership finally led us to go for this new generation of inspection machine," says Gerd Müller, Cold End Manager at Stoelzle. "And we have not been disappointed. The stable software and the modern, future-orientated user interface simplify our daily work tremendously." Gerd Schütz, Heye's Product Development Manager Cold End, praises Stoelzle Oberglas as competent partner for the installation of the first SmartLines 2. "We are very happy to have performed the first installation of this new generation together with this great Stoelzle team. It was an easy commissioning without any start-up difficulties." The mechanical design and drive system in particular are highlighted for their robust design, while the control system is renowned for its reliable operation. "Sales

figures of SmartLine 2 exceeded our expectations," confirms Gerd Schütz. "Joint development in cooperation with our customers turned out to be the right way."

Reliability and robustness

It is essential for innovations to stand the test of time. In the case of many 21st century developments, this requirement is achieved by the use of robust industrial electronics and a climate-controlled electrics and electronics compartment, together with high quality components. A touchscreen monitor, simplified access to all electronic components and an extricable mounting plate for frequency inverters and servo controllers enhance operational usability. Hazard-free working conditions for the operator is provided by a micro-processor-controlled safety module. The machine sets the stand-

The use of cullet in glassmaking

The use of cullet in the process of melting glass is of great economic importance, resulting mainly from reduced consumption of raw materials and energy. The addition of cullet to the raw material mixture means that less heat is needed to melt the glass. In addition to the economic benefits, there are also ecological benefits of using PCR (post-consumer) cullet, as the amounts of emissions of harmful compounds in the melting process are reduced.

Glass cullet can be divided into:

- own, i.e. arising from a glass producer's normal production processes;
- foreign – delivered to glassworks from the outside, i.e. from glassworks of other industries or from large recipients of glass products (beverage bottling plants, lighting equipment manufacturers, construction, etc.);
- post-consumer recycled (PCR) packaging and glass products, collected through recycling programmes.

Constant improvements and automation of packaging glass production processes result in the reduction of waste material being generated and, therefore, in the amount of cullet formed in the production process. This lower volume does not meet the needs of packaging glass producers and forces them to use cullet from secondary circulation, i.e. foreign and PCR cullet. PCR cullet in particular introduces impurities into the batch that can disturb the melting process and cause glass defects. Also, the colour requirements for glass packaging narrow the acceptable parameters for glass cullet obtained from recycling. For this reason, any external cullet must be subjected to cleaning and processing. Special technological processes that have been developed for these purposes have now achieved a high degree of automation. Forglass' newest technology in cullet management meets the most stringent requirements of container manufacturers.

ard in terms of reliability and robustness. The user interface has been improved and makes job changes as easy as possible. Both, the mechanical design and also the control unit are extremely reliable and easy to operate.

The large hood gives optimal access to the working space, reducing job change times to a minimum.

Improved job change times

The application of servo technology results in a high degree of flexibility. Fast and easy changes to an item's indexing positions and optimal use of the servo torque for up to four rotation stations are possible. Optimised motion sequences allow faster reactions to changing process parameters. The maximum article height accommodated is 400 mm (up to 500 mm on request), with angular, oval and round containers processed. Thanks to the servo-driven star wheel, indexing positions from six to 48 are possible.

The enlarged working radius guarantees a high compatibility with many existing tooling sets on the market. The tooling range includes a body starwheel, neck starwheel, out-feed guide, centring piece, plug/gauge, stripper and infeed screw.

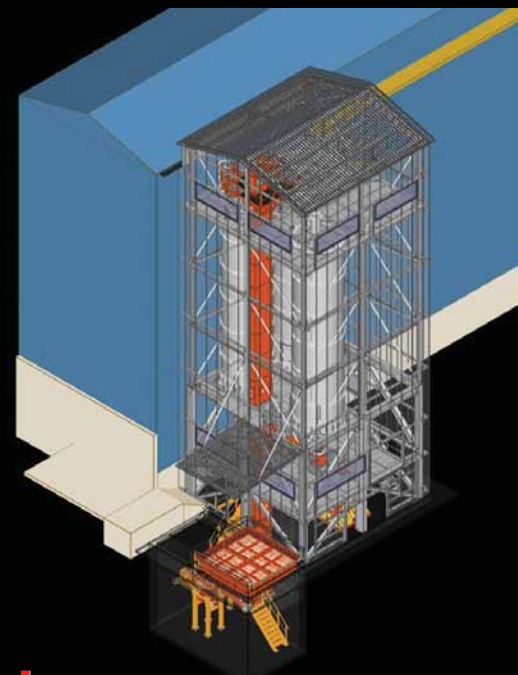
FORGLASS PCR CULLET SYSTEM

Experts from Forglass and Stoelzle Glass Group worked together to develop an external cullet preparation line for the Stoelzle factory in Koeftach Austria. This task was especially challenging because the factory produces extra-flint glass, which requires special preparation of cullet.

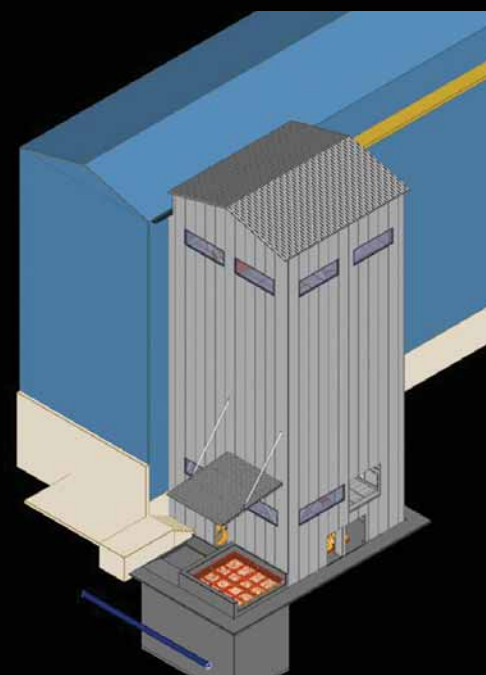
One particular difficulty that had to be overcome at the Koeftach site was the presence of groundwater in the basement. The usable depth of the basement



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had to be reduced to only 5.5 metres, while housing a 16 m³ hopper and two vibrating feeders.

One of the main components of the technology line is a dedicated crusher with a unique ability of cullet gradation adjustment. This significantly reduces the formation of dust, and also allows granulation control of crushed cullet.

The low-dust Atlas Crusher

This double-roll crusher (KDW type), designed and manufactured by Forglass, crushes glass to the desired fraction. The rollers, driven by two separate electric motors use intergranular crushing method, which significantly limits the formation of dust during crushing. Using two independent drives, the design allows foreign material to leave the crushing chamber without damaging the rollers. Additionally, the rollers are equipped with linings that can be replaced without removing the rollers from the crusher, which significantly shortens maintenance time.

The crusher's design was subjected to demanding tests in cooperation with The Main Mining Institute in Katowice, Poland. Studies have shown that it is characterized by extremely high crushing precision. Over 92 per cent of the output is in the range of the desired fraction, thanks to which the crusher does not have a problem with dusting or passing of larger cullet fractions.

Transport, storage, dosage

The new line is integrated with the existing cullet storage system, but it will replace the old cullet transport. This will save a considerable amount of space on the factory floor due to the compact structure of the new solution. The new line is equipped with three silos, with a total volume of 300 m³, which will increase

the existing storage capacity by 100 per cent, with the possibility connecting to the old line. The design is future-proofed with the built-in option of adding another 150 m³ silo without interfering with the building structure. The new line is also integrated with the existing control system.

The cullet is transported to the upper level of the building by a bucket elevator. Filling the silos and transport to the old line are accomplished with one device – a mobile vibrating chute. All parts of the equipment that come in contact with the highly abrasive material, including the silos, are protected with an anti-abrasive system, which significantly increases their service life.

The weighing and dosing system is based on three compact weighing belt conveyors. It allows dosing several types of cullet at the same time, with smooth feed regulation from the control room or from the device panel. Weighing belt conveyors take up less space than traditional scales and do not require an additional pre-feeder, which allows additional space and money savings. As part of the integration with the existing line, Forglass will extend the existing belt conveyors and install a vibrating feeder, connected to the existing line in the batch plant.

The new line will allow Stoelzle Koeflach to enjoy the possibility of storing additional 300 m³ of cullet, and dosing it at a volume of up to 75 t/h, with the possibility of in the future. The entire system, including the basement and unloading basket, occupies only 110 m² of space.

How does the user benefit from the Forglass system?

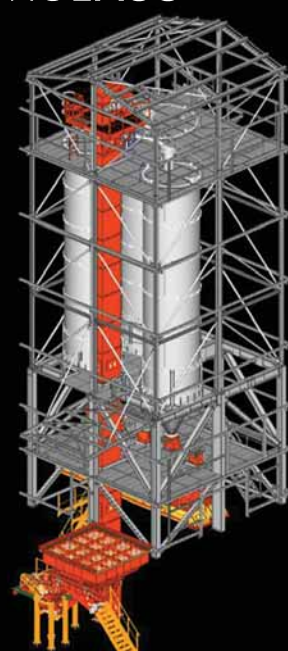
- Quality control of external cullet;
- active management of magnetic and non-magnetic impurities;



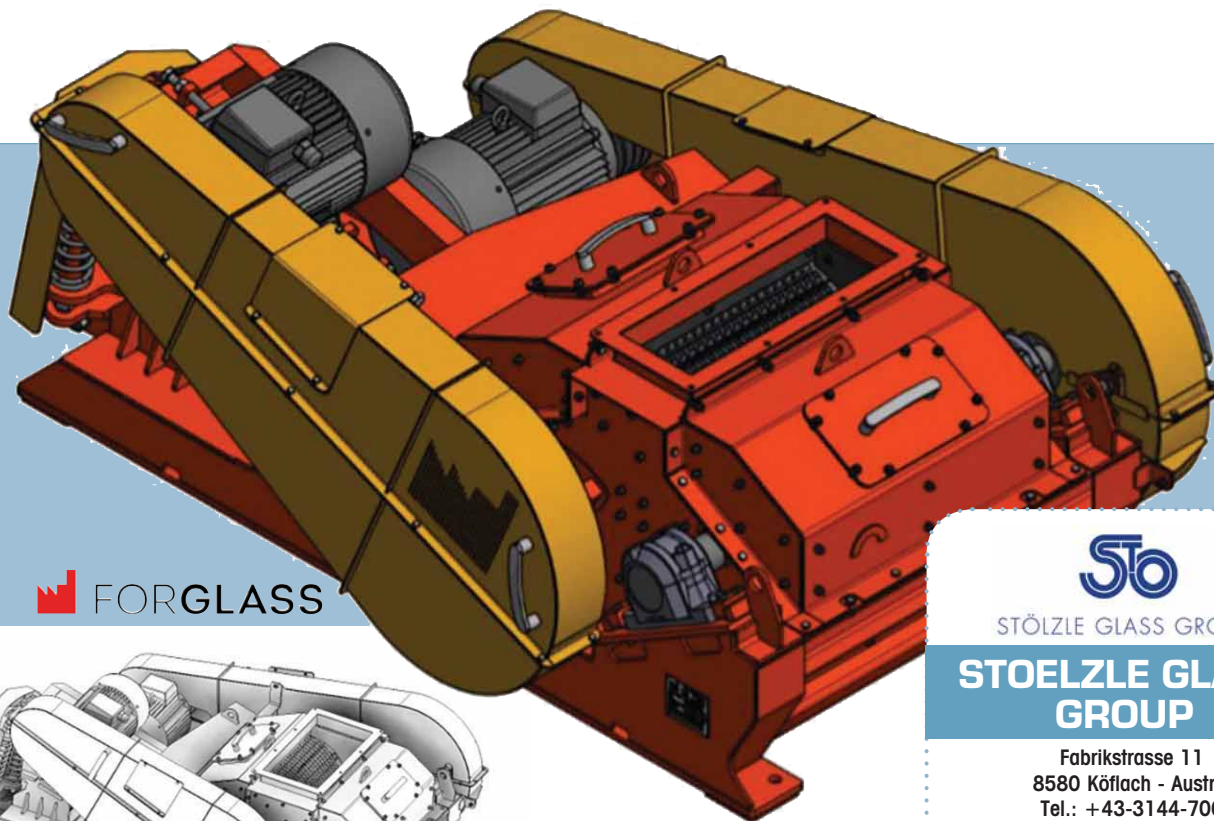
 FORGLASS



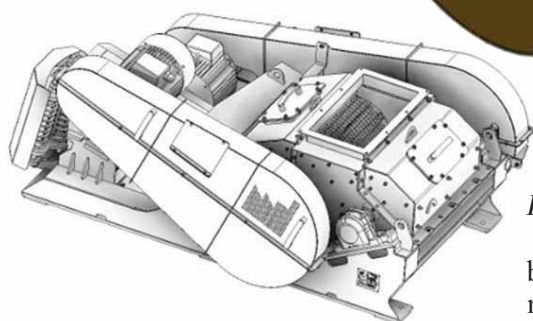
 FORGLASS



 FORGLASS



 **FORGLASS**



- recovery of contaminated cullet;
- high separation efficiency = minimal cullet waste.

What is the outcome?

- Improvement of glass quality;
- verification of external cullet sources;
- elimination of the risk associated with introducing magnetic and non-magnetic impurities in a glass furnace;
- cost reduction.

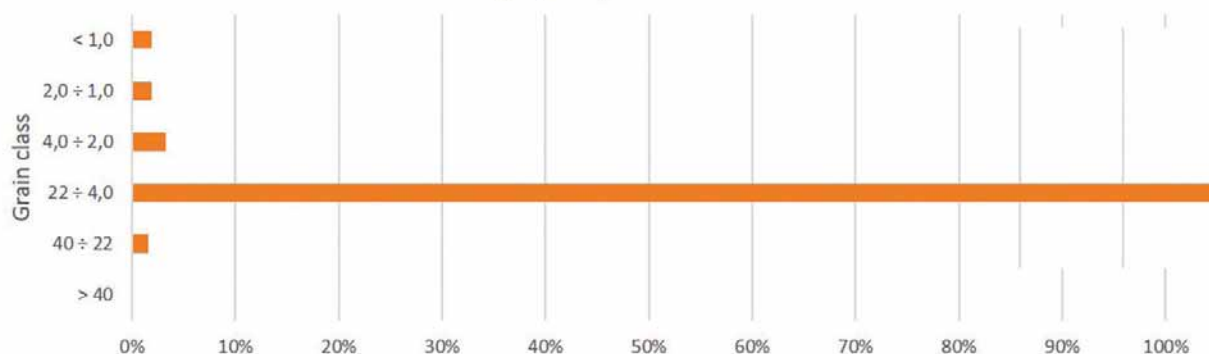
How does it work?

The system is based on a number of feeders and chutes, connecting individual storage silos. The technology line is equipped with an array of sensors detecting metallic and non-metallic impurities. Contaminated cullet is directed through automatic gates onto the appropriate path and subjected to subsequent stages of segregation or purification. The entire system is tailored to the customer's needs and has a built-in, broad range of adjustment, so that the manufacturing plant can easily adapt to the fluctuating market demands. ■



G I G

Results along with expanded uncertainty
($k=2$, $P=95$)



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Fifty years of being switched on

FIFTY YEARS OF BEING SWITCHED ON

SORG

Furnaces with a bright past
and sustainable future



The use of electric furnaces for glassmaking was first brought to the market by SORG 50 years ago. Since then, the group has continued to innovate, providing tailor-made systems that not only ensure the high quality glass required nowadays, but also low energy consumption in response to the need to reach climate neutrality in a foreseeable period.

Since introducing the first all-electric VSM® furnace 50 years ago, the SORG Group has supplied over 100 cold-top Vertical Super Melters, as well as electric boosters for over 500 traditional fossil-fired furnaces worldwide. Still today, SORG continues to innovate with sustainable solutions to tackle climate change.

SORG mostly uses electric energy to increase the capacity of fossil-fired melters and also improve the glass quality. In fact, its first applications of electric melting can be traced back further to the 1960s. Now an independent supplier of more than 500 boosting systems in over 70 countries, these can be applied to any make of combustion furnace.

The Electric Melting team

FIFTY YEARS OF BEING SWITCHED ON

includes electrical engineers, mechanical engineers and industrial management assistants. Technical development and pre-engineering are included in the quotation phase, with all calculations and key equipment design carried out in-house.

Systems are tailor-made to individual customer needs and boundary conditions. Technical documentation is provided to help resolve day-to-day problems, while commissioning support and a free after-sales service include inspections to see when electrodes need replacing. The team also works alongside SKS/Sorg Feuerungsbau, who can provide expert maintenance assistance to customers facing any severe equipment issues.

TAKING TODAY'S TECHNOLOGY FORWARD

With the Paris Agreement asking for a 40 per cent reduction in carbon emissions by 2030 and net zero by 2050, the global glass industry faces a huge step change as manufacturers seek more renewable energy sources.

Modern glass melting furnaces are highly effective and energy consumption is on a relatively low level. High quality requirements, especially with regard to homogeneity and bubbles also have to be met. While of course, emissions such as NO_x, SO_x, dust and CO must be within the limit values.

Furnaces tend to have a high to very high flexibility, so that glass producers can react to the market demands. They need to be designed so that colour changes of the glass can be carried out quickly, together with changes in the raw materials due to availability, price and quality.

The one major disadvantage of modern glass melting furnaces is that they are fossil-fuelled. Many have installed electric heating, but only to increase the melting per-

formance and the glass quality.

As high-energy-intensive installations, furnaces continue to produce significant CO₂ through the combustion of fossil fuels. Efforts are underway to reduce CO₂ emissions and slow down global warming. The European Union goal for climate neutrality by 2050 means a complete eradication of fossil fuels, leaving electrical energy as the most logical alternative.

SORG has an entire department dedicated to this more sustainable energy source. Currently led by the fourth and fifth generations of the Sorg family, the Group offers a unique range of safe and sustainable solutions to provide the lowest cost of ownership over the life of the investment.

ALL THE BENEFITS OF ALL-ELECTRIC MELTING

The cold-top vertical melting principle of SORG's Vertical Super Melter has proved to be the best technology available for glass furnaces using only electricity as their energy source.

Patented in 1970, the VSM[®] produces all kinds of glass, especially high-quality glassware ranging from borosilicate glass to tableware. It can reduce energy consumption in a number of unique ways. With no combustion, no energy is lost in terms of a large quantity of waste gasses. The only gas stream generated is a relatively small amount from the decomposition of raw materials in the batch, as well as water vapour from raw material humidity. This waste gas stream can be removed from the furnace superstructure. Cleaned by means of a small baghouse filter, it prevents in-factory dusting and is released into the environment without any further treatment.

As the main process steps take place in the vertical direction of the furnace, the outside



surface area of the cylindrical melting tank is relatively small. Furthermore, heat insulation can be applied to large parts of the tank, making losses through the refractory exceptionally low. Other large components with high wall losses, such as a large superstructure or heat recovery system, are totally unnecessary.

SORG's rotating crown batch charging system achieves a perfectly even coverage of the melt with a layer of raw materials. This batch blanket acts as an insulating layer on top of the melt and an integrated batch preheater, resulting in superstructure temperatures of between only 150 and 300°C. The sealed superstructure also prevents dust within the factory.

Relatively easy to operate, all-electric melters also benefit from less maintenance and a shorter repair downtime. And with more than 100 VSM[®] furnaces installed since 1971, all kinds of special glasses have been successfully produced.

The first widely-used application of all-electric melters was in producing glasses with volatile components. Due to the cold raw material cover, these components can be reabsorbed in the batch blanket and not lost to the environment.

An increased demand for all-electric melters in localities with high environmental require-

ments has led to urban glass producers being allowed to extend production capacity only by switching to a furnace technology that avoids emissions of air pollutants like sulphur dioxide or nitric oxides. In areas with high hydro-power potential or limited supply of natural gas, electricity is the cheapest energy available.

One of the biggest advantages to having an all-electric melter is in the simplicity of operation. Without combustion and waste gas treating equipment, only a small number of auxiliary aggregates have to be installed, operated and maintained. Just two main control loops are required – the electric heating power and glass level. Day-to-day furnace operation is low and maintenance work is mostly limited to the batch charging system, inspecting and exchanging worn electrodes, whenever necessary.

GOING BEYOND THE LIMITATIONS

The cold-top vertical melting process does come with certain limitations, such as in the possible meter size and pull. Requiring an even layer of batch to be spread across the whole surface of the melt, all-electric melters have a size limit of around 200 metric tons per day.

Reducing and neutral glasses are difficult to produce with all-electric melters today, while glasses for continuous reinforcement fiber have a very high specific electrical resistance and would require melters of a reasonable size to operate at dangerously high voltages.

Besides electricity being more expensive than natural gas in most parts of the world and therefore uneconomical for standard glasses, a lower melting capacity means that a single

all-electric furnace might only supply one or two production machines. However, this will also lead to higher flexibility in production and less furnace repair downtime impacting the overall output of the plant. A shorter total lifetime of the all-electric melter is compensated by shorter glass-to-glass repair time and considerably lower refractory cost.

If energy prices are disregarded and the industry reconsiders everything in terms of the environment, then pure electric melting furnaces are an adequate replacement for fossil-fired melting furnaces.

The VSM® is solely electrically heated and produces no CO₂ emissions from combustion. However, this requires the acceptance of cutbacks that are controllable.

MOVING AND MELTING WITH THE TIMES

Our big challenge is to reach climate neutrality in a foreseeable period. The future of glassmaking requires sustainable melting technology. Legal guidelines such as emission trading and increasingly strict limits on air pollutants will force glass producers to change their furnace technology. Classical combustion technology, like the regenerative firing principle that has been used for more than 150 years now, will soon be gone.

The concept of hybrid melting and alternative combustion fuels, such as hydrogen have been debated and developed for a while, but with the high capital cost involved, they still have a long way to go. All-electric melters have proven technology and may see a renaissance in the production of special glasses. By implementing certain process changes, they make an ideal alternative for mass produced

glass such as containers.

Even though such a long-term commitment is extremely difficult due to undefined boundary conditions, it's possible to commission a first design stage melting furnace almost conventionally today. Simply by boosting shares of more than 10 per cent in the total energy and increasing the use of electricity over time in accordance with the changing regulations. This furnace concept has the advantage of greater flexibility, especially if there is the possibility of future fossil heating using green hydrogen.

The need to reduce emissions is more important than ever, and as long as there is a sufficient supply of carbon-neutrally generated electric energy, the solution for future glass production is electric melting.

With half a century in all-electric melting, SORG has been switched on to greater sustainability long before reducing our industrial carbon footprint became the all-important issue it is today. By always asking difficult questions and looking for the brightest solutions, SORG is leading the way forward in its own inquisitive and conscientious way.

To find out how SORG is staying switched on, visit the sustainable melting microsite at: <https://sustainablemelting.sorg.de>.

SORG

VALUE
BY
DESIGN

**NIKOLAUS SORG
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RESPONDING TO GROWING DEMAND

TIAMA

A full range of services to meet customer satisfaction

Romain Lechiffart
SERVICES BUSINESS DEVELOPER

In response to the growing demand of services from its customers, TIAMA created a special Service Department in 2016. With a team of 70 engineers (speaking 15 languages) all over the world, and seven technical area managers, TIAMA is now organized to meet all the requests in terms of maintenance, training, technical assistance, audit, etc., and can also rely on all the remote assistance tools offered by the company. By improving key customer indicators, TIAMA also ensures that its range of services offer the best payback possible.

WHAT CAN GLASSMAKERS EXPECT FROM TIAMA SERVICES?

Each day of service sold to customers must be designed to improve the final quality of the production process. Four major indicators can be enhanced:



Services are an essential part of any company, and being able to respond to this ever growing demand is fundamental. With services covering maintenance, training, technical assistance, audit, and much more, Tiama also ensures that its range of services offer the best payback possible.

resorting rate, final customer claims, machine uptime and false reject rate.

The goal that Tiama and its customers want to reach together is to improve one or more of these indicators, for each day of service performed. Each progress, however small, will not only lead to a quality gain, but also to financial savings for the customer.

HOW DOES TIAMA MEET THESE EXPECTATIONS BY GUARANTEEING GOOD PAYBACK?

There are three ways to provide service to customers:

1. On request: for example one week of training, a technical audit, preventive maintenance... TIAMA provides this 'one shot' service, making sure afterwards that it has helped the customer on his pain points: skills improvement,

identification of upgrades to be achieved, spare parts to be replaced, drawing of action plan to be scheduled... All these improvements will be a gain for the customer.

2. Service contract: the second way to provide continuous service is through the Service Contract. These are the same services described above but articulated in a programme of solutions or services to be performed over a given period of generally one or two years. Each service contract is associated with a Quality project. Upon signature of the contract between the customer and TIAMA, the Services program is defined jointly. It usually contains several visits throughout the year, in order to ensure regular presence and to anticipate failures as soon as possible. These contracts may include technical or per-



RESPONDING TO GROWING DEMAND



formance audits, continuous training to compensate the team turnover for example, preventive maintenance, technical support... All visits are followed by a Service Contract Leader to define and monitor quality projects, and to drive the customer to progress along the priority axes defined at the beginning. This is the best way to track the effectiveness of the service contract, and thus its profitability.

In April 2020, TIAMA counts 41 service contracts, representing over 1,000 machines under contracts, and 1,000 contract-service days performed annually. **Today the average Return On Investment of these contracts is eight months, for a one-year contract.** The year-to-year contract re-signing rate, close to 95 per cent, is a

proof of customer satisfaction.

3. **Service solutions:** Complementary to the two previous solutions, TIAMA, is now developing tools with dedicated engineers, to improve glassmaker's daily life. Three of them:

- **Online quizzes:** multiple choice question tests on different machines, for several levels (operator, adjuster, expert) enabling our customers to evaluate their teams in order to choose the most adapted training programs.
- **Simulators:** Available for MULTI4, MCAL4, or ICARE, the simulators are virtual machines, on which customers can train. They can either work on exercises by training on settings for different detections, but it is also an interesting tool for



customers to optimize the production by testing settings on their real images without risking interfering on the current production. Simulators are a good tool to find the best adjustments and improve skills of operators and adjusters.

- **SPOC:** these Small Private Online Courses are a series of 30 explanatory videos about MX4 (operation, maintenance, job change...), followed by a quiz to validate the understanding of the trainees. They are available in any customer language. Customers can train how many times as they

want, anywhere. Customers can also receive training on demand, tailored to their production constraints.

All these tools can be included in a Service Contract.

WHAT ARE TIAMA'S SERVICES FOR TOMORROW?

TIAMA is becoming increasingly engaged in the path of predictive maintenance as part of the development of its Smart Factory strategy. This type of maintenance makes it possible to anticipate the occurrence of failures on machines according to data relating to their working state. Thanks to an agent installed on the machines, real-

time data can be collected and analysed. Then, real-time monitoring of indicators such as card/board temperatures, disk storage capacities, or the percentage of RAM used, allow TIAMA to anticipate future problems with e-mail notifications, thus saving on OPEX. This solution called Tiamo E-connect, is a secured solution that has been approved by Orange cyber defence and is already being tested and widely approved by some glassmakers.

TIAMA is committed to the continuous improvement of customers' work, by supporting them and creating innovative solutions. All these services, solutions, tools, whether included in contracts or not, are designed with the goal to help customers make the most of their investments by supporting them to use their machines at the best of their potential in order to have the best production possible.

Each service is delivered with the aim of increasing daily work and improving its profitability. ■



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Tiama
CUSTOMER
support

COMPANY UPDATE

With a history going back over 100 years, Vetropack is continuing on its path of growth and development with strategic acquisitions, takeovers and mergers. Put this together with technological progress and the opening of new markets and we can see how growth and experience go hand in hand in the mission of the group.

VETROPACK

Targeted investments; environmental awareness





INVESTMENTS

The second half of 2019 saw extensive renovation work being carried out and successfully completed at five Vetropack sites. These investments aim to increase production output and product quality while reducing energy costs.

In the glass industry, sustainable increases in capacity have to be planned a long time in advance. It is therefore virtually impossible to fast-track any capacity expansions.

Short-term peaks in demand can be covered by running down stock, but to ensure long-term organic growth, Vetropack is making targeted investments. Double-gob production is increasingly making way for triple-gob systems in the small items and lightweight glass portfolio, thus helping to boost output to the levels needed to satisfy increasing demand. Further modernisation measures are leading to more efficient information exchange between production and test technology.

INCREASE IN MELTING CAPACITY

Vetropack's largest coloured-glass furnace (in terms of area) underwent an overhaul between September and November 2019, and now

boasts an average melting capacity of around 380 tonnes per day. On top of this, a new glass-blowing machine with 12 stations for double- and triple-gob production was installed on one line, while the existing 12-station glass-blowing machine on the other line was re-engineered in close cooperation with local companies and put back into operation on schedule.

Extensive renovation work was also carried out at Vetropack's plants in Kyjov, Nemšová, Pöchlarn and St-Prex.

Thanks to the modernisation of the packaging and inspection technology at the cold end of individual plants, a perfectly coordinated exchange of information between production at the hot end and the inspection system can now be guaranteed. This will help to enhance product quality on a sustainable basis.

To minimise the environmental impact of glass packaging and meet the most stringent quality and efficiency standards, Vetropack is constantly investing into the heart of production



COMPANY UPDATE

– the furnaces. The energy efficiency levels achieved with new and well-maintained machines is higher compared to purely pneumatic systems thanks to the use of servo technology. Another well-known method for improving energy efficiency is to continuously increase the proportion of used glass employed in glass manufacturing.

ENVIRONMENTAL AWARENESS

Recycling used glass has hugely improved the environmental footprint of glassmaking within just a few decades. However, the used glass contains a considerable amount of foreign substances that increase production costs. This is why the Vetropack plant



in St-Prex purchased two glass sorting machines last year.

Glass is a natural material and is one hundred per cent recyclable without compromising on

quality. Using used glass gives glassmaking a much smaller environmental footprint than using primary raw materials. In order for used glass to become a high-quality secondary raw material, however, all foreign substances and extraneous matter must be removed during processing. After being presorted manually, the used glass reaches the recycling station, where the glass is separated from the foreign substances using compressed air and other separation systems.

Between 300 and 350 tonnes of used glass is sorted and processed daily at Vetropack's plant on Lake Geneva. Used glass makes up substantial 80 per cent of total production in St-Prex –



more than anywhere else in the Vetropack Group. This high used glass content allows for an energy saving of almost 25 per cent.

The quality of recycled glass in Switzerland is higher than in other countries. Even in St-Prex, however, foreign substances can still make up some 9 per cent of the used glass supplied to the plant. Impurities and bubbles in finished bottles are the result of foreign substances which were not filtered out. These bottles remain in quality control and are removed from the process.

Only the best-quality glass packaging reaches the customer.

Increased efficiency

Filtering out foreign substances makes production more expensive. For this reason, St-Prex decided to purchase two Clarity glass sorting machines in 2019. One machine processes 14 tonnes of used glass per hour. Processing follows a two-shift pattern from Mondays to Fridays. The used glass then goes through several more stages of processing.

The new Clarity sorting machines made by Binder + Co do much more than just visual sorting: Clarity is also equipped with various sensors. Not only do these sensors work together,



but the data they capture is also linked to evaluation algorithms devised specifically for this purpose. This enables simultaneous sorting of heat-resistant glass ceramic without using X-ray fluorescence. The high level of detection quality and rapid sorting diverter technology ensures a high degree of accuracy in the separation process. The two sorting machines process cullet sizes of between 10 and 20 millimetres and between 20 and 80 millimetres respectively.

This purchase allows Vetropack to work much more precisely with the technology currently available and spot even the tiniest bits of metal and aluminium using detectors.

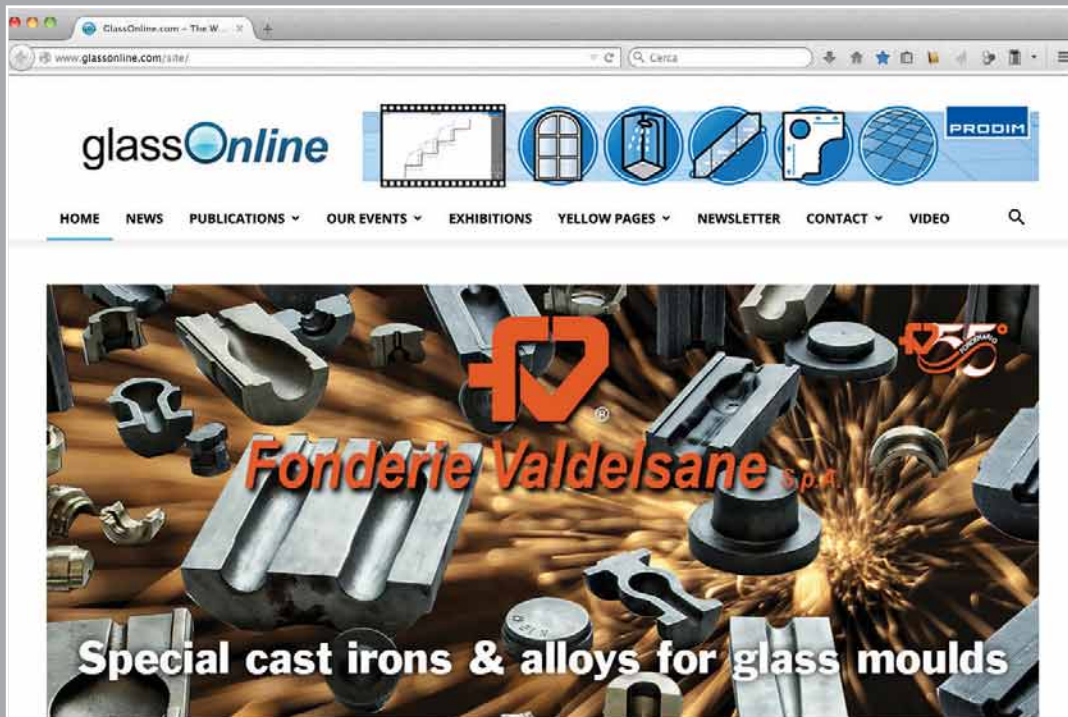
Clarity takes the burden off downstream process steps, increases production quantities and product quality and reduces processing costs. ■





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Glass Storage, Loading & Cutting Machinery

Glass Technology Services: COVID-19 update

16 April 2020
Gareth Jones, Operations and director at GTS, said, "In this situation we are heeding guidance and implementing measures to protect..."

FOCUS ON



The furnace of the future: a vision for climate neutral packaging.
14 April 2020

FENSTERBAU FRONTALE

FENSTERBAU FRONTALE and HOLZ-HANDWERK will not take place in 2020
16 April 2020

Against the background of the continuing corona pandemic and its effects on the world economy, NürnbergMesse has decided, in agreement with the Department of...

TECHNOLOGY UPDATES

STOELZLE GLASS GROUP

Inspection and cullet technology: saving space, guaranteeing speed, reliability and flexibility

Stoelzle Glass Group has been known for its know-how and excellence in the manufacturing of high-end packaging glass for more than 200 years, thanks to continuously updating its locations to keep up with market demand. In this article, we speak to two of the companies involved in the recent upgrade of Stoelzle's Oberglas premises in Austria, where Heye inspection and Forglass cullet technology are being used.

Group's Nienburg glassworks to undertake essential testing work.

Flexible inspection options

Among the SmartLine 2's highlights are faster job changeovers thanks to the equipment's improved design and accessibility, the potential to use existing tooling sets and its enhanced user interface. Full data connectivity to all plant information systems is possible, with easy integration into existing lines. As well as featuring the latest non-contact inspection innovations, the equipment benefits from outstanding control reliability to avoid downtime.

Depending on requirements, the characteristics of the finish, diameter, container, finish and checks; bottom checks; body wall inspection; etc.



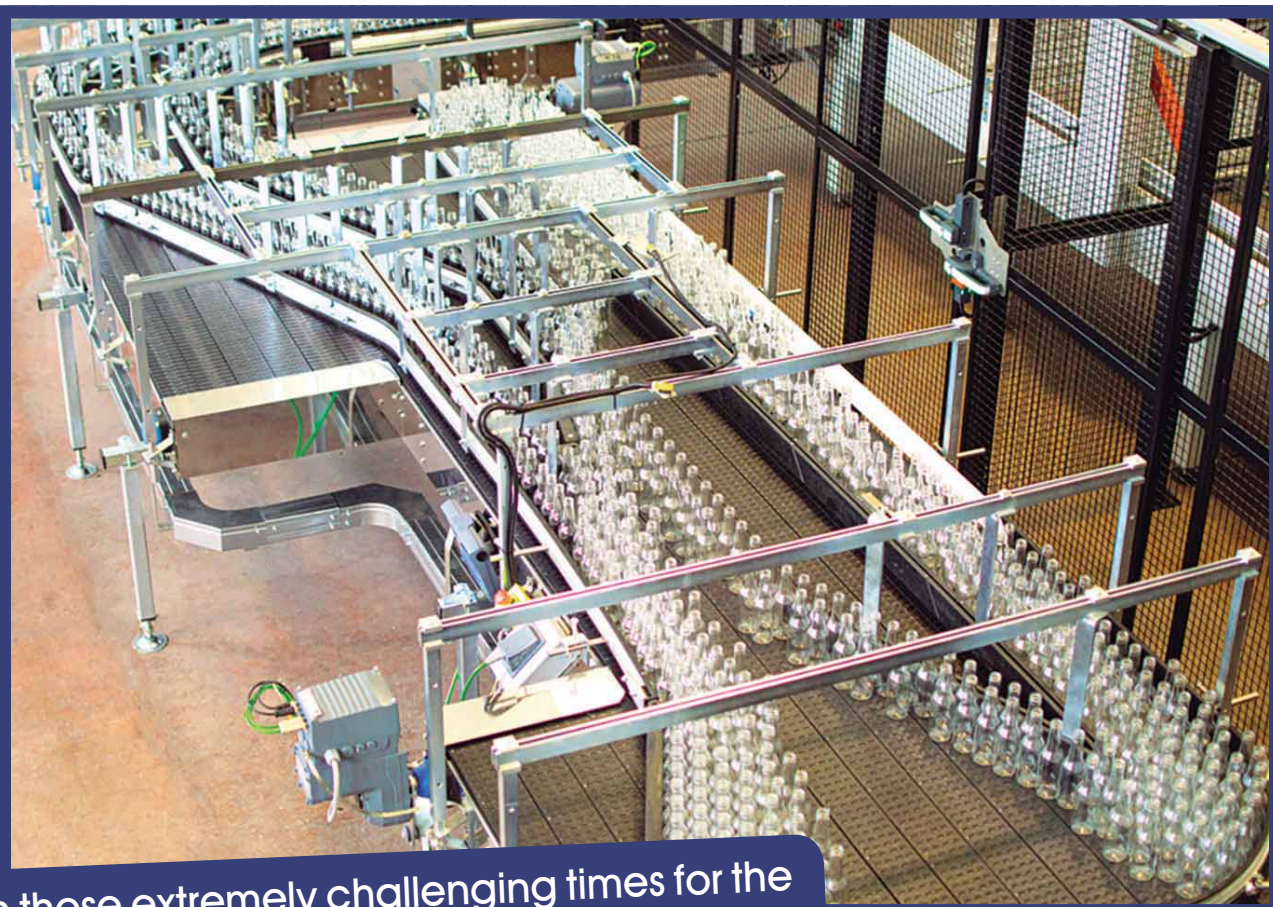
SmartLine 2 is the latest generation of Heye's star machine series.

www.glassonline.com

VETROMECCANICA

Quality and know how –
100 per cent Made in Italy

Company and market update



In these extremely challenging times for the entire world, an important characteristic of companies is that of being able to continue working, which is often – if not always – made possible thanks to working entirely in-house. This article gives us an example of one of these companies, which also ensures 100 per cent Made in Italy production.

Andrea Bertinelli - Glass Department Sales Manager
Francesco Cavatorta - Sales Department
VETROMECCANICA

How to continue working during these incredibly challenging times when the Corona Virus has put a halt to a significant amount of global business? Here at Vetromeccanica we are focusing on our assets, our reputation and our products – 100 per cent Made in Italy. We believe, now more than ever, that doing a good job and understanding the requirements and concerns of our customers can lead to the best results. In this

COMPANY AND MARKET UPDATE

period of uncertainty, the trust of our customers, along with our extensive experience and know how, are the pillars that will ensure the continuous growth of our company.

CONTINUOUS AND ONGOING WORK – ALL IN-HOUSE

Our 100 per cent in-house production has meant that we have never stopped during these months, and we have continued to process and deliver all our orders.

In fact, thanks to our Mechanical Department, we can carry out all the phases of the production process of our solutions: mechanical-electrical engineering, production and assembling. This department is specialized in laser cutting, plasma cutting, sheet metal bending, iron welding, stainless steel welding, powder or liquid coating, cold and hot galvanization.





Thanks to our machinery we can work on sophisticated design projects and create complex shapes with tight bending radii.

conveyor lines and palletizers, with important innovations in terms of efficiency, maintenance and speed. ■

WORKING FOR THE FUTURE

Vetromeccanica is now working and investing for a continuous growth and for conquering new markets.

In addition to consolidated historical experience in conveying solutions for containers with thousands of turnkey installations for Food & Beverage, Chemical, Pet-Food, Personal and Health Care sectors, today our aim is to also offer turnkey Cold End Solutions both with regards to



VETRO COLD END SOLUTIONS
MECCANICA

VETROMECCANICA SRL
Glass Packaging Solutions

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Vetromeccanica has a team of well-known specialists in the glass sector: (from left to right) Luca Zoni, Marco Bertagnolo, Sandro Melegari, Stefano Bartoli, Francesco Cavatorta, Andrea Bertinelli, Gino Caraffi, Carlo Felici, Marco Friggeri, Stefano Pizzini, who will support our customers from the planning stage right through to installation and after-sales service.

BERTHOLD TECHNOLOGIES

Reliable and safe level
measurement to
improve glass production

This article looks at one of the most important aspects of glassmaking – efficient and quality production. A repeatable and accurate measurement system using Co-60 isotope, proper alignment, and an effective calibration procedure, shows to give the best results with regards to safety, reliability, and throughput.

Industrial glass melt furnaces are used in glass production to melt raw ingredients (batch) into a molten glass at temperatures exceeding 1200°C. Level control just after the outlet of the melt furnace is one of the main process control challenges to facilitate efficient and high-quality glass production. Due to the harsh conditions, non-contacting measurement methods are mandatory. Standard online furnace level control methods, such as optically based technologies like lasers, do not produce reliable and reproducible results without constant, almost daily, maintenance and upkeep. Furthermore, optically based measurements require the refractory to be completely removed, hence exposing the furnace heat and gases to nearby workers what is creating a potential risk for workplace safety incidents.

Radiometric based level measurements offer best in class reliability and safety for the glass industry to aid in streamlining glass production and producing consistent quality glass while minimizing costs and maximizing throughput.

GLASS LEVEL AT THE FEEDER CHANNEL

Glass comes in all shapes and sizes. From optical lenses, building materials and bottles, to toothpaste additives, glass is a part of our everyday lives. Glass manufacturing also takes many shapes and sizes, but to create glass, a raw ingredient mixture or “batch” must first be melted. Melt furnaces are large enclosures with dense refractory brick layers on all sides including at times a refractory roof.

Such furnaces utilize gas or electric power to “fire” the raw ingredients into a molten state with process temperatures maintained above 1200°C during furnace operation. The molten



“batch” slowly progresses and churns from one end of the furnace to the other over the course of a ~ 24-48 hour residence time. Upon leaving the furnace, the molten material enters what is known as the feeder channel. The feeder channel is the main channel that feeds any number of molten glass tributaries. At the end of each tributary is a glass “pull” where the molten glass is pulled via gravity from underneath the tributary and further processed depending on the form of the final product. The figure above gives an overview of the furnace and its control.

Reliable glass level measurement and control at the beginning of the feeder channel is necessary for a streamlined and efficient glass production as well as consistent glass quality. Traditional offline glass level measurements or dip checks are performed manually on a schedule. To perform such a dip check an operator inserts a metal rod into the molten glass to the bottom of the feeder channel (typically 200...400 mm in depth).

After a short time has passed, the rod is removed and placed in a steel V-channel with a ruler for

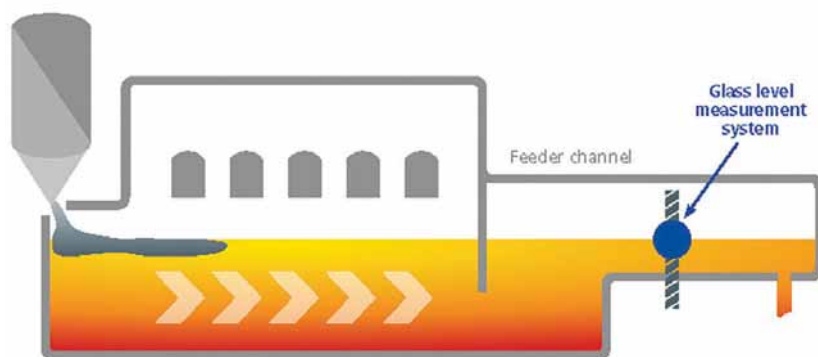
glass level measurement. Along with offering only a “snapshot in time” measurement, manual dip checks can vary from operator to operator by the method of dipping. Furthermore, relying exclusively on manual dip checks for level control creates unnecessary potential for workplace safety incidents. In contrast, online glass level measurements offer non-contacting, continuous glass level readings with an increase in accuracy, reliability, and a reduced feedback loop that allows for improved response time. With an improved response time, process upsets such as low or high batch bin level or glass pull runaway can be assessed in seconds rather than in hours. When compared to traditional offline level measurements, online glass level measurements provide superior safety and process reliability to aid in optimizing the production process and producing consistent quality glass.

NON-CONTACTING MEASUREMENTS: OPTICAL VS NUCLEAR

Standard non-contacting, online glass level measurements have historically been optically

PROCESS CONTROL CHALLENGES

Glass level at the feeder channel



based. Such measurements require furnace refractory to be removed completely on one or even both sides of the furnace, creating an open 'window' to the furnace that allows for the travel path of the laser or camera. The laser or camera is transmitted at an angle along the width of the furnace reflecting off the molten glass level. The receiver of the optical signal evaluates the reflection or interaction of the optical signal and the molten glass level to provide the online level reading. Optical glass level measurements are sensitive to dusty environments inside or around the furnace as well as dust coating on the lens of the transmitter and receiver. Gases and dust inherent of glass furnaces create scenarios in which optical level measurements can become unreliable even with daily lens cleaning. Seemingly aware of these inefficiencies, some optical level measurement manufacturers have recently discontinued glass level product lines with no replacement planned⁽¹⁾.

Non-contacting, nuclear glass level measurements use gamma radiation directed across the width of the feeder channel to correlate changes in measured radiation with a rise or fall in molten glass level. The figure below shows a typical arrangement of a radiometric level measurement at the feeder channel.

Gamma radiation interacts with matter by transferring energy in an "everything or nothing" phenomenon⁽²⁾. This phenomenon has a greater propensity to occur as the density of the opposing medium increases. Thus, the amount of radiation present at the radiation detector depends on the intensity of the gamma energy as well as the density and thickness of the medium opposing the gamma radiation. Due to the relatively high energy of gamma rays and the low density of dust and gas, gamma-based measurements are not affected by dust or gases associated with glass melt furnaces. The resolution and working life of any nuclear glass level measurement depends entirely on a sufficient radiation 'delta' at the radiation detector. This radiation delta is the difference in radiation between the two extreme conditions of furnace level operation.

With this in mind, it is common with nuclear glass level measurements to remove some, but not all of the sidewall refractory layers on either side of the width of the feeder channel furnace to allow for sufficient radiation delta. Removing some, but not all of the sidewall refractory layers also allows design engineers to match the working life of the nuclear level measurement with the expected length of the furnace campaign (up to 15 years).

The amount of radiation detected by the detector can be used to calculate the process value. Nuclear measurement technology is highly reproducible and reliable. Using the laws of physics and statistics, as well as sophisticated software, the success of any nuclear-based measurement is almost granted. However, correct and exact application information is imperative for the design of an accurate and reproducible measurement.

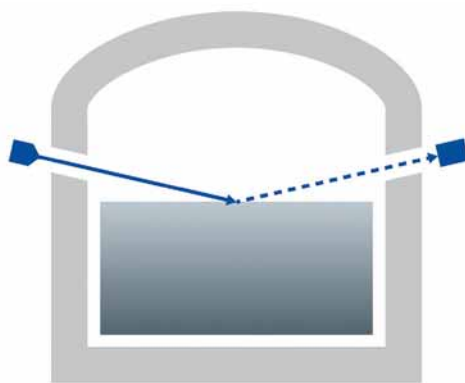
THE NUCLIDE MAKES THE DIFFERENCE – THE CASE FOR CO-60

In industrial applications just a few nuclides are actually used for measurement purposes. The most commonly applied isotopes are Cesium-137 and Cobalt-60. They differentiate from each other in half-life time, but also by the emitted gamma energy.

It is very easy to confuse the meaning of "activity" and "energy" of the emitted radiation from a source. It is important to understand that the number of emitted gamma quanta – and hence the activity – has nothing to do with their energy. This is similar to the colour of light which is not linked to its brightness.

- Activity describes the average number of the isotope's nuclear decays that result in an emitted gamma quantum. Or in other words: the amount of radioactive material.
- Each gamma quantum has a specific energy. The energy distribution of an emitted gamma quant is characteristic for each isotope. The gamma energy is directly linked to the ability of the radiation to penetrate through materials (media, vessel, etc.).

Historical nuclear glass level measurements were made using Cs-137 as radiation source. Cs-137 is a common isotope used for nuclear industrial pro-



Typical optical level measurement arrangement

cess control measurements and most radiation based industrial measurements can be performed with a Cs-137 activity in the range of 100-250 mCi per measurement. For comparison, nuclear glass level measurements have been noted to be installed with as much as 8000 mCi of Cs-137 activity. Taking in account that for nucleonic measurements the ALARA (as low as reasonably achievable) principle should apply, this discrepancy is alarming.

Glass melt furnaces consist of dense refractory brick up to 4000 kg/m³⁽³⁾ with molten glass filling the channel width at densities of ~ 2200 kg/m³⁽⁴⁾. Understanding that the probability of gamma radiation interacting with matter increases as the matter's density increases, glass melt furnaces represent a challenging application for gamma radiation to penetrate and produce a reliable level measurement. Isotope selection provides the key in designing an effective nuclear glass level measurement system.

To understand this further it is worth reviewing the Cs-137 and Co-60 decay scheme:

Cs-137, undergoes two beta decays, one to Barium 137 – not useable for measurement – and another to a metastable Barium, which has a further gamma

decay, releasing an energy of 662 keV.

In comparison, Co-60 undergoes a beta decay to metastable Nickel 60, but two separate and measurable gamma decays follow, releasing gamma energies of 1173 keV and 1332 keV. With two measurable gamma releases both having energies roughly twice the gamma energy of Cs-137, Co-60 gamma radiation better penetrates glass feeder channels including dense refractory walls. Hence, the use of Cobalt-60 allows designing systems with a significant lower activity.

The greater penetration power of Co-60 vs. Cs-137 is further illustrated by each isotope's half value layer (HVL). The half value layer of any isotope is the thickness of shielding that must be in place to reduce the radiation entering the shielding by half. According to the United States Occupational Safety and Health Administration (OSHA), the steel HVL of Cs-137 is 1.6 cm and the steel HVL of Co-60 is 2.1 cm⁽⁶⁾. Thus, a $> 30\%$ thicker piece of steel is needed to reduce Co-60 radiation entering by half versus Cs-137 radiation entering. Co-60 gamma radiation more readily penetrates glass feeder channels that include dense refractory walls and can be used to produce reliable and

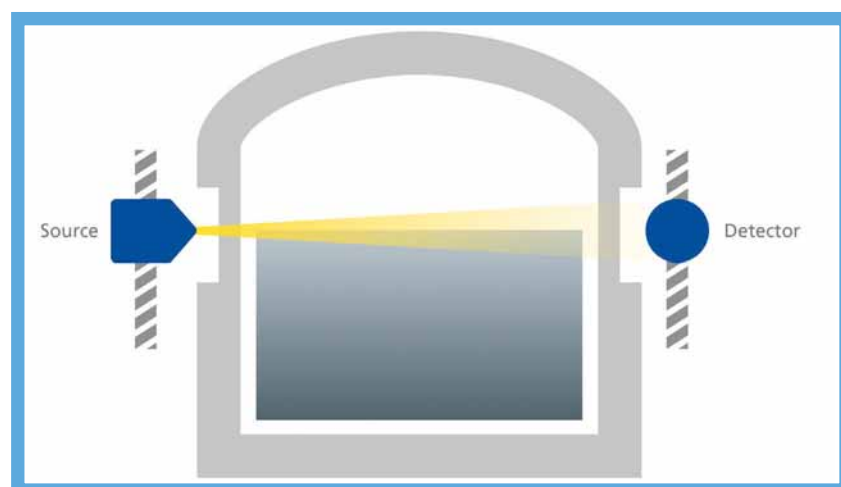
safe non-contacting nuclear glass level indication and control.

ALIGNMENT AND CALIBRATION

Glass melt furnaces require high resolution and repeatable level control of the feeder channel to ensure stable charging, flow, and glass pull. Accurate alignment and calibration of any glass level measurement system is critical to the performance of the measurement. Given the harsh conditions in and around the furnace, robust and stable mounting equipment and an effective calibration procedure is required.

Glass measurement systems are typically mounted via external steel structures. In most applications, heat deformation of the external steel mounting structure is not an issue. However, in glass level applications, the heat can introduce an error to measurement, mounted on extended or cantilevered steel pipes, such as some optical glass level measurement solutions. Some optical glass level systems are designed to account for up to 0.1 mm of heat deformation in the mounting structure while still maintaining reason-

Typical radiometric level measurement arrangement



PROCESS CONTROL CHALLENGES

able accuracy. However, around glass furnaces conditions that can cause up to 0.6 mm of heat deformation are frequent⁽⁵⁾. This introduces significant error into the measurement.

Due to the weight and close proximity of nuclear glass level systems to the furnace exterior, heat deformation of the larger structural mounting members required to mount the nuclear system is generally a non-issue. The alignment challenge with nuclear glass level measurements is to ensure the source and the middle of the 50 mm by 50 mm sensitive area of the radiation detector are aligned both vertically and horizontally at the designated 'glass level'. This can and has been done effectively by using common reference points outside of the furnace. By using a 360° laser level and a rod inserted into the dip check hole in the roof of the furnace, the source and detector can be aligned effectively both horizontally and vertically at the designed glass level.

Calibration of nuclear glass level measurements can be performed in cold furnace conditions, but a final calibration must be performed under hot furnace, steady glass conditions to ensure system performance. Typically, calibration points are taken at the glass level, the maximum glass level operating condition, and the minimum glass level operating condition.

Calibration points are taken with glass flow remaining steady at the designated furnace glass level. A precise method to raise and lower the source shield and detector in lockstep to each calibration point can be achieved using a detector/shield mount that incorporates precision adjustable linear slide rails. With this calibration procedure, an effective calibration curve is built and can be verified via manual dip checks. With accurate cold

alignment and proper calibration procedure, Co-60 nuclear glass level measurement systems have resolution of down to 0.05 mm/0.002 in. This robust resolution and repeatability provide reliable process measurement and control for the end user resulting in increased throughput and reduction in maintenance as well as in downtimes.

CONCLUSION

Glass melt furnaces offer one of the most challenging environments for any type of industrial process measurement and control. Efficient and quality glass production requires a reliable and safe glass level measurement just after the glass leaves the main feeder channel. The extreme temperatures and dense refractory call for a robust, yet repeatable and accurate level measurement. Nuclear level measurement systems with the use of Co-60 isotope, proper alignment, and an effective calibration procedure offer best in class measurement results for the glass industry to maximize safety, reliability, and throughput.

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Simulation methods

Analysis of the plastic deformed layer by the smoothing of cast iron moulds

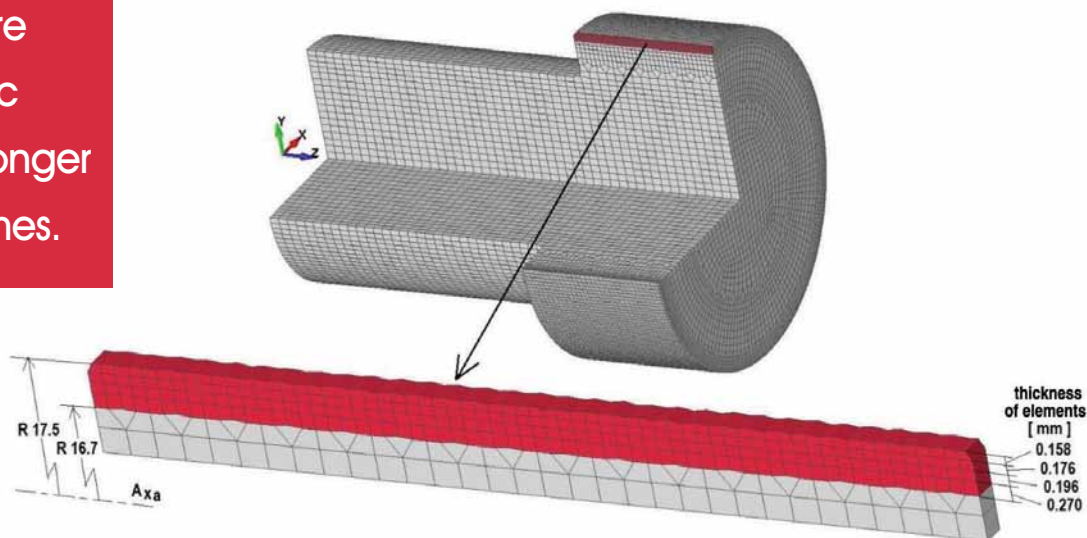
This article takes us through the different steps taken to improve and increase mechanical properties and surface quality of mould parts, focussing on plastic deformation. Analyses show that the more intense the plastic deformations, the stronger the material becomes.

COMPLETING THE SIMULATED MODEL

Improving the mechanical properties of the parts and increasing the quality of the surfaces obtained by plastic deformation in the smoothing process can be determined, using numerical simulation methods, by in-depth analysis of the layer in which the plastic deformations occur.

The in-depth analysis of the layer subjected to plastic defor-

mation during the smoothing operation is based on the defined model, with some improvements. A control layer was delimited under the surface subjected to the smoothing process, the thickness of which was suggested by the preliminary simulations. In these simulations it was found that the thickness of the plastically deformed layer by smoothing with a spherical head tool does not exceed 0.8 mm, even if the radial working force takes the



The control layer

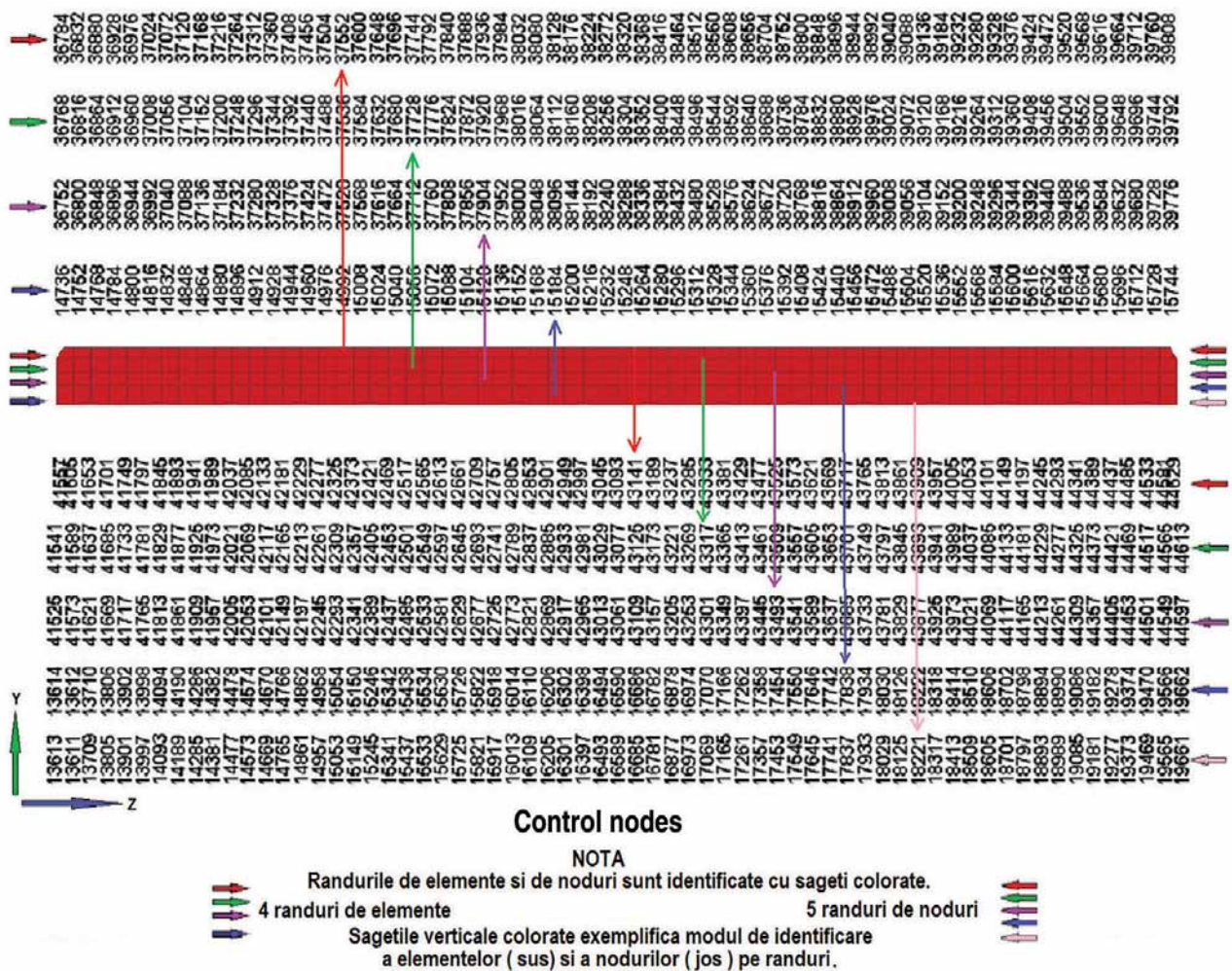


Fig.2. Control layer – control elements and nodes

maximum value of 1000N. This layer, composed of four rows of elements, with variable thickness depending on the radius is shown in Figure 1. The symmetry of the problem allowed the circumferential development of the control layer on a single row of elements.

The control layer contains a set of control elements and a set of control nodes. The situation is detailed in Figure 2 together with a very suggestive scheme for identifying the control elements and nodes in rows.

In the algorithm for solving the simulation programme used – LS-DYNA – the control elements and nodes occupy a privileged position.

In addition to the general solution to the problem, the numerical

simulations underlying the analysis of the plastically deformed layer focus in particular on the history of field functions, displacements, deformations and stresses in the control elements and nodes, provided that they are declared in the command file.

The initial roughness on the surface to be processed was generated randomly, corresponding to the rough turning operation.

The material model was improved by replacing the approximate Johnson-Cook with a real plastic characteristic of the material, established by its own experimental determinations shown in Figure 3.

The material curve was also associated with the effect of the viscosity of the material, which is felt most strongly in the area of contact with the tool, when its spherical head passes over

the material. Quantitatively, the effect of viscosity is introduced by the Cowper-Symond method, with the coefficients set out: $C = 7200 \text{ s}^{-1}$ and $p = 3.32$. The flow tension scaling method was used.

To the plastic characteristic curve, determined by compression tests, up to the yield point $p_l = 0.25$, an extension was added which ensures the strength of the material up to at least $p_l = 0.4$. This correction is justified for the stresses that occur in the case of the smoothing-compression operation in the three directions, without concentrators, as in the case of BRINELL hardness tests where values of effective plastic deformation above 0.4 were reached without the material to give in.

Considering that the process benefits from an optimal lubrication, the coefficient of friction

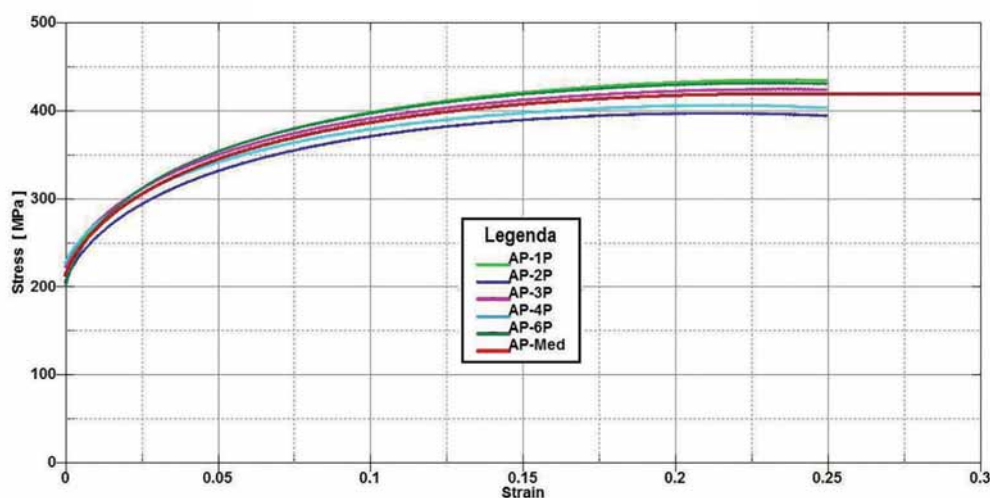


Fig. 3. Average plastic characteristic for lot n. 1

- production and in-depth development of the plastic state;
- residual voltage state;
- voltage state in the contact area;
- improving the surface quality by means of the smoothing operation.

PRODUCTION AND DEEP DEVELOPMENT OF THE PLASTIC STATE IN THE CONTROL LAYER

The analysis was performed, for each test case, considering two states of deformation: an intermediate state and a final state.

Figures 4 and 5 show the actual plastic deformations produced when smoothing with a force of 500 N.

It is found that in the surface layer – the first row of elements – the field of plastic deformations is relatively inhomogeneous. One of the causes of surface deformation with

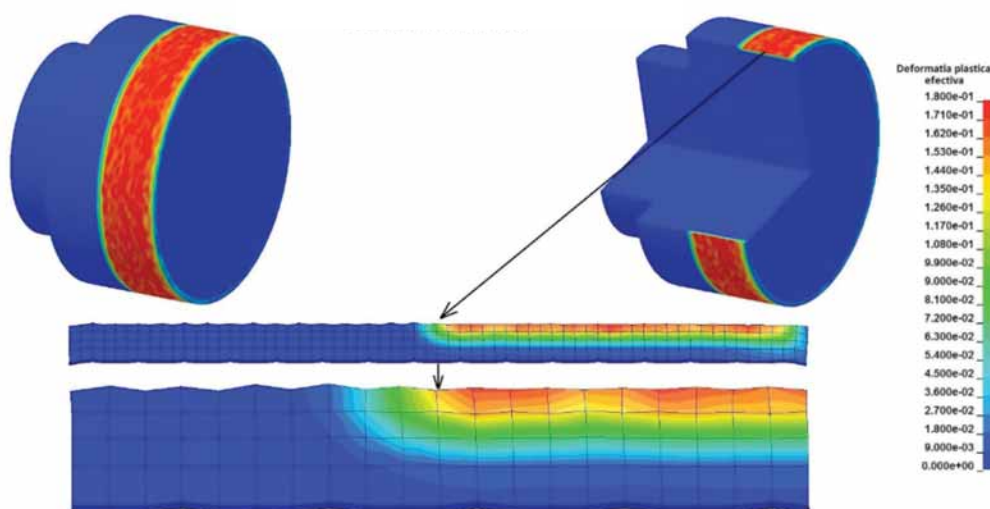


Fig. 4. Plastic deformed surface layer in the smoothing process with $F_r = 500$ N - intermediate state

between the material and the spherical head of the tool was reduced from 0.08 to 0.05.

In order to increase the productivity, respectively to reduce the calculation effort at the simulation, the axial feed was increased from 0.09 mm/rot to 0.16 mm/rot.

The plastic deformed layer was analysed by numerical simulation for two force stages, 500 N and 1000 N, following some important aspects such as:

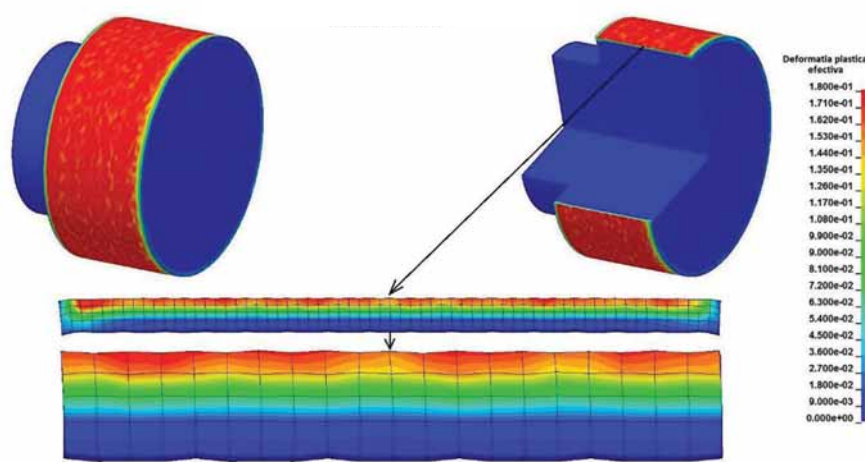


Fig. 5. Plastic deformed surface layer in the smoothing process with $F_r = 500$ N - final state

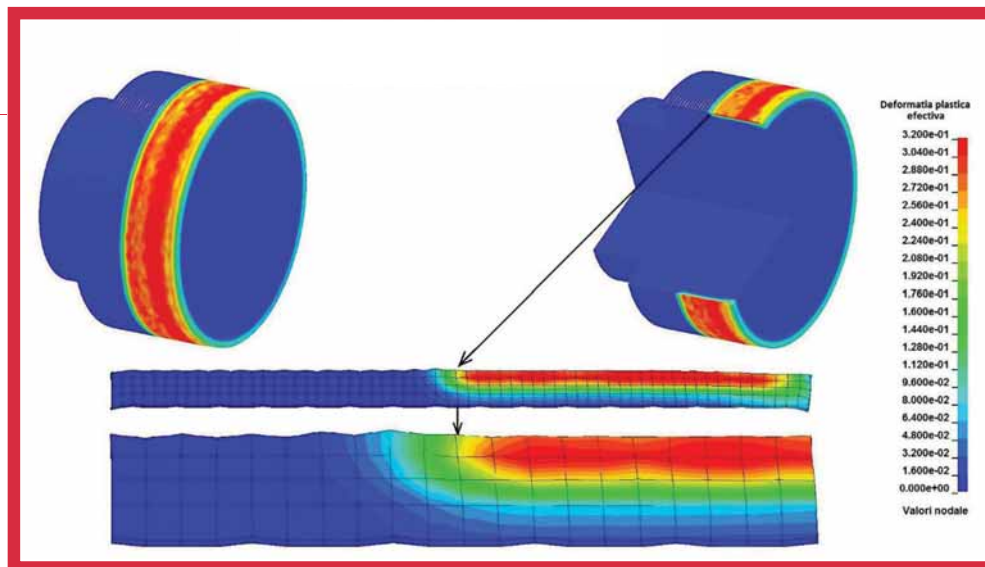
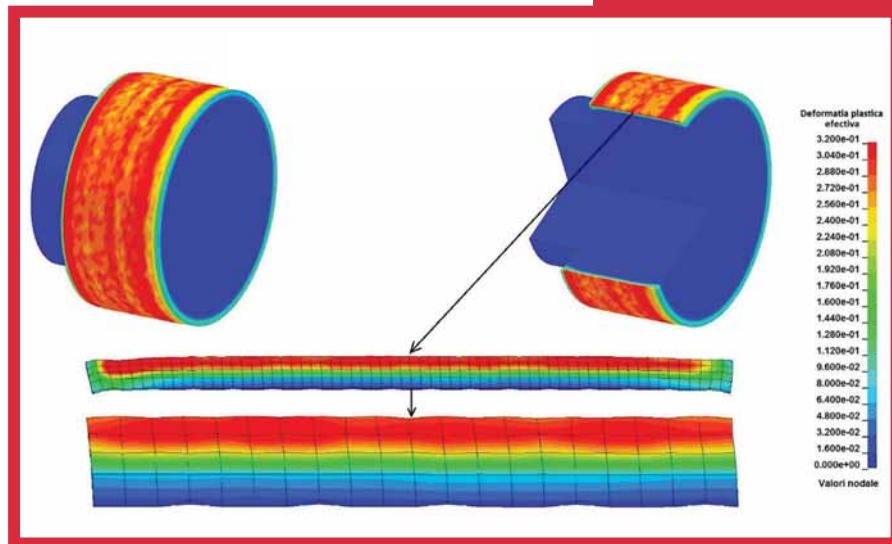


Fig. 6. Plastic deformed surface layer in the smoothing process with $F_r = 1000\text{ N}$ - intermediate state

Fig. 7. Plastic deformed surface layer in the smoothing process with $F_r = 1000\text{ N}$ - final state



variable intensities is the presence of roughness. As the plastic deformation penetrates deep, the degree of homogeneity of the field increases.

The edge effect is obvious. The front, free surfaces of the semi-finished product give freedom of axial movement, which reduces the intensity of the actual plastic deformation.

Except for the edge areas of the semi-finished product, the smoothing operation can be considered to solve the problem of hardening the material on the machined surface with a working force of 500 N. Thus, on this surface the flow voltage increases from the initial value of 215 MPa to at least 400 MPa in the weakest areas. Figure 5 shows that the plastic deformation varies monotonously, reducing in intensity with the penetration into the material. At this workforce the last row of elements is very little affected.

The results obtained in the simulation with the force of 1000 N, represented graphically in Figures 6 and 7, highlight the same edge effect. In terms of homogeneity, there is an improvement in the first row of elements. When processing with a force of 1000 N, the hardening on the outer surface increases accordingly to a value of the flow stress of min. 420 MPa, according to the material curve.

At this regime, however, a remarkable fact is highlighted, namely, that the maximum inten-

sity of the effective plastic deformation is achieved in the substrate. On the details from the two analysed figures, a concentration of effective plastic deformations can be observed at the level of the second row of nodes. In this working regime, the effective plastic deformation no longer decreases monotonously in thickness, because it has a maximum in the substrate. This time the last row of elements is plasticized.

The importance of the existence of maximum values below the level of the processed surface will be analysed later, in conjunction with the stress state.

Referring to the conclusions of the Brinell hardness test on the strength of the material in a state of predominantly compressive stress, it can be determined that the plastic deformation pro-

cess that takes place during the smoothing operation, with forces up to 1000 N, is not dangerous if ensures good lubrication.

After this analysis it can be seen that one of the goals of the smoothing process – improving mechanical properties, strength and hardness – is achieved as a result of plastic deformation of the surface layer. The more intense the plastic deformations, the stronger the material becomes (hardening occurs).

For the spherical head tool, with a radius of 4 mm, following this analysis it can be determined that machining with a force of 1000 N has the best mechanical effects, without endangering the integrity of the machined parts.

The production of the plastic state and its evolution in time in the surface layer of the semi-



finished product can be analysed in the graphs in Figures 8 and 9.

These graphs show the time functions of the actual plastic deformation on a part of the control elements chosen in four equidistant groups, containing four elements per thickness. To be more suggestive, the graphs are oriented according to the movement of the tool, the abscissa being related to the position of the centre of the spherical head.

A clearer highlight of the variation in the depth of the control layer was made by representing the values of deformations, not on nodes as before, but in the centres of the elements. In the field representations in Figures 8 and 9, the whole element was assigned the calculated value in its centre, without interpolations. When analysing these graphical representations, it is found that the plastic deformations increase in steps, at intervals equal to the axial advance of 0.16 mm/rot. The deformations vary only during the interaction between the elements and the spherical head of the tool. In the graphs, the elements in the same row are represented with the same colour, close to the predominant one in the representation of the field of effective plastic deformation on the elements.

In general, the graphics are well grouped by colour, which shows good homogeneity. As it was also found, the deep rows have a better homogeneity. The graphs in the two figures show much more clearly than the previous representations of the variation of the effective plastic deformation on the thickness of the control layer. If at processing with a working force of 500N the deformation

decreases monotonously, taking the highest values outside, at processing with a force of 1000N a relocation of the maximum values occurs. Figure 9 clearly shows, both from the field of deformations and from the graph, that the maximum values occur in the substrate, in at the level of discretization adopted, on the second row. Some quantitative evaluations can also be made on the chart. Thus, if in the elements adjacent to the processed surface the actual plastic deformations do not exceed the value 0.3, among the immediately following elements increases up to the value of 0.38 are achieved. As already mentioned, the problem of increasing the plastic deformation in the substrate will be addressed together with the problem of the local state of tension. ■



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Fig. 8. Production of the plastic state in the surface layer of the semi-finished product during the smoothing process with the force $F_r = 500 \text{ N}$ - representation on the control elements

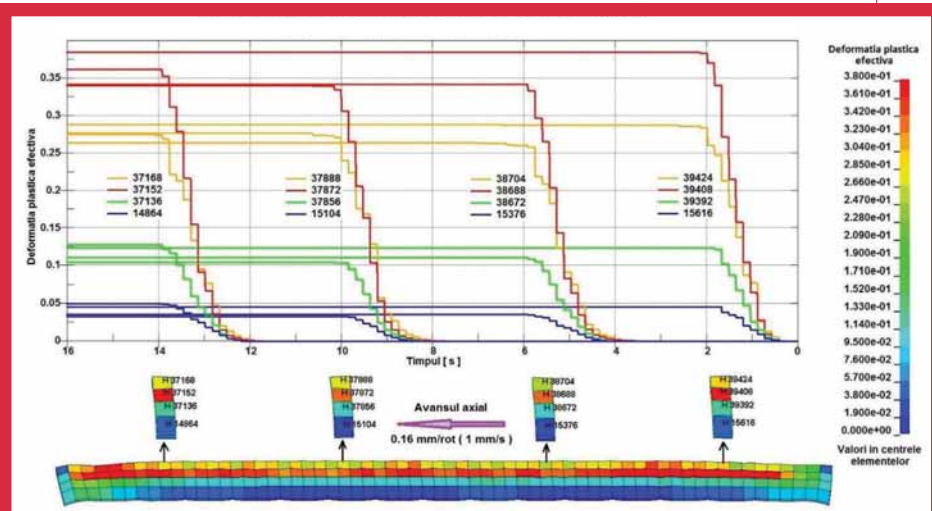
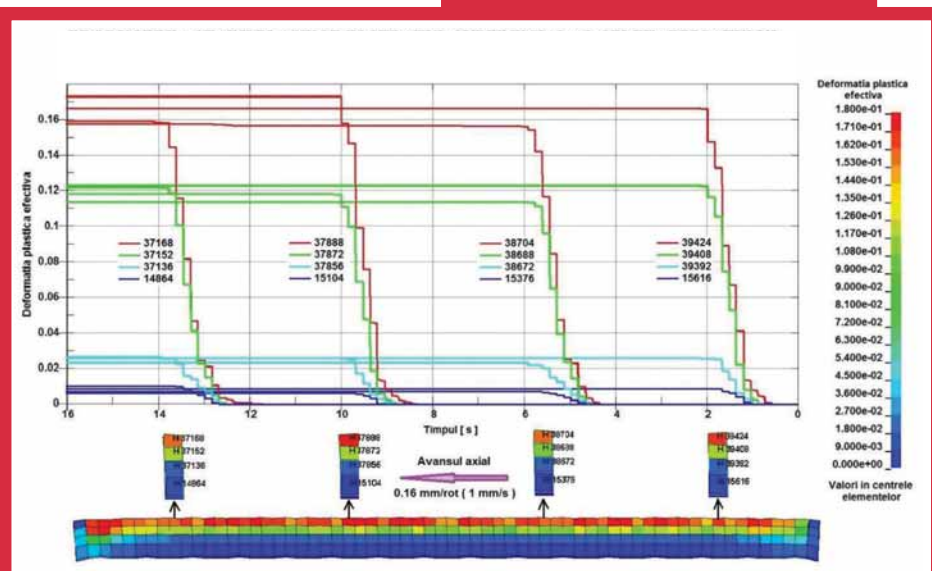


Fig. 9. Production of the plastic state in the superficial layer of the semi-finished product during the smoothing process with the force $F_r = 1000 \text{ N}$ - representation on the control elements

MOULD MANUFACTURING



DIVERRE GROUP

Quality, flexibility, responsiveness,
and competitiveness



Diverre Group manufactures and repairs all types of metal moulds for the glass and crystal industry, as well as designing, manufacturing and installing conveyors for the hollow glass industry (bottles and flasks). The Group meets the most complex demands with

regards to needs and demands regarding special machines, sheet metal, mechanized welding and bespoke assembly for all types of industries: agribusiness, automotive, robotics...

Diverre glassware customers are the world's biggest players for perfumery and pharmacy bottles,

tableware and crystal glassware, located in France, of course, but also throughout Europe, the Americas and the Indian subcontinent.

Recognized as a specialist in the glass industry, the Diverre group is able to intervene at every stage of life of a glassware mould,

Specialized in the glassware industry, the Diverre Group works on the whole mould life cycle: from the design, to manufacture and repair. We take a look at the Group, its sister companies and its continuous work to improve industrial processes, ensuring competitiveness and sustainability.



whether it is in the design, manufacturing or repair. This allows our glassware and crystal glassworks' customers to permanently benefit by the technical solution that best fits their needs and constraints.

A DESIGN OFFICE SERVING CUSTOMERS

Thanks to the use of CAD software, Diverre creates moulds starting from models of products created by designers, paper layouts or computerized files of bottles. Working together, in particular concerning the question of mould relief, enables to industrialise this operation for the glassmaker.

The resulting file is treated with Delcam software for the design

and manufacturing of tools using two modules: PowerShape for tooling design and PowerMill for 3D machining. Moreover, Spirit software is used for turning operations, while Type Edit software is applied for engraving and marking.

Some machining centres are directly configured by operators in parametric programming.

MANUFACTURING

Blank moulds, blow moulds and accessories are manufactured by Diverre, with adaptation and flexibility for each and every type of production.

Accessories manufactured by the company include: baffles, bottom-plates, blowheads and funnels, etc., while baffles

and bottom-plates can be built with inserts in various materials. Colmonoy is also available for matches or cavities (full profile, moulds and accessories).

The standard manufacturing process for moulds and accessories includes: reception of the material, machining preparation (identification, inspection), colmonoy preparation if necessary, metallizing, finishing (mould joint, profile), external operations (notches, bottom-plate relief, lugs, vents ...), marking, fitting, polishing, dimensional control.

In fact, it is almost never the same mould or the same operations either, therefore requiring a high capacity to adapt and to be flexible.



MOULD MANUFACTURING



The machines used can be traditional ones (milling machine, lathe, grinder, metallizing station, polishing station) or digital control (lathes, milling machines, four- or five-axes machining centres). Operators must have knowledge of the mould to obtain the desired quality, which also means that, in addition to initial training, on the job training is both lengthy and necessary.

REMOV – NEW LIFE FOR MOULDS AND METAL TOOLS

Remov has been specialising in polishing and finishing of all metal parts or tooling since 1996, resulting in excellent quality of mechanical polishing, which can reach right up to 'mirror finish'. This specialisation is particularly appreciated by companies of the tableware sector and those who make bottles for premium spirits.

Remov performs all material surfacing operations, milling (digital control), turning (digital control), adjusting and polishing. All types of repairs can be carried out, from the most basic (knock outs, play, polishing) to the most complex (full colmonoy, mould joint and diameter machining).

Remov also extends the life of metal moulds for the sake of sustainable development by carry-

ing out modifications on round, shaped or engraved tooling.

MATERIALS

Adapting materials to the finished product

With regard to manufacturing, cast iron is the main raw material, but for some moulds, steel, bronze, nickel alloys or even graphite are required, depending on the finished product or process. These types of machined materials require adapted machines and tools.

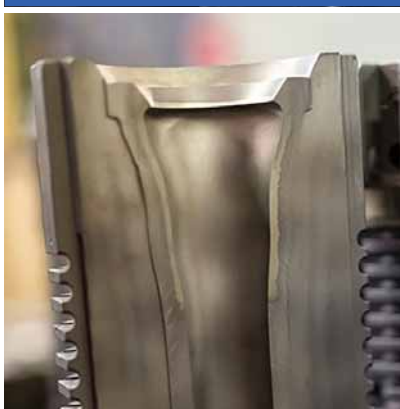
- Cast iron is ordered from European foundries familiar with the requirements of glassware. The main differences in quality are with SG (spheroidal graphite) or FG (lamellar graphite). This product arrives in the form of cast iron bars, half bars or cast profiles.
- Stainless steel (Z15, APX APX V) is supplied in bars.
- Bronze comes in bar form or cast profile.
- Nickel/chrome alloys with high hardness properties are supplied as casting or inserts.
- Colmonoy is performed with a torch using different powders of nickel/chrome alloys.
- Graphite and copper are used in Electrical Discharge Machining electro-erosion.

- Crystal glassworks may require moulds in graphite.

Applications

- Bottles – Jars – Decanters – Crystal
- Mould production and repair
- Mould production:
 - High end perfume bottles;
 - Bottles for the pharmaceutical industry;
 - Jars for cosmetics;
 - Decanters for premium spirits;





- Tableware (plates, glasses, dishes);
- Crystal: glasses, vases, decoration, jewellery (...).
- Mould repair:
 - All previous moulds and more;
 - Bottles for champagne, wine, beer, fruit juice, water, and so on;
 - Food industry jars: jam, yogurt, preserves, condiments ...

OTHER GROUP COMPANIES

The Diverre Group entities constantly play their synergies in the area of purchasing, technical know-how, industrial tools and commercial relations. The multi-site and multi-geographical positioning of the Diverre Group is a guarantee of security for customers.

Pharmov has been specialised in manufacturing moulds for bottles in large series in the pharmacy, perfumery as well as the tableware sectors for 40 years. Quality, responsiveness, productivity and competitiveness are all characteristics.

Normov has 70 years of specialisation in the realization of the most complex moulds, such as multi-parts moulds, draw moulds and moulds for semi-automatic processes (i.e. crystal). This prestigious reputation, also for major exports, is associated with a high-performance industrial tool that meets the competitiveness demanded by our customers.

B.M.V., which became part of the Diverre group in 2018, manufactures moulds for glass-makers working in the perfume and high-end bottling industry.

Duinov integrates all the experience and skills of Duinat Metal Construction, with soldering and welding as its core business. It has 40 years of working together with glass partners or colleagues from SMEs in Lyon. ■



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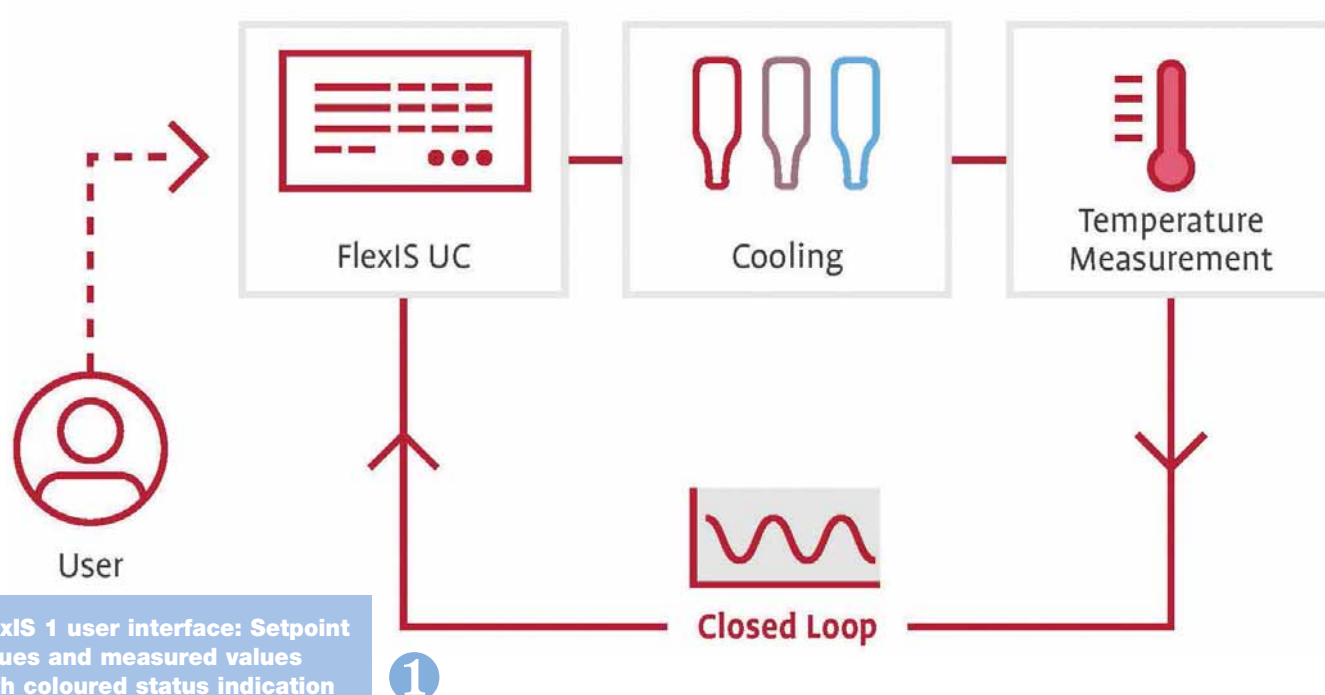
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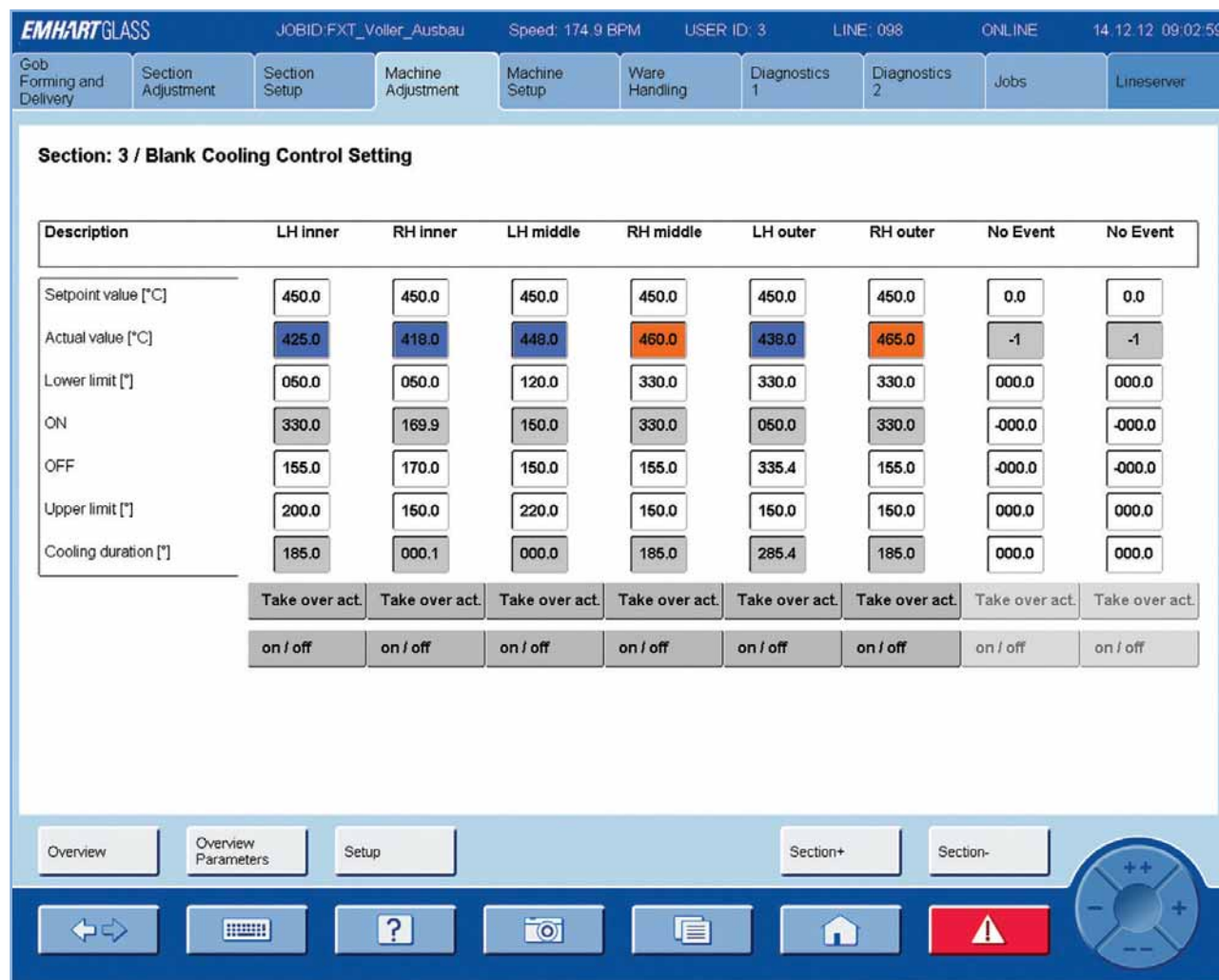
More stable production
runs while preventing
quality problems with FlexIS
Blank Cooling Control

The FlexIS Process Control System is the core component that makes automation of the container forming process possible. FlexIS is not only capable of controlling a forming machine, but also driving all mechanisms from feeder to stacker.



FlexIS 1 user interface: Setpoint values and measured values with coloured status indication shown in the Settings Section page (sample values)

MOTION CONTROL SOLUTIONS AND TECHNOLOGY



FlexIS 2 and 3 user interface: Setpoint values and measured values with coloured status indication shown in the Closed Loop Adjustment page (sample values).

Knowledge in motion control solutions and technology, combined with expertise in technology and application of the Bucher Emhart Glass IS machines, make the FlexIS a powerful process control system

that can manage the entire glass container forming process.

The FlexIS Control System is at the heart of a strategy that brings well-coordinated and integrated process control to glass container production and the

2

FEATURE/BENEFITS

Features	Benefit
<ul style="list-style-type: none"> FlexIS Blank Cooling Control is fully integrated into the FlexIS controls, stored in the job file 	<ul style="list-style-type: none"> Reduced complexity / better ease of use Improved start up after job change
<ul style="list-style-type: none"> No additional cabling or sensors in the machine 	<ul style="list-style-type: none"> Accessibility and mold change procedure stay as before
<ul style="list-style-type: none"> Automatically adjusts temperatures of mold halves 	Keeps process steady / less variation <ul style="list-style-type: none"> - over time - between cavity halves - less stops <ul style="list-style-type: none"> higher quality / pack rate
<ul style="list-style-type: none"> TCS or BlankRadar remote access through the FlexIS remote access system 	<ul style="list-style-type: none"> Optimal addition to FlexIS remote service. Experts can support remotely auditing real time TCS and Blank Cooling closed loop.

capability to interface with other current and future components – from the feeder to inspection.

FLEXIS BLANK COOLING CONTROL

FlexIS Blank Cooling Control is a control loop available in the FlexIS Timing using information from the TCS (Temperature Control System) or the BlankRadar. It gets the measured temperature values of the mould surfaces and adjusts automatically the duration of the mould cooling. Depending on the machine type and configuration, up to 72 mould halves are permanently monitored and adjusted to slow changes of surrounding parameters. This leads to more stable production runs and also prevents quality problems such as leaners, for example.

APPLICATION

FlexIS Blank Cooling Control is very beneficial for all types of production.

SETTING

FlexIS Blank Cooling Control is fully integrated into the FlexIS controls (FlexIS 1, 2 and 3). All settings are carried out on the User Console and are stored as job data. The configuration setup can be done according to the number of available cooling valves and according to the locations measured.

Settings (all per closed loop)

- FlexIS Blank Cooling Control on/off
- Setpoint value for temperature
- Upper and lower limits

Feedback to the user (all per closed loop)

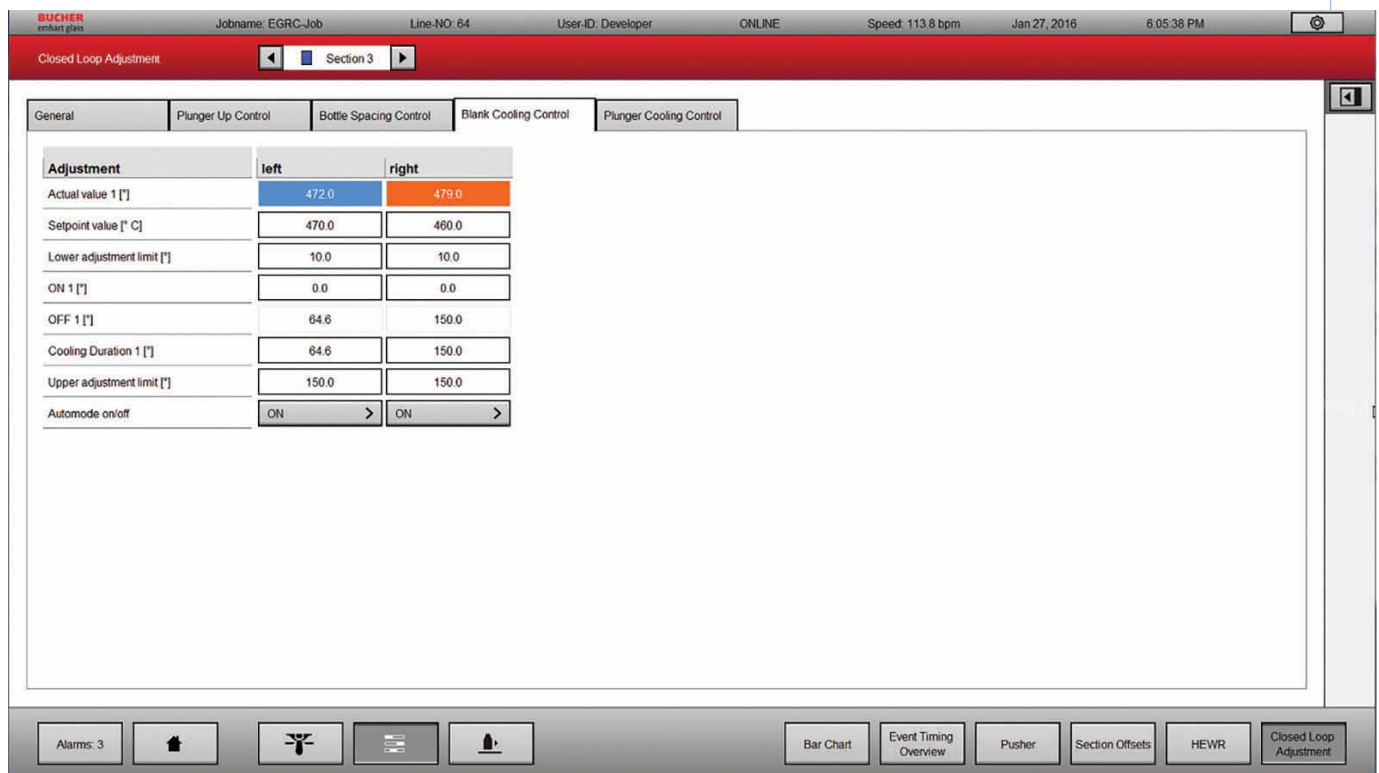
- Actual (measured) temperatures
- FlexIS Blank Cooling Control on/off (status)
- Cooling duration (event OFF-ON)
- Cooling duration reached a limit (status)

Functions

- See all values per section or grouped in an overview
- Fill values to all closed loops or to all sections

Remote Access Extension

- Due to the communication with the FlexIS, the TCS or BlankRadar gets accessible through the FlexIS remote access system. ■

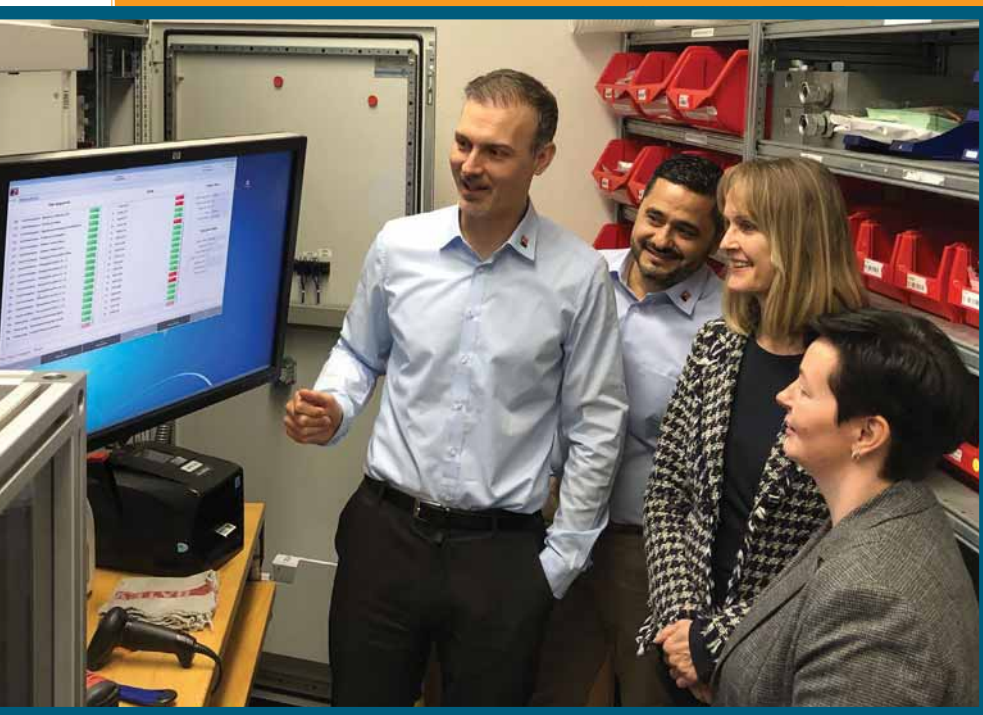


VDMA

Virtual production processes are optimising the glass industry

Digitalisation in production is continuing unabated, with monitors, sensors, cameras and server farms becoming characteristics of modern production halls. Humans are becoming observers and monitors of manufacturing processes, with manual intervention more an exception than the norm. As the increasing lack of qualified specialists is causing problems for companies, it is no surprise to see automation and digitalisation

becoming ever more prevalent. And the glass industry is no exception. Suitable solutions are available from the start of the production chain, all the way up to the cold end.



EME With a distributed control system from Siemens, EME GmbH is using a virtual factory solution to create a digital twin of a plant prior to its commissioning. Using software simula-

tions and real-time analyses, they are able to discover errors in advance and minimise potential hazards. Operators can simulate emergency scenarios which would not be possible during ongoing operations, as the simu-

lation software is separate from the actual plant software. Once a plant is operational, all data is collected, archived and evaluated, while remote access to the customer ensures quick reactions in the event of a fault. The goal is to

establish standardised interfaces to enable all devices to communicate with each other, for example using OPC UA. Here, the hardware used is not a relevant factor, as the concept is server-based. EME has converted its entire batch system to use web technology, and the company sees its future as being online. Only the browsers require testing, after which the operator can use any end device. The operator can link ERP and other manufacturing execution systems with the field level and SCADA, which are isolated solutions protected by a firewall.



Batch Bibliothek für PCS7

- Advanced Process Library für Mengenanlagen



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UAS MESSTECHNIK

No autoclave required

Digitalising processes is sensible if the company can benefit from data analysis. Ideally, the management should not only derive immediate measures, but also gain insights for the future. At the moment, the overall assessment of a production plant is often overlooked. Instead, individual line segments are often digitalised, and as a result data is only collected at certain points. UAS Messtechnik GmbH is using its developments and future research projects to improve energy management and optimise costs throughout the entire production line. Additional measurement data is included in the assessments, as well as

raw material prices and the quality data of the produced articles. Depending on their requirements, the manufacturer can link modular systems to the existing systems in order to depict the production as a holistic unit and optimise it as such. If the plant is operated using fossil fuels and electric auxiliary heating, coupled controls may result in energy and cost savings, depending on the use. These processes must be monitored.

Deviations that only emerge gradually are difficult to identify. However, using data, algorithms and physical regularities, these deviations can be discovered over time. For example, ever stronger corrective actions for the same setpoint and similar framework conditions are an indication that thermocouples are ageing. At the same time, if the actual value of the glass temperature changes while the setpoint and the regulator output on the burners remain constant, this can indicate influences from other parameters, such as changed settings of the electric auxiliary heating.

UAS is planning a modular system with individual tools that work independently of one another. It has been cre-

ated as a research project in cooperation with multiple interdisciplinary companies and the Grafenau Technology Campus at the Deggendorf Institute of Technology.

ROSS EUROPA

Smart to the very last valve

Working with pressure requires valves. If a valve is faulty, it is replaced. Or at least this used to be the case. Digitalisation does not stop at pressure-regulating valves. Ross Europa GmbH has therefore concentrated on adapting its proportioning valves to work in a smart environment with their software developed in-house.

The software helps determine whether a valve is actually responsible for faults in the production process, with smart functions organised into self-diagnosis, system diagnosis and communication clusters. A three-stage communication process can notify the user of faults, monitor processes or analyse. Up to 254 valves can be actuated via an RS-485 bus line and a diagnostics tablet. The system can recognise influencing variables, such as fluctuations in voltage and pressure, incorrect

VDMA

The VDMA represents around 3300 German and European companies in the mechanical engineering industry. The industry represents innovation, export orientation, medium-sized companies and employs around four million people in Europe, more than one million of them in Germany.

PRODUCTION DIGITALISATION

offsets and much more. Up to 14 states can be displayed by an LED on the valve, while a circular buffer provides initial information. Details of the process and settings data can be shown by conducting a more in-depth analysis of the data and online measurements on the diagnostics tablet using special software. The monitoring limits and functions are stored in the valve, as are the parameters. After 50 or 65 million control cycles, the system sends signals for predictive maintenance or replacement. All smart functions are optional, and the electrical standard interface remains unchanged. Moreover, the valves are robust against dirt – a significant advantage in container glass production.

MSK VERPACKUNGSSYSTEME

Perfectly tracked

Other tasks await at the cold end in container glass production: the auditing requirements of food

and beverage filling companies are increasing. From the time of inspection, the state of each individual article must be traceable without any interruptions. MSK Verpackungs-Systeme GmbH has specialised in precisely this area in the intralogistics sector.

The company's visualisation software communicates with ERP systems and peripheral devices, enabling processes to be controlled in a uniform and connected manner. The software boasts intuitive touch operation and has interfaces to all well-known PLCs and operating systems. Automation makes it much easier to switch between jobs. The system automatically collects all the important data on production, downtime, maintenance and fault times and evaluates it.

An integrated calendar function enables predictive management of job changes and maintenance. The software displays error causes and offers solutions, also via remote maintenance. The

EMSY analytics data management software combines the data from all devices in real time. Increasing digitalisation makes it possible to develop self-learning systems which boost efficiency and can help compensate for the increasing lack of available specialists.

From the summer of 2020, MSK will also offer EMSY smart, which enables the mobile monitoring of MSK system statuses. Virtual reality solutions are planned for 2021. ■



VDMA

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UniMould

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Graphoidal Developments

MOULDS: MAINTENANCE EQUIPMENT

Ecotecne

MOULDS: PREHEATING OVENS

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Car-Met
MT Forni Industriali
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MOULDS: WELDING LINES

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MOULDS & PLUNGERS COATING SYSTEMS & MATERIALS

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Busellato Glass Moulds
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Messersì Packaging
MSK Covertch
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OMS
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Glass Service

Olivotto Glass Technologies

Waltec Maschinen

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Falorni Tech

Famor Engineering

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Horn
The TECO Group (KTG
Engineering)

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Zecchetti

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VPIstruments

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Graphoidal Developments

VACUUM PLANTS & ACCESSORIES

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VACUUM PUMPS

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Moderne Mecanique
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VIAL FORMING MACHINES/LINES

Moderne Mecanique
OCMI OTG
Spami-Optrel-Stevanato
Group

VIAL PACKAGING MACHINES

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OCMI OTG
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ZIPPE

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Stara Glass

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