



GLASS FUTURES partners with GRENZEBACH in shared decarbonisation drive

A GLASS FUTURES member, GRENZEBACH is now a key technology supplier to the Global Centre of Glass in St Helens, UK - the world's first openly-accessible glass melting facility for R&D, innovation and training that's also commercially available with the capacity to produce 4 kms of flat glass daily. Glass Futures Global Engagement Lead Dave Fordham recently asked Grenzebach Sales Manager BU Glass Markus Michels about a unique plant, due to go live this spring - complete with lehr and roll plate line, as well as an experimental 30 tpd furnace.

DAVE
FORDHAM:
MARKUS,
WHY DID
GRENZEBACH
DECIDE TO
COLLABORATE
WITH GLASS
FUTURES?

Markus Michels: As Glass Futures was planning to build a research line, it contacted us regarding the necessary equipment. Initially, we engaged solely as a supplier to provide the required components. In this context, we delivered an annealing lehr, a cutting line and a control system. Over the course of our collaboration, that relationship with Glass Futures has since grown, ultimately leading to our membership in the Glass Futures' network.



DF: Has the partnership fulfilled your initial expectations so far?

MM: Most certainly it has met our expectations. Throughout our discussions we have grown closer - to the point that we're now an official Glass Futures partner. Our membership allows us to conduct further tests and equipment demonstrations, have valuable dialogue as well as exchanges concerning trends and challenges within the network, which includes visiting clients on-site

for live presentations of our new annealing lehr design. Additionally, using devices like a stress measurement tool we will receive data from our independent equipment tests. Another potential research area is that of data collection, storage and pre-processing with our SERICY applications. It is an evolution of our partnership that underscores our commitment to both innovation and technological advancement in the industry.

DF: What more can you tell us about Grenzebach's role in the project?

MM: Grenzebach's role in the project is that of equipment supplier. We have provided essential components, including an annealing lehr, a cutting system, and a control system. Such elements are all crucial for the functionality of the research line - all while significantly contributing to the project's overall success.

DF: What expectations do you have from the project moving forward?

MM: We expect to significantly contribute to improving the glass manufacturing industry. Here we anticipate gaining new insights by which to utilize our product development efforts. We especially see great potential in four key areas: firstly, by leveraging digital technologies to optimize processes and enhance data management. Then in advanced lehr controls and metrology by implementing state-of-the-art control systems and metrology solutions for precise management of the annealing process. Thirdly, in the development of intuitive dashboards that provide real-time key performance indicators (KPIs) to facilitate informed decision-making.





Finally, in establishing robust monitoring systems to track the condition of processes and equipment, ensuring efficiency and reliability. For us, all these areas represent key opportunities for innovation and service improvement. Here's why this winning collaboration aims to both enhance operational efficiencies and drive innovation within the sector.

DF: Can you elaborate on the solutions Grenzebach is providing?

MM: Sure, Grenzebach has provided Glass Futures with its newly-developed annealing lehr (heating, cooling, transport), along with our cutting line (cold end) and the control system (digitalization, controls, & visualization) that accompanies this equipment. Such advanced

technologies are designed to enhance the efficiency and quality of glass production processes. Here Grenzebach's annealing lehr contributes to a stable glass and covers -in this case/ project- only 25 metres, divided into zones A, B, C (closed radiation cooling), E (ambient cooling), and F (open convection cooling). The control system measures, controls and visualizes the metrology data along the annealing lehr and cold end and temperature data (glass and air) along the annealing lehr. In the cold end, the cutting system transforms the continuous glass ribbon into the required format. It allows glass to be cut to sizes with minimal product loss.

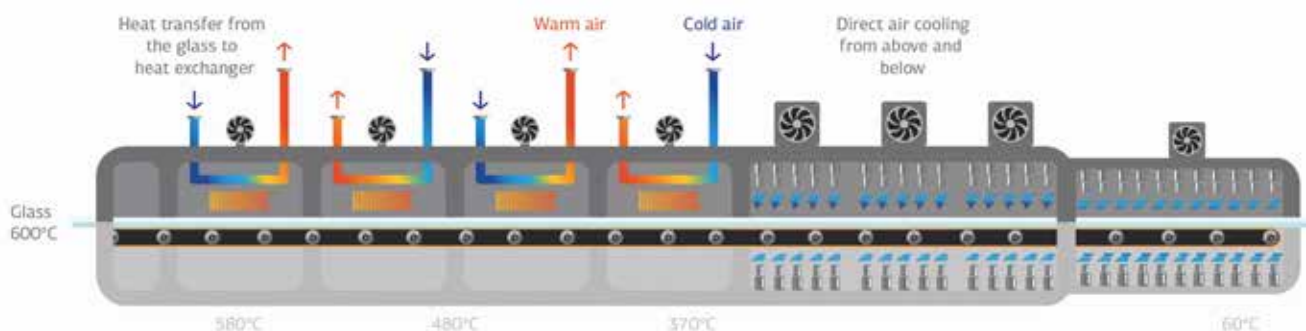
DF: What are the technical features or highlights of the product?

MM: For the annealing lehr there are five important points to note. Firstly, there's up to 70 percent less energy consumption. That reduction in energy and emissions is thanks to highly-efficient cooling, optimized insulation, lower heat losses and an optional heat recovery system for heating and cooling. To this we add controlled cooling capacity. Individually controllable heating and cooling sections enable the process to be more precisely calibrated while flexibly reacting to changes. Here shorter modules lead to shorter control zones to maximise a more precise response to the process. The flexible annealing point is a further consideration. It remains flexible thanks to its adapted temperature curves. Controllable cooling can also optimize tension

distribution across the glass ribbon. Fourthly, there is a minimized risk of scratches. Contraction of the glass during cooling is compensated by segmented drive trains with controlled servo drives - thereby significantly reducing the risk of scratches. Lastly, we have optimized operation and maintenance. The innovative drive design facilitates maintenance of the annealing lehr - offering increased personnel protection during both maintenance and operation thanks to innovative protective covers. Also, users benefit from a significantly reduced noise level and intuitive system operation.

DF: Which of these technical features are particularly beneficial to the plant?

MM: The new Grenzebach annealing lehr deserves



special mention. Its design makes production much more flexible regarding tonnage and thickness range. For example, annealing lehr control by the inverter (fan speed) gives the glass producer higher flexibility when controlling stress in the glass. In our Grenzebach annealing lehrs we also blow the cooling air in the radiation area through a battery of one-piece heat exchangers, the design of which prevents contamination of the glass. As a result, higher-quality glass is ensured and the accuracy of the process is better controlled.

DF: What solutions are being provided by Grenzebach here?

MM: The control philosophy of the new annealing lehr marks a significant departure from past practices. Instead of relying on control valves, this Grenzebach lehr utilizes the speed of the fans for control, resulting in improved efficiency. Furthermore, we employ blowing fans rather than sucking fans, which leads to reduced energy consumption. Additionally, it's essential to note that customers can upgrade

specific sections of the production line rather than requiring a complete overhaul. For instance, a targeted zone exchange (cold repair) allows for the replacement of old or defective components. This approach provides customers with clear benefits, as enhanced efficiency can lead to higher productivity and 'space savings' - achieving higher tonnage within the same footprint. We observe a notable shift in the brownfield market, where investments in existing facilities surpass those in new installations.

DF: What are the benefits of your involvement at the Global Centre of Excellence for the wider glass production industry?

MM: The benefits here are threefold, namely higher flexibility at the annealing point during production regarding tonnage and glass thickness, improved possibilities for simulations to optimize the annealing lehr during the project engineering phase, and reduced energy consumption and emissions through highly efficient cooling and lower heat losses.

DF: What are the 'green aspects' of your solutions?

MM: We are constantly working to improve the energy efficiency of our solutions. We aim to significantly increase energy efficiency by pursuing innovative approaches such as 'Design

to Efficiency'. One important aspect, for instance, is reusing process heat to maximize efficiency. The innovative annealing lehr integrates measures for partial heat recovery. The controllable cooling sections with optimized coolers (blowing fans instead of sucking fans) significantly reduce energy consumption, which is not only cost-effective but also helps to reduce emissions. Thanks to its innovative design, the annealing lehr maximizes the efficiency of cooling processes and minimizes heat loss through optimized insulation. The modular design also reduces the amount of material used and optimizes packing density during shipping,



reducing the system's resource requirements during production and transport. These technologies not only have the potential to lower operating costs but also promote sustainability in glass production by reducing the production's environmental footprint.

DF: Why would you recommend this product to glass manufacturers?

MM: We recommend the Grenzebach annealing lehr solution to our customers for several compelling reasons. Of these, the first is enhanced glass quality. The controlled cooling process significantly optimizes internal stresses in the glass, leading to a higher-quality product. By optimizing this crucial stage in the manufacturing process, we ensure the glass meets stringent quality standards. Secondly, it's important

to underscore that this is proven technology: with over 40 years of expertise in annealing lehr technology and a customized calculation programme that has demonstrated success over decades, our solution delivers reliability and efficiency that our customers can trust. Contamination prevention is also crucial here. By using one-piece heat exchangers in the closed radiation cooling sections of the annealing lehr, we significantly reduce the risk of contamination during the cooling process. This leads to superior glass quality and minimizes defects. Then there's energy efficiency: our annealing lehr employs advanced mechanisms, such as blowing fans, which not only improve process control but also contribute to lower energy consumption,



making our solution more sustainable and cost-effective. Finally, in terms of flexibility in upgrades, customers can choose to retrofit specific sections of their existing lines instead of undertaking a complete overhaul. This flexibility allows for targeted improvements, resulting in enhanced efficiency and higher tonnage within the same production area. In sum, by choosing a Grenzebach annealing lehr, customers can expect a significant return on their investment through improved product quality, reduced

operational costs, and a sustainable manufacturing process.

DF: Finally, Markus, is this product only useful for new lines or also existing ones?

MM: Our annealing lehr can be partially integrated into existing production lines too, allowing for zone-based upgrades rather than a complete overhaul. This flexibility enables customers to replace only specific sections, such as through cold repairs, thereby providing significant benefits.



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