



► HWI introduced Jade, a high-thermal shock-resistant brand for hot repairs.

Refractory solutions to decarbonise glass manufacturing

Bryn Snow* and Paul Stipanovich** outline HWI's products and services for refractories, which can aid glass manufacturers with their decarbonisation goals.

Efficient furnace operation is crucial for energy savings and decarbonisation in glass manufacturing. Around the globe, the Caldersys Group, including HWI, a member of Caldersys in the Americas, continues to develop refractories, materials, and services that contribute to decarbonisation efforts related to furnace operations.

Central to these advancements is the creation of refractory bricks and monolithics designed to enhance the thermal efficiency and longevity of glass-melting furnaces at the heart of glass production.

In addition, application technologies such as laser mapping are helping manufacturers on their journey to optimise performance and reduce their carbon footprint.

Caldersys has a large international footprint – both in sales and installation services – enabling a higher level of service for the global glass industry.

Caldersys has been providing monolithic solutions to the industry for many years.

Combined with the complete portfolio of products and services from HWI, the company delivers its solutions globally.

Advancements

During the past century of HWI's history, the company's research and development teams serving the global glass market have created solutions that continue to impact how glass is manufactured today.

As a precursor to today's decarbonisation focus, almost 30 years ago, when concerns about the environmental impact of chromia alumina refractories grew, HWI created a reuse programme for these products to provide alternatives to hazardous waste landfilling for glassmakers. Today, all suppliers of refractories to the glass industry have followed this lead.

Refractory design and energy reduction engineering have been a focus for decades. Since 2008, HWI has utilised outside technologies such as high-emissivity coatings to increase efficiency, reduce emissions, prevent oxidation and corrosion, and reduce maintenance in the

manufacture of glass.

The company has developed refractory product lines, such as Jade and Horizon, to reduce the energy used to manufacture the product.

These product lines not only save HWI energy, but have also been reported to reduce the amount of electricity used in the melting of glass when utilising them in a full melter lining design.

HWI's highly insulated bottom construction, high-emissivity coatings, and the development of the Jade and the Horizon product lines are just a few examples of solutions brought to the market to reduce the energy needed to manufacture glass.

Large-shape technologies

Additional areas of decarbonisation support from refractories include a shift to larger shapes of refractories in furnace design, in recognition that fewer joints can reduce the potential influx of cooler air and offer greater energy efficiencies. Caldersys and HWI offer large shape technologies in nearly all product

compositions to meet the needs of the glass industry.

In its EMEA and APAC regions, Calderys designs and installs precast shape blocks for end-fired and cross-fired melting tanks, melting tank bottoms, doghouses, and throat bottoms.

The company also continually invests in its prefabrication workshop in Sézanne, France. Its latest advancements include a new air system for pre-assembling sides and surfaces, as well as a new cutting and lifting tool.

The deployment of these fireclay precast blocks has successfully replaced traditional fired bottom blocks and bricks across various container glass and fibreglass furnaces. This approach enhances furnace efficiency and contributes to a reduced carbon footprint.

The advanced material composition of these shapes offers superior thermal insulation and heat retention, which helps maintain stable furnace temperatures and lowers fuel consumption.

While production of any shape or thickness is possible, Calderys is an experienced producer of fireclay precast blocks for glass production, with over 150 existing moulds of various thicknesses and dimensions.

An exact fit in furnace components reduces gaps, minimises heat loss, and leads to fewer repairs, directly translating to energy savings and reduced carbon emissions.

In the Americas, HWI utilises the company's gel-cast and dense-cast technology for its complete product portfolio, including AZS, chromia alumina, silica, zircon and mullite compositions.

The flexibility in producing large format shapes, in conjunction with traditional standard series brick, enables furnace designers to create the optimum design for efficiency and performance.

In addition to improving operational efficiency, precast shapes reduce installation time and labour costs, allowing for quicker furnace construction or maintenance. Their durability extends the service life of glass furnaces.

Regenerator spray materials

As large shapes are used for constructing and maintaining key furnace components, regenerator spray materials provide an effective solution for maintaining performance and extending the life of regenerators. These insulating products enable glassmakers to spend less

energy heating furnaces.

Over time, regenerator refractory bricks can degrade due to high temperatures, chemical attack, and mechanical stress, leading to reduced heat recovery efficiency, higher fuel consumption, and increased carbon emissions.

HT RegenSpray is a bio-soluble mineral wool spray exterior insulation material applied to form a protective layer that fills cracks, seals surface damage, and restores the thermal performance of the bricks.

The material ensures that the regenerator's ability to recover and reuse heat remains optimal, reducing the overall energy required for glass melting.

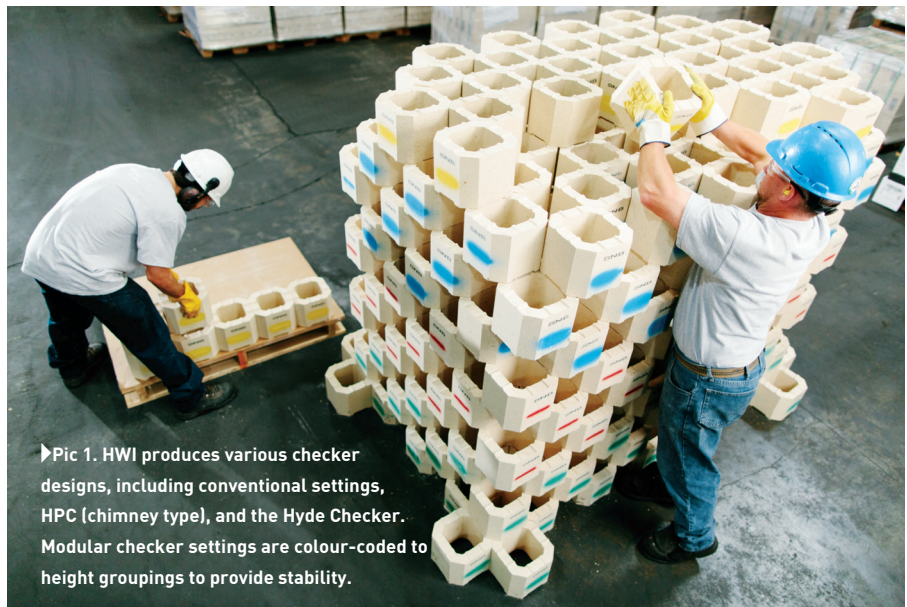
This maintenance process extends the life of the regenerator, maintains high thermal efficiency, and reduces the

efficiency and support decarbonisation efforts by helping to extend the life and performance of glass furnaces and reducing energy needs.

Laser mapping technology has emerged as a transformative tool in glass manufacturing. HWI has played a key role in laser measuring, monitoring, and managing refractory linings for glass melting.

Drawing on laser mapping solutions developed for the steel industry, HWI was recently granted a new continuation of its predictive refractory performance measurement system, extending this process to glass furnaces.

One of the benefits of laser mapping technology is its ability to integrate with process data points, enabling an analysis



need for frequent and energy-intensive refractory replacements. Fibre-based, it is suitable for continuous use at temperatures up to 950°C.

HT RegenSpray has been used globally to seal and insulate glass furnace regenerators' external walls.

Laser technology

Historically, the glass industry has benefitted from adopting technology from other sectors to enhance its melting operations. Some of the most effective solutions in glass production, such as magnesite and silica, originated in steel melting.

Technologies outside the glass industry, like NASA-developed high-emissivity coatings, have further enhanced glass melting processes.

These adoptions have improved

of how refractory materials perform under various operational conditions.

By understanding the exact wear patterns and thermal stress points within a furnace, manufacturers can make informed decisions about refractory selection and maintenance schedules, ultimately leading to more efficient furnace operation.

The latest advancements in this technology enable glass manufacturers to achieve accurate measurements of refractory thickness and contour, allowing for detailed assessments of refractory wear over time.

Laser scanning systems can create detailed 3D models of furnace interiors, providing crucial data to predict maintenance needs, optimise furnace

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operations and extend the lifespan of refractory materials.

Integrating laser mapping technology into refractory management improves furnace maintenance in glass manufacturing.

By enabling safer and more efficient operations and extending the life of critical furnace components, this technology is helping to pave the way for a more sustainable and environmentally responsible future in glass production.

The future

With newly joined forces, Caldeyrs and HWI are positioned to continue meeting the needs of the glass industry. Their research and development plan is focused on the trends and challenges of the industry.

To help advance energy alternatives for furnaces, HWI has invested in GlassTrend's GT37 project, addressing refractory corrosion in hydrogen-fired furnaces.

Across its network, Caldeyrs Group teams are also working with furnace designers on other hybrid and electric melting designs.

HWI has collaborated with experts



◀ Pic 2. Integrating laser mapping technology into refractory management improves furnace maintenance in glass manufacturing.

in AI, energy balance modelling, laser technologies, wearable technologies, and various other Internet of Things (IoT) technologies to provide world-class refractory products and technical support from start to finish.

Since 2023, when HWI and Caldeyrs united under single ownership as the Caldeyrs Group, the organisations have created a refractory solutions provider with even greater opportunities to serve the glass industry.

Its product offering, technical expertise, training, consultation,

installation services, and support have combined to deliver full-service, end-to-end solutions globally for glass customers. ■

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