

As well as being a glass-forming equipment company, Bucher Emhart Glass is also involved in the specialist refractory market. Its manufacturing plant in Owensville, MO, USA designs and produces advanced refractory shapes and materials.



Focus on Bucher Emhart Glass' refractory division

Bucher Emhart Glass' involvement with refractories dates right back to the firm's early years. In 1926, Hartford-Empire, the forerunner of today's Bucher Emhart Glass, formed Corhart Refractories, a joint venture with Corning Glass Works to design, engineer and manufacture refractory systems. It was eventually broken up in the 1960s, but Hartford-Empire continued to make refractories at its plant in Bloomfield, Connecticut, which were offered to clients alongside its ranges of glass-forming and inspection machines.

In 1980, Emhart Corporation (as it then was) acquired refractory specialists Laclede Christy of Owensville, Missouri. Originally founded in 1844 as a manufacturer of fire-bricks, Laclede Christy focused exclusively on refractories from 1976 onwards, building up a reputation as a leader within the glass industry. Laclede Christy's Owensville premises included a research laboratory as well as a manufacturing plant, so it was logical that it should become Emhart's sole refractory plant.

Today, as part of Bucher Emhart Glass' global setup, the Owensville plant (pictured above) continues to research and develop glass refractory expendable compositions, along with other refractory parts.

The company's in-house refractory

expertise is enhanced with technical support from the nearby Missouri University of Science and Technology (MST). This allows the firm to collaborate with experts in the fields of glass, ceramics and refractories and access some of the world's most advanced analytical equipment.

The Owensville plant is certified under ISO9001:2008 by NSAI, the National Standards Authority of Ireland.

Integration and innovation

Bucher Emhart Glass is an integrated supplier. Feeder refractories for the production of container glass, such as spouts, tubes, orifice rings, rotors, plungers, and stirrers are designed from the original feeder designs, resulting in refractory shapes which perfectly match the mechanical equipment.

In addition to container glass, Bucher Emhart Glass manufactures refractories for a variety of glass industries, including fibreglass, tableware, pressware, lighting, rolled plate and hand glass. With more than 40 different refractory compositions, the company has solutions for most glass manufacturing situations.

The company also puts a strong focus on RD&E and innovation, as it has for many decades. Many materials developed by the plant have since become standard throughout the global

glassmaking industry. Today, the most popular include mullite formulations such as FOMLAC and 338, zircon-mullite compositions such as 315 and 333, and fused silica materials such as FUSILLAC 100P and 211-XFS.

How a refractory is made

The process of making refractory shapes by the slip casting method starts with the creation of a plaster mould from which the refractories are formed.

Moulds are hand-made by craftsmen at the Owensville plant. Once used, they are stored until needed again – the company currently has around 4500 moulds in storage.

To create the refractory itself, the base materials are mixed together in water-based systems. Only the highest-quality raw materials are used, in order to achieve the desired consistency in terms of material properties.

To establish which material is right for a particular customer, engineers consult the firm's in-house Refractory Database, which cross-references its materials with the manufacturing processes used by real-world glassmakers.

In slip casting, the material is poured into the mould and left to harden for a period of time. The mould is then

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'stripped' away from the hardened refractory, which can then be left to dry fully – a process that can range from a few days to a few weeks depending on the size and geometry of the part.

Most of the refractories are dried in special humidity controlled drying rooms to minimise the overall drying times needed.

Some parts produced by Bucher Emhart Glass, particularly orifice rings, are pressed. This involves physically forming the refractory material into shape using a mechanical press.

This allows the company to produce a large number of a particular part in a short time.

Refractory parts are placed in gas-fired kilns where they are heated to high temperatures to set the desired material phase for the optimal material properties.

Finally, at the quality control stage, the components of the refractory are inspected, tested and pre-assembled to confirm that they meet Bucher Emhart Glass' quality standards.

If everything is in order, the parts are packed and shipped to the customer's factory, where they will be assembled once again to form the finished refractory.

More value for customers

In recent years, Bucher Emhart Glass has been working to make sure refractory products and parts reach its customers quicker. By streamlining production steps at Owensville, the firm has succeeded in reducing lead times by as much as 25%. The 230 refractory parts that fall under the company's S-Class

parts programme are shipped in eight to 10 business days. If a part is not in stock but a mould is available, it can be made and delivered in 20 days. Even if a new mould has to be created from scratch, the lead time is 35 days.

When a refractory becomes damaged, the company's engineers take the opportunity to find out why. If material is returned by a customer, it is analysed to discover the potential root cause, and identify improvements to the design of the product or the material itself.

Typical issues leading to refractory failures include thermal shock (heating or cooling the refractory too quickly during repairs, startup or shut-down), alkali vapour attack, static glass corrosion and dynamic glass corrosion respectively. Refractories can also be damaged by simple physical problems such as the over-tightening of bolts or other fixtures.

Recent developments

In 2011, the company introduced a new Ultra-Premium Mix known as 301, containing 35% zirconia. It sits alongside Standard Mix 333 and Premium Mix 315, which contain 10% and 20% zirconia, respectively.

The new 301 mix offers a 15% improvement in corrosion resistance over 315, excellent resistance to thermal shock, and improved life expectancy. It's ideal for making tubes, orifice rings, plungers and spouts for use in expendable refractories.

Traditionally, orifice rings are sealed to spouts with gaskets formed from luting cement, a wet clay rather like modelling clay that is placed around the ring and

hardens when exposed to heat. Recently, Bucher Emhart Glass launched a 'hard' gasket that is made from pre-cut bio-soluble ceramic fibre board on top of bio-soluble ceramic wool, making installation far easier. So far, gasket sets are available in diameters of 5", 7", 9", 10" and 13".

EmCast 25 is a lightweight, insulating refractory castable that can be used as a backup insulation for spouts and orifice rings, protecting metal casings from the extreme temperatures of molten glass.

It's combined with water and poured in between the steel casing and the refractory, after which it quickly fills voids to insulate the refractory. After one or two hours, the material is fully set and the refractory is ready for service again.

Refractory materials are often heavy, so when covers over a glass feeder have to be removed, the combination of heat and weight pose a health and safety concern for operators. Bucher Emhart Glass has worked to address this concern with its new EmLite 30 material.

The material is 30% lighter than a traditional refractory, while still providing the required heat and alkali vapour resistance for prolonged service.

Summary

Bucher Emhart Glass has a long, proud history in refractories for the glass industry. With its variety of parts and materials, the company is well equipped to provide refractory solutions to a large number of glass manufacturing processes. ■

Bucher Emhart Glass – Refractories
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