Spout covers made of EmLite 30 in service.

A history of refractory innovation

Bucher Emhart Glass has continued its tradition of innovation with the development of refractory materials to address the growing needs of the glass industry. Materials have been designed to provide better insulation, withstand greater thermal shock and provide longer service life for various aspects of the glass industry. Roger Smith* reports.

The Bucher Emhart Glass Refractory group is currently based in Owensville, USA. The site has been producing refractory materials for the glass industry since 1980 and is the company's sole producer of refractory materials. With a staff of approximately 50, the site supplies customers around the globe with refractory feeder expendables, cements, insulation and forehearth refractories.

Part of the core refractory business for Bucher Emhart Glass is the production of distributor and forehearth refractory superstructures for the glass industry. In addition, units designed for borosilicate and C-glass have also been supplied. Bucher Emhart can provide specific shapes, or complete packages including brick, mortar and insulation.

Bucher Emhart also offers substructure refractory for forehearths. Bonded refractory channel blocks are produced out of Bucher Emhart material 333, an aluminium zirconium silicon oxide material containing 11% zirconium oxide. This material has been the workhorse for glass contact applications for many years and has a proven track record. For flint container glass, it offers a lower cost alternative to fused cast channels.

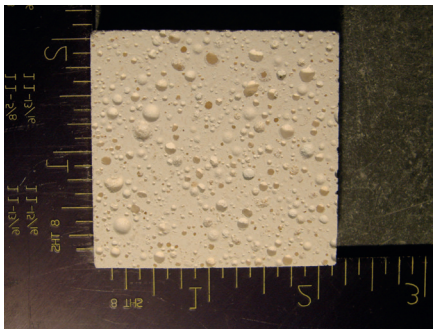

Fig 1. Cross-section of EmLite 30.

The substructure and superstructure for the forehearths are cast and fired in Owensville. They are then machined to specifications and preassembled. During the preassembly, the blocks are match marked and photographed to make assembly on-site simple.

Within the Owensville plant resides the refractory research and design group.

It is here that new materials are investigated to address the various needs of the glass industry.

New developments

Over the last few years, a number of new products have been released. Bucher Emhart Glass material 301 was developed as an ultra-premier refractory material containing 35% zirconium oxide for feeder expendable applications. According to the company, Material 301 has improved the useful service life of refractory spouts when compared to other materials. An insulating castable refractory labeled EmCast 25 was designed to ease the installation of a refractory spout or orifice ring by providing a material that could flow underneath and fill the voids beneath the refractory. EmCast 25 also provides some protection in the event of a crack in

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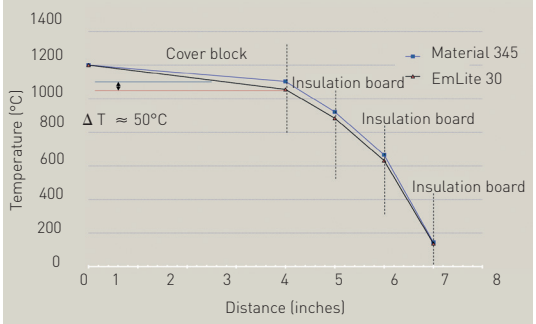

Fig 2. Heat Loss as calculated by Steady-State Heat Flow comparing EmLite 30 and Material 345.

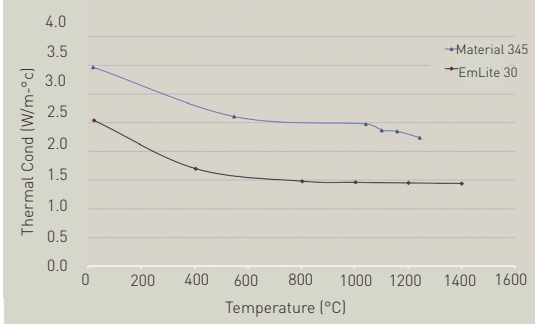

Fig 3. Thermal conductivity of EmLite 30 compared to Material 345.

the refractory. The material mixes with the glass and raises the melting point, freezing the glass off at the crack.

Weight reduction for parts

One of the latest developments is an effort to reduce the weight of some refractory cover blocks. These are heavy because they are designed to withstand the rigours of plant life under extreme environments.

The blocks must withstand chemical attack from the glass and alkali vapours, they must handle extreme heat and remain strong to contain the many tons of glass they are exposed to on a daily basis. In some applications, these heavy blocks are in the form of covers that must periodically be moved to conduct maintenance. This often requires an operator, or pair of operators, to physically lift the block out of position, typically under extremely hot conditions.

What if the all of these requirements could be met while reducing the weight of the refractory? A new material, labeled EmLite 30, has been developed that maintains all of the core requirements for a refractory spout cover, while reducing the weight of the cover by 30% (***Fig. 1***). This reduction provides improvements to the health and safety of the operators that must work around the feeders in a glass container plant.

The reduction in weight of EmLite 30 is achieved by increasing the porosity of the material. Most refractory cover materials contain between 18 and 20% porosity, but EmLite 30 increases that value to more than 40%, more than doubling the porosity while still maintaining enough strength for cover applications. Many of the pores, or voids, in the material are in the form of large, macro-scale bubbles, which provide a regular distribution throughout the material.

The increase in porosity not only reduces the density of the material, but also increases the insulation value. Thermal conductivity measurements have been performed comparing EmLite 30 to Bucher Emhart Glass material 345, a mullite composition commonly used for spout cover applications (***Figs. 2 & 3***). At 1000°C, the thermal conductivity of 345 is approximately 2.5 W/mC, compared to 1.5 W/mC for EmLite 30. This results in a 50°C reduction in the surface temperature of the cover. By increasing the insulation value of the cover, more heat is retained within the spout, which in turn leads to less fuel consumption by the spout burners.

EmLite 30 has seen in service in a number of glass plants throughout the United States over the past year. All of the plants have reported excellent results.

Today, additional products are being developed to further aid the glass industry. Refractory materials with greater thermal shock resistance are being investigated to make the material less prone to cracking during hot installations.

New processing techniques are being developed to reduce refractory lead times without sacrificing material quality.

The goal of Bucher Emhart Glass is to find new solutions to the various issues faced in a glass plant, whether those problems are in the form of equipment design, controls matters, or refractory needs. The company will continue to address the refractory needs of the glass industry by developing new materials and improving processing techniques, striving to improve efficiency, performance, and health and safety. ■

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