The art and science of glassmaking

JON HORNER ADVISES US ON SELECTING THE PROPER MATERIALS FOR HOT GLASS HANDLING

A SAMPLE OF VARIOUS WARE HANDLING PRODUCTS

Glass manufacturing is often viewed as both an art and a science: just as the artist needs his media and the scientist his laboratory, the glass manufacturer needs proper equipment in order to produce a marketable product. The equipment needed to manufacture glass includes a vast array of items, which must be carefully selected to ensure quality products.

For instance, in container production, once the ware is formed it must be safely transported from the mould to the annealing furnace. While this may seem a small detail in the overall scheme of glass production, it is actually extremely vital. In order to transport containers safely, appropriate materials must be selected for contacting the un-annealed glass.

While there is no single solution for all hot ware handling needs, manufacturers do have a variety of materials to choose from for each particular application. Historically, materials such as asbestos and fluoropolymer resins have been used for many of the hot ware handling needs. However, these materials pose serious health risks to employees. Therefore, manufacturers have been forced to seek out alternative materials.

POPULAR MATERIALS

For the takeout area, necessary requirements include low thermal conductivity (to prevent thermal shock), lubricity (to prevent sticking to the glass) and adequate strength (to maintain shape and resist rapid deterioration). Graphite inserts are currently the most popular option, while polyimide inserts have also been extremely successful.

Material selection for sweepout pushers can be even more challenging. While low thermal conductivity and lubricity are two key properties, the contact materials used in sweepouts must have additional qualities as well.

The strength of these contact materials must be high enough to withstand glass jams, repeated impact with ware and occasional harsh handling by operators. Also, these materials should resist oil absorption (caused by the swabbing of the moulds), which will lead to thermal shock checks and contamination.

While graphite and carbon-fibre carbon materials retain most of the above properties, they also pose the risk of oil absorption. Polyimides and high-temperature silicone composites offer all of the necessary properties listed above, including the resistance to oil absorption.

CURVED CHAIN TRANSFER

At the curved chain transfer, the key properties are much the same as the sweepout area. Although the temperature of the ware has decreased, low thermal conductivity is still necessary to protect the glass from thermal shock.

Also, because the motion of the machine changes the direction in which the glass is travelling, lubricity is extremely important to prevent sticking and/or scratching. Due to the impact of the ware entering the transfer and the potential contact with downed or broken glass, strength and durability are important.

Finally, the material should resist absorption, as both chain lubrication and hot end coating are present. Silicone composites, graphite, carbon-fibre carbon and fluoropolymer resins are the most commonly used materials in this area. Again, the silicone composites offer resistance to absorption, so hot end coating and oil build-up can be cleaned off the surface of these parts, allowing longer service life.

LEHR STACKER BAR APPLICATIONS

Stacker bar inserts/contacts require slightly different characteristics than the other applications. While lubricity and impact strength are still very important, thermal conductivity is perhaps most critical. The ambient temperature at the opening of the lehr furnace is extremely hot and often exceeds the capabilities of many materials, resulting in rapid deterioration and short service life.

The recommended materials for lehr stacker bar applications include carbon-fibre carbon, dense graphite, calcium silicate hydrate, stainless steel mesh and high temperature textile tape.

As seen, the materials required to safely transport hot ware from the moulds to the annealing furnace are quite specialised and definitely not an area to be overlooked. Only through the science of glassmaking can we find the art of glass. ■

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