A lower carbon future is possible

How can the UK glassmaking industry reduce its carbon emissions? **Stephen B Harrison,** managing director of **Sbh4 Consulting**, which specialises in decarbonisation, assesses the options.

During glassmaking – like the making of lime, cement and refractory products – CO_2 emissions are unavoidable, because the sands and minerals used contain CO_2, which is released during the melting and calcination processes. These mineral processing industries must live with the fact that geogenic CO_2 is generated, even if heating from renewable electrical power or hydrogen is used to replace fossil-fuel-fired burners. However, many things can be done to mitigate CO_2 emissions into the atmosphere. Decarbonisation may be 'difficult' but it will be possible.

Glass production in the UK has a long history: Pilkington's, in St Helens, has been operating since 1826, for example. The glassmaking industry in the UK has managed many transitions over the decades, including the implementation of modern tin-bath float glass technology and the conversion of burners for glass melting from coal to natural gas. The next transformation will be to decarbonise operations and reduce CO_2 emissions. But the good news is that technologies exist, and more are on the horizon, to enable the cost-effective decarbonisation of glassmaking.

CARBON CAPTURE MUST BE PART OF THE SOLUTION

There is no alternative to the sand and minerals used for glassmaking; they must be a specific type, and geogenic CO_2 is released from the minerals during the melting process. There are several existing methods to reduce emissions though, such as improving energy efficiency, or using recycled glass with the raw materials.

Even if the glass melting heating process is decarbonised, for example with electrical heating from renewable power, geogenic CO_2 will still be released during glass melting. Part of the decarbonisation solution in glassmaking and other mineral processing industries must therefore include 'carbon capture'.

A range of technologies for capturing CO_2 emissions exist, such absorption into an amine-type solvent, or adsorption onto solid sorbents that have a high affinity for CO_2. Mineralisation of CO_2, for example by combining it with ultramafic rocks, is another way to capture CO_2 emissions.

As an alternative to traditional carbon capture technologies, the UK-based company C-Capture has developed an inexpensive carbon capture process that uses less energy than conventional technologies. The chemistry involved uses a different solvent to the traditional amine-based technology, and, through smart engineering, it operates at low temperatures and pressures to minimise the capital cost of the equipment and to reduce heat losses. C-Capture's process is due to be piloted at the UK's Drax Power Station in Selby, North Yorkshire, and is set to be one of Europe's largest bio-energy carbon capture and storage schemes.

C-Capture, based in Leeds, has announced that it will work with Pilkington to investigate the feasibility of using its technology to capture CO_2 emissions from glass production. The partnership has been given funding through Innovate UK's Sustainable Innovation Fund.

In some cases, captured CO_2 can be used. In other cases, it may need to be injected underground for permanent storage, as part of a carbon capture and storage (CCS) scheme. In the UK, several CCS schemes are being considered for government support and implementation, such as HyNet North West, The Acorn Project and Zero Carbon Humber.

Commercial applications for captured CO_2 include combination with ammonia for urea fertiliser production, freezing food and the production of carbonated beverages. Also, and with great relevance today, CO_2 can be used to create dry ice, which has been used expansively throughout the current coronavirus pandemic in the vaccine supply chain, including airfreight from manufacturing sites, road transportation and short-term storage at vaccination sites.

PROGRESS, AND THE ROAD AHEAD

According to a report from Glass Alliance Europe in 2020, overall emissions from the glass industry have been decreasing in the last 50 years. However, progress has been slower since the 1900s, because additional reductions have been difficult to achieve.

The glassmaking industry undoubtedly aspires to decarbonise, and lessons can be shared across the various mineral processing sectors. In the European cement industry, there are pilot projects underway for the decarbonisation of post-combustion and geogenic CO_2 emissions.

Without doubt, capital will need to be invested and additional energy will be required, with the result that glass products may be marginally more expensive. But these are the costs that must be borne universally as we move closer to becoming a net-zero society.

© Anton Kurashenko/Shutterstock