Glass Futures: improving cross-sectoral awareness of the opportunities for fuel switching through the IFS programme

What is Glass Futures?

Glass Futures was first established in 2016 with the aim of finding solutions to decarbonise the glass industry. The organisation was created after the CEO of British Glass proposed that a global centre of excellence for glass production should be established in the UK. This early input from the UK industry body representing glass manufacturers meant that the project could secure backing from three large glass manufacturers (Guardian Glass, Encirc and O-I Glass) and a key manufacturer in an associated industry (Seimens) from its inception.[1] The initial funding to establish the organisation came from a combination of contributions by its industry members as well as investment from local[2] and national government.[3]

The original focus of the organisation was to bring together academics working on glass production with commercial organisations from the glass industry and related consumer industries (such as drinks manufacturers). More recently, its work has begun to include other industries using similar processes, such as steel and ceramics. Glass Futures operates as a not-for-profit organisation with no owners or shareholders; the idea is that pursuing R&D as part of a consortium reduces the “risk and cost” to individual members in terms of experimenting with more sustainable technology for glass production.[4]

Glass Futures led a feasibility study under Phase 2 of the first Industrial Fuel Switching (IFS) programme which explored the range of fuel-switching options available to the glass industry. The feasibility study was followed by a demonstration project under Phase 3 of IFS, which included commercial-scale trials using bio-fuels in both container glass production and flat glass plants.

Glass Futures as an illustrative case of cross-sector awareness

This case study explores how Glass Futures’ involvement in the IFS programme has raised awareness of decarbonisation options within the glass sector, its supply chain customers, and associated sectors such as brick and cement. It presents an illustrative example of how switching trials can be designed to engage companies from across the supply chain and how the increased confidence in switching technology generated by successful trials can extend beyond the industry involved in the trials.

[1] https://www.glass-futures.org/article/?p=Qtfr2f9a2M0Ru052ufezn1KzBGhFgGMjNO4Dto65teKpdu0yGtMOefD
[2] https://www.liverpoolcityregion-ca.gov.uk/strategic-investment-fund
[3] https://www.discover.ukri.org/strength-in-places-fund/
[4] https://www.glass-futures.org/membership/

The core source material for this case study is an interview conducted with the Glass Futures IFS project lead and additional interviews with representatives from Encirc and Pilkington UK, two glass companies who provided the sites to run industrial-scale trials of using biofuels to power the production of 'container glass'[5] and 'flat glass'.[6] The case study also makes reference to the end of project report that Glass Futures produced in 2022. In addition, the case study looks at how IFS projects were disseminated by the glass companies and customer companies involved. It also considers how the trials were reported in online publications aimed at the wider glass sector or its customer base (e.g. the drinks industry).

Increasing glass sector awareness and engagement

The Glass Futures IFS project has accelerated the decarbonisation process for Encirc and Pilkington UK, who hosted the biofuel trials, by providing evidence that their production processes can be successfully run via this alternative fuel source. While these companies would likely have pursued this type of experimentation at some point due to their pre-existing commitments to improving sustainability[7], the IFS projects enabled trials to begin sooner and jump to a larger scale than if the companies themselves had undertaken them without support. The project partner for Pilkington UK — who hosted the flat glass trial — explains:

> *"…I don't think it would have been done on the same scale. We would have done a lot smaller trials. Maybe we'd have fired one port or two ports with the furnace, as [a] small percentage of the actual [production]… The furnace is large, so maybe we'd have done 15% to 20% of the furnace fired on bio-oil rather than 100%, which is what we actually did."* (Pilkington UK)

He further explained that leapfrogging to a full-scale trial has increased the company's confidence in switching as it moved internal discussions from "if" their furnace could be run on biofuels to questions of "how" to make it commercially viable to switch:

> *"…with the bio-oil trial, we fired bio oil on the plant for about three and a half days continuously. So that was a full furnace conversion; we converted the whole furnace to fire on bio-oil. And we managed to generate good-quality glass during the whole of that [trial period]… we've kind of moved from 'can we do it?' to 'what's the best way of doing it?' in terms of identifying the lowest-cost bio-oils which are available for us, rather than just a bio-oil. So I think we were very happy with the Glass Futures outcome."*

The container glass trial appears to have been even more influential on Encirc's willingness to seriously consider biofuels as an alternative fuel for use in production. The Glass Futures lead for IFS believes Encirc's involvement in the trial has provided the company (and one of its customers from within the beverage industry) with the confidence to start investing in their own switching technology:

[5] 'Container glass' refers to the type of glass used for the production of bottles and jars.
[6] 'Flat glass' refers to the type of glass commonly used in the manufacture of windows, doors and windscreens.
[7] See https://www.glassonline.com/encirc-investing-for-the-future/ and https://www.nsg.com/-/media/nsg/site-content/sustainability/sustainability-report/nsg-sustainability-data-book-2018_e02.pdf

> *"There was an announcement relatively recently from Encirc, the fact that they plan to put down a brand new zero-carbon furnace in partnership with Diageo. Both Encirc and Diageo are members of Glass Futures, and the research that we did initially, but also the research that we're being asked to do over the next few years, will essentially sign off the business case for that investment because they're not going to make an investment [otherwise]…"* (Glass Futures IFS Lead)

Diageo's announcement about its joint investment in a low-carbon furnace is consistent with this view, as it directly references the IFS trial undertaken by Encirc as setting a precedent for the technology that will be used.[8]

Key finding: Involvement in switching trials can kickstart a self-led process of decarbonisation for the companies involved. Once the technical feasibility of fuel switching has been demonstrated via a successful trial, industrial companies are more likely to be confident about committing their own funds to decarbonising their production.

There are also signs that the increased confidence resulting from successful industrial-scale bio-fuel trials conducted under IFS has been felt in glass companies beyond the two directly involved. The Pilkington UK lead explained how other flat-glass companies have since tried to emulate the trials undertaken under IFS:

> *"…we can see that some of our competitors [in the flat glass industry] are carrying out similar trials to the ones that we have done. It [the IFS trial] has kind of spurred the market on, I would say, into decarbonising."* (Pilkington UK)

The Glass Futures consortium also proactively raised awareness among other glass producers, inviting "all UK glass container, flat and fibre manufacturing sites" to an engagement session to learn about the biofuel trial. This session resulted in seven of these manufacturers arranging an on-site consultation with Glass Futures to learn more about their site's suitability for switching, and a further three opting to do this online.[9]

Regarding the softer impact that the trials may have had on raising awareness of switching possibilities within the glass industry, it is noteworthy that both trials received coverage in industry-wide publications.[10]

Key finding: Successful bio-fuel trials can have a ripple effect on confidence within the industry involved, as other companies are inspired to secure funding for their own trials.

[8] https://www.diageo.com/en/news-and-media/press-releases/2022/encirc-and-diageo-announce-hydrogen-powered-furnace-to-change-the-face-of-uk-glass-manufacturing-industry

[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1119897/Phase_3_Alternative_Fuel_Switching_Technologies_for_the_Glass_Sector.pdf

[10] See https://www.glassworldwide.co.uk/industry-announcements/ground-breaking-biofuel-trial-success and https://www.glass-international.com/news/pilkington-uk-runs-furnace-on-biofuel-in-four-day-trial

Improving confidence across the supply chain

An important feature of the IFS project's success in raising commercial awareness of the potential of biofuels in glass production was Glass Futures' engagement with industries that are consumers of glass products (rather than just focusing on glass producers). As part of the IFS trial to produce container glass at Encirc, several prominent drinks companies (Molson-Coors[11], Carlsberg-Marstons[12], Heineken[13] and Diageo[14]) were given the opportunity to receive prototype low-carbon versions of their bottles. The Encirc partner described how this feature of the IFS trial has created an appetite for further decarbonisation efforts among drinks industry customers, which, in turn, supports the business case for Encric's involvement in similar trials in the future:

> *"So the fact that we were able to do this [trial] and it was successful and [with a]… number of our customers which you'll see publicly anyway…we were able to produce effectively a bottle that was 90% carbon-free. That [bottle] was actually showcased at COP26…as a result of this… trial.. [it's] excellent, really.*
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> *And the confidence and the enthusiasm that [this] creates amongst our customers, it's been hugely beneficial in the way that they've continued to support us and encourage us further upstream here in terms of other ways to decarbonise. Which takes you onto the electrification and, of course, the hydrogen side of things as well."*

Participation in the IFS trial has also served as a way to bring companies from this part of the glass supply chain into the fold of the wider Glass Futures project. Diageo[15] and Heineken's[16] involvement in the IFS trial directly led to these companies formally joining the Glass Futures consortium. This show of confidence seems to have encouraged other large drinks companies (who were not part of the trial) to follow suit, with Rémy-Cointreau[17] and Pernod Ricard joining in November 2022.[18] These companies joining Glass Futures marks a significant development, as it indicates that the IFS trial has had follow-on effects in improving the drinks industry's confidence and interest in fuel switching, which have extended beyond the life of the first IFS programme.

[11] https://www.molsoncoorsblog.com/molson-coors-introduces-low-carbon-bottles-uk
[12] https://www.carlsberggroup.com/newsroom/carlsberg-marston-s-brewing-company-to-trial-glass-bottles-with-up-to-90-lower-carbon-impact/
[13] https://www.heineken.co.uk/media/heineken-bottles-go-even-greener
[14] https://www.diageo.com/en/news-and-media/stories/2021/diageo-collaborates-on-innovation-trial-to-make-most-sustainable-glass-scotch-whisky-bottles-ever
[15] https://www.diageo.com/en/news-and-media/stories/2021/diageo-collaborates-on-innovation-trial-to-make-most-sustainable-glass-scotch-whisky-bottles-ever
[16] https://www.glassonline.com/heineken-to-collaborate-with-glass-futures-on-low-carbon-bottles/
[17] https://www.remy-cointreau.com/app/uploads/2022/08/Integrated-annual-report-2021-22.pdf
[18] https://www.glass-futures.org/article/?p=6DK2QCcSkemwIpeueDArDKf4QDsD3t0KD1JHecwSLPemn22NcnGctS2

Key finding: Involving consumer industries of manufactured goods (such as glass bottles) in switching trials can help improve the business case for fuel switching: it helps generate future demand for low-carbon products among the companies purchasing these goods.

Raising awareness and engagement in related sectors

In addition to stimulating interest in fuel-switching technology from within the glass sector and beverage industries, the biofuel trials conducted under IFS have also served as a useful prototype for related industries. Following the successful trials for glass production, the Glass Futures IFS lead described an uptick in switching interest from related producer industries, such as brick and cement, as well as consumer industries, such as food:

> *"So you're looking at the brick industry, you're looking at food, you're looking at a range of different industries who are now looking at it. And I think that's basically due to the success of the first Phase that other industries are now jumping on it as well, just to make sure that they're ready as well.*
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> *Because they perceive it's real…that some things are going to happen, and they want to be ready. Whereas without that programme, I think it would have just been a lot of ideas without actually getting closer to reality. So yes, [it's] definitely having an impact industry-wide, I would say."*

The Glass Futures IFS lead also felt that having one industry act as a pioneer – by taking part in the early bio-fuel demonstrations under IFS – had served to break down previous barriers to cross-sector collaboration on decarbonisation, as other industries realised that they had a lot to learn through cooperating with Glass Futures:

> *"I know that we were slightly ahead of the curve. When you're slightly ahead of the curve, you manage to gain an advantage in being seen as the people that are slightly ahead. To a degree, it's helped cross-sector collaboration. Otherwise, if the ceramics industry was doing its own stuff and the metals industry was doing its own stuff all at the same pace, there would be no reason to look over the fence and ask someone else to do it. By glass being slightly in front, steel and ceramics have come and talked to glass, so we've talked to steel and ceramics. Then everyone started talking. So I think it's catalysed across industry research activity…"*

This eagerness to catch up after the first IFS trial's success has led to ceramic industry organisations forming tangible research partnerships with Glass Futures. Under the subsequent IFS programme (IFS2), a ceramics company, DSF, has joined the original two glass company partners (NSG and Encirc) in undertaking further biofuel trials led by Glass Futures, including the addition of two of Glass Futures' members Ardagh Glass and O-I.[19] In addition, Glass Futures has provided the site to host the pilot hydrogen kiln for the first hydrogen firing demonstrations led by the British Ceramic Confederation under IFS2.

[19] https://www.gov.uk/government/publications/industrial-fuel-switching-programme-successful-projects/industrial-fuel-switching-programme-Phase-2-summaries-of-successful-projects

Following the success of the IFS 3 trials, Glass Futures also began to build partnerships with members of the Steel industry[20] and has secured UKRI funding for a project to develop low-emission furnaces in cooperation with Liberty Steel and Tata Steel.[21]

Key finding: The confidence effect of fuel switching trials will likely extend to other industries using similar production processes. This new-found switching interest from associated sectors provides an opportunity to build on earlier cross-company collaboration and create cross-sector partnerships for future research.

What lessons can be learned?

The case of Glass Futures' work under the IFS programme provides an example of how fuel-switching trials can be designed to maximise their overall effects on improving industry confidence in alternative fuel sources.

The breadth of industries inspired to decarbonise has been maximised by Glass Futures' decision to involve consumer industries (rather than just glass producers) in their trials and their willingness to share knowledge gained from the trials with associated industries such as ceramics.

When considering how easily this strategy might translate to other energy-intensive industries, it is worth noting that the consumer companies involved in the Encric container glass trials were very large and high profile. For example, based on net revenue for 2019, both Heineken and Diageo were among the ten largest global drinks companies, with revenues of $26.75bn (USD) and $16.8bn (USD) respectively.[22]

Relatedly, the cross-sector collaboration between glass and cement appears to be the direct result of one industry being an early adopter and having trial knowledge to share. Fostering this type of cooperation may be more challenging when two similar industries embark on their first switching trials simultaneously.

[20] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1119897/Phase_3_Alternative_Fuel_Switching_Technologies_for_the_Glass_Sector.pdf

[21] https://www.glassonline.com/glass-futures-combustion-research-facility-ecolownox-project/

[22] https://www.drinks-insight-network.com/features/top-ten-drinks-companies-in-2020/

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