

Advancing sustainable glass production

Ernesto Cattaneo and Annick Lachance Nyiringango discuss the presentation of Stara Glass' LIFE SUGAR project at AFGM 2022, and explain how hydrogen generation by steam-methane reforming of waste gas could offer glassmakers a new opportunity for heat recovery.

Furnace designer Stara Glass attended the 44th ASEAN Glass Conference in Pattaya, Thailand in November last year (AFGM 2022). The conference was hosted by the Federation of Thai Industries (GMFTI) headed by Somporn Temudomsomboon of Bangkok Glass under the theme 'Glass: Sustainable World Solutions', which is in line with Stara Glass' own mission to build furnaces for sustainable glass production.

During the conference, Stara Glass presented its LIFE SUGAR Project along with innovations such as its Centauro hybrid regenerative-recuperative glass furnace, and SWGR [strategic waste gas recirculation] and HEAS [high efficiency air staging] technologies.¹

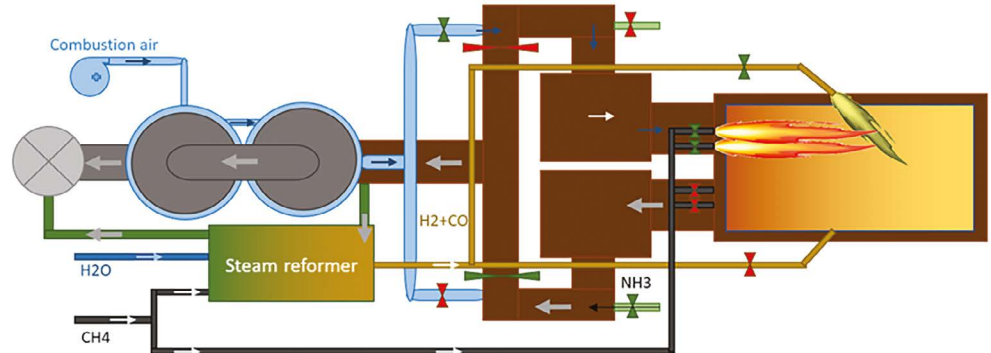


Figure 1: Centauro + SUGAR Technology.

What is LIFE SUGAR?

Co-financed by the European Union, LIFE SUGAR [Sustainable Glass: Architecture of a furnace heat recovery system including a steam Reformer]² is a project that was developed to help reach the EU's goal of being climate-

neutral by 2050. (Carbon neutrality means that any CO₂ emitted into the atmosphere as a result of a company's operations is offset by an equal amount removed.)

SUGAR was developed to improve the sustainability of glass production by significantly reducing energy consumption and, as a result, CO₂ emissions. It does so by recovering residual heat from exhaust flue gases to produce a hydrogen-rich syngas by steam-methane reforming to be utilised as a part of the furnace fuel (in addition to the combustion air preheating). SMR (steam-methane reforming) is a consolidated process for producing hydrogen and syngas in a variety of industrial sectors (refining, petrochemical, fertilisers, etc.).

The LIFE SUGAR system will utilise the Stara Glass Centauro system's heat recovery architecture,³ which is divided into a high temperature regenerative and a low temperature recuperative part. This architecture enables the generation of a waste gas stream at a temperature suitable for providing heat for the reforming reaction between the two-heat recovery sub-systems. A portion of the natural gas to be used as furnace fuel is thus 'reformed' with steam to produce an H₂/CO rich syngas with a higher energy content. This solution enables the reuse all possibly recoverable thermal energy in the fumes, bringing the melting system's efficiency closer to theoretical thermodynamic limits. Although the project is still ongoing, the tests that have already been completed demonstrated the process and feasibility; hydrogen generation by steam-methane reforming is a real opportunity for heat recovery. ▶



L-R: Annick Lachance Nyiringango, R&D Engineer at SGRPRO, an affiliate of Stara Glass and Ernesto Cattaneo, LIFE SUGAR project co-ordinator and Stara Glass Head of Innovation department.



Ernesto presenting at the 44th ASEAN Glass Conference in Pattaya, Thailand in November last year.

Promising progress

So far, a mock-up of the SMR system has been designed and built in order to study and analyse the integration of an SMR process in the heat recovery system of a glass plant, specifically in the temperature range suitable in Centauro furnaces, as well as to test different catalyst material types in order to find the optimal one for the application. Because of the laboratory's semi-industrial nature, not all parameters can be measured with high accuracy, but the results provided enough useful information

to guide the system's design on an industrial scale. The mock-up tests revealed a high conversion efficiency in conditions close to the industrial plant, giving us confidence in the proposed layout's effectiveness.

The project is currently in the design phase for the pilot (1:5 scaled) to be installed at the Bormioli Luigi Centauro furnace in Abbiategrasso, Milan. The system is intended to save 15% energy in regenerative and oxy systems, but the results may be even better. Despite the fact that the technology

is currently being used on a Centauro furnace, it is also intended for use on oxy-fuel furnaces with the appropriate catalyst. Aside from that, the LIFE SUGAR project encourages the advancement of traditional Martin-Siemens regenerative technology toward a total recovery furnace. As a result, this concept could have applications outside of the glass industry.

For Stara Glass, 2022 was a great year as the LIFE SUGAR project received so much attention and interest that it was also presented to the COP 27 event 'Climate is LIFE: Italian project solutions for fighting climate change.' Stara Glass's commitment and motivation for the project are strengthened by this special attention. However, in 2023, Stara intends to go even further and pursue its sustainability mission with even more zeal and ambition. ●

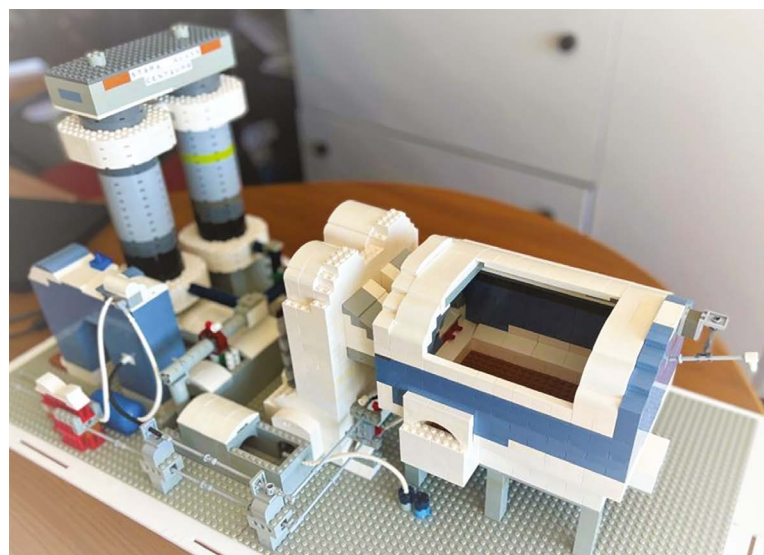


Figure 2: Legotauro – a Centauro furnace with a SUGAR module built entirely out of LEGO.

- 1 <https://www.staraglass.it/innovative-products/>
- 2 www.lifesugarproject.com
- 3 <https://www.staraglass.it/innovative-products/centauro/>

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