

LIFE SUGAR – LIFE19 CCM IT 001314

Sustainable Glass: Architecture of a furnace heat recovery system including a steam Reformer

PROJECT LOCATION: Genova, Savona, Roma, Venezia (Italy), Reading (UK) + TBD industrial user

BUDGET INFO:

Total amount: 3,772,664 EURO

EC Co-funding: 2,031,680 EURO (55%)

DURATION:

Start: 01/06/2020 – **End:** 30/11/2023

PROJECT'S IMPLEMENTORS:

Coordinating Beneficiary: Stara Glass

Associated Beneficiary(ies): Johnson Matthey, KT - Kinetics Technology, Stazione Sperimentale del Vetro, Università degli Studi di Genova



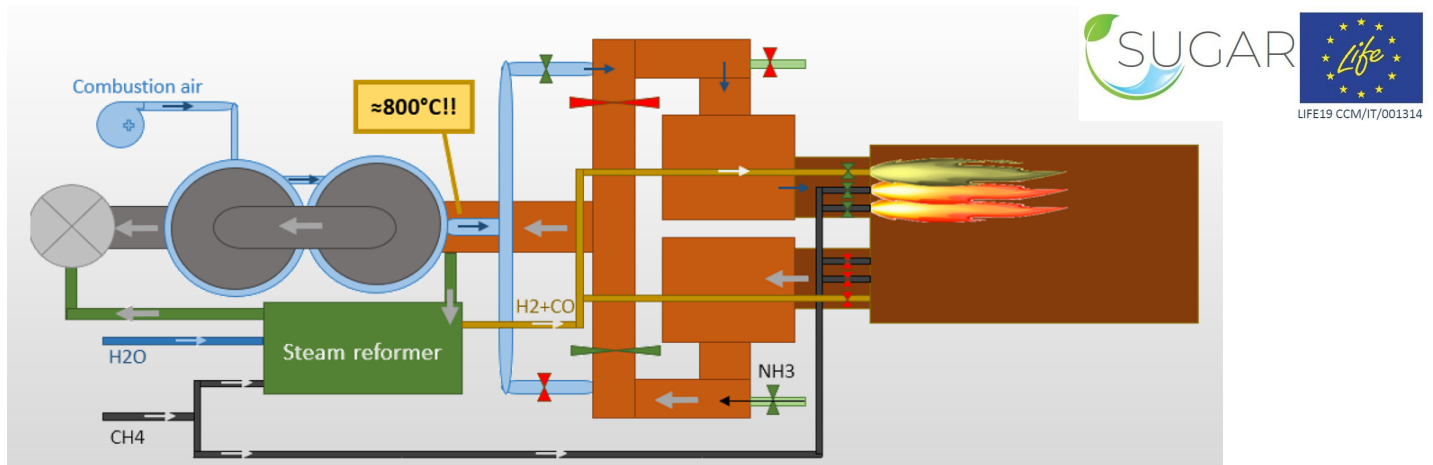
PROJECT'S HIGHLIGHTS

Glass production is a very energy intense process. In fuel fired furnaces a part of the energy of waste gases is commonly recovered to preheat combustion air, but **still a significant quota of their heat is lost to the atmosphere**

➤ The project fosters the use of residual thermal power to convert a part of the natural gas into Hydrogen via steam methane reforming, **saving 10-15% energy consumption and CO2 production.**

➤ Steam reforming is a consolidated process for hydrogen and syngas production in many industrial sectors (refining, petrochemical, fertilizers, etc.) but has **never been used in glass production** nor has the heat ever been **recovered from flue gases**

➤ The technology will be integrated into the Centauro furnace, benefitting from is **low NOx emissions** and will allow for the **full recovery all exploitable waste gas energy.**



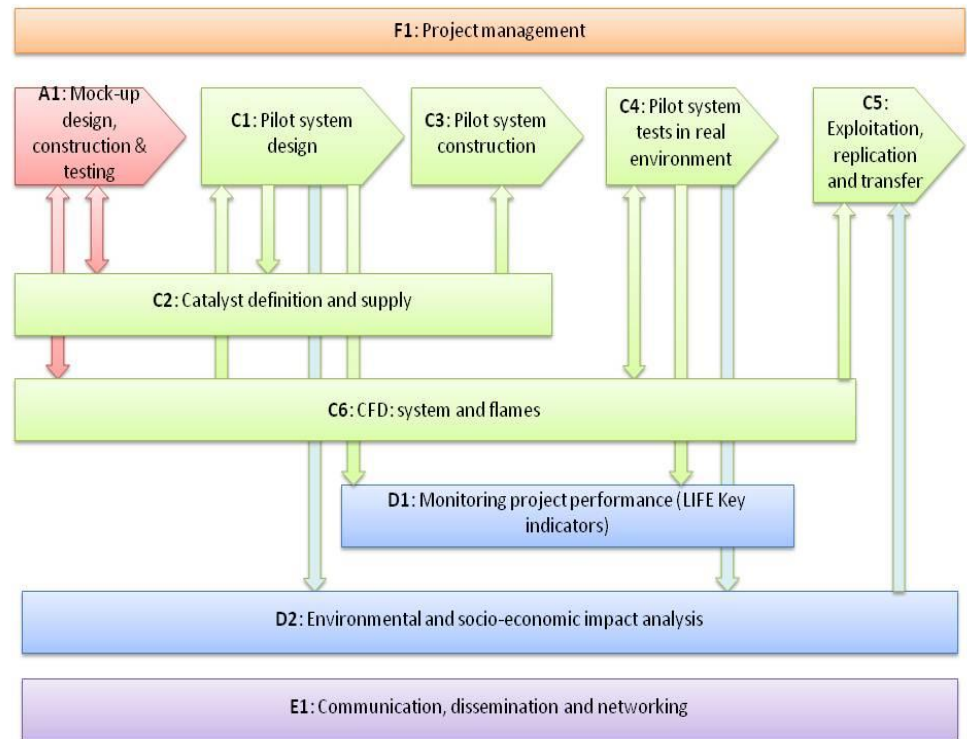
OBJECTIVES & SCOPE

Solution: SUGAR aims to exploit the generation of hydrogen-rich syngas by a Steam-Methane Reforming reaction (SMR) as a thermal and chemical vector for enhanced recovery of residual heat of glass-melting furnaces' waste gases.

Objectives:

- Saving energy and reducing CO₂ emissions of the melting process by 10-15%
- Development of furnace which fully recovers all exploitable waste gas energy
- Validation at a 1:5 pilot scale on a real hybrid regenerative furnace for container glass production
- Be prepared for market introduction: final system design, scaled-up to average industrial glass furnace; modelling tools for design support; LCA & business plan; Raised awareness among ¼ of EU glass producers

Actions:



EXPECTED IMPACTS

Immediate impacts:

- Proven savings of 10-15% energy consumption and CO2 emissions on hybrid regenerative glass furnace
- Reduction of Co2 emissions by 454 ton/year and energy consumption of 190 Toe/year in the prototype
- Total yearly energy savings of 190 Toe & CO2 emission reduction of 454 tons on prototype scale
- At least ¼ of glass producers informed about the novelty

Long-term impacts:

- Full introduction at EU level would result in a reduction of approximately 0,4 – 0,5 Mtoe energy consumption and 1 million tons of CO2 emissions per year
- Furnace with average production of 90K tonnes of glass per year obtains net energy reduction of 2,3 K tons CO2 emissions per year
- Increased competitiveness of glass producers:
 - substitution end-port with SUGAR-Centauro: - 500 k€/year methane costs
 - substitution recuperative with SUGAR-Centauro: - 3 M€/year methane costs
- Potential applications in the flat glass sector (side-port furnaces) and non-glass sectors and potential for CO2 recovery
- Inputs for Glass BREF update as Best Available Technology (BAT)



POLICY IMPLICATIONS

SUGAR strongly contributes to the EU long-term strategy towards a **competitive, low carbon and resource-efficient economy** and specifically to the objectives of the following Union policy and legislation:

- *EU 2030 Climate and energy framework, the 2050 low-carbon economy roadmaps & LIFE Climate Change Mitigation policy priority n. 4:*
 - reduction of energy consumption and GHG-emissions in EII of glass production by 10-15%
 - Leadership in advanced manufacturing and safeguarding of competitiveness of glass industry (safeguarding sector-jobs threatened by carbon leakage)
- *Energy efficiency Directive (EU) 2018/2002*, due to full recovery of waste-gas energy
- Development of cost-effective technological solutions for energy consumption and Co2 emission reductions, in line with the *Emission trading system Directive, (EU) 2018/410* & the *Commission delegated Decision 2019/708 EU*
- *Directive (EU) 2018/410* amending *Directive 2003/87/EC* to enhance cost-effective emission reductions and low-carbon investments, and *Decision (EU) 2015/1814*



CONTINUATION (REPLICATION, TRANSFER, MARKET UPTAKE)

Replication & Market Uptake:

- SG: Strong marketing campaign at European and global scale
 - SG: Tailoring design for each specific customer, targeting both upgrade of existing "Centauro" furnaces with SMR and conversion of old furnaces into Centauro with SMR
 - KT: Design support and EPC contractor of the SMR modules
 - JM: Marketing the selected catalysts
 - UNIGE: Use numerical tools and simulation approaches for design of future configurations
 - SSV: promote inclusion in BREF update
- Expected results: 5% EU furnaces within 5 years = 1/10 of all new-builds, ca. 25 customers

Transferability :

Potential will be studied for transfer of the technology to :

- other glass production processes (flat glass, side-port), widening applicability to 90% of the glass industry
- other industries e.g. cement, steel, oil refining, petrochemical processes, hydrogen combustion or fuel cell applications