LIFE OPTIMELT - Demonstration of thermochemical reforming of natural gas for reducing GHG emissions in Energy Intensive Industries

LIFE15 CCM/NL/000121

Project description

Background

A total of 58.9% of EU glass melting capacity is based on either end-fired or cross-fired regenerative glass furnaces. These recover waste heat in flue gas by preheating the combustion air with regenerators. This is currently the most economically-viable choice for the container and flat glass glass manufacturing segments in which large-scale furnaces are used.

A further 19.1% of glass is melted using recuperative air-preheated furnaces, which consume large amounts of energy. Some 10% of the market is taken by oxy-fuel furnaces. These replace air combustion with pure oxygen, requiring 10-20% less natural gas and resulting in 80-90% lower nitrous oxide (NOx) emissions. This technology is considered state of the art in current BREF documents (Industrial Emissions Directive 2010/75/EU, Best Available Techniques (BAT) Reference Document for the Manufacture of Glass). However, the high capital cost of oxygen separation plants, combined with the cost for electric energy required to operate these facilities, has limited the uptake of oxy-fuel combustion for glass melting in Europe.

Objectives

The LIFE OPTIMELT project will carry out the first full-scale demonstration of an innovative waste heat recovery concept. The technology, called OPTIMELT, is able
to use an endothermic reaction of natural gas with water vapour/CO2 in the flue gas to recover more heat than previously possible in high-temperature manufacturing processes. It serves as an add-on to existing oxy-fuel combustion furnaces, making this option more environmentally friendly and cost-effective (20% reduction in fuel and oxygen consumption).

The demonstration will be carried out in a furnace producing 105 tonnes/day of domestic glass. Specific objectives are as follows:

- Energy consumption and greenhouse gas emission savings of at least 20% compared to best available technology in the glass industry (oxy-fuel combustion), and lower nitrous oxide emissions;
- Demonstration of the economic viability of OPTIMELT technology;
- Dissemination of project results to at least 500 relevant manufacturing locations of high-temperature companies in the EU; and
- Definition of technical requirements for steel and aluminium manufacturing in which OPTIMELT is applicable, so as to facilitate technology transfer to project stakeholders from these industries.

Expected results: The project is expected to lead to the following reduction in energy consumption and emissions at Libbey Leerdam (based on the implementation of oxy-fuel + OPTIMELT technology):

- Less energy used in the process, with no difference in the quality of the end products (59% less energy than recuperative air combustion, 36% less energy than regenerative air combustion; and 20% less energy than standard oxy-fuel combustion);
- A 59% reduction of in CO2 emissions (8,323 tonnes/yr); and
- A 41% reduction in NOx emissions (18.8 tonnes/yr).

Importantly, the demonstration of the OPTIMELT technology will have the following additional results:

- To contribute to the shift towards a resource-efficient, low-carbon and climate-resilient economy with a breakthrough technology;
- To improve the development, implementation and enforcement of European Union climate policy and legislation by labelling the technology as a best available technique (BAT); and
- To act as a catalyst for, and promote, the integration and mainstreaming of climate objectives into other EU policies and public and private sector practice by demonstrating the technology and providing a basis for replication by and transfer to other high-temperature industries.

Results
Climate change Mitigation - GHG reduction in EU ETS sectors
Climate change Mitigation - Energy efficiency

Keywords

glass industry, emission reduction, energy efficiency

Target EU Legislation

- Industry and Product Policy
- Directive 2010/75 - Industrial emissions (integrated pollution prevention and control) (24.11.201)
- Climate Change & Energy efficiency
- COM(2011)112 - "A Roadmap for moving to a competitive low carbon economy in 2050" (08.03.2011)

Natura 2000 sites

Not applicable

Beneficiaries:

Coordinator BV Koninklijke Nederlandsche Glasfabriek Leerdam
Type of organisation International enterprise
Description Koninklijke Nederlandse Glasfabriek Leerdam (Royal Leerdam Crystal) has been manufacturing glassware in Leerdam, South Holland, since 1875. In 1995, the company was acquired by Danone, which sold the table glass and crystal business to the US-based glass manufacturer, Libbey, in 2003. Libbey has European operations in Portugal as well as Libbey Leerdam in the Netherlands.
Partners PRAXAIR EUROHOLDING S.L., Spain

Administrative data:

Project reference LIFE15 CCM/NL/000121
**Duration**
15-JUL-2016 to 15-APR-2020

**Total budget**
8,284,751.00 €

**EU contribution**
2,275,538.00 €

**Project location**
Zuid-Holland(Nederland)

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**Read more:**

**Leaflet**
Title: Project's leaflet Year: 2017 Editor: Praixair
No of pages: 2

**Leaflet**
Title: "Praxair News release: Praxair and Libbey Receive 2.3 Million Euro Grant for Emissions Reduction Project in Europe" (83.3 KB)
Author: Jason Stewart, Juan Pelaez
Editor: Praxair Technology
No of pages: 2

**Leaflet**
Title: "Praxair was exhibiting at Glasstec 2016. 20th - 23rd, 2016 Düsseldorf" (4.76 MB)
Year: 2016 Editor: Praxair Technology
No of pages: 4

**Press article**
Title: "Advanced heat recovery for oxy-fuel fired glass furnaces" (article in Glass Wordwide, seventh issue, 2017)
Year: 2017 Editor: Glass Wordwide
No of pages: 1

**Press article**
Title: Praxair news release Year: 2017
Editor: Praxair Technology
No of pages: 2

**Project web site**
[Project's website]

**Slides Presentation**
Title: "Advanced Heat Recovery for Oxy-Fuel Fired Glass Furnaces with OPTIMELT PLUS Technology - 77th Conference on Glass Problems (Columbus, USA)" (955 KB)
Author: S. Laux, U. Iyoha, R. Bell, ... [et al]
Year: 2016 Editor: Praxair Technology
No of pages: 17

**Slides Presentation**
Title: "Enhanced Furnace Energy Efficiency with OPTIMELT TCR System - Glasstec September 20th 2016 (Dusseldorf, Germany)" (1.72 MB)
Author: Laux S., Iyoha U., Bell, R., ... [et al]
Year: 2016 Editor: Praxair Technology
No of pages: 17

**Slides Presentation**
Title: Presentation of the project at the 'WASTE HEAT RECOVERY SEMINAR' on 15th November, 2016, SHEFFIELD BRITISH GLASS
Year: 2016 Editor: Praxair Technology
No of pages: 22

**Slides Presentation**
Title: "Fuel savings and Operating Experience with OPTIMELT" (2.10 MB)
Author: J. de Diego, H. Kobayashi, ... [et al]
Year: 2016 Editor: Praxair Technology
No of pages: 25