

Project case name: Hydrogen use in ceramic-production kilns

Introduction

The ceramics industry is typically energy-intensive and relies heavily on natural gas for its production processes. Its high-temperature requirements make electrification challenging. By using green hydrogen as a clean energy source, the industry can significantly reduce its carbon emissions and contribute to the industry's transition towards a low-carbon future.

Vandersanden is a Family-owned company and one of the largest brick-producing companies in Europe. The company makes facing bricks, brick slips and pavers, offering facade and street solutions. Through their strategy "[Together to Zero](#)" their aim is to operate and produce completely carbon-free by 2050. Together with their partners they undertake action in eight areas including renewable energy. Hydrogen is expected to play a crucial role in this.

Vandersanden is not alone in its belief of the importance of hydrogen for decarbonization of the ceramics sector. The KNB (de Koninklijke Nederlandse Bouwkeramiek) sector organization for instance signed the "Hydrogen Pact" in 2021. This document was published ahead of the Dutch elections in 2021 by a coalition of 38 grid operators, industries, energy companies, governments, nature- and environment organizations. The pact calls on the government to support and invest in the hydrogen sector to develop a hydrogen chain to decarbonize industries and the energy system, thereby achieving cost reductions, creating jobs, and establishing a leading role in the European hydrogen market.

Challenge and Background

Future proofing ceramics production processes requires a transition to climate neutral solutions. The high-temperature heat requirements of the production kilns where the ceramic properties are achieved however make direct electrification challenging. This implies a continued dependence on molecular energy carriers beyond the fossil era. Hydrogen, being a gas that can be produced from renewable electricity, forms a promising solution for this sector and other heat-intensive sectors like the glass industry.

First tests for the use of hydrogen in industrial heating processes have already been done. For example, the French multinational Saint-Gobain recently conducted a [first demonstration](#) of the blending of 30% hydrogen in the ovens for glass production in their facility in Herzogenrath.

Also the European funded [HylInHeat](#) project provides a relevant reference. The project aims to integrate hydrogen as a fuel for high-temperature heating processes in energy-intensive industries, particularly in the aluminium and steel sectors.

Also within the ceramics industry itself, studies have already been performed. For example by [Gasunie](#), and the Vereniging Koninklijke Nederlandse Bouw Keramiek ([KNB](#)). The next step towards large-scale roll-out of this application would be the execution of small-scale demonstrations to gain experience and new insights.

Vandersanden has indicated their ambition and willingness to be involved in a first small-scale demonstration of the use of hydrogen in one of their production facilities located in the Euregion Maas-Rijn e.g. Spouwen and Lanklaar in Belgium or Kessel and Beek in The Netherlands. Their contribution to such a project would be to make available their installation for these tests. They are however **looking for partners with technical knowledge and expertise on the topic to lead such a project** – possibly a research institute.

Objective

- Set up a first test/demonstration/proof of concept as a follow-up to laboratory scale tests of blending hydrogen in kiln burners.
- Answer remaining questions on the impacts of hydrogen on the production process and its product, including with regards to:
 - Colour and quality of bricks
 - Impact and redesign of technical installation
- Leverage cross-border exchange of knowledge e.g. Saint Gobain in Germany or HyinHeat
- Leverage cross-sectoral experiences from high temperature industries (Glass, aluminium etc.)
- Exploring possibilities for regional synergies in the production, delivery or use of green hydrogen (across sectors, e.g. mobility)

Deliverables

- Setting up a test/pilot
- Setting up a demonstration
 - Acquiring the permitting
 - Technical design
 - Safety analysis
- Execution of a demonstration
- Evaluation of a demonstration

Demarcation

Vandersanden is willing to make available one of their industrial kilns for a test or demonstration. Depending on the scale of the pilot could this be a continuous tunnel kiln or a badge wise periodical kiln.

Risk analysis

Risk	Likelihood	Mitigation measure
Missing legislation, codes and standards on the combustion for H2 in ovens/kilns		Transparent communication with safety authorities, inclusion of dedicated deliverables in the project to come to inform decisions in the area

Longer permitting processes as a result of missing legislation, codes and standards		Transparent communication with the local authorities
Supply chain issues causing delays for components		Relatively low-tech innovation (existing burners and blending of H2 and NG)

Preconditions for (smooth) implementation

- Involvement of sector organisation KNB
- Involvement of experienced partners from other sectors (e.g. Saint Gobain, HyInHeat)
- Involvement of capable and experienced providers/suppliers

Phasing and planning

- **Year 1: study and preparation**
- **Year 2: start implementation permits**
- **Year 3: demonstration**
- **Year 4: demonstration and evaluation**

Acknowledgement

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