H2 Ceramic: Demonstration of an H2 value chain in the ceramic industry in Türkiye

Partnership between GIZ, Burgbad AG and Eczacibasi Yapı Gereçleri Sanayi ve Ticaret A.Ş

The challenge

In 2021 a total of 5.055.533 pieces ceramic products were produced globally.

The International Energy Agency (IEA) estimates that, global emissions emerging from the ceramic industry surpass 400 Mt CO2/year. CO2 emissions from the ceramics industry depend on two factors, the chemical transformation from raw materials employed during the manufacturing process (calcination) and fossil fuels used in the production process.

With regard to the latter, the main energy consumption during the production process is for drying, firing and cooling stages. Natural gas burned in kilns during firing stage of ceramic production is the biggest source of carbon emissions in the production process. Therefore, the greatest challenge in reducing carbon emissions in the ceramic manufacturing process will be to reduce the use of fossil fuels during the firing process. Electrification of the firing process of ceramic production is an option, however, the viability of applying electric kilns in large-scale ceramic manufacturing plants is controversial, and electric kilns have not yet been implemented on a large scale (i.e., in shuttle kilns). The firing process requires large-deployment of high-temperature heat which is not proven with electrification technologies (e.g., electric kilns). Therefore, using green hydrogen at the highest possible percentage for the firing process could be a solution.

The solution

To investigate the use of green hydrogen in the kilns during the firing stage in the ceramic production, first pilot projects are needed.

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) has formed a public-private partnership (PPP) project with the German Burgbad AG and the Turkish Eczacibasi Yapı Gereçleri Sanayi ve Ticaret A.Ş, to investigate the use of green hydrogen in the ceramic industry in Türkiye.

The partners intend to demonstrate the whole green H2 value chain from production to the end use in the kilns in an existing production facility. This includes the on-site green hydrogen production at the factory site, the later use in the kilns and the investigation of the effect on the ceramic end products during the operation phase. The demonstration project will be followed by on-site training measures.

Ceramic production facility in Bilecik, Türkiye © VitrA

The results of this pilot project will be public available and discussed with stakeholders from public and private sectors.

Our services

The aim of this joint project is to analyze and demonstrate the complete green hydrogen value chain for the use of green hydrogen in a kiln in a existing ceramic production

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facility in Bilecik, Türkiye. Here fore, the PPP partners will work together in all process along the value chain:

- Preparation phase,
- Construction phase
- Operational phase

These activities are accompanied by a training for internal and external stakeholders. In addition, the production with its pilot plant will be open for stakeholders to present the PPP results.

For the construction phase, electrolysers will be installed in the factory and run mainly by solar power. A minimum capacity of 1 MW is estimated.

During the subsequent operational phase, the effect of using green hydrogen in the production process on the ceramic products will be evaluated.

Furthermore, it is also essential to ensure high standards in terms of occupational health and safety so that in **the** framework of this PPP corresponding training will be carried out.

Impact and results

The PPP as a pilot project, will be a pioneer and exemplary project for both using green hydrogen in the ceramics industry in general and for the hydrogen market ramp-up in Türkiye. The results could be beneficial for the decarbonizing of the ceramic industry in Türkiye and beyond **as well as** for the development of a hydrogen market in Türkiye.

The Turkish ceramics industry accounted for over 12% of the total natural gas consumption in the manufacturing sector. Thus, working on hydrogen as a clean fuel alternative will play an important role in the decarbonization of the industry and the country. Besides, the successful implementation of the pilot project and similar projects will lead to the implementation of more comprehensive projects in the future, increase in the demand for green hydrogen and development of the hydrogen market.

This pilot project will be actively contributed to the reduction of carbon emissions in the ceramics industry, by using green hydrogen in their kilns.

At a glance	
Duration	12/23 – 12/25
Country	Türkiye
Partner	GIZ, Burgabd AG & Eczacibasi Yapı Gereçleri Sanayi ve Ticaret A.Ş (VitrA)
Expected Reults	Phase I (12/23 - 03/24) • Analysis of framework conditions • Techno-Economic Analysis for green hydrogen production • Rollout of results Phase II (04/23 - 12/25) • Plan Construction / EPC process • Operation phase • Trainings & Stakeholder Engagement • Rollout of the results

The International Hydrogen Ramp-up Programme (H2Uppp) of the German Federal Ministry for Economic Affairs and Climate Action (BMWK) promotes projects and market development for green hydrogen in selected developing and emerging countries as part of the National Hydrogen Strategy.

Published by:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

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Bonn and Eschborn, Germany

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Istanbul, December 2023

Layout
peppermint werbung berlin GmbH, Deutschland

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