

Steel2Chemicals

Steel2Chemicals: paving the road for reducing millions of tons of CO₂ emission in the Steel Industry



Project number SI-30-02

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Partners ArcelorMittal, DOW, Ghent University, Tata Steel, TNO

Budget 9 500 k€

Duration 2018-2022

Incentive

Although the Benelux steel industry is very efficient, it has traditionally been a big contributor to CO₂ emissions in the Netherlands and Belgium, but has the potential to significantly reduce its CO₂ footprint. As a joint initiative, the Institute for Sustainable Process Technology (ISPT) together with Dow, Tata Steel, ArcelorMittal, TNO and Ghent University, are joining forces to develop a circular “steel” carbon chain together. This pilot plant scale system integration project is based on high-end separation- and conversion-technology and will be executed in Belgium and Netherlands.

Objective

The S2C project aims to valorize Carbon-Monoxide (CO) produced in steel-making processes. Currently, CO is used for energy-generation and thus generates CO₂. The project has been established to investigate conversion of large amounts of CO produced at ArcelorMittal and Tata Steel with hydrogen into naphtha. The naphtha will subsequently be evaluated as feedstock for the Dow steamcracker in Terneuzen.

Approach

The chemical conversion of CO from sources such as blast furnaces provides several major technological challenges. The gas also contains a lot of CO₂ and N₂. This will impact the conversion of CO, the subsequent products separation and size of the required facilities. Next to that, steel gas contains several impurities, that could affect the catalysts that convert CO. And finally there is a challenge concerning the operational fluctuations related to the blast furnace operations.

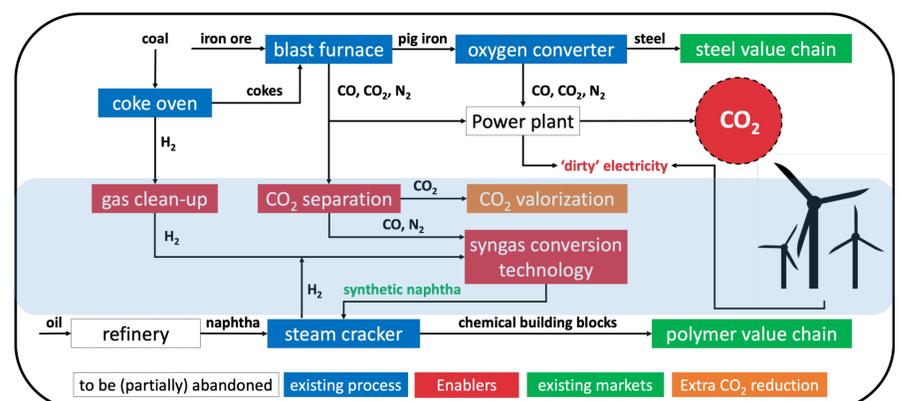
To overcome these challenges, the S2C project will first of all build a mobile pilot plant in which to explore the performance of a new catalyst under commercial conditions at ArcelorMittal and TataSteel that converts CO together with H₂ into high quality naphtha. This will be tested to establish technical performance and will help assess economic feasibility and impact on the environment when production is scaled up.

Supportive research will be conducted regarding the separation of CO from N₂. Finally, robustness, replication possibilities and requirements will be researched to amongst others study embedding such project in a wider environment and assess the optimal phasing of required investments to facilitate successful growth of the enabling system around CO conversion.

Results

The final results will give insight into the technical and economic feasibility of the next steps. This should allow the participating parties to make a well-founded decision on a possible follow-up in a demonstration phase. Status to date is that the mobile S2C pilot plant has been built and is scheduled to be transported to the ArcelorMittal site in Ghent, Belgium.

Schematic representation of the Steel2Chemicals concept linking formerly independent supply chains



Next steps

- Experimental testing campaigns with the pilot plant at ArcelorMittal & Tata Steel production sites;
- Validation and assessment of naphtha quality;
- Further research on CO-N₂ separation using specific adsorbents and SEWSG technology;
- Economic, technical and environmental studies (TEA, LCA), incl use of data from pilot testing;
- System analysis studies



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This project is co-funded by TKI-E&I with the supplementary grant 'TKI-Toeslag' for Topconsortia for Knowledge and Innovation (TKI's) of the Ministry of Economic Affairs and Climate Policy.