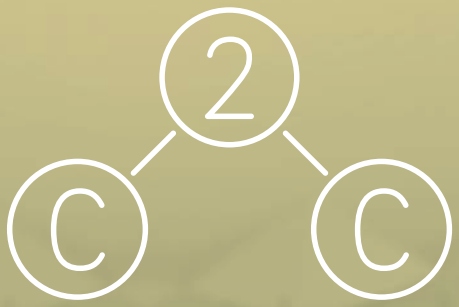
Subproject L-III

SYNTHESIS GAS

Project content
for the period 2020 to 2024



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PROJECT AIMS

Using the example of the integrated metallurgical plant of thyssenkrupp Steel Europe AG in Duisburg, it was successfully shown in the first phase of the subproject that the gases that arise containing carbon oxide, hydrogen, and nitrogen can be used chemically. In the project, hydrogen production was also demonstrated using pressure swing adsorption (PSA) from coke oven gas. The robustness of the previously developed concepts for purifying and conditioning metallurgical cases should now be verified. These processed gases can be used to synthesize various chemicals. The findings should be transferred to the use of other CO_2 sources. Possible sources include waste incineration plants, cement works, lime grinding plants, and biogas plants.

PROJECT CONTENT

The solutions developed for purifying industrial process gases should be robust and versatile. The intensive operation of the technical center is required for further development. In the following points, the robustness of the systems should be presented:

- The operation of the technical center, gas purification, the PSA, and electrolysis should run fault-free.
- The purified and conditioned gases are made available to chemical syntheses in the laboratories.
- A further aspect is the oxygen separation from coke oven gas previously only investigated using model gases. The reactors and systems should now be operated in the laboratory and technical center with real gases.
- The synthesis of ammonia continues to be a key part of the subproject.

MILESTONES

The focus of the second phase lies on process intensification. The concepts of innovative production networks consisting of metallurgical plant and chemical production, which were created in the first phase, are developed in detail and, where applicable, expanded. Many functioning gas purification concepts are investigated in long-term experiments and optimized technologically, economically, and ecologically. The results flow into ecological and economic overall views. These represent a direct interface to the overall simulation. The testing plants for fundamental laboratory research are continuously operated with real gas.

An industrial implementation and basic engineering of the system networks should be largely feasible from a technical viewpoint after the end of the project. As part of this, technical transferability to other applications and industries, which cannot prevent CO_2 emissions in their processes in the future, is also investigated intensively. These industries must increasingly make use of a circular economy in the future and develop new technologies for this.

PROJECT PARTNERS

- Linde GmbH, Linde Engineering (coordinator)
- thyssenkrupp AG
- Clariant Produkte (Deutschland) GmbH
- Ruhr University Bochum
- Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT