SUCCESS STORY

K1-MET
Competence Center for Advanced Metallurgical and Environmental Process Development

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HYFOR
HYDROGEN-BASED FINE-ORE REDUCTION

DIRECT PROCESSING OF FINE IRON ORE USING HYDROGEN AS A SOLUTION FOR A DECARBONIZED IRON AND STEEL INDUSTRY

Started under the internal research name FluidRed, this project with the current name HYFOR is planned to be grown to a solution for the iron and steel industry to achieve a CO_2 reduction by 80-95% until 2050 with the ultimate goal of climate neutrality according to the EU Green Deal.

Lab-scale tests at the Chair of Ferrous Metallurgy, Montanuniversitaet Leoben, showed the proof of principle of this technology. Based on these tests, a pilot plant was developed and commissioned by Primetals Technologies Austria at the voestalpine Stahl Donawitz site.

First tests with the pilot plant using 100 % hydrogen as reducing agent were successful. For one test run, approximately 800 kg iron ore can be processed. The pilot plant is built to verify the technical feasibility of the HYFOR process and to bridge the gap between laboratory scale tests and an industrial scale plant.

This technology is the world’s first direct reduction process for fine iron ore directly from the beneficiation process. Thus, no usually needed agglomeration step, like sintering or pelletizing, is required, which reduces CAPEX and OPEX costs.

Using hydrogen as primary reducing agent, which can be generated from renewable energies, or alternatively hydrogen rich gases from natural gas pyrolysis or steam reformer, results in a low CO_2 footprint of the HYFOR process.

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Impact and effects

The HYFOR technology provides a solution for a CO_2 free ironmaking by using hydrogen from renewable energies. Even a low-CO_2 ironmaking as intermediate step is given by using hydrogen based on natural gas until hydrogen from renewable energies is available in required quantities.

Besides the low CO_2 footprint of the process, the requirement of low operation costs and high overall process efficiency are met by the avoidance of the agglomeration step. And by using iron ore fines as feed material, abrasion losses due to material handling and transportation with screening of undersize material are avoided. In combination with dry dedusting and recycling of the iron oxide dust, a very high iron oxide yield is achievable.

Fig. 1.: HYFOR pilot plant (copyright: primetals.com)

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Project partner

- Primetals Technologies Austria GmbH, Austria
- voestalpine Stahl Donawitz GmbH, Austria
- Montanuniversität Leoben, Austria

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