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Hydrogen Pulse Injection into the Blast Furnace Shaft

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As part of the 2030 Climate Target Plan, the European Union has set a target of reducing green-house gas emissions by 55% and becoming carbon neutral by 2050. The use of hydrogen will be the backbone of the steel industry's transformation towards carbon neutrality. In the long term, for the vast majority of the roadmaps communicated by the various steel producers, the technical solution will be to replace the traditional blast furnace plants with direct reduction plants using hydrogen. However, due to global economic constraints and limitations on the availability of green electricity and hydrogen, as well as the fact that BFs have campaign lengths of 10-20 years, these roadmaps for CO2 abatement still include a large proportion of the BF process even beyond 2040. Consequently, technologies to reduce the carbon footprint of blast furnace ironmaking are also needed as bridging technologies. In the short to medium term, hydrogen injection is widely discussed as a way to reduce CO2 emissions from BFs.
Hydrogen injection at the tuyere level has already been successfully tested, but has some drawbacks. For example, the hydrogen competes with pulverised coal for available oxygen and resulting flame temperatures with hydrogen are high, resulting in higher heat loads near the tuyere tip. It is believed that injecting hydrogen at shaft level has the potential to mitigate such effects and could even lead to higher gas utilisation rates. Based on these considerations, a consortium of research and industry partners has been funded by the European Commission to evaluate and demonstrate the potential of sequence impulse injection of hydrogen into the blast furnace shaft. This article presents the concept of sequence impulse shaft injection of hydrogen, as well as initial results from injection depth trials on a demonstration scale test rig.

Primary author: KLOCK, Rainer (thyssenkrupp AT.PRO tec GmbH)

Co-authors: BARTUSCH, Hauke (VDEh-Betriebsforschungsinstitut GmbH); EDMOND, Ross (Primetals Technologies Ltd); HAUCK, Thorsten (VDEh-Betriebsforschungsinstitut GmbH)

Presenter: BARTUSCH, Hauke (VDEh-Betriebsforschungsinstitut GmbH)

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