Press release

thyssenkrupp

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Injection of hydrogen into blast furnace: thyssenkrupp Steel concludes first test phase successfully

thyssenkrupp Steel has successfully completed the first phase of hydrogen tests on "Blast Furnace 9" in Duisburg. In recent months, several tests on one of the 28 tuyères of this blast furnace could be conducted, while complying with corona requirements, among them some long-term tests. The company has gained important findings in these tests, enabling it to extend the tests to all tuyères in the next step and to transfer this technology to large-scale industrial use. The injection tests are part of the company's climate strategy with which it intends to reduce its CO_2 emissions by 30 percent by 2030.

Successful development: Tests confirm suitability for industrial use

On November 11, 2019, thyssenkrupp Steel was the first company globally to inject hydrogen into a blast furnace during operation. Hydrogen replaces coal dust as additional reducing agent. The goal is to reduce CO_2 emissions – for unlike carbon, hydrogen does not react in the blast furnace to form CO_2, but water. The project is funded under the IN4climate.NRW initiative launched by the state government, is scientifically supported by the BFI research institute and supplied with hydrogen by Air Liquide.

A particular focus of the first test phase was on findings on plant technology with the use of hydrogen. To this end, injection of hydrogen was tested on one of the 28 tuyères of "Blast furnace 9" at the Duisburg site. Based on continual data collection and analyses during the 24-hour tests, the team was able to gather extensive information, for instance, on the positioning of the hydrogen lance in the furnace, on flow and pressure conditions and on the interaction between elevated temperatures and plant technology. The collected data were used to optimize the hydrogen technology with each trial. It was also possible to reach the envisaged injection volume of about 1,000 m³ of hydrogen per hour in the tests.

Dr. Arnd Köfler, Chief Technology Officer of thyssenkrupp Steel: "The development of the hydrogen technology at blast furnace 9 is an important step in our transformation towards climate-neutral steel production. That way, we are able to reduce the CO_2 emissions of the conventional coal-based blast furnace process significantly. We are very grateful to the state of North Rhine-Westphalia for funding this first trial phase, which has laid the foundations for the second phase now to come. This will then be followed by the next decisive step towards climate neutrality: The construction of direct reduction plants, which are purely hydrogen-based and can be operated completely without coal".

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Technical basis for extension to all tuyères completed

In the second test phase, the tests will be extended to all 28 tuyères of the blast furnace, thus paving the way for large-scale industrial use. The focus of research will then be on the impact of hydrogen technology on the metallurgical processes in the blast furnace. The second phase is scheduled to start in 2022, somewhat later than originally planned due to the corona pandemic. While the hydrogen for the first test phase was delivered by truck, a pipeline is required for the quantities of hydrogen needed for the second phase.

The Federal Government has held out the prospect of funding for the second phase as part of the real-world laboratory program.

A preparatory agreement on the supply of hydrogen to the blast furnace via Air Liquide's long-distance pipelines has been concluded recently. Air Liquide was already a partner in the first project phase and intends – subject to funding approval – to invest in a new pipeline connection between the blast furnace and the existing hydrogen long-distance pipeline.

Gilles Le Van, Chairman of the Management Board of Air Liquide Germany: "thyssenkrupp, and Air Liquide are working together on a lighthouse project for the hydrogen society. Together we are pushing forward the decarbonization of steelmaking – with the aim of equally addressing climate protection and international competitiveness. This is important for North Rhine-Westphalia, for Germany and Europe, and we are proud to make our contribution. Air Liquide brings more than 50 years of experience in the field of hydrogen to our joint project work with thyssenkrupp. We'll build on that".

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