

World first in Duisburg as NRW economics minister Pinkwart launches tests at thyssenkrupp into blast furnace use of hydrogen

thyssenkrupp Steel has celebrated a world first. The Duisburg-based steel producer has launched a series of tests into the use of hydrogen in a working blast furnace. They are the first tests of their kind and are aimed at reducing significantly the CO₂ emissions arising during steelmaking. The start of the test phase in the presence of NRW economics and digital minister Prof. Dr. Andreas Pinkwart marks a milestone in the transformation towards climate-neutral steel production.

Interim target 2030: 30 percent reduction in emissions

The tests now started are an important part of thyssenkrupp's climate strategy to become climate-neutral by 2050. By 2030 emissions from the company's own production and processes (scope 1 emissions) as well as emissions from the purchase of energy (scope 2) are to be reduced by 30 percent. "We've set ourselves a clear goal with our climate strategy," said Dr. Klaus Keysberg, member of the Executive Board of thyssenkrupp AG responsible for the group's materials businesses. "Steel production will play an important part in reaching our climate targets because the potential for reducing emissions is huge. That's why we're working flat out to drive the transition to hydrogen technology."

Water vapor instead of CO₂

In the classic blast furnace process around 300 kilograms of coke and 200 kilograms of pulverized coal are needed to produce a ton of pig iron. The coal is injected as an additional reducing agent into the bottom of the blast furnace shaft through 28 so-called tuyeres. At the start of the tests today hydrogen was injected through one of these tuyeres into blast furnace 9. It marks the start of a series of tests in which thyssenkrupp Steel plans to gradually extend the use of hydrogen to all 28 tuyeres on blast furnace 9 and then, from 2022, to all three further blast furnaces. The advantage is that whereas injecting coal produces CO₂ emissions,

using hydrogen generates water vapor. CO₂ savings of up to 20 percent are therefore already possible at this point in the production process.

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“Today is a groundbreaking day for the steel industry,” said Premal Desai, Chairman of thyssenkrupp Steel Europe. “We are doing pioneering work here. The use of hydrogen is the key lever for climate-neutral steel production. Today’s test is another step in the transformation of our production which will culminate in green steel. At the same time, we see what is possible when business and government work together towards a common goal. We are very grateful to the state of North Rhine-Westphalia for supporting the project.”

Support from state of NRW

The project is being funded under the IN4climate.NRW initiative launched by the state government and is scientifically supported by the BFI research institute. The state government gave funding approval for the first test phase in April 2019. NRW economics and digital minister Prof. Dr. Andreas Pinkwart: “The project is an important step on the path to a greenhouse gas-neutral industry and a good example of how innovative key technologies can be developed in North Rhine-Westphalia. We need to keep driving the use of hydrogen in industry because it offers great opportunities, especially in steel production.”

From lab to industrial scale

The start of the test phase also marks the project’s transition to industrial scale. Preliminary investigations and simulations have been carried out over recent months. The tests in a working blast furnace take the project to the next level. “We want to reduce emissions with hydrogen while continuing to produce pig iron of the same quality,” explains Dr. Arnd Köfler, thyssenkrupp Steel Europe’s Chief Technical Officer. “At the same time we are breaking new ground with the tests on blast furnace 9 so it is now a question of continuously analyzing and evaluating the furnace’s operation. The results will help us to widen the use of hydrogen to all 28 tuyeres.”

Hydrogen infrastructure more and more important

Hydrogen will be a key driver of thyssenkrupp Steel’s climate strategy in the coming decades. Following the conversion of the blast furnaces, the company plans to build large-scale direct reduction plants, which will then be operating with hydrogen-containing gases, starting in the

mid-2020s. The sponge iron they produce will initially be melted down in the existing blast furnaces but in the long term will be processed into crude steel in electric arc furnaces using renewable energies.

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In Air Liquide the project has a partner on board for the injection tests who has expertise in the entire hydrogen value chain from production and storage to the development of end consumer uses. Gilles Le Van, CEO of Air Liquide Deutschland: “Hydrogen is the key to both the energy transition and industrial transformation. This special molecule can be both a raw material for industry and a medium for energy storage and recovery. At Air Liquide, we are convinced of the potential of a global hydrogen economy – and we bring more than 60 years of experience and innovation in this field to our joint project work. Together, we are shaping Germany’s hydrogen future and contributing to the achievement of climate goals.”

About thyssenkrupp Steel Europe

thyssenkrupp Steel Europe is one of the world’s leading suppliers of carbon steel flat products. With around 27,000 employees, the company supplies high-quality steel products for innovative and demanding applications in a wide variety of industries. Customer-specific material solutions and services around steel complete the range of services. With a production volume of approximately 12 million tons of crude steel annually, thyssenkrupp Steel is the largest flat steel producer in Germany.

<https://www.thyssenkrupp-steel.com/en/>

About Air Liquide

A world leader in gases, technologies and services for industry and health, Air Liquide is present in 80 countries with approximately 66,000 employees and in 2018 achieved sales of around 21 billion euros. The company supplies three quarters of the industrial companies in the DAX index and is thus an important pillar of the German economy. Air Liquide Deutschland is at home in NRW and is active in trade associations such as the German Chemical Industry Association (VCI).

<https://www.airliquide.com/>

About In4climate

With the “IN4climate.NRW” initiative, the state government is supporting the necessary transformation processes in industry. Experts from business, science and administration are working on strategies and solutions for how industry can maintain its competitiveness, generate additional growth and contribute to achieving the Paris climate protection goals.

<https://www.in4climate.nrw/>

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About BFI

As a non-profit research institute within the VDEh steel institute, BFI has been supporting the steel industry in particular with solutions for current and future challenges for 50 years now. It sees itself as a research partner who with its technical expertise and many years of experience creates the important link between research findings and industrial practice. New topics such as energy efficiency, process optimization, measurement technology and industry 4.0 are focal points of its research work.

<http://www.bfi.de/de/>

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