

thyssenkrupp's water electrolysis technology qualified as primary control reserve – E.ON and thyssenkrupp bring hydrogen production to the electricity market

- Large-scale electrolysis plants can be linked to the German electricity market via E.ON's virtual power plant
- Successful tests prove response speed and efficiency of the technology
- Important milestone for industrial power-to-X applications and sector coupling

thyssenkrupp has reached a further milestone in the reliable use of renewables: Its proprietary water electrolysis technology for the production of green hydrogen meets the requirements for participation in the primary control reserve market. In the future thyssenkrupp's electrolysis plants will be able to act as large-scale buffers to stabilize the power grid and compensate fluctuations quickly and flexibly. Operators can now link their plants to the German electricity market via E.ON's virtual power plant.

"With this we have achieved a further important goal. Earlier tests already demonstrated that our electrolysis plants can produce green hydrogen highly efficiently and with sufficient response speed and flexibility to participate in the energy balancing market. Our plants are thus making a significant contribution to ensuring both a stable power supply and the cost-effectiveness of green hydrogen," says Christoph Noeres, Head of the Energy Storage & Hydrogen unit at thyssenkrupp.

"The collaboration with thyssenkrupp is in line with our principle that the conversion of industry to clean energy must be realized cost-efficiently. Our expertise on all energy market issues has also eliminated a barrier to the viable use of hydrogen in electricity generation," says Stefan Hakansson, CEO of E.ON Business Solutions.

thyssenkrupp and E.ON conducted the necessary tests jointly in an existing water electrolysis plant operating as part of the Carbon2Chem® project in Duisburg. It was shown that thyssenkrupp's electrolyzers can increase and decrease their production at the speed required to participate in the premium primary reserve market. Prerequisites include being able to provide full supply within max. 30 seconds and maintain it for at least 15 minutes.

Green hydrogen and sector coupling are the key to a successful energy transition

In order to bring the fluctuating availability of electricity from renewable sources into line with electricity demand, solutions are needed for the storage and subsequent use of surplus energy. Water electrolysis produces green hydrogen that can be stored for hours, days or

months, converted back into electricity or used as a clean, CO₂-free starting material in the mobility sector or for the production of sustainable chemicals.

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Another central requirement is the need to stabilize the power grid against short-term fluctuations. As a two-in-one solution, thyssenkrupp's industrial-scale water electrolysis process meets both criteria, allowing operators maximum flexibility and cost-efficiency: Hydrogen production is ramped up within seconds when surplus energy needs to be used and scaled back when output is low. Plant operators can market their willingness to adapt flexibly to general electricity demand and thus generate additional revenues.

As part of the Carbon2Chem® project, thyssenkrupp's alkaline water electrolysis unit is already successfully supplying hydrogen for the production of chemicals from steel mill waste gases. In 2018 methanol was produced from steel mill gases for the first time. In the following year the production of ammonia succeeded. By contrast with conventional production methods, this process does not require fossil fuels such as natural gas, thus reducing CO₂ emissions in both steelmaking and chemical production. The technology can also be used in other industries such as cement production.

"We can already offer our customers economically viable solutions for energy storage and the production of sustainable chemicals. In this way we are making our contribution to building a stable and sustainable cross-sector energy system," says Sami Pelkonen, CEO of thyssenkrupp's Chemical & Process Technologies business unit. "Another good example is sustainable ammonia: With water electrolysis and our leading ammonia production process, we can supply integrated plants that produce ammonia from nothing but water, air and sunlight or wind."

The starting point for all sustainable value chains and an integrated energy system across the electricity, heat, mobility and industry sectors is large-scale water electrolysis. The technology is based on decades of experience gained by thyssenkrupp in chlor-alkali electrolysis. The patented design of the electrolysis cells allows system efficiencies of more than 80 percent. The electrolysis units are supplied as prefabricated 20 MW modules and can be combined easily into hydrogen plants with capacities in the multi-megawatt to gigawatt range

thyssenkrupp

thyssenkrupp is a technology group with strengths in materials. Over 162,000 employees in 78 countries work with passion and technological know-how to develop high-quality products and intelligent industrial processes and services for sustainable progress. Their skills and commitment are the basis of our success. In fiscal year 2018/2019 thyssenkrupp generated sales of €42.0 billion.

Chemical & Process Technologies

The Chemical & Process Technologies business unit combines unique technological expertise and decades of global experience in the engineering, procurement, construction and service of chemical plants. We develop innovative processes and products for a more sustainable future and thus

contribute to the long-term success of our customers in almost all areas of the chemical industry. Our portfolio includes leading technologies for the production of basic chemicals, fertilizers and polymers as well as complete value-chains for green hydrogen and sustainable chemicals.

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