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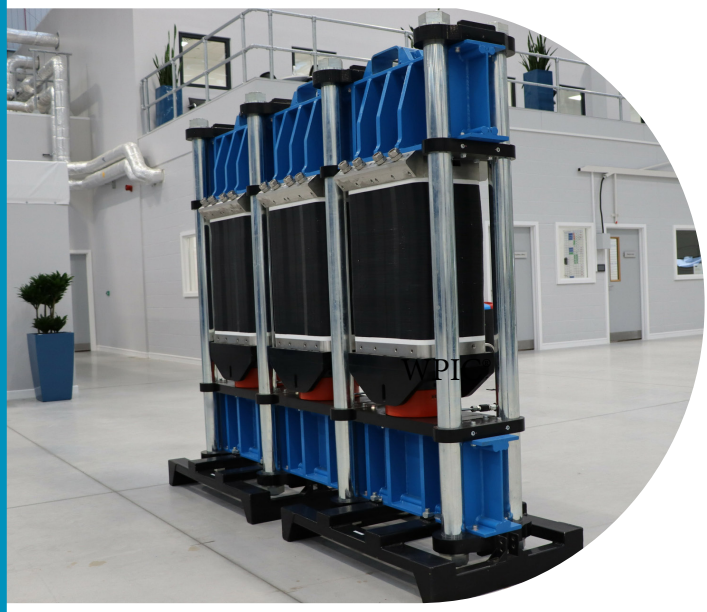
PEM electrolyser stack to be used at the Yara ammonia production plant to generate green hydrogen. Picture credit: Yara



FERTILE GROUND

Platinum's role in fertiliser production is long established – and it is now working to help the industry decarbonise

IIn the early 1900s, scientists developed the Haber-Bosch process for the mass-production of ammonia, a nitrogen-containing compound that plants absorb from the soil. Today, ammonia is the second-most commonly produced chemical in the world, used in huge quantities to make fertiliser.

The Haber-Bosch process was a game-changer for crop production, doubling the number of people that one acre of land could feed; currently it enables the provision of food for over 70 per cent of the world's population. However, ammonia production is energy intensive, requiring extensive use of fossil fuels; its manufacture contributes between one and two per cent of worldwide CO_2 emissions. Today, the chemical industry is looking at ways of decarbonising the production of fertilisers through the use of green hydrogen.

For example, earlier this year, Linde Engineering and fertiliser producer Yara announced the signing of a contract for the construction and delivery of a 24-megawatt green hydrogen electrolyser system at Yara's Porsgrunn ammonia plant in Norway. Porsgrunn is one of Norway's largest sources of CO_2 emissions outside the oil and gas industry, emitting around 800,000 tonnes per year. The project is expected to demonstrate that ammonia produced using green hydrogen can reduce the impact of carbon dioxide in fertiliser production and to serve as a feasibility study for future upscaling.

Nitrogen-based fertilisers are made by mixing nitrogen from the air with hydrogen at high temperature and pressure to create ammonia. Nitric acid, which is itself produced using platinum catalysts, is then mixed with the ammonia to produce nitrate fertilisers such as ammonium nitrate.

The green hydrogen demonstration plant will be the second 24-megawatt platinum-based electrolysis facility designed and constructed by Linde Engineering. Picture credit: Yara

Platinum-based electrolysers

The project at Yara's plant aims to partially replace hydrocarbon-based hydrogen production with green hydrogen made using platinum-based proton exchange membrane (PEM) electrolysers.

The plant will have an annual capacity of around 10,000 kg per day of green hydrogen that will replace chemical ethane as a raw material in production, thereby removing 41,000 tons of CO_2 emissions annually. The hope is that the resulting 'green' ammonia will be available from as early as 2023.

The green hydrogen generated will be able to produce 20,500 tonnes of ammonia each year which can be converted to between 60,000 and 80,000 tonnes of fertiliser, roughly five times the amount of fertiliser used for annual production of food-grade wheat in Norway.

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