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Atmonia ehf.

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Atmonia: Equipment for sustainable fertilizer production ready in about three years

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The innovative company Atmonia is working on two different products, both of which have the ultimate goal of producing fertilizer in a sustainable way – on any scale. The aim is for the first product to be launched in 2026 and the other two years later.

In recent years, the progress of Atmonia has been regularly reported here in Bændablaðið, as their technology will have a decisive effect on Iceland's potential for sustainable fertilizer production in the near future.

Considerable growth

According to CEO, Guðbjargar Rist, the company has grown considerably over the past year. "We now have a team of 20 people, and most of them work on research and development for the two projects. There has also been considerable business development work that has resulted in significant contracts with companies such as SABIC, which has paid for the exclusive rights to produce ammonia using Atmonia's technology in the regions of Saudi Arabia, Bahrain, Kuwait and Oman."

Guðbjörg says that one of the product types that is being developed involves capturing ammonia that escapes into the atmosphere and turning it into a valuable nitrate fertilizer. "When ammonia escapes into the atmosphere, it is not only a loss of value, but the release of ammonia causes serious environmental damage; such as acidification of lakes and seas. A large amount of ammonia is lost in this way every year, for example from manure. By converting this ammonia into value, you can save a huge amount on fertilizer purchases and reduce your carbon footprint. For example, the amount of nitrogen that is lost in the form of ammonia from manure in Iceland each year is



Guðbjörg Rist, CEO of Atmonia

believed to be similar to the nitrogen in the fertilizer that is bought to the country every year. Atmonia's product, which is scheduled to be launched on the market in 2026, fits particularly well with plants that are already producing methane gas from waste. The product is then simply connected to the gas collected from the waste, which contains both methane and ammonia. The ammonia is then separated from the methane and converted into valuable nitrate. Atmonia already has a pilot project underway with SORPU, where ammonia, which comes as a side product from methane gas production at the GAJA composting plant, is immediately converted into nitrate."

The search for the catalyst

Atmonia's other project involves the production of ammonia at ambient temperature and ambient pressure from water, air and electricity. "As long as sustainable electricity is used in the production, the ammonia produced is also sustainable. A grant of around 3.5 million euros for three years was awarded to this project from the European Union last year. A major milestone was also reached last year when Atmonia was able to conclusively prove for the first time that "catalysis" occurred in one of Atmonia's patented compounds. A "catalyst" is when a substance speeds up a chemical reaction.

In the case of the technology where ammonia is made, it can be said that the chemical reaction that creates ammonia from nitrogen in the air and water, with electricity, cannot take place without assistance. However, when the water and nitrogen come into contact with a certain metal alloy (the catalyst) – and while electricity is run through the catalyst, this desired chemical reaction takes place. Ammonia is then formed from nitrogen and water.

The search for this specific metal alloy, or catalyst, has been Atmonia's mission since 2012 and is all about finding the exact right catalyst that can do this," explains Guðbjörg. She adds that no researchers have previously been able to "stimulate" ammonia production in this way with an electric current, according to published scientific papers. Atmonia is currently working on improving the catalyst and it is expected that the first device of this type will be launched in 2028.

The devices can be installed at home on farms

In the other device, the process is being accelerated as ammonia turns into nitrate. "There are so-called biocatalysts at work, or enzymes." The enzymes are contained in bacteria isolated from nature. The bacteria are maintained inside a special tank that is being built by Atmonia.

When ammonia is pumped into the tank, the enzymes inside the bacteria - which are inside the tank - immediately convert the ammonia into nitrate, which is a more valuable and usable fertilizer than pure ammonia," says Guðbjörg. It is expected that a specialized manufacturing company will handle the production of the devices. Guðbjörg says that Atmonia will, however, set up the production of certain components for both devices, which will be essential for the efficient operation of the devices.

The devices that are intended to be brought to market will have a maximum output of 150 tons of ammonia per year on the one hand, and 23 tons of ammonium nitrate on the other hand. When Guðbjörg is asked about the possibilities for farmers to use the devices, she says that the devices can easily be installed directly at home on farms. "However, it will be much more economical in both

cases to produce the fertilizer from them in 'mini-factories', where perhaps 100 devices are run together at once, and the fertilizer is then transported to its destination."

More economical fertilizer production with Atmonia technology

She reckons that in Iceland it will be more cost-effective to use the equipment at home on farms for fertilizer production than to buy imported ready-made fertilizer, due to the fact that electricity is relatively cheap here, while retail fertilizer is expensive. "On farms abroad, it is uncertain whether efficiency is achieved with production directly on the farm due to high electricity prices and cheaper fertilizers on the market.

However, if the devices are assembled in "mini-factories" to Atmonia's specifications, and the fertilizer is then transported relatively short distances to 100 farms or more, it is fairly certain that fertilizer produced using Atmonia's technology will be more profitable than fertilizer sold on the market in most places in the world."

About Atmonia

Atmonia is an Icelandic tech startup company developing a sustainable process for ammonia production. Atmonia's mission is to significantly reduce greenhouse gas emissions with new technologies in the field of ammonia and nitrate production. The company's technology is both economical and environmentally friendly, and will contribute significantly in the fight against global warming. Atmonia's new technology will produce ammonia from air and water and will emit no greenhouse gases, but the current ammonia production method is responsible for 1-2% of the world's anthropogenic carbon dioxide emissions.

For further information: www.atmonia.com

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