

# Orion uses waste ethanol to reduce the nitrogen load in the Baltic Sea

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*The alcoholic liquid by-products generated at the production plant of Fermion, an Orion subsidiary, can now be used in saving the environment, thanks to innovative new technology. The by-product, which was previously destroyed as waste, is now used for cutting the nitrogen content of wastewater in significant amounts.*

A few kilometres outside the city of Hanko, two plants stand side by side, Fermion, an Orion subsidiary that manufactures pharmaceutical ingredients, and Genencor International, an enzyme manufacturer owned by Dupont. The two plants jointly own an industrial wastewater treatment facility, Hangon Puhdistamo Oy, which is operated by Genencor.

The nitrogen load flowing from the plants through the treatment facility into the sea has in recent years remained at the level of 100–150 kg/day, which is well below the legal upper limit of 200 kg. The two companies wanted to work together to further reduce their load on the Baltic Sea, especially now that both plants are anticipating growth in their production in the next few years.

A simple solution was nearer than anyone first imagined.

## From hazardous waste to mitigator of nitrogen emissions

“Denitrification, the removal of nitrogen, usually requires a source of carbon, which serves as a nutrient for microbes. Alcohol is a good source of carbon, and it also allows for easy adjustment of the denitrification process,” says **Martti Mikkola**, Plant Manager at Fermion’s Hanko unit.

This concept led to an idea that Mikkola put forward at the end of 2019: would it be possible to utilise the weak ethanol solution that is produced in vast quantities as a by-product during the manufacturing of a pharmaceutical ingredient produced at the plant?

“On an annual level, the volume of the alcoholic by-product produced is 200–500 cubic meters. It is classified as hazardous waste, as in addition to alcohol it also contains certain chemicals. The waste was taken to Fortum’s Riihimäki plant for disposal,” Mikkola says.

## Circular economy brings tangible results

Genencor were enthusiastic about Mikkola's suggestion and it was immediately taken up for further development to be rolled out at the wastewater treatment facility. The staff at Fermion's distillery developed a method by which the weak alcoholic solution is made into a liquid with an alcohol concentration of 50–80 per cent, which is more suited for recycling.

"The chemicals are captured in the light fraction which continues to be delivered to the Riihimäki plant for incineration, but on average more than 70 per cent of the waste solution is utilised in the water treatment circulation," Mikkola says.

In line with the principles of circular economy, the energy used in the distilling process comes from waste energy – and takes place at an existing facility.

The new process was tested at the wastewater treatment facility in early 2020, as soon as the environmental authority had issued the necessary permits. A major milestone in the year-long project was achieved in December 2020, when Fermion introduced a 20 cubic-metre container for the alcoholic solution processed at the distillery, from where it is led to the wastewater facility as necessary.

"The system is fully automated, so it takes up very little manpower," Mikkola says.

## Working for the environment and the Baltic Sea

According to Mikkola, the test runs of the new process have shown that the nitrogen load emitted into the sea can be reduced by at least 50–60 per cent from the previous levels.

"Orion is committed to work for a cleaner Baltic Sea. What we have achieved are very concrete steps to improve the state of the Baltic Sea," he says.

One cornerstone of Orion's corporate responsibility is to support the wellbeing of not only humans but also the environment. According to Mikkola, sustainability is not just rhetoric but also a real aspect in the plant's daily work and an important motivator for innovation.

"Our staff are proud to be able to build tangible solutions to help solve the environmental crisis."

*Text: Sanna Jäppinen*