KRÜGER VEOLIA

Phosphorus recovery at Helsingør Wastewater Treatment Plant, Utility Helsingør, Denmark

RESOURCE RECOVERY

The rather small Struvia facility at Helsingør WWTP produces about 100 kg phosphorus-rich struvite per day. The amount of phosphorus contained in the product corresponds to the same amount of phosphorus contained in 400 kg of standard NPK fertiliser. This means that an annual phosphorus production from the Struvia facility at Helsingør is enough to fill approx. 6,000 bags of standard NPK fertiliser of 25 kg each.

This shows that Resource Recovery does matter.

Struvia™ installation design criteria:

Reactor volume: 2.2 m^3 Treatment zone

Struvite concentration in reactor: Approx. 100 g/l

Hydraulic retention time: 30 minutes

Draft tube mixing in the treatment zone

Lamella for effluent polishing

Flow: 60 m^3/d

Treatment capacity: PO_4-P 15 kg/d

pH 7-8

NaOH for pH control

$MgCl_2$ for P-precipitation

Struvite production: 100 kg/d $NH_4MgPO_4 \cdot 6H_2O$

Product dryness: 80-90%

The customer's needs and wishes

"We want to be a "green" company and recover some of the resources that we expect to see a shortage of in the future," says Charly Dahlsen, Production Manager at the utility company "Forsyning Helsingør".

"We believe we demonstrate due diligence and sustainability by recovering phosphorus once the new technology is in place" said Charly Dahlsen, when the decision about the project was made. I.e. having focus on resource recovery for the benefit of the environment as well as the local community at Helsingør Municipality.

The decision to choose the Struvia™ technology was based on the advantages of low investment costs, simplicity as regards operation and product dewatering, small total footprint (55 m^2) and the low height (2.7 m), as the unit had to be installed in a basement room with a ceiling height of only 3.5 m.

The struvite produced at the facility has obtained the EU REACH approval and it has been approved by the Danish Ministry of Environment and Food as a 5-13-10 (N-P-Mg) fertiliser. I.e. it can be distributed locally or sold to foreign buyers. Either as an efficient, slow-release P-fertiliser product or as a P-source, that can be used in the production of standard or organic NPK-fertilisers.

The operational savings on chemicals for P-precipitation, the decreased sludge production and handling costs, plus the sale of struvite, are paying for the investment in the technology.

Struvia™ installation in shielded area in basement

Struvia™ reactor and struvite drainage system

Veolia's solution

The P-recovery technology, Struvia™, is supplied by Veolia's Danish subsidiary Krüger A/S.

Struvia™ is a compact, resource-efficient patented process, developed for the precipitation of struvite from waste streams with high concentrations of PO_4-P, such as reject water from dewatering of anaerobically digested sludge or industrial effluents.

The high phosphorus concentration in struvite allows for economical storage and transport of the product, which is essential in order to achieve improved resource efficiency

The development and the design of the Struvia™ technology applied at Helsingør Utility, is based on extensive testing and operating experience from pilot plant studies and demonstration tests performed on municipal and industrial effluents in several countries.

The Struvia™ technology has also been an important part of the EU's International phosphorus recovery project, P-REX, under The Seventh Framework Program.

Struvite production from wastewater is a step in Veolia's commitment to ensure sustainable management of natural resources by circular economy.

Struvite recovered from wastewater

At the Struvia facility, struvite is precipitated from reject water from the sludge dewatering process. Magnesium chloride ($MgCl_2$) is used for the precipitation process, and the pH levels can be adjusted, if required. The struvite product is continuously removed from the Struvia™ reactor and directed to a dewatering system. This system consists of a number of dewatering big bags, in which the water is drained off and the struvite is retained. An automated system controls the feed to the bags and shift to next empty bag when the desired filling degree has been obtained. The bags of struvite are then ready to be transported to the users.

After two weeks' storage, the dry matter content is approx. 70- 80%. If further stored, dryness above 90% can be achieved.

The run-off from the struvite dewatering and the overflow from the Struvia facility are returned to the inlet of the activated sludge system at the WWTP.

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