

concept
implementation of

Phosphogreen™

recycle phosphorus
from wastewater to
a valuable fertilizer

Marselisborg

wastewater
treatment plant
in Denmark

ready for the resource revolution

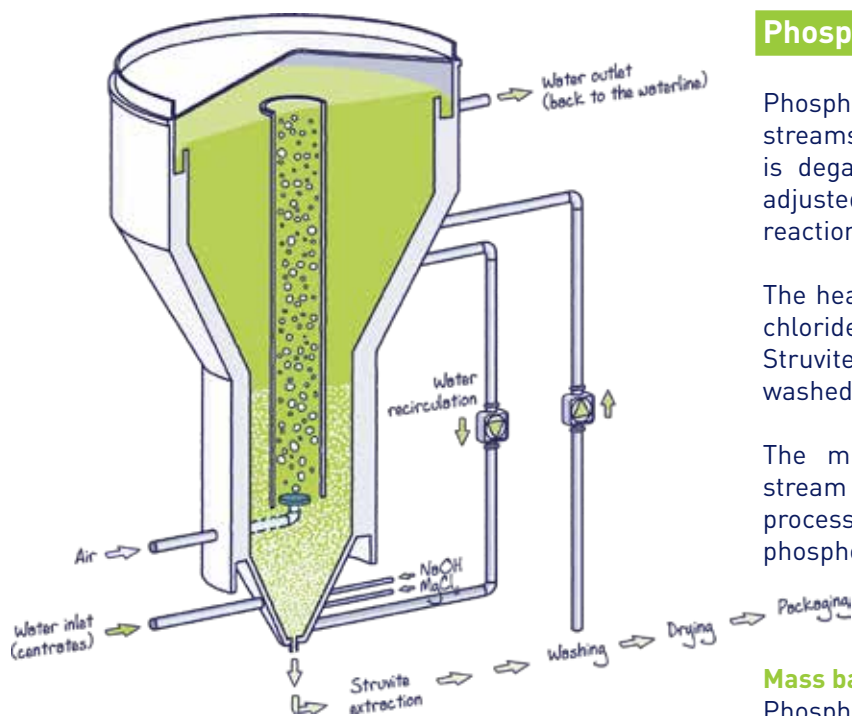


suez

recycle phosphorus
from wastewater to
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Phosphogreen™

Phosphorus is a non renewable resource essential for agriculture and food production. Without reuse of phosphorus depletion is foreseen in 100 years from now. The European Commission has classified phosphorus among the 20 "critical materials".



Phosphogreen™ technology

Phosphorus is recovered from phosphorus-rich side streams. They are introduced into the reactor where CO_2 is degassed by air injection. The pH is measured and adjusted if necessary by adding NaOH to optimize the reaction conditions.

The heart of the process consists in injecting magnesium chloride to obtain precipitation-crystallization of struvite. Struvite is then extracted at the bottom of the reactor, washed, drained and dried before being packaged.

The minimum phosphorus concentration in the side stream for the technical and economic viability of the process is 70 mg/L. It is often necessary to have biological phosphorus removal on the water line.

Mass balance with potentially up to 50% recovery

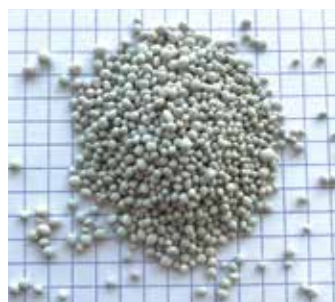
Phosphogreen™ recovers the phosphorus from a side stream in the WWTP and operates on two streams of phosphorous rich reject water.

One side stream from predewatering of bio P sludge and one from dewatering of digested sludge. Totally up to 40-50% of the phosphorus in the incoming wastewater can be recovered.

Struvite features

The process recovers phosphorus and converts it into an agricultural fertilizer – struvite.

- granule size: 1 to 3 mm
- 12,5% phosphorus
- 5,5% nitrogen
- 10% magnesium



Benefits

financial revenue



- commercialization of struvite as a fertilizer generates revenue
- return of investment: 5-10 years

savings on several levels



- reduction of chemical consumption
- less energy consumed for biological treatment
- increase of equipment service life thanks to controlled and localized precipitation of struvite
- reduction of sludge disposal costs by minimization of sludge volumes

sustainable development



- resource recycling: a contribution to the circular economy
- lower environmental footprint through energy savings



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aarhusvand



Marselisborg

committed
to sustainable
development

Marselisborg Wastewater Treatment Plant uses Phosphogreen™ solution to extract phosphorus via struvite from the wastewater and turns it into a valuable fertilizer. Harvesting struvite in a controlled way minimizes pipe clogging in the plant and thus reduces the expenses of maintaining the sewage works.

Phosphogreen™ at Marselisborg

The main reason for implementation of P-recovery solution was an existing problem of struvite scaling at Marselisborg plant. Nutrients recovery was a key factor for creating a green image for the plant.

Struvite is approved and registered as a fertilizer in Denmark. The product is called PhosphorCare™ by Aarhus Vand and sold on international private market.

Product quality

Struvite produced in the Phosphogreen™ plants is very clean and contains much less heavy metals than typical mineral fertilizer.

Heavy metals	Unit	Struvite 3 samples	Limits sludge applic. DK
Cd	mg/kg	< 0.02	0.8
Hg	mg/kg	< 0.1	0.8
Pb	mg/kg	< 0.2	120
Ni	mg/kg	0.3	30
Cr	mg/kg	< 0.1	100
Zn	mg/kg	2.7	4000
Cu	mg/kg	0.7	1000

The table shows the quality of the struvite based on the plant data from Aaby WWTP.

About the plant

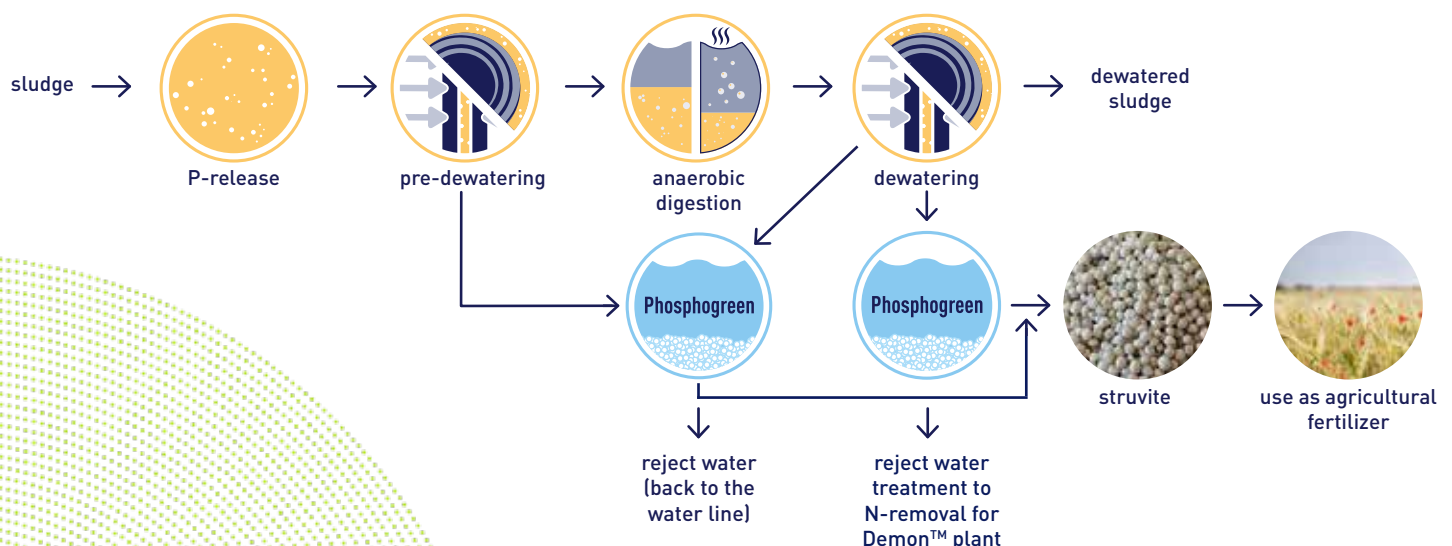
Marselisborg WWTP is the largest wastewater treatment plant in Aarhus with a capacity of wastewater equivalent to 200,000 persons (BOD).

Parameter	Unit	Load 2017
Flow	[m ³ /d]	26,687
BOD5	[kg/d]	8,235
Total N	[kg/d]	1,736
Total P	[kg/d]	231
PE ₅₀₀	á 60g BOD/pxd	137,000

The plant is a biological/chemical plant with partly biological and partly chemical P-removal, nitrification and denitrification. The reject water treatment includes a deammonification process based on a Demon™ reactor. For this reason the Phosphogreen™ process is divided into two different lines.

One line treating the final dewatering reject water and one treating a combination of pre-dewatering and final dewatering reject. Total struvite production range between 650-800 kg/day.

Process diagram



SUEZ references



Marselisborg WWTP, Denmark
capacity: 200,000 PE
2018



Villier Saint Frédéric, France
capacity: 40,000 PE
2020



Sausheim-Mulhouse, France
capacity: 490,000 PE
2021



Aaby WWTP*, Denmark
capacity: 84,000 PE
2013



Herning WWTP*, Denmark
capacity: 150,000 PE
2015

*through our partners

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