

ANPHOS®

Phosphate recovery at WWTP Land van Cuijk

Application

Ever since the presentation of Dutch initiatives like the 'Energy Factory' the interest for nutrient and energy recovery through selective treatment of WWTP process streams is increasing. Water is no longer considered a waste product, but treated like a raw material. Phosphate represents an obvious nutrient which can be readily recovered from waste water. At the WWTP Land van Cuijk (Haps, NL) phosphate is successfully reclaimed using an ANPHOS® installation in the sludge line since February 2011.

During sludge digestion the phosphate present is largely transformed into ortho-phosphate ($\text{PO}_4\text{-P}$) and nitrogen into ammonium ($\text{NH}_4\text{-N}$). After separation via centrifugation the rejection water from the purification unit is treated using the ANPHOS® process. In this process the rejection water is aerated first, thus inducing a positive pH shift. Subsequently the ortho-phosphate reacts with ammonia after the addition of magnesium hydroxide to generate magnesium ammonium phosphate ($\text{MgNH}_4\text{PO}_4\cdot 6\text{H}_2\text{O}$). This crystal is also called 'struvite'.



After the reaction the struvite is precipitated and de-watered. As such it can be commercialised as an (artificial) fertiliser. The retail of struvite is guaranteed. In this way the phosphate cycle is closed in a sustainable manner.

Results

In the rejection water 80 – 90% of the phosphate is present as ortho-phosphate. In the ANPHOS® process >90% of the ortho-phosphate is removed. Per kilogram ortho-phosphate removed 0,45 kg ammonium nitrogen and 1,3 kg magnesium react to generate 7,9 kg struvite.

Using the ANPHOS® installation about 20% of the entire daily phosphate load of the WWTP Land van Cuijk is removed. In addition to that the ANPHOS® process takes care of an additional removal of organic material (COD).

The operational costs for the de-phosphatization using ANPHOS® comprise of the dosage of magnesium hydroxide and of the aeration energy which is required to raise the rejection water pH.

The revenue of the ANPHOS® process comprises a.o. of the production of struvite which can be commercialised as an (artificial) fertiliser. At the same time the operational costs for the aerobic water purification are significantly reduced, because less chemicals (e.g. FeCl_3 , AlCl_3) are required for the precipitation of phosphate. This results in a much lower salt load in the effluent of the WWTP. Meanwhile the sludge production is much lower, resulting in the reduction of the sludge discharge costs. Furthermore the ANPHOS® process results in a lower COD- and NH_4 -load in the side stream, which leads to a reduced oxygen demand in the aerobic purification unit.

Apart from its inherent sustainability attributes all extra cost savings associated with the ANPHOS® process contribute to its interesting economics.

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