STW Olburgen/Aviko potato processing

PHOSPAQ™ and ANAMMOX®

Combining two technologies to maximize a sustainable effluent treatment at low total cost of ownership.

> We were convinced by the low power consumption, the recovery of resources and the limited space required. The performance of the plant shows we have made the right decision

Richard Haarhuis, Operational Manager of Waterstromen

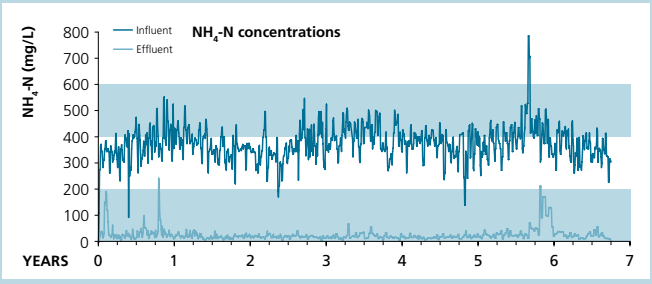
The challenge

- Stringent requirements for nitrogen en phosphorus
- Minimise total costs of ownership
- Maximise sustainability

The solution

- PHOSPAQ™ process converts phosphate to struvite
- ANAMMOX® process converts ammonium to N_2

Stable performance, high N Removal efficiency



The benefit

- Annual savings on discharge costs (> EUR 1.5 million)
- Comply with stricter EU regulations for nitrogen and phosphorous
- Production of 400 ton/year fertilizer (struvite)
- Compact process, smaller reactor volume (1,200 m^3 instead of 7,000 m^3)
- Less sludge production per year (600 tons)

Facts and figures

Aviko potato processing
- 100 tons/h potatoes
- Wastewater stream = 160,000 p.e.

Anaerobic pre-treatment
- 85% reduction of COD
- Biogas conversion into heat & electricity (600 kWe)

UASB effluent:
- 1,600 kg COD/day
- 1,000 kg NH_4-N/day
- 200 kg PO_4-P/day

PHOSPAQ™ process
- 80% PO_4-P reduction
- 400 tons/year struvite suitable as fertilizer
- 70% COD removal

ANAMMOX® process
- 90% NH_4-N reduction

The challenge

Since 1982, the wastewater of the AVIKO potato processing plant in Steenderen, the Netherlands, has been treated by the municipal STW Olburgen, based on anaerobic UASB technology. Aviko produces a wide variety of potato products. The wastewater contains proteins, starch and phosphate equivalent to a population of 160,000 persons.

In the UASB reactors the organic components (COD) is converted into biogas that is reused by conversion into electricity and heat (600 kWe). The effluent from the UASB reactors is discharged to the sewage treatment plant (Waterstromen) and still contains considerable amounts of COD, NH_4 and PO_4 which represents discharge costs of over EUR 1.5 million per year.

In 2003 it was decided to give Waterstromen the task to reduce the phosphate and nitrogen content of the anaerobic effluent, due to the new EWFD regulations. The challenge was to find a suitable process to remove these high amounts of phosphate and nitrogen at the lowest total cost of ownership, while maximising sustainability.

The solution

A comprehensive feasibility study by Waterstromen resulted in the selection of the PHOSPAQ™ process combined with the ANAMMOX® process to achieve their goals.

In the PHOSPAQ™ process effluent from the UASB reactors, with a small reject water stream coming from sludge dewatering on the STW, is fed to the PHOSPAQ™ reactor. Phosphorous and residual COD removal is combined in the reactor by means of aerated crystallisation. Under addition of MgO, phosphate is removed by precipitation as struvite. The struvite produced is harvested from the bottom of the reactor.
One of the advantages is the synergy obtained by combining P- and COD removal in the PHOSPAQ™ reactor. The design of the reactor ensures thorough mixing and a good struvite quality.

In the ANAMMOX® process ammonium is directly converted into nitrogen-gas by a combination of nitration and anammox bacteria, in one single stage.

The effluent water is discharged to the sewage works and further treated to reach surface water discharge quality.

Process advantages:

- Maximum generation of biogas, since no COD is needed for NH_4^- removal
- Energy savings up to 40% since less aeration is required
- Struvite complies with EU fertilizer standards and can be used as slow-release fertilizer

Waterstromen

The benefit

The combination of PHOSPAQ™ and ANAMMOX® processes provides many advantages. The plant offers Waterstromen a yearly saving on discharge costs of EUR 1.5 million. In addition, the removal of phosphorous and ammonium is over 80% and over 90% respectively. As a consequence, STW Olburgen complies with the stricter discharge limits for N and P.