

Circular Agronomics Tech Study

Phosphorus Recovery from soybean processing

Pilot plant in Ieper Belgium



NuReSys

World-wide reserves of P and K are under stress and eventually will become more scarce and threaten such as food and feed production. The EU is nearly completely dependent on import of these resources. Current phosphorus fertilizer increases losses to groundwater and run-off to surface water. A slow release P fertilizer could prevent this. P and K recovery producing a slow release precision fertilizer can be done by crystallization ($\text{NH}_4\text{MgPO}_4 \cdot 6\text{H}_2\text{O}$ or $\text{NH}_4\text{KPO}_4 \cdot 6\text{H}_2\text{O}$).

NuReSys technology crystallizes struvite by implemented the correct process conditions (pH and Mg dosing). The reactor can be used on sludge flows (e.g. digestate) or water flows. A boundary condition is that phosphorus has to be present as PO_4^{3-} at concentrations higher than 60 ppm. To produce K-struvite the NH_4 needs to be absent or depleted before K-struvite can be produced. After crystallisation the product can be extracted by sedi-

mentation and reused directly.

Soybeans do contain P as phytic acid and are also high in K. To implement struvite formation, the phytic acid will be hydrolysed by adding phytase enzyme. The generated wastewater also has the specific property that P is limiting and not Mg. So NH_4 -struvite can be produced by only pH adjustment and K-struvite is an option after aerobic treatment. Both approaches will be investigated and run as pilot trails in the Circular Agronomics project.

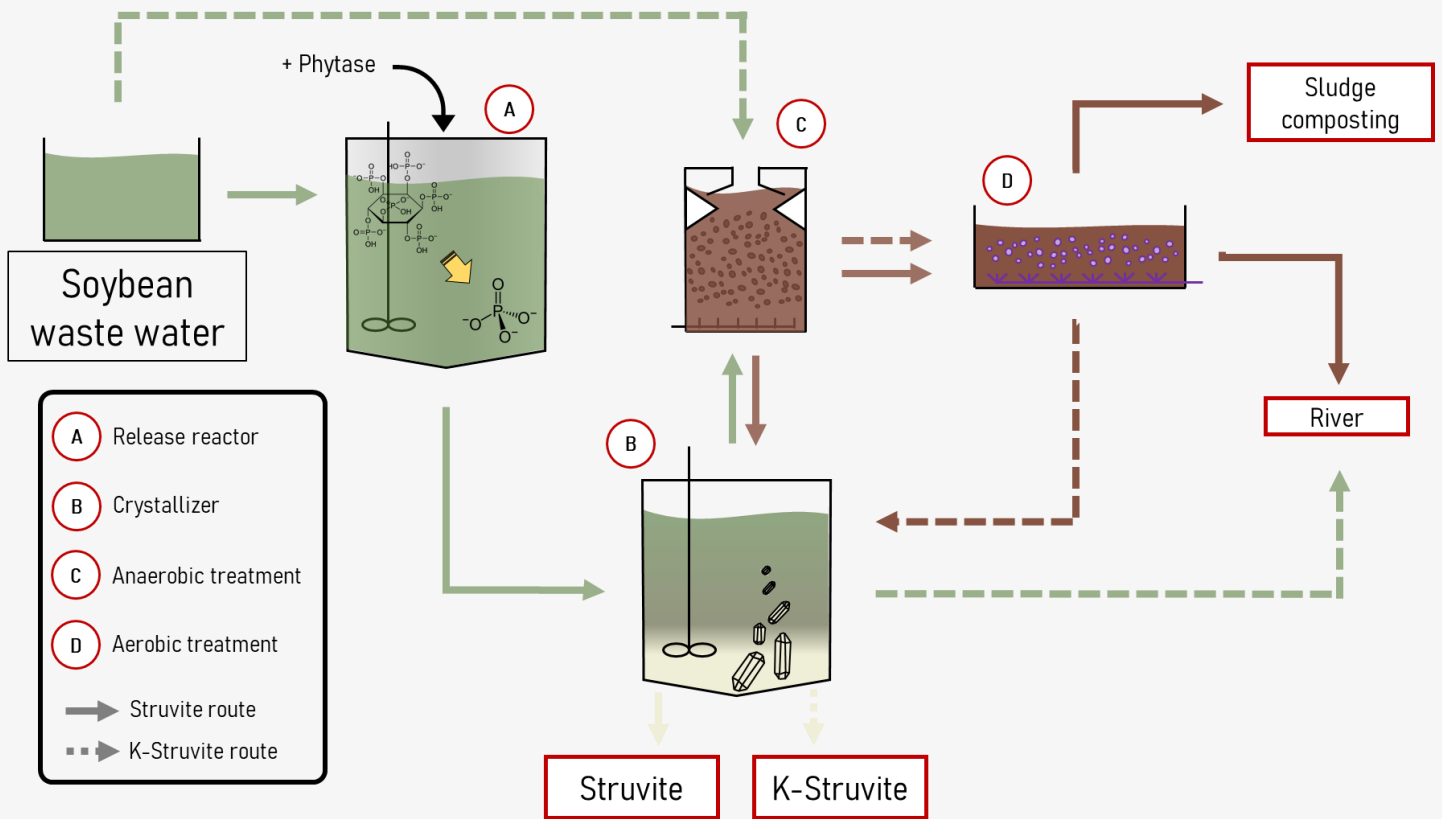
Operating conditions

T	25 – 40 °C
pH	7.8 – 8.8
HRT	60 min

Chemicals required

Phytase	10 $\mu\text{g/g}_{\text{COD}}$
MgCl_2	K-struvite
Removal efficiency	80 – 90 %





Unique Selling Points



- ➡ 60-65 % conversion of phytic acid to soluble $\text{PO}_4\text{-P}$
- ➡ 80-90 % P recovery possible with no reagent addition ($\text{NH}_4\text{-struvite}$)
- ➡ Production of non-soluble K-salt (K-struvite)
- ➡ Production of precision fertilizer ready for immediate reuse
- ➡ Key technology in regard to EU Greenddeal related to fertilizer impact