



TECHNOLOGY FACT SHEET

Phosphorus solubilisation and precipitation: RePeat

The RePeat (Recovery of P to eat) process is an acid-alkaline approach to separate solid fraction of digestate into a low-P soil improver and precipitated phosphate salts. The concept has been developed by Wageningen University and Research (Wageningen, The Netherlands) and Nijhuis Industries (Doetinchem, The Netherlands).

The Repeat installation consist of the following units:

- Acidification tank where solid fraction is mixed with process water and sulphuric acid
- Screw press 1 – leaching step 1
- Screw press 2 – leaching step 2
- Lamella clarifier to remove fines from the acid liquid fraction
- Precipitation reactor
- Settling tank to separate the precipitated P

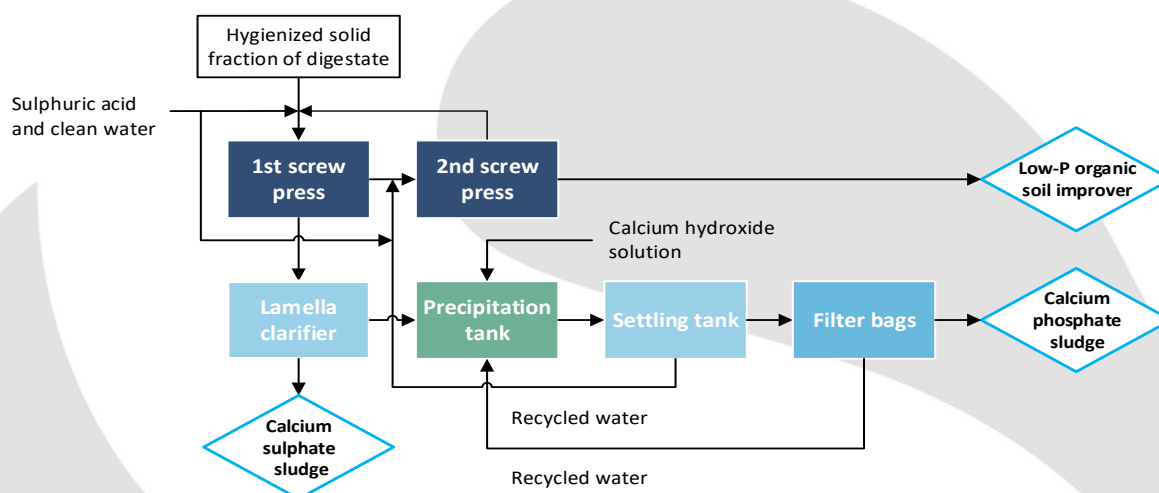


Figure **Fout! Geen tekst met de opgegeven stijl in het document.**-1 Process scheme of the RePeat installation at GZV (as configured in May 2020) (Brienza et al. 2020)

The solid fraction of co-digested pig manure after decanter centrifuge is diluted with process water that remains after the after the second leaching step (screw press 2). This way the solid fraction is liquid enough to be pumped to the acidification tank.

There the pH of the slurry is lowered to pH 5.5 through addition of 98% H₂SO₄ and the slurry is thereafter separated into a solid fraction and a liquid fraction by means of the first screw press.

The solid fraction is thereafter again mixed with process water (with a low P content), acidified to pH 5.5 and dewatered in the second screw press. This second leaching step removes residual P from the solid matrix, ensuring a high P removal efficiency.

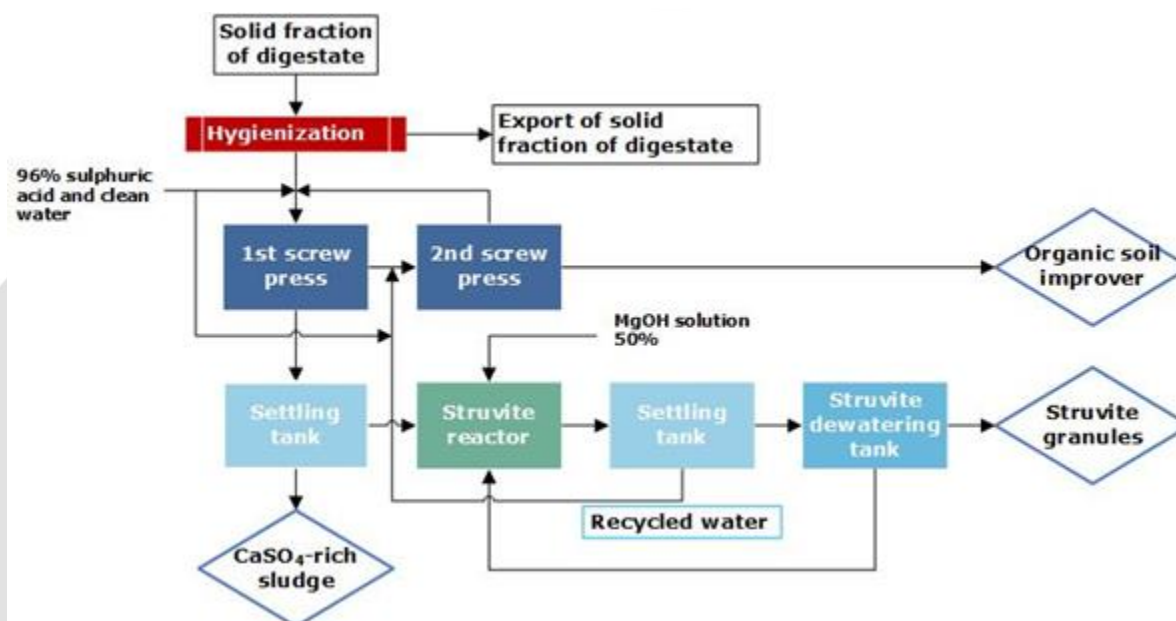


The liquid fraction after screw press 1 contains about 3000 mg/L of P mostly as ortho-phosphate (P-PO₄) and is treated by a lamella clarifier to remove fine organic matter prior to feeding it into the precipitation tank.

In the precipitation tank, phosphate precipitation is induced by increasing the pH to 7.0 through addition of a 45% Ca(OH)₂ suspension. The precipitation tank is continuously mixed by means of aeration and a screw. The volume of the precipitation tank (>30 m³) is large enough to ensure a hydraulic retention time of five hours.

The effluent of the precipitation tank is fed into a settling tank where the precipitated P salt is separated from the liquid based on difference in density. The sludge of the settling tank has a dry matter content of about 20%. The effluent of the settling tank is poor in phosphorus and recycled back to the second screw press.

The calcium phosphate salt sludge is pumped into a storage tank. An additional treatment step to increase the dry matter content of the slurry is foreseen. An alternative route also currently under development, is investigating the feasibility of P precipitation as struvite by adding Mg(OH)₂ instead of Ca(OH)₂.



Configuration of RePeat as to commence production in January 2020

Read more about the recovery efficiencies, energy requirements and costs in Chapter 2.2.9.1 of D 3.2 [Final report on schemes and scenario's for nutrient recovery and Reuse](http://www.systemicproject.eu/downloads).
www.systemicproject.eu/downloads → "project deliverables"

References

Brienza, Claudio, Inge Regelink, Micol van Puffelen, Jasper Dedeyne, Henk Giordano, Andrea Schepis, Harry Hoskyns Abrahall, Thomas Meier, and Ute Bauermeister. 2020. *D 1.4 Third Annual Updated Report on Mass and Energy Balances, Product Composition and Quality and Overall Technical Performance of the Demonstration Plants (Year 3)*. Vol. 5.

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