P-REX

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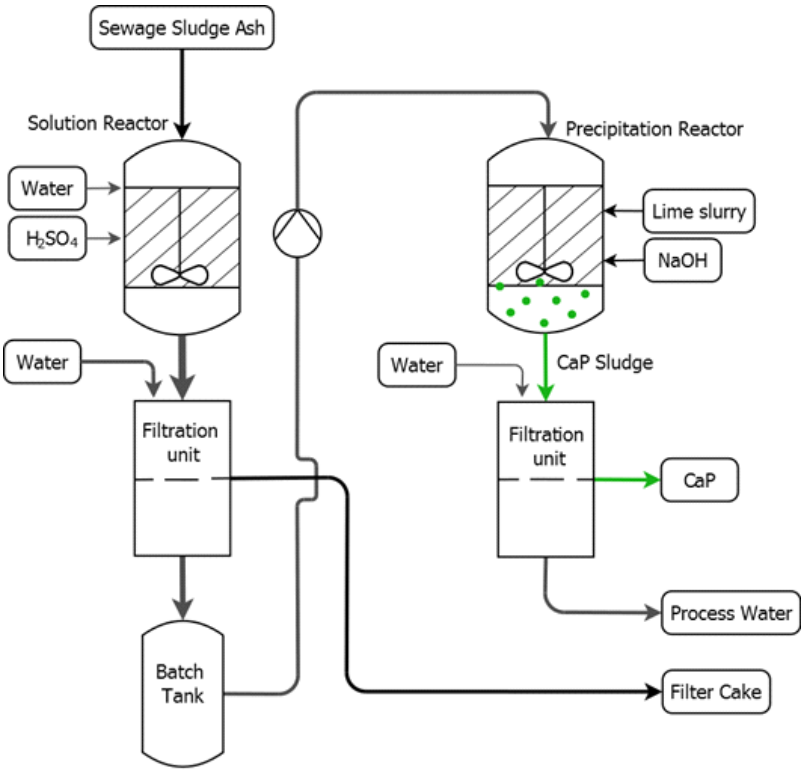
Leachphos® *Ash leaching*

Short description

LeachPhos was developed by BSH Umweltservice GmbH. Phosphorus (P) is extracted from sewage sludge ash (SSA) by addition of diluted sulfuric acid. 80-95 % of P is transferred into the leachate. The pH is subsequently increased by addition of sodium hydroxide or lime until target $P_{recovery}$ is achieved. Heavy metals such as cadmium, copper, and zinc are only partially dissolved and precipitated, leading to acceptable mass fractions in the output material. A mixture of aluminum-, ferric- and calciumphosphate is separated by filtration. The remaining heavy metals in the filtrate are quantitatively precipitated at pH >9 with a precipitating agent and are separated for disposal. Calcium phosphates or magnesium ammonium phosphate (struvite) are targeted output materials for future industrial-scale plants.

Process scheme



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This project has received funding from the European Union's Seventh Framework Programme for Research, Technological Development and Demonstration under the Grant Agreement no. 308645.

General Data

Type of Process	wet chemical
Type of Plant	leaching and crystallisation reactors
Input Material	sewage sludge ash
Product	CaP or struvite (wet)
P-concentration	20 - 40 % P_2O_5 of DM
P recovery performance[1]	70% of P in sewage sludge ash

Supply

Average total electricity demand[1]	1.6 [kWh/kg $P_{recovered}$]
Average chemical demand[1] (as 100% concentrate)	5.6 [kg H_2SO_4/kg $P_{recovered}$] 0.6 [kg NaOH/kg $P_{recovered}$] 3.9 [kg $Ca(OH)_2$/kg $P_{recovered}$]

Advantages

- Output material comparable to dicalcium phosphate
- High P content of output material
- Reduction of heavy metal content
- High process flexibility

Remarks

- Wet residual filter cake (60% DM) requires disposal (1.7 kg wet waste/kg ash) or additional treatment.
- Process data does not include a potential finishing (e.g. drying, granulation) of the wet LeachPhos output material (40-50 % DM).
- Higher recovery rates can be reached depending on ash composition and output quality requirements

Patents and Licenses

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References

Pilot study BSH 2012/2013

Amount	40 t sewage sludge ash
Throughput	2 t ash/h

Pilot plant at FHNW

Batch process with 50 kg ash

1Process data related to reference sludge line defined in P-REX (ash of wastewater treatment plant for 1 Mio inhabitant equivalents), ash composition (% DM): 10.7% P, 5% Fe (EBPR ash) or 15% Fe (ChemP ash). More information on modelling can be found in fact sheet "reference model" and P-REX LCA report.

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