P-REX

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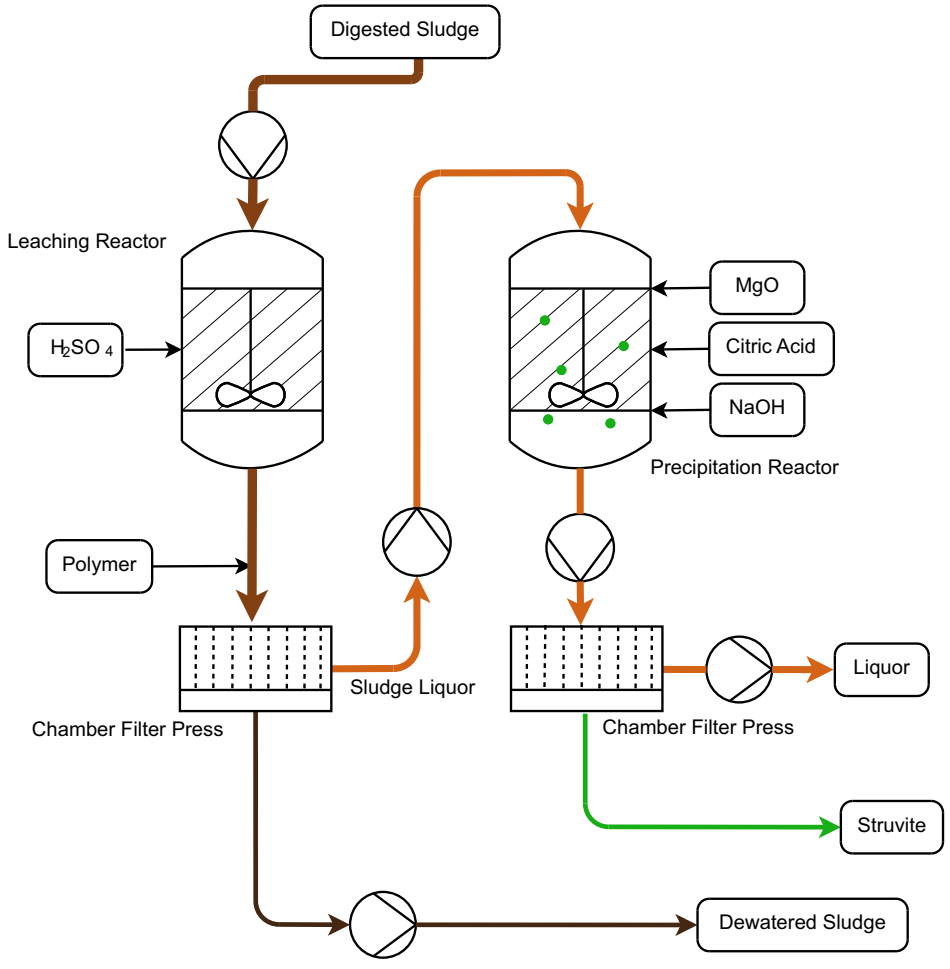
Stuttgart *Sludge leaching*

Short description

The STUTTGART process for P recovery from digested sludge of chemical P removal WWTPs was developed at University of Stuttgart by the Institute for Sanitary Engineering (ISWA). The process is based on acidic extraction of P from digested sludge at pH 4 with addition of H_2SO_4. After solid/liquid separation, dissolved Fe and heavy metals in liquor are masked by citric acid to prevent their transfer into the P product. Struvite precipitation is initiated by dosing of MgO and raising pH to 8, adjusted with NaOH. Finally, struvite is harvested as a powder by solid/liquid separation and dewatering/drying.

Process scheme



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	acidic dissolution and precipitation
Type of Plant	extraction and precipitation reactors
Input Material	sewage sludge
Product	struvite
P-concentration	27 % P_2O_5 of DM
P recovery performance[1]	45 % of P in sludge input

Supply

Average total electricity demand[1]	4.8 [kWh/kg $P_{recovered}$]
Average chemical demand[1] (as 100% concentrate)	11.9 [kg H_2SO_4/kg $P_{recovered}$] 1.5 [kg MgO/kg $P_{recovered}$] 1.2 [molar ratio Mg:$P_{recovered}$] 1.0 [molar ratio Mg:$P_{dissolved}$] 2.7 [kg NaOH/kg $P_{recovered}$] 3.9 [kg $C_6H_8O_7$/kg $P_{recovered}$]

Advantages

- Process applicable for WWTP sludge from enhanced biological or chemical P removal
- Complexation of Fe and heavy metals with citric acid
- Proportional reduction of phosphorus and nitrogen return load from sludge liquor

Remarks

- Higher rates of P recovery are possible at a pH lower than 4, but with reduced dewaterability and increased chemicals consumption
- Citric acid consumption depends on metal concentration (Fe) in input sludge

Patents and Licenses

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References

Offenburg (Pilot plant)

Start of operation	2011
Scale	8.000 PE
P yield	50 kg struvite/d

[1]Process data related to reference sludge line defined in P-REX (digested sludge of wastewater treatment plant for 1 Mio inhabitant equivalents, dry matter (DM) content: 3%, P content: 4.2% of DM, PO_4-P in liquor: 200 mg/L (EBPR) or 10 mg/L (ChemP), Fe content: 2% (EBPR) or 6.6% (ChemP)).More information on modelling can be found in P-REX LCA report.

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