Inline P-Filter

Removal of phosphorus by adsorption on iron

Interreg North Sea Region NuReDrain
European Regional Development Fund
EUROPEAN UNION

Benefits

+ Can be used on existing collector tile drain systems
+ Long-term filter effect
+ Easy-to-operate, to maintain & to renew
+ Cheap filter material (only transportation costs)
+ Limited space needed
+ No energy supply necessary

Limitations

- Additional material & installation costs
- Maintenance work necessary
- Filter effect reduced by clogging (use Pre-filter)
- Reduced flow when low gradient

Working principle and installation

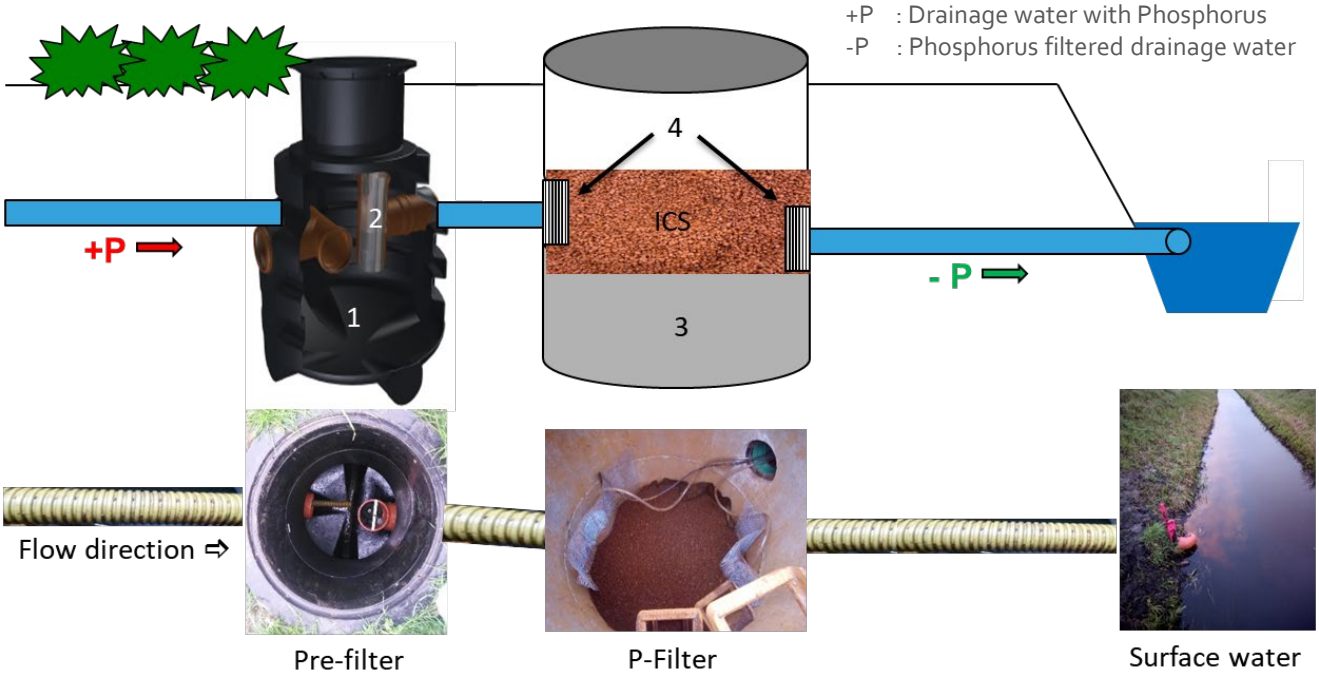
Mechanism

Tile drainage water enters the Pre-filter. Most of the mineral and organic substance carried along settles. The water flows through a sieve into the P-Filter, which consist of Iron-coated sand (ICS). ICS is a by-product of regional drinking water production. Phosphorus is bound to the iron, the resulting iron phosphate is retained on the filter material. The water is then discharged into the receiving surface water.

Measured filter performance: 83% of total P removed.

Legend

1 : Pre-filter
2 : Filter sieve
3 : Substructure filter material
4 : Filter screen
ICS : Iron-coated sand (> 3 mm)
+P : Drainage water with Phosphorus
-P : Phosphorus filtered drainage water



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Conditions for installation and application

Technological

- Upgrade of existing collector systems
- Filter shafts: concrete elements (or other, depending on price, availability & practical use)
- Filter material: Iron-coated sand (ICS)
- A sufficient gradient ensures the water flow through the filter material
- Added value compared to sheet cover & bedding of drainage pipes: long-term nutrient filter performance, renewable, modifiable, replacement of filter substrate and substrate type possible in own work

Practical

ICS Range of use with regard to P-content in water

- Suitable for low (open ground cultivation) and high (greenhouse) P concentration
- Do-It-Yourself (DIY) design & maintenance

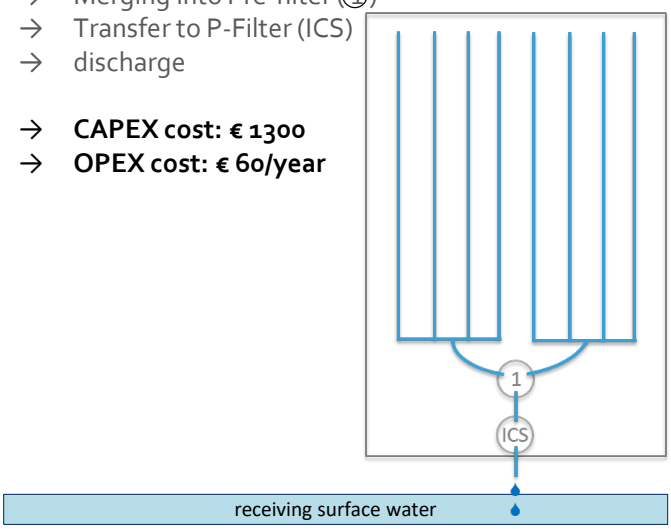
Lifespan of P-Filter material

- Depends on P concentration

Economical

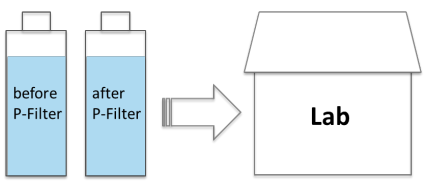
- DIY extension of an existing tile drain collector system with a P- Filter:
  - → Drainage water from open ground cultivation
  - → Merging into Pre-filter (①)
  - → Transfer to P-Filter (ICS)
  - → discharge

  - → **CAPEX cost: € 1300**
  - → **OPEX cost: € 60/year**



- Without narrowing & crampons:
  - → No special manhole cover required
  - → Mechanical lifting of the filter material
  - → ICS in big bags

- Check degree of saturation of the filter material by taking a water sample before and after the filter.



Important

- Reduced efficiency when clogged.
- Check degree of saturation of the filter material.

Legal

- Check legal requirements for the treatment of drainage water discharge.
- Standard for Total P discharge in surface water: 0,1-0,3 mg/l (Rakon, German classification).