Moving Bed BioReactor

Nitrate removal by biological denitrfication

€ 3,000-50,000 + € 1,000 – 3,000/y
Flow: 3-15 m³/d
PO4 removal
NO3 removal
Plant Protection Product removal
OM removal

Benefits

+ Compact and straightforward design
+ Easy-to-operate
+ Withstands temperature fluctuations and peak loads
+ No sludge disposal
+ Customized design for each application is possible

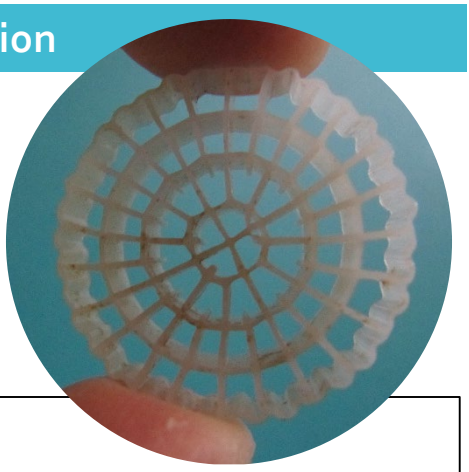
Limitations

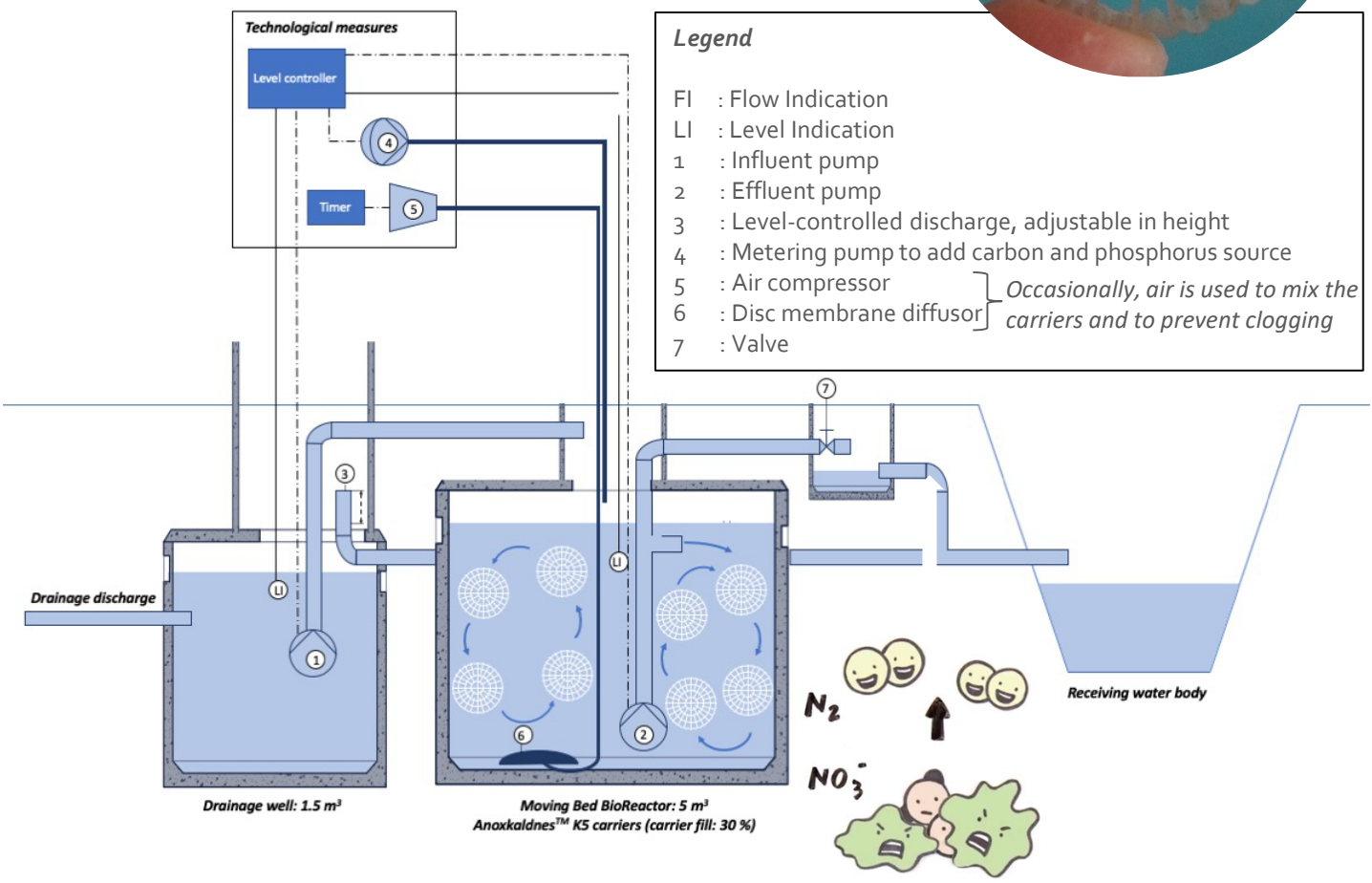
- Energy supply is necessary
- Low water temperatures affect the removal efficiency in the MBBR system
- Residues of pesticides can negatively influence the efficiency
- No N recovery

Working principle and installation

Mechanism

Under anoxic conditions, denitrifying bacteria convert nitrate to the harmless nitrogen gas in the presence of a suitable electron donor, i.e. a glycerol-based carbon source. The bacteria grow within a biofilm fixed onto the moving carriers of the Moving Bed BioReactor (MBBR).





Legend

FI : Flow Indication
LI : Level Indication
1 : Influent pump
2 : Effluent pump
3 : Level-controlled discharge, adjustable in height
4 : Metering pump to add carbon and phosphorus source
5 : Air compressor
6 : Disc membrane diffusor
Occasionally, air is used to mix the carriers and to prevent clogging
7 : Valve

Interreg North Sea Region NuReDrain European Regional Development Fund
EUROPEAN UNION

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Conditions for installation and application

Technological

- Carriers: AnoxKaldnes K5 carriers (800 m²/m³)
- Anoxic conditions are necessary
- External carbon source needed to maintain denitrification (COD/N ratio = 5)
- Energy efficient mixing by intermediate aeration
- Denitrifying capacity of MBBR is determined by:
  - → type and quantity of carriers in the reactor;
  - → type and amount of carbon source dosed;
  - → water temperature.

Practical

Low flow, low budget MBBR application

- Flow rate: ± 3 m³/day
- Ideal for drain water effluent of greenhouses
- Needs to be installed in a roofed (and warm) environment
- Self-construction design

High flow MBBR application

- Flow rate: 7,5 - 15 m³/day
- Ideal for drainage water of greenhouses and open ground cultivation
- Underground installation or in container

Economical

- Low flow, low budget application (3 m³/d):
  - → Greenhouse drainwater effluent
  - → CAPEX cost: € 3 000
  - → OPEX cost: € 1 000/y

- High flow MBBR in container (15 m³/d):
  - → Drainage water from open ground cultivation
  - → CAPEX cost: € 50 000
  - → OPEX cost: € 6 000/y

- High flow underground application (7,5 m³/d):
  - → Greenhouse drainage water
  - → CAPEX cost: € 15 000
  - → OPEX cost: € 4 000/y

- High flow underground application (15 m³/d):
  - → Drainage water from open ground cultivation
  - → CAPEX cost: € 30 000
  - → OPEX cost: € 5 500/y

Important

- Reduced efficiency in cold conditions
- Continous dosing of a carbon source is mandatory

Legal

- After efficient nitrate removal, the drainage water can be discharged or spread on grassland.
- The EU standard for discharge in surface water is 50 mg NO_3/L.