WEHRLE

TREATMENT OF DIGESTATE / MBT EFFLUENT / LIQUID MANURE

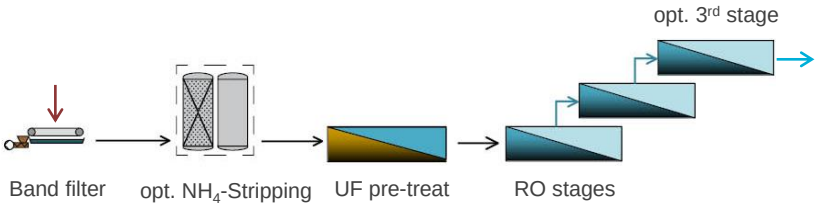
Energy Technology · Environmental Technology · Manufacturing

TREATMENT OF

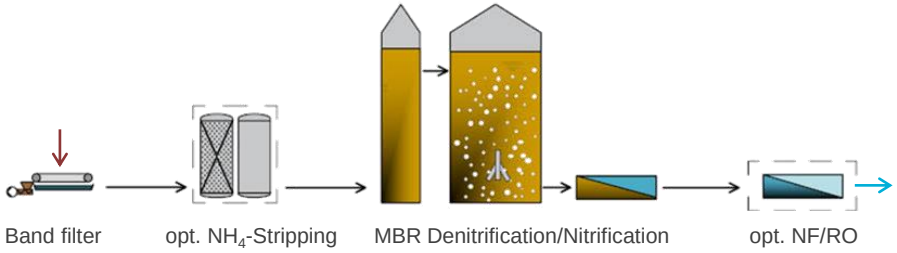
- ▶ DIGESTATE
- ▶ LIQUID MANURE
- ▶ MBT-EFFLUENT

TECHNOLOGIES

BF/UF/RO



BF/MBR



Ultrafiltration & Reverse Osmosis

- *Separation/concentration* method
- Effluent contains some NH_4-N
- Nitrogen recovery by RO concentrates and optional stripping

Membrane Bioreactor

- *Elimination* method
- Effluent free of NH_4-N
- Nitrogen recovery by optional stripping
- Easy upgrade to water re-use

TECHNOLOGY COMPARISON

Criteria	BF/UF/RO (concentration)	BF/MBR (elimination)
Invest Costs*)	≈ 0.9 M€ (@ 100 m³/d)	≈ 1.1 M€ (@ 100 m³/d)
Basic Operational Costs*)	10 … 15 €/m³	8 … 12 €/m³
Chemicals	😐	☺
Operational hours p.a.	> 7.500 h	> 8.200 h
Discharge	😐 (contains NH_4-N)	☺
Main Benefit	Compactness	Robustness

*) depending also on further factors

Highest Nitrogen recovery!

Highest process stability!

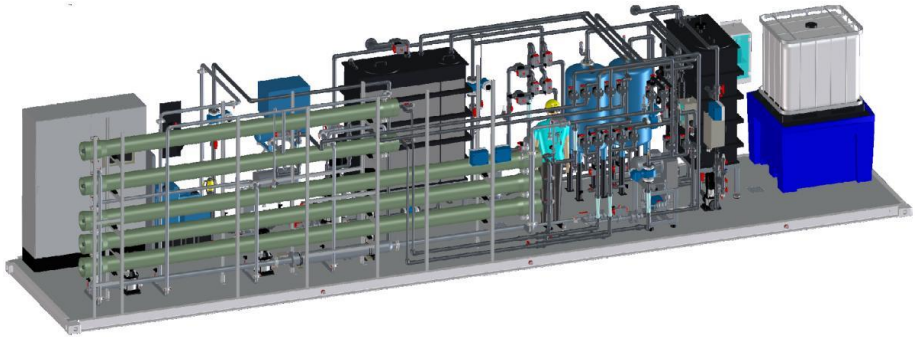
UF/RO

Characteristics

- Separation of pollutants by pressure
- Pressure depending on the pollution, up to 80 bar
- Rejection characteristics selectable by choosing appropriate membrane

Features

- Very compact design, e.g. in container
- Easy to install & start up
- No activated biology required
- Generates concentrate that may be re-used or disposed of

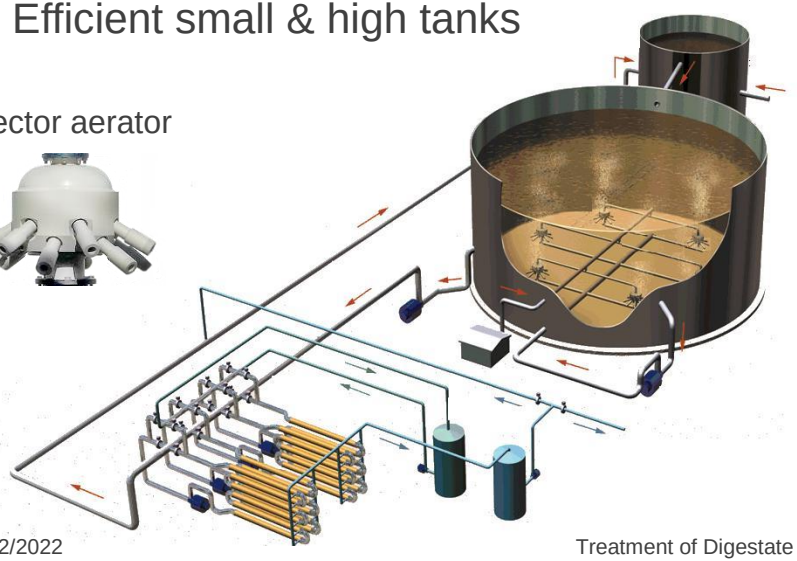


MBR (BIOMEMBRAT®)

Characteristics

- Elimination of pollutants by microbes
- Cross Flow: external membranes
- Maintenance free ejector aeration
- Efficient small & high tanks

Ejector aerator



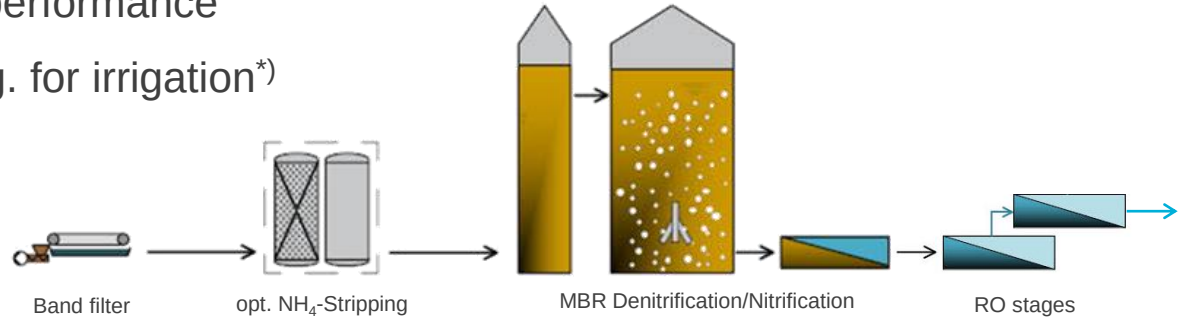
Features

- Very compact design, small foot-print
- Membranes separated from aeration
  → less precipitation on membranes
- Self-cleaning effect on membranes
- Very low chemicals requirement / CIP
- Very high membrane lifetime

WATER RE-USE BY COMBINATION OF TECHNOLOGIES

- Benefits of both technologies combined
- Sustainable high cleaning performance
- Effluent can be re-used, e.g. for irrigation*) free of pathogens and APIs

*) depending on local regulations



Exemplary plant performance

	Inlet [mg/l]	TS [%]	MBR [%]	RO I [%]	RO II [%]	Outlet [mg/l]
COD	70.000 … 100.000	40 … 70	99	99,9	99,99	≤ 25
NH_4-N	2.000 … 7.000	5 … 10	99,9	99,99	99,999	≤ 1
TN	3.000 … 8.000	20 … 60	90 … 99	95 … 99,5	99 … 99,9	≤ 10
TP	500 … 2.000	60 … 90	98	99	99,9	≤ 0,15
K	1.500 … 5.000	5 … 10	5 … 10	85	95	≤ 100

THERMAL UTILIZATION OF SOLID WASTE

WEHRLE Fluidized Bed Technology K³

- Screen overflow
- Solid digestate & manure
- Refuse Derived Fuel (RDF)
- Biomass & contaminated waste wood

Features

- Small-sized, decentral plants
- High plant flexibility, wide fuel spectrum
- Optional energy production

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