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Membrane Bio Reactor with Submerged Plate Type Filter

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Results

Introduction

The combination of a mixed liquor tank with a membrane filtration for the separation of mixed liquor is called membrane bio reactor. The membrane filtration replaces the conventional final clarifier (sedimentation) for the separation of the mixed liquor. The use of membranes compared to classical sedimentation offers the following advantages:

- 100% retention of bio-mass
- higher concentration of bio-mass in the reactor
- effluent without particles and low content of germs
- no building of flocs in the mixed liquor necessary (no problem with bulking sludge)
- further treatment, e.g. reverse osmosis, possible without problems

Test Setup

The setup for the trials is shown schematically in Fig. 1.

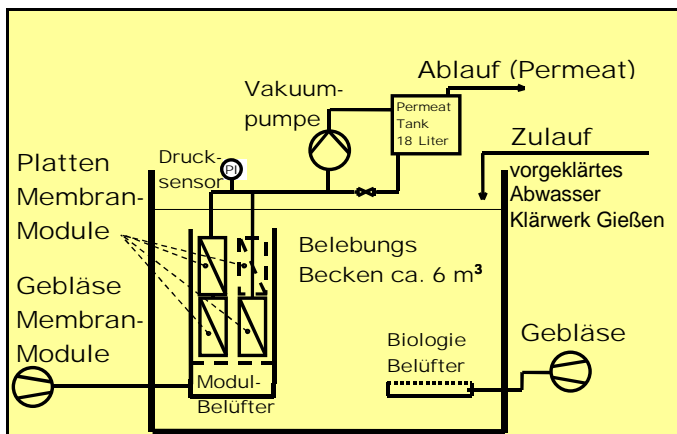


FIG. 1: Test plant for a membrane bio reactor

A tank with a volume of 6 m³ is filled with mixed liquor with a concentration of dry solid matter of 12 g/l. The influent is pre-treated water of the municipal sewage treatment plant at Giessen (screen with a gap of 25 mm, sand trap and primary sedimentation tank). The membrane modules are submerged into the mixed liquor tank and are aerated constantly (Air-Flush).

The filter modules are plate type modules of WEISE WATER SYSTEMS, consisting of 24 parallel membrane plates with a total area of 3,5 m² (per module). The cut-off of the membranes used equals roughly a pore size of 0,05 µm. Of each type respectively one or two modules are mounted on top of each other.

1. Flux and Permeability

FIG 2 shows the flux and the permeability of the two membrane types (PAN or PES), resp. the configuration (one or two modules on top of each other) vs. time.

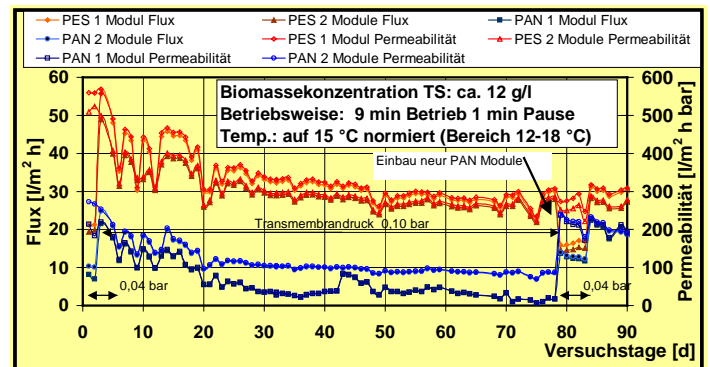


Abb. 2: Flux and Permeability vs. time for the modules placed inside the membrane bio reactor

The flux of the PES membranes stabilises in the range of almost 30 l/m²h and the old type PAN membrane in the range of 10 l/m²h. After changing the PAN modules, their flux is in the range of 20 l/m²h. It could not finally be concluded, if placing two modules on top of each other has disadvantages.

No problems with fibrous substances could be observed, although there was a high load of hairs and other fibres (no fine screening in pretreatment)

2. Effluent Quality

The high hygienical quality of the effluent treated by the membrane bio reactor compared to the effluent of a conventional sewage treatment plant is clearly shown (see table 1).

Tab. 1: Effluent Quality of the membrane bio reactor compared to the effluent values of the MSTP Giessen and influent values

parameter	influent (from prim. sediment.)	effluent membrane bio reactor	Effluent MSTP Giessen
Colony forming U.I	300.000 CFU/ml	1 - 1.000 CFU/ml	10.000 CFU/ml
Coliforms	4.000.000 /100 ml	n.m *	30.000 /100 ml
Escherichia coli	2.000.000 /100 ml	n. m.*	20.000 /100 ml

* n. m. = not measurable

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