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# Membrane Bioreactor with upstream Aerated Lagoon / EU-LIFE Project

## Lagoon-Memb

## Saarland / Germany

Funded under the EU-LIFE program and by the Ministry for the Environment of the State of Saarland, the LAGOON-MEMB plant concept has been commercially implemented in a first-of-its-kind plant.
The plant concept combines an upstream aerated lagoon for solids retention and hydraulic buffering with a highly effective membrane bioreactor unit providing excellent disinfection. This novel plant concept is paving the way for the treatment of wastewater to bathing water quality at economical membrane surface area requirements, and is thus amenable to a great variety of grey water applications.

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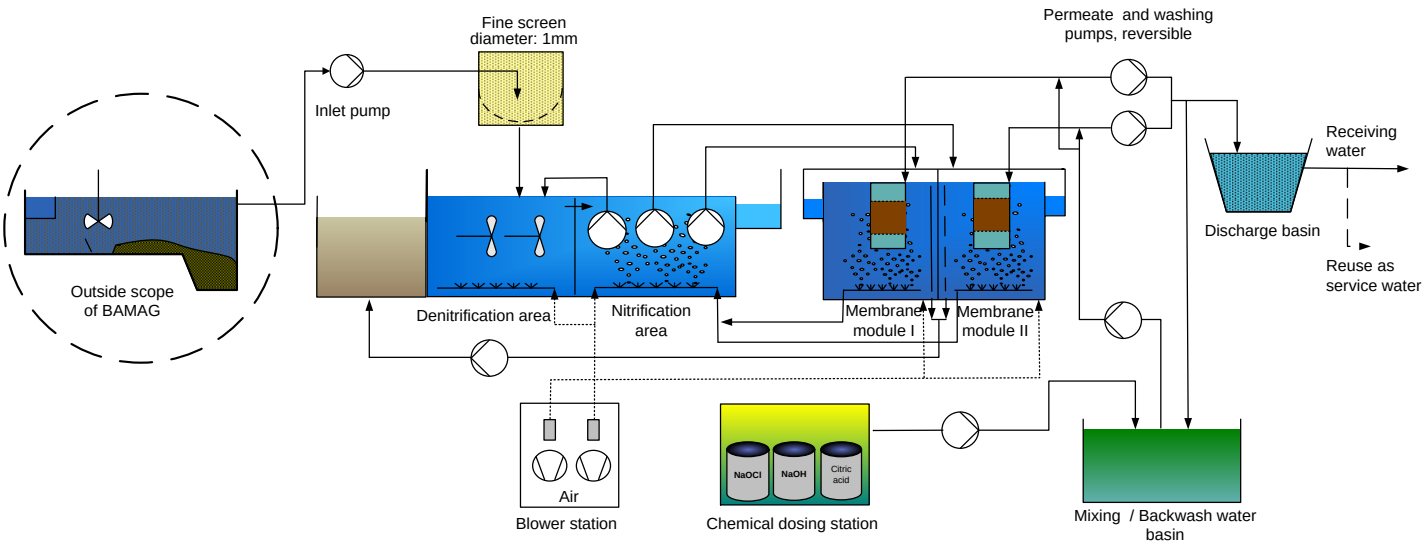


Membrane technology is known for its effectiveness in separating activated sludge from the mixed liquor after biological treatment of municipal wastewater and for producing a high-quality treated effluent. The novel treatment concept using an upstream aerated lagoon allows the membrane surface area to be drastically reduced. In addition, the upstream lagoon contributes to the operating reliability of the MBR unit by levelling out hydraulic and load fluctuations, providing partial reduction of the organic load and eliminating fats and fibres.

## 1. Objective

Treatment of municipal wastewater

Design data

| | |
|---|---|
| Wastewater flow, max. | 14.4 m³/h |
| BOD load | 23.1 kg/d |
| COD load | 46.2 kg/d |
| TKN | 6.9 kg/d |

Treatment objectives

| | |
|---|---|
| BOD5 | 15 mg/l |
| COD | 90 mg/l |
| NH4-N | 10 mg/l |
| Ntot | 25 mg/l |
| pH | 6.0-8.5 |

## 2. Plant concept

The plant consists of two treatment stages serving the following functions:

1. Upstream aerated lagoon

- Retention of sand, coarse matter and float in the intake area
- Buffer volume for stormwater treatment
- Sludge storage
- Levelling out fluctuations in load and biological pre-treatment

2. Aerobic membrane bioreactor

- Advanced biological treatment (BOD5 removal, nitrification / denitrification)
- Effective solid / liquid separation and maximum retention of bacteria and
- faecal viruses

Unit processes

Pre-screening
biological treatment including nitrogen elimination, membrane filtration

Description

The wastewater is fed to the aeration tank by a frequency-controlled pump (interface to upstream lagoon system).

Screening unit

The influent is routed via a drum- type screen with a mesh size of 1 to 2 mm.

Bioreactor

The bioreactor consists of an upstream denitrification zone, a nitrification zone and a sludge storage compartment.

From the nitrification zone, the activated sludge is pumped into the membrane chambers. Sludge recirculation is by gravity.

Membrane filtration system

The membrane filtration system consists of 2 parallel membrane filters with 2 separate filter chambers, each with provisions for in-situ chemical cleaning and manual intensive cleaning in the dry state. The membrane filter is the first of its kind to use the novel membrane modules manufactured by Puron.

The permeate is drawn off by reversible rotary piston pumps into a backflush tank.

By reversing the direction of flow, these pumps are also used as backflush pumps.

Aeration for both scouring and fouling control of the membrane surfaces and oxygen supply to the activated sludge process is accomplished alternately (air cycling).

The MBR unit will be controlled from a central control station.

## 3. Plant characteristics

1 drum-type screen

| | |
|---|---|
| Mesh size | 1 mm |
| Screen area approx. | 1.5 m² |

1 aeration tank

| | |
|---|---|
| Volume | 80 m³ |
| Nitrification volume | 40 m³ |

Aeration system:

Aeration grid

| | |
|---|---|
| Max. influent rate | 14.4 m³/h |
| DS content | 8-12 g/l |

Agitators

O2 control, recirculation pumps

2 membrane filters

Capillary membranes, operated in the negative pressure dead-end mode

| | |
|---|---|
| Manufacturer | Puron |
| Volume per filter | 5,3 m³ |
| Membrane area | 350 m² / filter |

Effluent storage tank, CIP station (fully automated)

Sludge storage tank

| | |
|---|---|
| Volume | 62 m³ |

## 4. Operating experience

The plant has been demonstrating optimum process stability and sufficient treatment reserves. The permeability of the membrane modules has so far been constant at extremely low energy consumption (< 1.5 kWh/m³ during dry weather periods) and an excellent effluent quality.

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