



MABR

MEMBRANE AERATED BIOFILM REACTOR



Innovative wastewater treatment solution produces high effluent quality at low energy consumption

Fluence's MABR process addresses water scarcity, providing cost effective biological treatment for small decentralized wastewater treatment plants close to the source, saving on construction cost of a collection system.

Ambient air is delivered by diffusion through a patented membrane to the wastewater, eliminating the need for pressurized air, as used in conventional systems.

Fluence MABR is able to substantially reduce energy costs, operation and maintenance

expenses, all while producing a very high quality effluent.

The effluent, followed by tertiary filtration can be directly reused for irrigation, industry, or can be harmlessly discharged to the environment.

Fluence MABR produces Title 22 and Class 1A disinfected tertiary effluent (10ppm BOD, 50ppm COD, 10ppm TSS, 10ppm TN, 5ppm ammonia, 0.5ppm TP) in a one-step biological treatment followed by a clarifier and sand filter.



How it Works

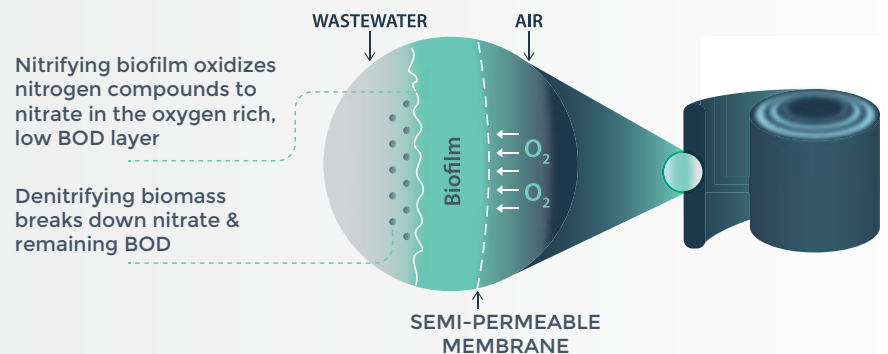
Fluence's unique, patented MABR process features highly efficient aeration and biofilm nitrification-denitrification. In MABR, a spirally wound membrane is submerged in a tank. Wastewater is fed continuously and effluent is discharged by overflow. Low-pressure air is blown through one side of the membrane and the biological activity takes place on the other side.

Oxygen is constantly supplied to a fixed biofilm that develops on the wastewater side of the

membrane sleeve. Simultaneous aerobic and anoxic conditions develop in this zone, leading to simultaneous nitrification and denitrification using very little energy and space. This low-pressure, passive aeration offers significant energy savings over conventional, high-pressure aeration.

The special conditions in the MABR spiral support a highly efficient nutrient-removal process even at low temperatures.

Simultaneous Nitrification and Denitrification



Features

- Up to 90% less energy required for aeration
- Simultaneous nitrification and denitrification
- Lower overall volume (requires shorter SRT)
- Highly effective, even at low temperatures
- Odorless and low noise system
- Simple operation and very low maintenance
- Remote monitoring and control

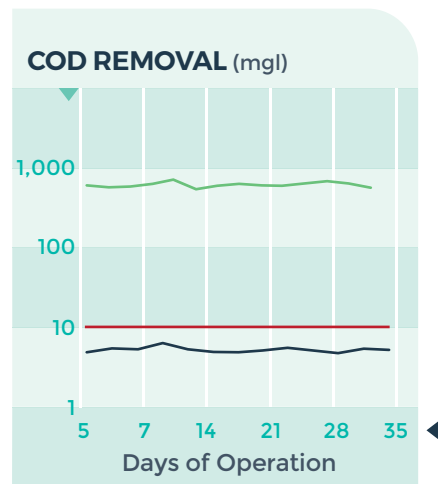
Benefits

- Operating cost up to 50% lower than with conventional treatment
- Reduced TN fit for the most advanced effluent regulations
- Smaller size reactor and lower capital costs
- Quality effluent in cold weather
- Suitable for local, decentralized treatment of wastewater
- Lower maintenance and operational overhead
- Allows central monitoring of several treatment plants

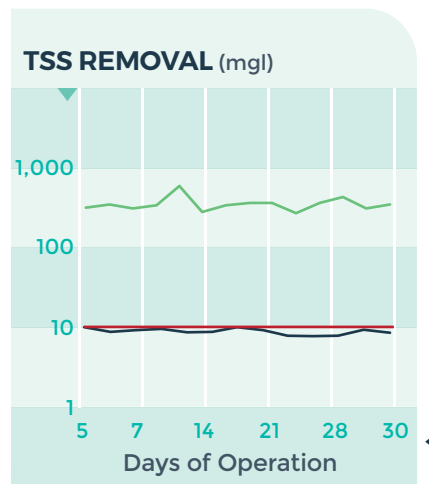


Fluence MABR is supplied in two configurations:

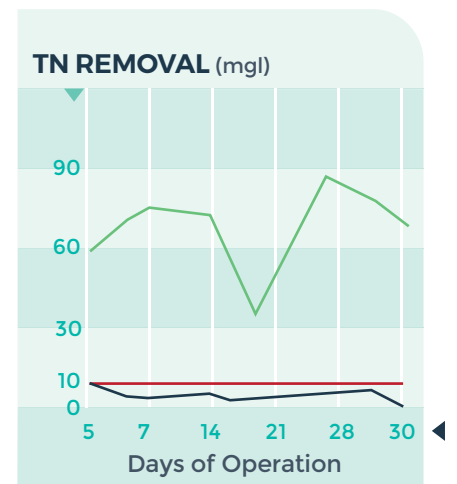
- **Aspiral™ Packaged Plant** - Container-sized reactors equipped with MABR spiral membranes, internal water and air pipes, and a control system.
- **SUBRE** - Large structure of MABR spirals in a steel frame. The SUBRE modules are inserted into existing and newly constructed basins.



- COD inlet (mg/l)
- COD 2nd Effluent
- Limit COD levels



- TSS inlet (mg/l)
- TSS 2nd Effluent
- Limit TSS levels



- TKN inlet (mg/l)
- TN Effluent
- Limit TN levels

*Taken from Aspiral L3, March-April, 2018

Typical Applications

Decentralized: Ideal for capacities of 20-2,000 m³/d (5,300 - 530,000 GPD), 250 to 10,000 people

- Rural villages, small towns, special economic zones
- Hotel, resorts, golf courses, temporary camps
- Commercial and high-tech campuses

MABR can be used to upgrade municipal treatment facilities to reach higher effluent standards.

Standard Features

- Mechanical bar screen
- Bio-Phosphorus removal
- MABR and sludge holding tank
- MABR membrane modules
- Clarifier (hopper bottom or mechanical)
- Service walkways, grating, stairways

Optional Features

- Tertiary media or membrane filter
- Disinfection (UV or chlorine)
- Tertiary chamber

Projects



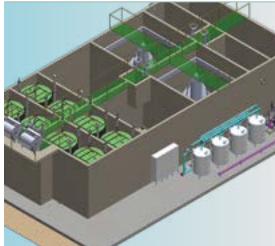
US Virgin Islands, St. Thomas 95 m³/d (25,000 GPD)

- MABR replaced old extended aeration plant
- Energy efficiency, low noise and no odors



Israel, Ha-Yogev 125 m³/d (33,000 GPD)

- MABR adds TN removal
- Water reused for agriculture



Israel, Ma'ayan Zvi, Ma'ayanot Haamakim 6,000 m³/d (1,500,000 GPD)

- Increase treatment capacity by 16%



Ethiopia, Mekelle University 320 m³/d (85,000 GPD)

- Landscape irrigation
- Municipal reuse



Ethiopia, Addis Ababa Residential Building 185 m³/d (49,000 GPD)

- Water reuse
- Environmental health
- protection



China, Luoyang 300 m³/d (79,000 GPD)

- Discharge to natural river
- Energy advantage
- Class 1A effluent



China, Changzhou College, Jiangsu 20 m³/d (5,300 GPD)

- Energy advantage
- Class 1A effluent
- Decentralized solution



China, Zhenfeng Educational Center 1,000 m³/d (264,000 GPD)

- Discharge to natural river
- Energy advantage
- Class 1A effluent



China, Tiandi Outang Quzhou, 40 m³/d (10,600 GPD)

- Energy advantage
- Class 1A effluent



China, Miyun District, Beijing 20 m³/d (5,300 GPD)

- Decentralized solution
- Energy advantage
- Class 1A effluent

ABOUT FLUENCE

Named 2018 Global Company of the Year for Decentralized Water & Wastewater Treatment by Frost & Sullivan, Fluence has experience operating in over 70 countries worldwide and employs more than 300 highly trained water professionals around the globe. The Company specializes in design, manufacturing and implementation of local, sustainable water sourcing, wastewater treatment and water reuse solutions, while empowering businesses and communities worldwide to make the most of their water resources.

Fluence offers an integrated range of products and services across the complete water cycle, from early stage evaluation, through design and delivery to ongoing support and optimization of water related assets. With established operations in North America, South America, the Middle East and Europe, Fluence is also expanding into China's rural wastewater treatment market.

Fluence is a public company traded on the Australian Securities Exchange (FLC).



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Value from Water