Aspiral™ is a smart, packaged wastewater treatment solution based on the Membrane Aerated Biofilm Reactor (MABR) technology.

Fluence MABR is an innovative, well-validated technology for low-energy treatment of municipal wastewater. It uses a spirally wound, self-respiring membrane sleeve to provide aeration by diffusion for the wastewater treatment process. The spiral membrane module at the heart of the biological reactor performs simultaneous BOD, TN and TP removal, all in a single pass.

MABR passive aeration and single pass flow consumes significantly lower energy compared to the energy consumed by typical conventional treatment technologies.

Select the right configuration for the most suitable solution for small- to medium-sized treatment plants 20-2,000 m³/day (5,300-530,000 GPD) serving villages, residential communities, resort hotels, commercial complexes and more. All Aspiral configurations can be remotely monitored and controlled.

The Aspiral system arrives fully equipped and checked for fast installation and start-up. It incorporates durable membrane materials with a life expectancy of over 20 years. The MABR biological treatment has no moving parts which leads to reduced maintenance. Aspiral meets the most stringent effluent regulations such as Class 1A (China) and Title 22 (US), and the effluent can be reused for agriculture and landscape irrigation with shorter implementation schedule and reduced regulatory procedure.

A standard Aspiral system will achieve the following removal rates at the clarifier effluent:

The Aspiral system can be cost-effectively designed for higher removal rates as required.

Typical energy consumption is 0.25 kWh/m³ (0.001 kWh/gal) for flow rates of >500 m³/d (132,000 GPD).

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Removal %</th>
<th>Typical entry value</th>
<th>Typical effluent value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD₅</td>
<td>&gt;96%</td>
<td>300 ppm</td>
<td>&lt;10 ppm</td>
</tr>
<tr>
<td>COD</td>
<td>&gt;88%</td>
<td>600 ppm</td>
<td>&lt;70 ppm</td>
</tr>
<tr>
<td>NH₄N</td>
<td>&gt;89%</td>
<td>45 ppm</td>
<td>&lt;5 ppm</td>
</tr>
<tr>
<td>TN</td>
<td>&gt;82%</td>
<td>55 ppm</td>
<td>&lt;10 ppm</td>
</tr>
<tr>
<td>TP</td>
<td>&gt;80%</td>
<td>8 ppm</td>
<td>&lt;1 ppm</td>
</tr>
<tr>
<td>TSS</td>
<td>&gt;94%</td>
<td>350 ppm</td>
<td>&lt;20 ppm</td>
</tr>
</tbody>
</table>
The Aspiral Family of Solutions

Aspiral S1
- Treats up to 50 m³/d of raw municipal wastewater
- Includes integral pretreatment screen and clarifier

Aspiral M2*
- Treats up to 115 m³/d of raw municipal wastewater
- Includes integral pretreatment screen and clarifier

Aspiral L3
- Treats up to 300 m³/d of raw municipal wastewater
- 40% of volume is aerated by fine bubble diffusers for residual BOD removal
- External clarifier for cost-effective multiple-reactor installations

Aspiral Product Line

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Length **</th>
<th># of MABR modules - Diameter</th>
<th>Capacity</th>
<th>People Equivalent</th>
<th>Integral Clarifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspiral S1</td>
<td>20 ft</td>
<td>1 - 220 cm Ø (86 in)</td>
<td>Up to 50 m³/d (13,000 GPD)</td>
<td>~300</td>
<td>✓</td>
</tr>
<tr>
<td>Aspiral M2*</td>
<td>30 ft</td>
<td>2 - 220 cm Ø</td>
<td>Up to 115 m³/d (30,000 GPD)</td>
<td>~700</td>
<td>✓</td>
</tr>
<tr>
<td>Aspiral L2</td>
<td>40 ft</td>
<td>2 - 220 cm Ø</td>
<td>Up to 185 m³/d (49,000 GPD)</td>
<td>~1100</td>
<td></td>
</tr>
<tr>
<td>Aspiral L3</td>
<td>40 ft</td>
<td>3 - 220 cm Ø</td>
<td>Up to 300 m³/d (79,000 GPD)</td>
<td>~1800</td>
<td></td>
</tr>
<tr>
<td>Aspiral L4</td>
<td>40 ft</td>
<td>4 - 220 cm Ø</td>
<td>Up to 350 m³/d (92,000 GPD)</td>
<td>~2100</td>
<td></td>
</tr>
<tr>
<td>Aspiral L5</td>
<td>40 ft</td>
<td>5 - 220 cm Ø</td>
<td>Up to 350 m³/d very low energy</td>
<td>~2100</td>
<td></td>
</tr>
</tbody>
</table>

*M2 will be launched soon.

** Standard marine container high cube dimensions

Unique Features and Benefits

**Features**
- Typical MABR biological energy consumption 0.25 kWh/m³ (0.001 kWh/gal)
- >500 m³/d (132,000 GPD)
- Reduced carbon source requirement
- Integral Bio-Phosphorus removal
- Simultaneous nitrification and de-nitrification

**Benefits**
- Saves on energy and environmental footprint
- Low chemicals consumption (Acetic acid)
- Low chemicals consumption (alum), Smaller footprint
- Cancels nitrate circulation
- Simple operation
- Low energy consumption
- Smaller footprint

Scope of Supply

Aspiral reactor arrives assembled with MABR membrane modules and internal air and water piping

- Supplied in Standard Configuration
- Fully equipped reactor
- Blowers skid
- Air piping
- Remote control software
- Detailed process and hydraulic design

- Optional
- Feed pump(s)
- Electricity and control unit
- Distribution chamber
- Pre-treatment screen
- Clarifier (supplied standard in S and M units)
- Tertiary filter skid including secondary and tertiary water tanks
- Supervision on installation and commissioning

**Site requirements - not in scope**
- Collection pit
- Equalization tank
- Earthworks
- Concrete works
- Interconnecting water pipes and valves
- Sludge tank

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