TITAN MBR MEM-FRAME™
Innovative Flat-Plate Membrane BioReactor Technology

TITAN MBR MEM-FRAME™ Features

- Engineered and pre-assembled in S&L's quality-controlled factory
- Designed for insertion into any concrete aeration basin
- Contains robust, flat-plate TITAN MBR™ Membranes
- Maintains high permeability and consistent flux
- Clean in place without plant interruption
- Frame fixed to tank, membrane modules removable with no draining

Benefits with TITAN MBR MEM-FRAME™

- Best-Available Technology for new treatment plants
- Superior effluent quality / potential for water reuse
- Achieve complete nitrification
- Gravity flow eliminates need for permeate vacuum pumps
- No recycle between aeration and membrane zones
- S&L offers significant process experience

Can be used in both new construction in concrete tanks as well as retrofitting of exiting tankage with side wall heights of 11’-6” (3.5 m) or more.
TITAN MBR™ Membrane Advantages vs. Alternative Designs

Durable Membrane & Module Composition
- Composed of PVDF (polyvinylidene fluoride) and PET non-woven fabric
- Membrane Sheets never collide during operation
- Robust design prevents breakage experienced in alternatives
- Produces higher flux rates over the life of the membrane
- Gravity feed into system eliminates need for pumps

TITAN MBR™ Membrane Data (typical)
- Design Flux: 13 gpd/sf (22 lmh)
- Pore Sizing: 0.08 microns
- Transmembrane Pressure: 0.50 - 2.00 psi (metric)
- Cleaning (In-tank): Semi-annual

Flat-Plate Design Superior to Hollow Fiber
- Eliminates clogs experienced in hollow fiber membranes
- Smooth, continuous surface negates bundling by stringy solids
- Facilitates air scouring much more effectively

More Economical Cleaning Method: Clean in Place (CIP)
- CIP reduces operating costs
- Requires less chemicals and operator time
- No backpulsing is required; eliminates associated equipment

TITAN MBR MEM-FRAME™ Sizing Data

<table>
<thead>
<tr>
<th>Model</th>
<th>Custom Design Flow gpd (cmd)</th>
<th>Total Plant Volume gallons (cm)</th>
<th>Flow with TITAN MBR MEM-FRAME™ gpd (cmd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25,000 (95)</td>
<td>50,000 (190)</td>
<td>62,000 (230)</td>
</tr>
<tr>
<td>1.5</td>
<td>32,000 (120)</td>
<td>59,000 (220)</td>
<td>80,000 (300)</td>
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<tr>
<td>2</td>
<td>50,000 (190)</td>
<td>94,000 (350)</td>
<td>125,000 (470)</td>
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<tr>
<td>3</td>
<td>76,000 (285)</td>
<td>145,000 (545)</td>
<td>190,000 (715)</td>
</tr>
</tbody>
</table>

TITAN MBR MEM-FRAME™ Components

The complete equipment provided by Smith & Loveless includes:
- Membrane modules
- Coarse bubble diffusers
- Required ball valves
- Controls and instrumentation
- Piping
- Frame work
- Blowers
- Chemical clean in place