The advantages of a unique combination

BIOSEP®, an innovative process developed by Veolia Water Technologies, is dedicated to the biological treatment of municipal and industrial effluents.

With BIOSEP® Veolia Water Solutions & Technologies offers:
• high performance combination of two proven and robust technologies:
  - biological treatment using activated sludge
  - immersed membrane filtration
• compact and easy-to-install: BIOSEP® produces a very high quality, fully compliant with standards for building areas, making them suitable for migration and industrial applications, significant reduction of water pollutants and non-toxic pollutants, high removal efficiency.

A physical barrier at the heart of the system

Membranes are placed in direct contact with the biomass, achieving the biological treatment of pollution. These membranes, either flat sheet membranes or organic hollow fibers, are high molecular resistance and deliver treated water with an excellent bacteriological quality.

The requirement of conventional clarifiers by membrane separation eliminates the constraints related to sludge settling and greatly simplifies the treatment line. Based on its proven design, BIOSEP® offers a highly compact water treatment solution using high biomass concentrations (3 to 5 g L⁻¹) combined with long sludge age.

Benefits over conventional activated sludge

• Exceptional treated water quality:
  - significant reduction of carbon and nitrogen pollutants
  - returns almost all suspended solids
  - high detention removal rates

• A highly compact system:
  - less equipment and civil engineering
  - simple treatment line
  - ideal for restricted spaces and easy retrofitting of existing plants

• No final clarification:
  - no risk of sludge loss
  - performance independent of the sludge index

• High COD removal: including slowly biodegradable COD (long biomass retention time)

• Reduced reagent levels in phosphorus elimination

• Thicker may also be removed

• Reduced sludge production

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BIOSEP®
Immersed membrane bioreactor

• compact design and environmentally safe
• reliable biological treatment
• high treated effluent quality

CONVENTIONAL TREATMENT LINE

Raw water → Screening → Screening → Primary settling → Biological treatment using activated sludge → Clarification → Sand filtration → UV disinfection → Treated water

BIOSEP® TREATMENT LINE

Raw water → Screening → Screening → BIOSEP membrane bioreactor → Treated water
**Operating principle**

**BIOSEP** combines an aeration tank and a membrane system where the membranes are grouped into modules and positioned vertically. These modules may be directly interconnected into the biological tank or in a separate tank.

- **After pretreatment** (e.g., screening), raw water flows into the activated biological tank where carbonaceous, nitrogenous and phosphorous pollution is removed.
- **Membrane filtration** then separates the purified water from the activated sludge. The treated water is drawn off using a pump, the excess sludge is directly removed from the biological tank for dewatering.
- **Maintaining filtration performance** is the key point of the process and is based on different automated functions: backwash, air injection and chemical cleaning.

**BIOSEP® PACK**

New standard filtration units

These standardized units, optimized for treating industrial and municipal effluents, benefit from the full range of **BIOSEP®** innovations, and guarantee the same high level of performance.

- **Available in a 60 m³/hr capacity**, especially when it comes to expanding capacity or for facilities where only limited space is available.

Each unit comprises two standard elements:

- The **membrane tank**, with multiple compartments, where the complete set of pipes, valves and instrumentation can be coupled with the biological system.
- The **filtration skid**, comprising the membrane UF unit (cleaning in place), the valves and the instrumentation (pumps, filters, blowers) and the built-in standard automation system (control cabinet).

**BIOSEP® Pack unit**

The long-term viability of the units can be supported through a customized service offer: the **BIOSEP® Care Service**.

It covers:

- Preventive and corrective maintenance
- Preventivity tests
- Membrane cleaning
- Remote monitoring of operating parameters.

**Membrane fouling prevention**

**[example for hollow fibers]**

**Filtration phase**

- Water is filtered from the surface to the inside of the fibers by low-pressure suction (< 0.5 bar).
- During filtration, the sludge is retained by the membranes, creating a sludge cake on the outside of the fibers.

**Backwash phase**

- Scour air continuously flows upward and also helps to release the sludge cake.

**BIOSEP® PACK, key features**

**Local authorities**

- **High quality treated water (discharge into environmentally sensitive areas)**
- **Compact design**
- **High bacteria removal rate**
- **Compact design**
- **Odor free**
- **High quality treated water (discharge into environmentally sensitive areas)**
- **Increase in treatment capacity**
- **Reduction or even elimination of the need for sea outfall**

**Municipal references:**

- **France**: Arc-sur-Perthes (77,000 PE), Thiais (2,500 PE), Perthes-en-Carron (45,000 PE), Courbevoie (91,000 PE)
- **Germany**: Nossen (30,000 PE), Wällimannsgraben (2,000 PE), Altkirchen (2,000 PE)

**Performance for standard wastewater**

<table>
<thead>
<tr>
<th>PERFORMANCE</th>
<th>STANDARDS*</th>
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<tbody>
<tr>
<td>COD &lt; 30 mg/l</td>
<td>90 mg/l</td>
</tr>
<tr>
<td>BOD &lt; 5 mg/l</td>
<td>25 mg/l</td>
</tr>
<tr>
<td>TN (total nitrogen) &lt; 10-15 mg/l</td>
<td>15 mg/l</td>
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<tr>
<td>TP (total phosphorous)</td>
<td>0.5-2 mg/l</td>
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<tr>
<td>Total coliforms</td>
<td>5 log &lt; 100/100 ml</td>
</tr>
<tr>
<td>Fecal coliforms</td>
<td>5 log &lt; 100/100 ml</td>
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<tr>
<td>Bacteriophage content</td>
<td>3 log</td>
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<table>
<thead>
<tr>
<th>Biological treatment efficiency</th>
<th>Disinfection efficiency</th>
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<tbody>
<tr>
<td>(in compliance with European standards)</td>
<td>(*)</td>
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**The result of Veolia Water research**

Since 1991, Veolia Water Solutions & Technologies and Anjo Rechsteiner, the R&D center of Veolia Water, have gained a unique level of expertise in the field of membrane bioreactors (MBR), through the design and build of over 30 such wastewater treatment plants—about half of which are operated by Veolia Water.

**Veolia Water**

A key technology of Veolia Water Solutions & Technologies sold under the **BIOSEP®** trademark in Japan and the United States.

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