



BIOSEP®

Immersed membrane bioreactor

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



Solutions & Technologies

The advantages of a unique combination

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

With BIOSEP®, Veolia Water Solutions & Technologies offers a **high performance combination of two proven and robust technologies:**

- biological treatment using activated sludge,
- immersed membrane filtration.

Compact and easy-to-implement, BIOSEP® produces a very high water quality, fully compliant with standards for bathing areas, water reuse for irrigation and industrial applications: significant reduction of carbonaceous and nitrogenous pollutants, high removal of bacteria.

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) offer high mechanical resistance and deliver **treated water with an excellent bacteriological quality.**

The replacement of conventional clarification 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** (8 to 15 g SS/l) combined with long sludge age.

Benefits over conventional activated sludge

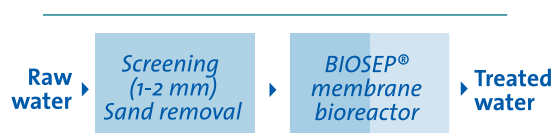
- **Exceptional treated water quality:**
 - significant reduction of carbon and nitrogen pollution
 - retains almost all suspended solids
 - high bacteria removal rate
- **A highly compact system:**
 - less equipment and civil engineering
 - simplified treatment line
 - ideal for restricted spaces and easy retrofit of existing plants
- **No final clarification:**
 - no risk of sludge loss
 - performance is independent of the sludge index
- **High COD removal, including slowly biodegradable COD (long biomass retention time)**
- **Reduced reagent levels in phosphorous elimination**
- **Thickener may also be removed**
- **Reduced sludge production**

An optimized treatment line

CONVENTIONAL TREATMENT LINE



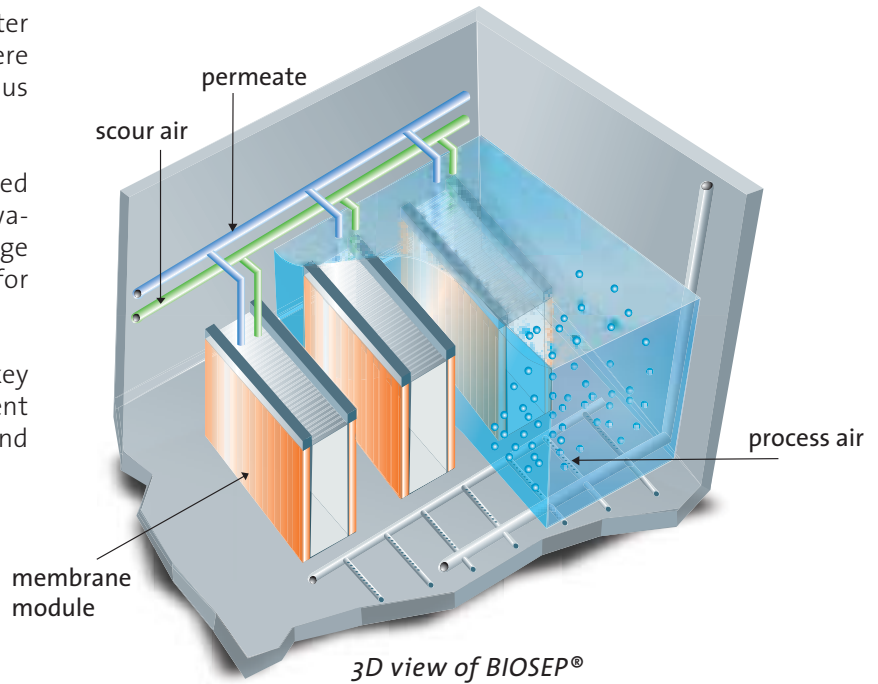
BIOSEP® TREATMENT LINE



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 immersed into the biological tank or into a separate tank.

- **After pretreatment** (e.g. screening), raw water flows into the aerated 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; this is based on different automated functions: backwash, air injection and chemical cleaning.



The result of Veolia Water research

Since 1991, Veolia Water Solutions & Technologies and Anjou Recherche, 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.



1995

First industrial contract: "Les Epesses" landfill (Le Cerisier, Vienne - France)

1993

BIOSEP® industrialization

1991

First tests on membrane bioreactors

Performance for standard wastewater		
	PERFORMANCE	STANDARDS*
COD	< 30 mg/l	90 mg/l
BOD ₅	< 5 mg/l	25 mg/l
SS	< detectable threshold	30 mg/l
TN (total nitrogen)	< 10-15 mg/l	15 mg/l
TP (total phosphorous)	< 0.5-2 mg/l	2 mg/l
Total coliforms	5 log or < 500 u/100 ml	10 000 u/100 ml
Heat tolerant coliforms	5 log or < 100 u/100 ml	2 000 u/100 ml
Faecal streptococci (group D)	5 log or < 100 u/100 ml	100 u/100 ml
Bacteriophage content	3 log	-

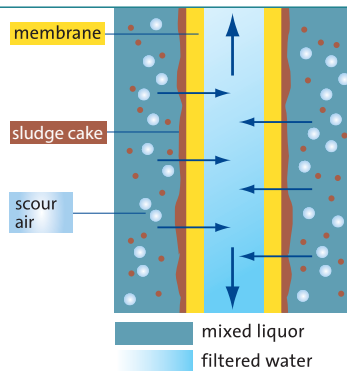
Biological treatment efficiency
 Disinfection efficiency

(* In compliance with European standards)

Membrane fouling prevention (example for hollow fibers)

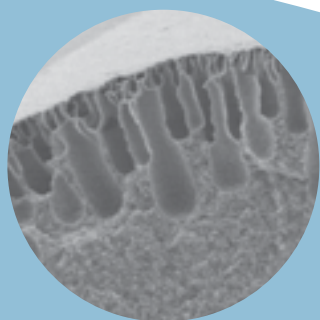
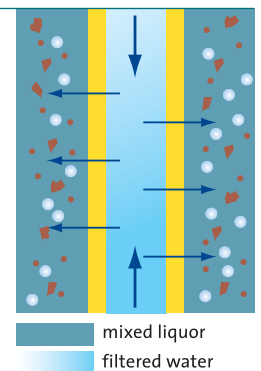
Filtration phase

- Water is filtered from the outside 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

- Fouling is prevented by pumping back the permeate (filtered water) in counter-current flows through the membranes.
- Scour air continuously flows upward and also helps to release the sludge cake.



1999
First municipal contract:
Perthes-en-Gâtinais
(Seine et Marne - France)

2003
Inauguration
of the Membrane
Expertise Center:
ARAMIS

2004
Launch of the new
standard filtration
units: BIOSEP® Pack

2006
One of the world leaders
in design, build
and operation
of membrane
bioreactors

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 **range of flow rates from 2 to more than 60 m³/hr**, BIOSEP® Pack is a modular and flexible solution. Its extremely compact design means that it can easily be installed within existing facilities, especially when it comes to expanding capacity or for facilities where only limited space is available.

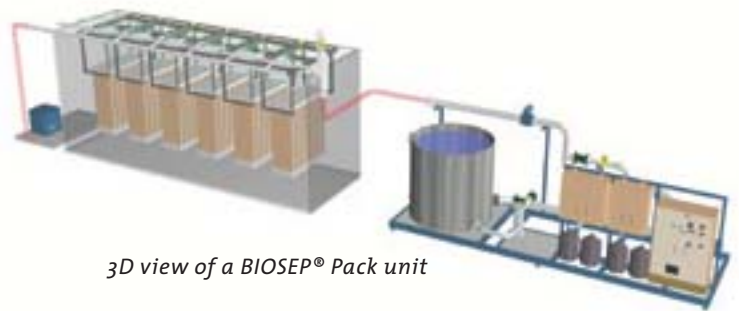
BIOSEP® Pack units are very easy to erect and can be delivered worldwide. Each unit comprises **2 standard elements**:

- 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 CIP unit (cleaning in place), the valves and the instrumentation (pumps, filters, blowers) and the built-in, standard automation system (control cabinet).

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
- permeability tests
- membrane cleaning
- remote monitoring of operating parameters...



3D view of a BIOSEP® Pack unit

BIOSEP® PACK, key features

Local authorities

- **high quality treated water** (discharge into environmentally sensitive areas)
- **compact design**
- **high bacteria removal rate** (public health safety, bathing water...)
- **odor free**
- **water reclamation**: recycling for public utility, golf course and aquifer recharge...
- **increase in treatment capacity**
- **reduction or even elimination of the need for sea outfall**

Municipal references:

- in France: Ile d'Yeu (20,000 PE), Thelus (2,500 PE), Perthes-en-Gâtinais (4,500 PE), Guéthary (10,000 PE), Saint-Jouan-des-Guéréts (7,500 PE)
- in Germany: Nordkanal (80,000 PE), Waldmössingen (2,500 PE), Monheim (9,000 PE)

Industry

- **high quality treated water** (discharge into environmentally sensitive areas)
- treatment of **highly concentrated effluents**
- **compact design**
- **significant reduction of biodegradable COD**
- **water reclamation**: recycling for utility, boiler-feed, process water...
- **increase in treatment capacity**
- **upgrading/refurbishment of existing facilities**

BIOSEP® references and applications cover all industrial sectors:

- food and beverage
- chemicals, cosmetics, pharmaceuticals
- pulp and paper
- automotive
- textiles
- landfill leachate...

Your contact:



Veolia Water Solutions & Technologies
"L'Aquarène"
1 place Montgolfier
94417 Saint-Maurice Cedex - France
Tel.: + 33 (0)1 45 11 55 55
Fax: + 33 (0)1 45 11 55 00

info@veoliawaterst.com
www.veoliawaterst.com/biosep

