



Biothane® Anaerobic Technology Memthane® 2.0

WATER TECHNOLOGIES

State-of-the-art solution

Memthane® is an Anaerobic Membrane Bio-Reactor (AnMBR) which **maximizes renewable energy production** while producing **high-quality effluent that can be reused** or discharged.

This leading-edge technology is a unique, small-footprint solution that offers an **array of benefits**, reducing disposal costs while generating valuable biogas.

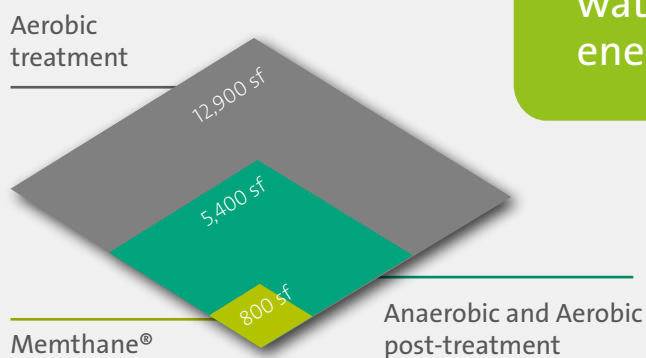
COD removal:

>98%

Recovers
nutrients,
water and
energy



*Replace fossil fuels
by generating biogas
from wastewater*



Economical and easy to operate

In addition to its performance advantages, Memthane® delivers a significant **reduction in total operating cost** compared to conventional technologies, taking into account all elements, including membranes, chemicals, sludge disposal and overall energy savings. The **fully automated reactor system** offers the possibility of remote control.

“*Easily scalable to meet individual plant characteristics and operating environments*”

A world of advantages

- › Rapid return on investment
- › Robust, reliable treatment
- › Superb effluent water quality for reuse
- › Easy operation
- › Low operational cost
- › Easy recovery of nutrients for reuse
- › Energy recovery through biogas reuse
- › Avoids biogas scrubbing
- › Minimizes sludge disposal costs
- › Reduces environmental footprint
- › Odor-free operation

Sustainable and profitable

Memthane is ideal for high-strength and high-solid waste streams from industries such as **distilleries, dairies, bio-ethanol producers**, and many other **food and beverage production** facilities.

The effluent is free of suspended solids to facilitate **recovery of nutrients** for fertilizer production and/or **water recycling** to the plant. The **valuable methane-rich biogas** produced can be sent to a Veolia-supplied

Combined Heat and Power (CHP) unit to generate electricity for plant operations. In some applications, 100% of the production facility's energy requirements can be achieved.

Veolia Water Technologies provides Memthane systems as **turnkey projects**, integrating CHP or any byproduct management systems desired by our customers into our designs to **optimize resource recovery and reuse**.

Memthane[®], the ideal solution for:

- Highly concentrated streams
 - COD 15,000 ~ 250,000 ppm such as dairy whey
- Ethanol Facilities
 - Stillage streams: pot ale, spent wash, thin stillage and vinasse
- Streams containing fat, oil and grease (FOG)
 - Ice cream, dairy and biodiesel
- Starch slurries
- High COD chemical applications



Memthane[®] treats high-strength effluents previously considered untreatable.

State-of-the-art laboratory

Veolia offers process validation and testing capabilities in our Pennsauken, New Jersey facilities, ensuring that our system designs are the best solution for your application. Laboratory capabilities include:

- Basic wastewater characterization
- Gas chromatography for volatile fatty acids testing
- Treatability and bio-methane potential (BMP) testing
- Biomass activity
- Anaerobic chemical toxicity testing
- Long-term laboratory pilot testing
- Aerobic testing
- Maceration equipment
- Solids separation with centrifuge or microfiltration membranes



Our on-site laboratory provides wastewater characterization and pilot testing services

Proven technology in an innovative process

The Memthane process developed by Veolia combines two proven technologies, **Biothane[®] anaerobic biological wastewater treatment** and Pentair X-Flow **ultrafiltration membranes**, to create an industry-leading anaerobic membrane bioreactor system. Veolia has multiple global industrial references, including installations in the ethanol, dairy, confectionery, and food processing industries.

Anaerobic biological treatment

Anaerobic treatment is a proven and energy-efficient method to convert industrial wastewater into biogas. Low energy requirements, a smaller reactor footprint, lower chemical usage and reduced sludge handling costs are among the technology's advantages. Biogas produced through anaerobic treatment can make the plant energy neutral or even a renewable energy producer.

Membrane separation (UF)

The ultrafiltration membrane unit provides a solution that is robust, reliable and flexible. Memthane[®] minimizes the surplus sludge production by applying long sludge retention times. The membranes are placed outside the reactor, offering a simple and easily maintainable stand-alone system that is fully enclosed, preventing odor release.



2 proven technologies:

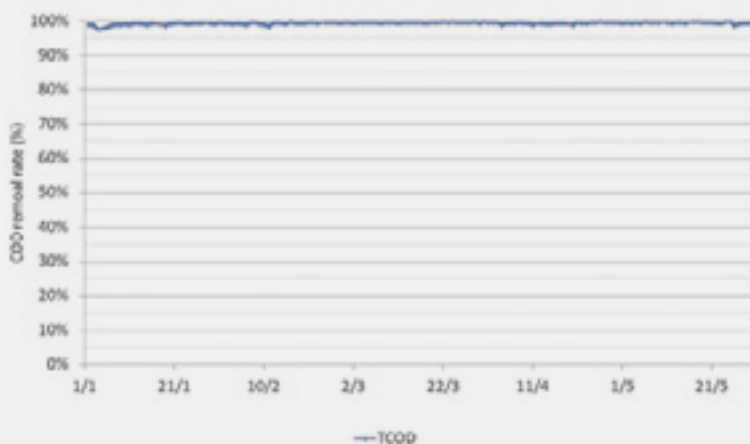
Anaerobic
biological treatment
+
Membrane separation
=
1 innovative solution

- > Maximizes COD + TSS removal
- > Reduces disposal costs
- > Generates methane-rich biogas

Influent Mixed Liquor Effluent/Permeate



TCOD Removal Efficiency



Pentair X-Flow is the world's leading company in the development and supply of high-quality and innovative membrane technology to global municipal and industrial markets.

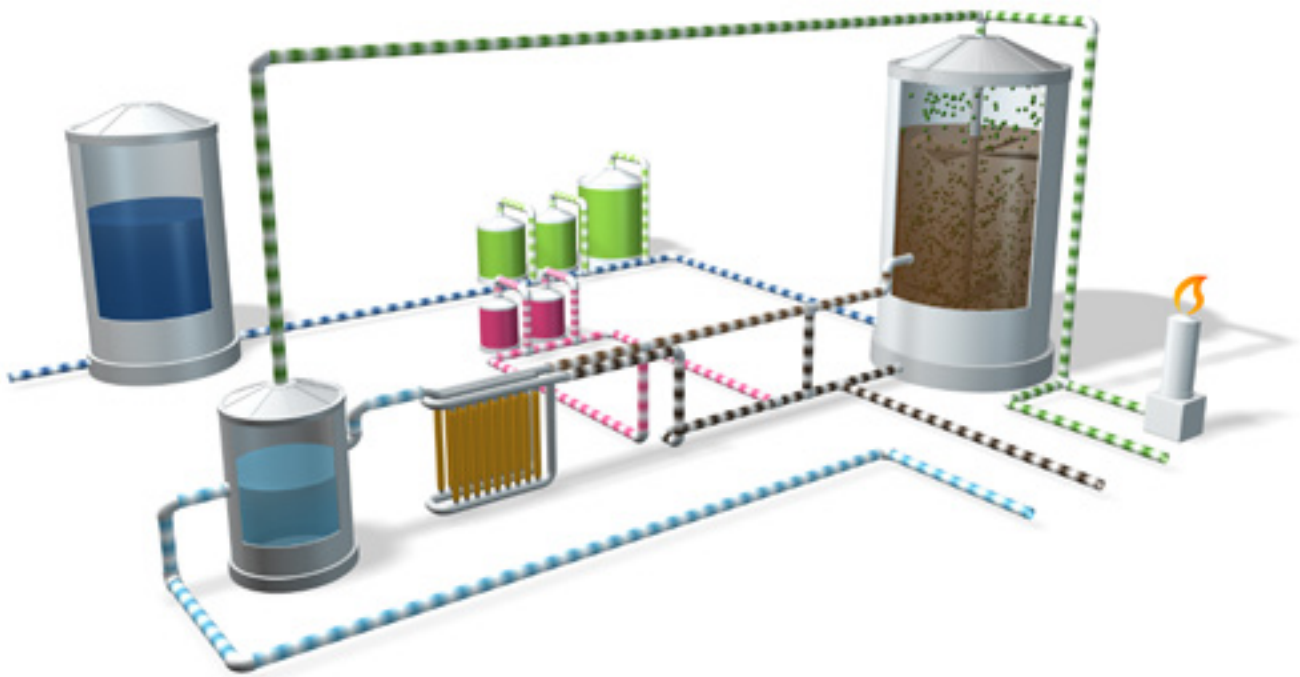
Memthane[®] step-by-step

Anaerobic digestion plus cross-flow membranes

After equalization, high-strength wastewater is conditioned as needed.

Influent is fed to the anaerobic bioreactor where the organic components are converted into energy-rich biogas.

A clean-in-place system is provided for easy maintenance of the membranes.



After anaerobic treatment, the UF membrane unit separates the clean permeate from the biomass.

The UF permeate is free of suspended solids and low in BOD, suitable for discharge or many reuse applications. If desired, polishing techniques can be applied to meet any process water quality requirements.

Biomass is returned to the bioreactor, while a small amount of biomass is removed from the system and discharged after dewatering.

The way in which the reactor is mixed and the preferential removal of inorganic solids optimize performance and are unique to the Memthane[®] technology.

Resourcing the world

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