Biological Wastewater Treatment

Highly efficient, cost effective biological methods to reduce pollution and recover energy with a minimal environmental impact.
Worldwide References
Biothane, part of Veolia Water Solutions & Technologies (VWS), is one of the world’s leading companies in the field of biological wastewater treatment. With more than 500 installations located in over 40 countries, Biothane has extensive experience in designing and building anaerobic and aerobic wastewater treatment plants for industrial clients.

Biothane technologies are applied for waste (water) streams from a wide variety of industrial sectors such as:
- Food & Beverage
- Chemical/Pharmaceutical
- Breweries
- Pulp and Paper
- Fermentation/Biofuels
- and many other industries

The portfolio of anaerobic wastewater treatment technologies such as the Biothane® UASB, Biobed® EGSB and Biobulk CSTR is complemented by extensive experience in solids and slurry digestion, aerobic post treatment processes for BOD, nitrogen and phosphorous (N/P) removal as well as the purification of biogas for energy reuse.

Clients benefit from Biothane’s leading anaerobic technologies as well as from the possibility to combine these technologies with a wide range of complementary processes from the Veolia Water Solutions & Technologies group. Biothane provides innovative and reliable solutions coupled with remarkable organizational strength. In close collaboration with our customers we develop the most suitable, cost-effective economic solution for every treatment problem.

Veolia Water Solutions & Technologies is a world leader in engineering, design, project management and the execution of construction projects for water and wastewater applications. With a unique portfolio of differentiating technologies the company provides technological solutions and design & build projects.

Company profile

Alongside its locations in Europe, the United States and Asia, Biothane has a global network of partners within Veolia Water Solutions & Technologies. Projects are individually established according to client’s needs in collaboration with local VWS entities. This global structure and understanding of local conditions allows Biothane to develop the most suitable solution for any treatment requirement.
Anaerobic Wastewater Treatment

Anaerobic treatment is a proven and energy efficient method to treat industrial waste(water) effluents. These days, more and more emphasis is placed on low energy use, a small reactor surface area, low chemical usage and reduced sludge handling costs. Biothane’s technologies— the Biothane® UASB, Biobed® EGSB and Biobulk CSTR— are especially favourable as they excel in these areas. The basis of anaerobic treatment is the utilization of anaerobic bacteria (biomass) to convert organic pollutants or COD (Chemical Oxygen Demand) into biogas in an oxygen-free atmosphere.

Biothane® UASB Technology

The Biothane® UASB (Upflow Anaerobic Sludge Blanket) technology is a proven and reliable process, exclusively owned by Biothane. It is a maintenance-free, corrosion-free and robust process with a straightforward design.

**UASB Upflow Anaerobic Sludge Blanket**

Before wastewater enters a Biothane® UASB treatment process, the wastewater chemistry is optimized in a **conditioning tank** where the temperature and pH—value are corrected. In the conditioning tank the wastewater will be mixed with recycled, anaerobically treated effluent by means of a recirculation stage and jet mixing. Furthermore, nutrients are dosed, if necessary, to achieve optimal growth conditions for the anaerobic biomass in the Biothane® UASB reactor.

The conditioned wastewater is then pumped at a constant, continuous flow to the **Biothane® UASB reactor**. A special influent distribution system ensures that the influent is equally distributed over the entire reactor surface area. The influent then passes a dense **anaerobic granular biomass bed** where the biological conversion process takes place transforming the COD (Chemical Oxygen Demand) into biogas.

Patented **three phase settlers** at the top of the reactor separate the treated water from the produced biogas. The biomass settles back to the bottom of the reactor while part of the treated effluent is recycled and returned to the conditioning tank for dilution.

**Biogas** is collected and piped to a biogas treatment step. It can serve as source of energy for the production site or alternatively be burned under controlled conditions in a biogas flare.

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**Technology Features**

- High Organic Loading Capacity (10 - 15 kg COD/m³/day)
- Compact Design
- Highly settleable granular biomass
- Patented double-baffle internal settlers
- Energy source from biogas
- Economical Operation
- Proven Reliability
The proprietary Biobed® EGSB (Expanded Granular Sludge Bed) technology by Biothane is extremely efficient due to its advanced and proven process design and its relatively low investment needs in capital and maintenance.

Biothane has developed a cost-effective and practical Biobed Package Plant solution for wastewater streams with limited flow and COD loading. The scope of this prefabricated plant is complete and ready for operation.

The Biobed Package Plant can be extended to up to 6 Biobed package modules (50m³ or 120m³). The units are 40ft container-framed modules that are easily transportable. The maximum COD load that can be treated per module is 1000-2000kg per day. The plant is applicable for different types of wastewater and easily expandable when production increases.

Biogas is collected at the top of the reactor, which acts as a biogas holder, and is piped to a biogas treatment stage. Under controlled conditions it can be burned in a biogas flare or alternatively serves as a source of energy for the production site. The Biobed® EGSB sealed reactor design eliminates emissions of nuisance odors. All potential odor emission locations are integrated into the pressurized biogas circuit, thus avoiding the need to install external odor removal equipment (e.g. biofilters).

To prepare the industrial effluent for anaerobic treatment, the pH-value and the temperature of the raw wastewater are regulated in a conditioning tank. The wastewater will be mixed inside the conditioning tank with recycled, anaerobically treated effluent for dilution. Nutrients are added, if necessary, to achieve optimal growth conditions for the anaerobic biomass in the Biobed® EGSB reactor.

In the following treatment stage the conditioned wastewater is pumped at a constant, continuous flow to the tall and slim Biobed® EGSB reactor. A special influent distribution system guarantees equal distribution over the entire reactor surface area. The influent then passes a dense and expanded anaerobic granular biomass bed where the biological treatment takes place, converting the COD (Chemical Oxygen Demand) present in the wastewater into biogas.

At the top of the reactor patented three phase settlers separate the treated water from the produced biogas. The biomass settles back to the bottom of the reactor while part of the treated effluent is recycled and returned to the conditioning tank for dilution.

Treatment Process

- Ultra High Organic Loading Capacity (15 - 30 kg COD/m³/day)
- Low surface area requirements
- Energy source from biogas production
- Economical Operation
- Extremely small footprint
- Patented triple-baffle internal settlers
- Highly settleable granular biomass
- Maintenance-free/corrosion-proof process
- No odor emission
- Proven reliability
When stringent discharge limits have to be met, in many cases anaerobic treatment is followed by aerobic post treatment. During aerobic polishing, final traces of organic pollution (COD/BOD) and nutrients such as nitrogen and phosphorous can effectively be removed. Biothane has extensive experience in the design of combined anaerobic/aerobic installations.

### Biobulk CSTR Technology

The Biobulk CSTR (Completely Stirred Tank Reactor) technology is a robust and proven process in which biogas is produced from industrial effluents with significantly high amounts of Chemical Oxygen Demand (COD), Organic Solids (OTS) or fats, oils and grease (FOG).

**Treatment Process**

Blended solid or liquid waste streams enter the reactor and are treated by **anaerobic suspended bacteria**. The majority of the soluble or solid COD is converted into **biogas**, significantly reducing the solids concentration in the waste stream. After a **retention time** of several days, the treated waste stream leaves the reactor. The Biobulk can be operated as a once-through system. Alternatively, biomass can be returned after a clarification stage. The key to the Biobulk design is the manner in which the reactor vessel is mixed and the design of the degassing stage prior to clarification.

Produced biogas is collected in the headspace of the Biobulk CSTR which acts as a biogas holder. Biogas can be used as a source of renewable energy or can be burned in a biogas flare.

### Gas Scrubbers

Biothane provides complementary solutions to clean biogas that is produced during anaerobic treatment. For reasons of health, safety and prevention of corrosion, desulphurization of biogas can be required. After scrubbing biogas it can be re-used for production of electricity, heat or for use in a boiler. Biothane can provide both chemical and biological scrubbers.

### Aerobic Post Treatment

When stringent discharge limits have to be met, in many cases anaerobic treatment is followed by aerobic post treatment. During aerobic polishing, final traces of organic pollution (COD/BOD) and nutrients such as nitrogen and phosphorous can effectively be removed. Biothane has extensive experience in the design of combined anaerobic/aerobic installations.

### Technology Features

- Tolerance for high concentration of TSS, fats, oil & grease (FOG)
- Highly efficient reduction of BOD, TSS
- Medium organic loading capacity (2-5 kg COD/m³/day)
- Energy source from biogas production
- Special internal mixing design
- Low operating and maintenance requirements
- Proven reliability

### Aerobic Process Offering:

- Conventional Activated Sludge System
- SBR (Sequence Batch Reactor)
- MBR (Membrane Bioreactor)
- AnoxKaldnes MBBR (Moving Bed Biofilm Reactor)
- Nitrification and denitrification (N-removal)
- Biological- and chemical phosphate removal (P-removal)
Biothane offers supportive consultancy services worldwide to ensure customer satisfaction. These services include technical support, operational support and performance improvement advice.

With backing of 500 projects we have established a well-organized biomass supply network. Only high-quality granular biomass that meets our standards is utilized for e.g. the start-up of new plants or restart of operation after calamities.

Laboratory and Analytical Capabilities

Biothane has in-house facilities for laboratory analysis and pilot testing. Analyzing samples of water streams allows identification of the digestibility of the wastewater. In simple batch tests or more extensive continuous trials possible COD reduction and biogas production from a wastewater stream can be tested. Furthermore, eventual toxic effects of certain components and the potential of biomass to adapt to the wastewater can be detected.

Biothane has a number of pilot plant units that are available for hire. Pilot plant studies provide information on reactor design parameters as well as on the biogas production and COD removal efficiency of a given wastewater stream. They can also be placed on site.

Consultancy Services

Biothane offers supportive consultancy services worldwide to ensure customer satisfaction. These services include technical support, operational support and performance improvement advice.

Biomass & Nutrients

With backing of 500 projects we have established a well-organized biomass supply network. Only high-quality granular biomass that meets our standards is utilized for e.g. the start-up of new plants or restart of operation after calamities.

Laboratory Capabilities:
- Detailed Wastewater Characterization Analysis
- Detailed Nutrient Analysis/ Nutrient Dosing Advise
- Anaerobic/Aerobic Toxicity Test
- Anaerobic/Aerobic Biodegradability Test
- Biomass Activity Test
- Biomass Quality Test
- In-house Lab Pilot Capabilities
- Anaerobic/Aerobic Pilot-Plant Experiments (on site/in lab)
Biothane

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