

# Dairy

## AnMBR Wastewater Treatment

### PROJECT DETAILS

Location:	Wisconsin, USA
Application:	External AnMBR system
Produced permeate:	2.160 m <sup>3</sup> /day
COD influent:	25.000 – 50.000 mg/L
Membrane:	8 mm, PVDF, backwashable



### PROJECT OVERVIEW

Among the food industries, the dairy industry is considered to produce one of the largest quantities of wastewater and one of the highest organic pollutants mass loads. The milk itself is the main source of flow and organic pollutants load from this type of industry.

The wastewater is produced in the process of cleaning and sanitizing tanks, pipelines and equipment, loading and unloading tanker trucks, and as a result of milk and whey spillage and leakage. The milk entering the factories can account for 75 % to 95 % of the total effluent volume with the condensate of the whey byproduct often being used in the cleaning and sanitizing operations.

### THE CHALLENGE

A dairy processor based in Richland County, Wisconsin, challenged

#### Berghof Membranes:

- ◊ To find an **efficient process to generate electricity and heat** from whey and other high strength liquid waste, left over from the manufacturing of cheese and yogurt from cow's milk.
- ◊ To **further treat anaerobic industrial wastewater** discharge with high levels of solids before discharging to a nearby river.

The stream being treated is the segregated and diverted high-strength wastewater from multiple milk processing factories. The volume and strength of this combined wastewater vary considerably from day to day. Total flow to the industrial wastewater treatment facility is expected to average up to 2.160 m<sup>3</sup>/day.

Biological treatment of this wastewater is complicated by residual cleaning agents and biocides used in the daily sanitizing operations. Scaling is a common and difficult-to-control problem in the wastewater treatment process of the dairy industry due to the high calcium content.

### WHY AnMBR?

The high concentrated organic matter and nutrients are a source of energy and can be used for the production of heat or power for the wastewater treatment plant. The high strength wastewater from milk processing factories is best treated using an anaerobic MBR system.

**AnMBR treatment offers a more compact technology** and is very efficient in **removing organic pollutants**: >99% reduction compared to only 75 % to 90 % using other methods.

In this project, AnMBR treatment created an opportunity to harness both improved management of waste while **generating electrical power and heat** to be utilized within the facility.

### THE BERGHOF MEMBRANES SOLUTION

Berghof Membranes, with its extensive experience in treating industrial effluent using PVDF tubular membranes, developed a **compact AnMBR system** for the Wisconsin-based dairy processor. The Berghof system **ensures complete retention of the biomass** within the anaerobic digester and brings a significant **improvement in the digestion process**, making it more robust, reducing the footprint, increasing biogas production and delivering superior effluent quality.

Any remaining bacteria and solid particles from the anaerobic digesters are removed from the water using the external Berghof tubular ultrafiltration membranes.

The wastewater treatment facility eliminates pollutants and solid matter from the wastewater that was previously used on farm fields or discharged to the municipal systems.

The Berghof Membranes external AnMBR technology utilizes variable **crossflow velocity** in order to create the necessary turbulence which **controls the scaling inside the membranes**.

This technology consistently achieves a superior effluent quality with **more than 99 % COD reduction** and is also **extremely effective in total phosphorus reduction**. The produced biogas is utilized within the facility, generating electrical power and heat.

## THE B<sup>o</sup>-SMART<sup>®</sup> SYSTEM

Based on a side-stream ultrafiltration system located outside the bioreactor (**the external principle**), the Berghof Membranes B<sup>o</sup>-SMART<sup>®</sup> self-regulating system uses high-quality tubular membrane modules.

The system is self-regulating and therefore **consumes less energy**. The proprietary built-in software system **analyses data in real time** using advanced algorithms based on transmembrane pressure (TMP) to control pump speed, backwash and cleaning frequency. The filtration system automatically monitors the individual TMP and automatically initiates the cleaning procedure if it exceeds defined limits as a result of fouling.

Depending on the need, the system selects one of the cleaning modes to eliminate fouling: **(1) increased cross-flow velocity, (2) backwash with- or without chemicals, or (3) flushing or cleaning-in-place (CIP)**. Once cleaning is completed, **the system automatically checks the TMP values** again and applies additional cleaning protocols if the set-point value is not reached.

Additionally, the unit can continue to produce a fixed amount of permeate even during the backwash process. The Berghof Membranes B<sup>o</sup>-SMART<sup>®</sup> self-regulating external filtration system treats wastewater streams at a cross-flow velocity of 1,5 – 2,5 m/s and a flux range of 50 – 100 LMH. All this combined **ensures less energy, reduced maintenance time and improved OPEX**.



Picture 1. External AnMBR system with Berghof Membranes UF modules

## Customer Benefits

The dairy industry produces some of the largest quantities of wastewater and one of the highest organic pollutants mass loads. The self-regulating external AnMBR system from Berghof Membranes proved to be an efficient and innovative solutions for the Wisconsin dairy processor.

- Small Footprint
- Fully automated operation
- Excellent scaling control
- Superior effluent quality for discharge to river
- Efficient and high biogas production
- Easy cleaning and maintenance
- High biomass retention efficiency



Think outside the box

## ABOUT BERGHOF MEMBRANES

Berghof Membrane Technology GmbH, part of the Berghof Group, is your leading manufacturer of tubular UF membrane solutions for the filtration and separation of process streams and wastewater in a variety of industries including dairy, landfills, food & beverage, chemical, pharmaceutical and oil & gas.

We at Berghof Membranes continuously “think outside the box” by not only offering tubular UF membrane modules, but we also deliver engineered filtration systems and support services to our OEM partners. From lab-scale testing, to piloting, to engineering design, to commissioning, to remote monitoring and analysis, to replace parts – we’re more than just a membrane supplier.

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