

PROJECT REFERENCE

Chemical Industry

REVERSE OSMOSIS CONCENTRATE

Project Details

Location:	Jiansu Kunshan, China
OEM Partner:	Nanjing Centre Electricity
Product:	Tubular UF membranes
Produced permeate:	2,784 m ³ /day
Membrane type:	5mm PVDF, chemical resistant, non-backwashable

Project Overview

Kunshan Zhong Yan Company, located in Kunshan City in China's Jiangsu province, manufactures 600,000 tons of **sodium carbonate** (also known as "soda ash") per year. Sodium carbonate serves multiple purposes in both domestic and industrial applications - widely used as a water softener, as a component in the manufacture of glass, a common additive used in swimming pools, and as an ingredient in certain foods, just to name a few.

The Challenge

In order to **meet stringent water reuse standards**, the Kunshan plant set out to find a **cost-effective solution to treat its reverse osmosis (RO) concentrate** and improve overall RO system recovery. Ultimately, the company's goal was to **achieve zero liquid discharge (ZLD)**, recycling treated water back into the process stream and reducing the amount of concentrate that is ultimately routed to the evaporator/crystallization system.

The Berghof Membranes solution

The Kunshan Zhong Yan plant contracted **Berghof Membranes (BMT)** to install its **unique tubular ultrafiltration (UF) membranes**, becoming the first commercial plant in China to use tubular membrane technology in soda ash production. The original system requirements called for a treatment capacity of 2,784 m³/day, a flux of 150 l/m²/h (LMH) and a crossflow rate 3,0 m/s. The Berghof Membrane system was designed with a total of 12 modules installed in two skids. In each skid, six modules are connected in series using Berghof's **5mm-diameter PVDF tubular UF membranes** which are rated to a **maximum operating temperature of 60° Celsius** to withstand rigorous Clean-In-Place (CIP) procedures.



Picture 1. Setup of the tubular UF membranes



Membranes
Think outside the box

One week after installation and seven days of continuous operation, the Berghof Membranes system circulation flow rate was measured at 4,560 m³/day for each skid, and a crossflow velocity of about 2.4 m/s.

The inlet feed pressure for skid #1 was at 3.0 bar and the outlet pressure registered at 0,5 bar, with a treated water capacity of 1,416 m³/day and a flux rate of 145 LMH.

Skid #2 treated 1,296 m³/day, at a flux rate of 134 LMH, with an inlet feed pressure of 3.5 bar and outlet pressure of 0.5 bar.



Picture 2. Berghof Membranes UF modules

Today, **more and more industries are employing zero liquid discharge processes** to meet stringent environmental regulations. However, operating costs can present real challenges as conventional membrane filtration technologies typically require high pressure equipment, are easily susceptible to fouling and are not robust enough to withstand rigorous chemical cleaning processes.

Berghof Membranes offers a **full line of tubular membranes** that are a **cost-effective solution to treat high-strength wastewater streams**, deliver excellent permeate results and reduced energy consumption.

Customer Benefits

The tubular UF membranes from Berghof Membranes proved to be an effective and efficient method in improving overall recovery from Kunshan's RO system and producing less concentrate that, in turn, required less energy for the plant's evaporation/crystallization process.

- **High flux of 134-145 LMH**
- **Feed capacity of 2,784 m³/day**
- **Variable crossflow velocity to minimize energy consumption**
- **Robust PVDF tubular UF membranes rated to maximum of 60° Celsius**
- **Integrated intelligent software automatically adjusts system parameters to minimize fouling**
- **Double-loop skid design to reduce CAPEX and OPEX**

The B-SMART™ System

Based on a side-stream ultrafiltration system located outside the bioreactor (**the external principle**), the Berghof Membranes B-SMART 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-SMART 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**.



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