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PLUM MEMBRANE TECHNOLOGY



Tubular Membrane Modules



Tubular Membrane Process
Solutions



Industrial Wastewater Zero
Liquid Discharge(ZLD)



Fluid Membrane Separation



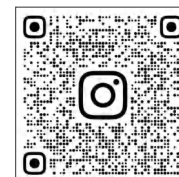
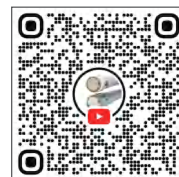
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About Us

Founded in 2004, Plum Membrane Technology Co., Ltd. is headquartered in the Hefei National High-Tech Zone, Anhui Province. The company occupies a 20,000 square meters campus with a built-up area of 50,000 square meters. As a leader in membrane technology R&D and industrial applications, we provide end-to-end solutions, including membrane module development, integrated system manufacturing, engineering design, installation, commissioning, and maintenance. Plum Membrane has established itself as a pioneering force in China's membrane technology sector.

Plum Membrane holds over 100 patents, including 40 invention patents, and is certified to ISO 9001:2015. Recognized as a National High-Tech Enterprise and a council member of the China Membrane Industry Association, we possess Grade II Contracting Qualifications in Environmental Protection and Electromechanical Engineering. Our achievements include the

2004 Founding Time

Plum Membrane Technology Co., Ltd.

50,000 m²

Building area

500+

Project Case

Ministry of Science and Technology Innovation Fund, Anhui Provincial "Specialized and Innovative" SME recognition, and the China National Coal Group's First Prize for Technological Advancement.

Initially focused on membrane applications in fermentation liquid extraction (e.g., lactic acid, amino acids, antibiotics), natural product separation (e.g., pueraria, monk fruit, stevia, tea beverages), condiment purification (e.g., soy sauce, vinegar, cooking wine), and sugar filtration and purification, Plum Membrane has since expanded into oilfield produced water treatment, landfill leachate ZLD, and industrial wastewater ZLD, including pharmaceutical, coking, and coal chemical high-salinity wastewater.

In 2011, Plum Membrane established a dedicated R&D center for tubular membranes, focusing on their development, production, and application. With multiple fully automated production lines, we manufacture PVDF and PES tubular membranes and pioneered the world's first PEK tubular membrane. This breakthrough product has delivered outstanding performance in wastewater treatment and fluids separation. We also offer process solutions based on PEK tubular membranes, addressing challenges such as hardness removal, impurity removal, oil removal, fluoride removal, silicon removal, and heavy metal removal—widely applied in complex industrial wastewater treatment.

100⁺ Term
Patents

40⁺ Term
Invention patents

2007 Year
Has expanded into industrial wastewater

2011 Year
Established a dedicated R&D center



Competitive Edge

By choosing Plum Membrane Technology, you receive innovative, reliable, and tailored membrane technology solutions. With exceptional technical strength, unique system designs, and extensive industry experience, we are committed to delivering high-quality service and significant value enhancement for our customers.



Application-Specific Solutions



Exceptional Technical Expertise



Unique System Designs



Proven Cross-Industry Expertise

Technological Innovation and Industry Leadership

Plum Membrane holds over 100 patents, demonstrating our ongoing commitment to innovation in membrane technology. We were the first company in the world to develop PEK tubular membranes, which offer superior chemical resistance and excellent filtration performance. These membranes are widely used in wastewater treatment and fluid separation under complex conditions, positioning us at the forefront of the industry.

Unique Membrane System Design

Plum Membrane's self-developed, anti-fouling, low-power continuous membrane separation systems and optimized continuous membrane concentration processes have seen widespread application across various industries. We were the first to introduce continuous membrane separation and concentration technology in China, effectively addressing issues such as contamination, high energy consumption, and low recovery rates that typically affect traditional batch membrane systems.

Rich Project Experience

Plum Membrane has successfully implemented numerous challenging projects across diverse industries, ranging from fermentation liquid purification to ZLD solutions for high-salinity wastewater. Our technology enables clients to tackle a wide range of complex wastewater treatment challenges. Whether in traditional industries or emerging sectors, Plum Membrane brings extensive hands-on experience and exceptional engineering capabilities.

Customized Solutions

Every customer's needs are unique. We provide flexible, customized membrane technology solutions tailored to specific application scenarios. Whether handling high-concentration wastewater or efficiently separating fluids, our membrane technology process solutions are precisely designed to meet customer demands, enhance production efficiency, and reduce operational costs.

Strict Quality Assurance

Plum Membrane is ISO 9001:2015 certified, ensuring that our products and services meet international standards. All membrane modules and equipment undergo rigorous testing to guarantee stability and durability in complex environments. Our comprehensive quality management system offers robust assurance to our customers.

Development Milestones



Company Founded
Plum Membrane Technology Co., Ltd. was officially established, focusing on the development and application of membrane separation technology.



Successful Implementation of Oil and SS Removal Technology
Plum successfully applied tubular membrane technology in oilfield produced water treatment, marking a key milestone in the water treatment industry.



High-Performance PEK Series Tubular Membranes
Plum Membrane developed the high-performance PEK series tubular membrane modules, achieving breakthroughs in chemical resistance, anti-fouling properties, and efficient separation performance.



Developed Nanofiltration Salt Separation Technology
Plum Membrane developed an innovative nanofiltration salt separation technology, achieving efficient separation of sulfate and chloride. The mass ratio of sulfate to chloride on the concentrate side reaches 10:1, while on the permeate side, the ratio of chloride to sulfate exceeds 60:1. This enhances separation accuracy, reduces mixed salts, and provides a better resource recovery solution.



Rich Technical Expertise
Plum Membrane developed integrated systems for desalination, defluorination, de-siliconization, and hardness removal, providing efficient solutions for the deep treatment of high-salinity wastewater.



Comprehensive System Stability and Technology Upgrades
Plum Membrane completed the full-process ZLD technology for PEK tubular membranes, softening, concentration, nanofiltration salt separation, and evaporation crystallization, driving low-cost, short-process wastewater ZLD treatment technologies.



In-Depth Exploration and Continuous Optimization
Plum focused on the development of fluids separation membrane technologies and their associated equipment, continuously optimizing process flows to provide customized solutions across industries.



Establishment of the Tubular Membrane R&D Center
The Tubular Membrane R&D Center was established to focus on the independent research, development, and innovation of high-performance tubular membrane elements, continuously improving the filtration efficiency and durability of membrane products.



Effective Solution for Challenging Landfill Leachate Treatment
The company launched the first integrated system for ammonia stripping and nanofiltration membrane treatment of aged landfill leachate, achieving a recovery rate of over 97%.

Plum Achievements

At Plum Membrane, we believe that innovation is the core driving force behind our continuous development. As pioneers in applying advanced membrane technologies across both traditional and emerging industries, we have achieved numerous "China's firsts" and led the way in the evolution of membrane separation technology. Notable achievements include:



40⁺
Invention Patent



60⁺
Utility model invention patent

- China's First Fully Automated Continuous Ultrafiltration Membrane System for sterilization and impurity removal in fermented soy sauce and vinegar production
- China's First Tubular Membrane Separation System for fermentation-based xylitol production
- China's First Fully Automated Continuous Tubular Membrane Filtration System for oligoxylan extraction from wheat straw via pyrolysis
- China's First "Full-Membrane" Extraction Production Line for alanine production via enzymatic methods
- China's First "Full-Membrane" Extraction Production Line for S-derivative antibiotics
- China's First "Full-Membrane" Extraction Production Line for L-lactic acid
- China's First Continuous Concentration and Dehydration Membrane Separation System for pig blood processing
- China's First "Full-Membrane" Extraction Production Line for branched-chain amino acids via fermentation



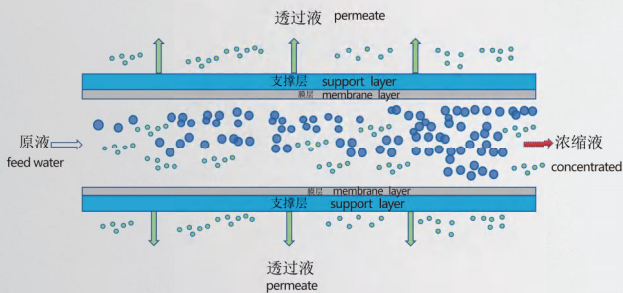
"China's firsts" and led the way in the evolution of membrane separation technology

- China's First "Full-Membrane" Production Line for stevia extract
- China's First "Full-Membrane" Production Line for PVDF-based synthetic wastewater catalyst recovery
- China's First "Full-Membrane" Extraction Production Line for inulin
- China's First Membrane Separation System for lignin extraction and recovery from bamboo processing waste
- China's First "Full-Membrane" Extraction Production Line for L-theanine from tea
- China's First Ammonia Stripping and Nanofiltration Membrane Full-Scale Treatment System for landfill leachate
- China's First Tubular Membrane and Nanofiltration "Full-Membrane" Production Line for processing 10,000 cubic meters of oilfield produced water per day
- China's First PEK Tubular Membrane Full-Process ZLD System for wastewater reuse
- China's First PEK Tubular Membrane Integrated Pre-treatment System for silicon, fluoride, and hardness removal
- China's First "Ultrafiltration + Nanofiltration" High-Salinity Wastewater Separation, Purification, and Resource Recovery System
- World's First PEK Tubular Membrane modules with acid-alkali resistance (pH 0-14)





Tubular Membrane modules



Product Overview

Tubular membranes are highly efficient filtration modules with a porous tubular structure, designed for ultrafiltration or microfiltration processes. They operate based on the principle of cross-flow filtration, enabling efficient treatment of systems that are typically difficult to process with traditional methods, such as high-viscosity, high-suspended solids, and oil-containing wastewater. Tubular membranes are available in various filtration channel sizes, including 6mm, 8mm, and 12.5mm, to meet a range of treatment needs.

PEK tubular membranes, with their unique material properties, deliver outstanding performance in challenging applications. These membranes offer exceptional chemical resistance and high-temperature tolerance, ensuring long-term stable operation in extreme conditions. They are particularly well-suited for treating complex conditions, such as highly polluted, corrosive wastewater, and mixtures with high concentrations of suspended solids and oil. Compared to traditional tubular membranes, PEK tubular membranes not only operate stably in harsh environments but also provide significant advantages in durability, fouling resistance, and ease of cleaning, offering a more reliable option for efficient separation and filtration.

Core Technology – PEK Material

Polyetherketone (PEK) is a high-performance specialty engineering plastic, known for its exceptional heat resistance, mechanical strength, and chemical corrosion resistance. It is suitable for use in a variety of extreme conditions. The core properties of PEK material include:



Hydrophilicity

With a hydrophilic contact angle of 62-65°, PEK demonstrates excellent hydrophilicity, high membrane flux, strong fouling resistance, and simple cleaning recovery.



Chemical Resistance

The polymer chain of PEK is composed of ketone and ether groups, providing exceptional corrosion resistance. It is suitable for neutral, alkaline, and even high-temperature, highly acidic environments. PEK membranes can operate in environments with a pH range of 0-14, offering excellent oxidation resistance and chloride tolerance up to 300,000 ppm·h.



Mechanical Properties

PEK exhibits excellent high-temperature resistance, wear resistance, and toughness, making it ideal for high-performance aerospace applications and mechanical sealing materials.



Performance Parameters

Parameters	Unit	Membrane Material					
		PVDF	PEK			PEK (Composite Support Layer)	PK
Pore Size / MWCO	/	30nm	0.2um	50nm	10nm	30nm	0.1um
Pure Water Flux	LMH/100kPa	900	2000	1200	300	1000	1500
Operating Pressure	kPa	-50~800	-100~1000			-50~800	-100~1000
Max Operating Temperature	°C	60	60			50	50
pH Range	/	2~10	0~12.5			0~14	1~11
Chlorine Resistance	ppm·h	250000	300000			300000	200000

Specifications and Models

Model	Tube Dia. (mm)	Module Length (mm)	Module Dia. (Inch)	Membrane Area (m²)	Housing Mat.
PL-G-6410-F/P	6	4000	10"	69	FRP/CPVC
PL-G-8410-F/P	8	4000	10"	53	FRP/CPVC
PL-G-6310-F/P	6	3000	10"	51	FRP/CPVC
PL-G-8310-F/P	8	3000	10"	40	FRP/CPVC
PL-G-638-F/P	6	3000	8"	34	FRP/CPVC
PL-G-838-F/P	8	3000	8"	28	FRP/CPVC
PL-G-636-F/P	6	3000	6"	19	FRP/CPVC
PL-G-836-F/P	8	3000	6"	15	FRP
PL-G-634-F	6	3000	4"	8.5	FRP
PL-G-834-F	8	3000	4"	6.4	FRP

PL-G-XXX-X: Plum- Tube Dia. (mm), Module Length (m), Module Dia. (inches) - Housing Mat.



Key Features

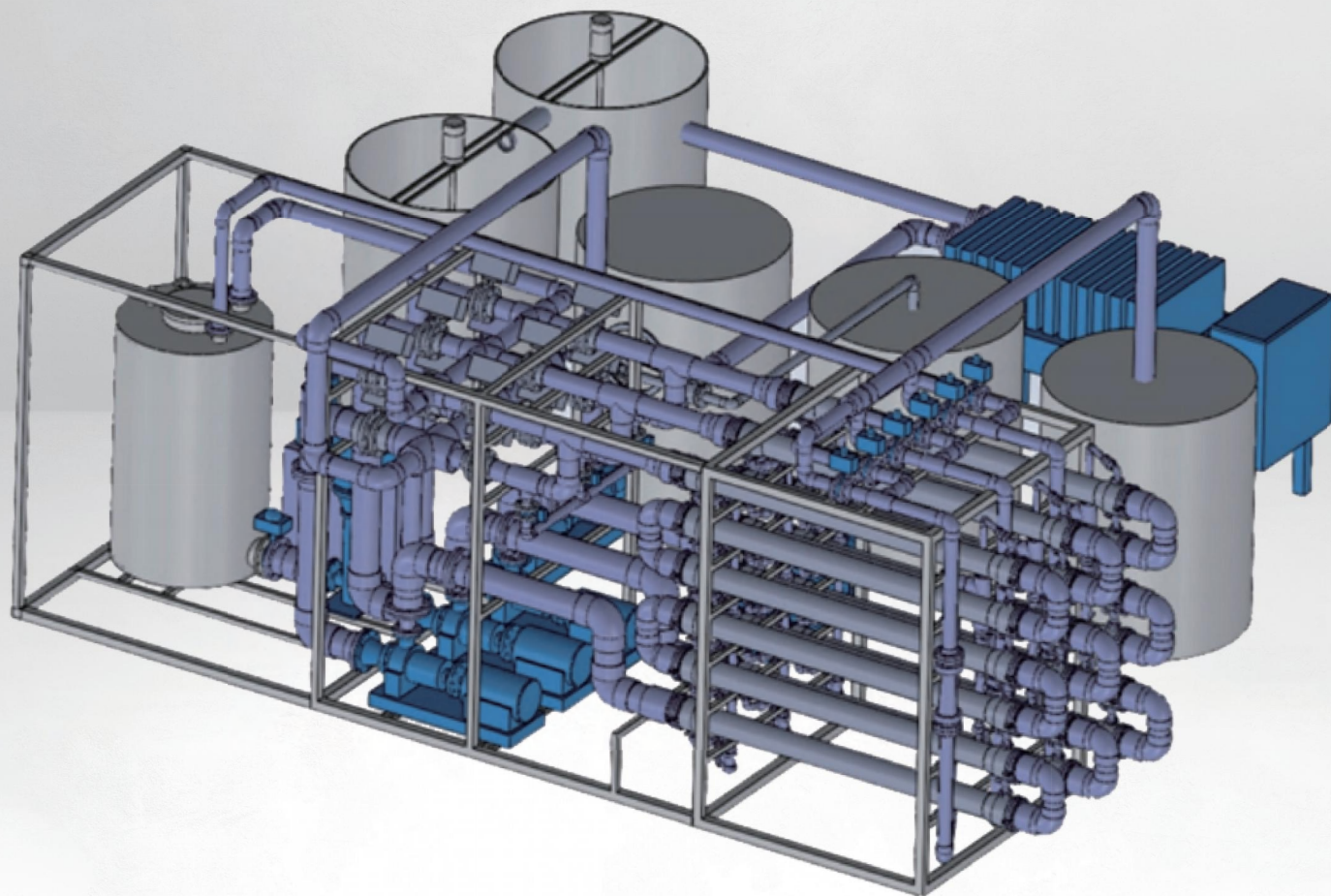
- **High-Strength Structure:** The support layer of the membrane tube is made with special non-woven fabric and double-sided welding technology, providing exceptionally high mechanical strength. This prevents clogging and ensures the longevity of the membrane modules.
- **Handling High-Concentration Fluids:** The PEK tubular membrane can directly filter fluids with suspended solids concentrations as high as 30-50g/L, making it ideal for efficient separation in complex operating conditions.
- **Chemical Resistance:** PEK membranes can operate stably within a pH range of 0-14, making them ideal for highly acidic and alkaline conditions. When combined with suitable processes, they can effectively treat complex water qualities such as hardness, heavy metals, silica, and oil removal.
- **Hydrophilicity and High Flux:** PEK material has excellent hydrophilicity, offering 20-50% higher flux than PVDF tubular membranes, and is more resistant to fouling, making it well-suited for continuous operation under challenging conditions.
- **Ease of Cleaning and High Flux Recovery:** PEK tubular membranes can withstand strong acid and alkali cleaning, with excellent flux recovery after cleaning. This makes them particularly effective for treating high COD and high suspended solids in water.
- **Pre-treatment Advantage:** PEK tubular membranes can serve as a pre-treatment process for spiral-wound membranes, achieving an effluent turbidity of <0.5 NTU and SDI15<3, ensuring the efficient operation of subsequent processes.
- **System Integration and Space Saving:** PEK tubular membranes can replace conventional pre-treatment processes like high-density sedimentation tanks, sand filtration, and hollow fiber membranes. This simplifies the process, reduces the footprint, and increases system recovery rates, improving operational efficiency.



Tubular Membrane Process Solutions

Overview

To address the diverse needs of various wastewater and fluid treatment applications, Plum Membrane has developed specialized tubular membrane process solutions tailored to different industries. Leveraging our extensive expertise in membrane engineering, these solutions are designed with fully automated control systems that dynamically adjust module configurations based on incoming water flow, ensuring high operational flexibility and adaptability across a wide range of treatment scenarios.



MBR Process Solutions



Suspended Solids Removal Process Solutions



Hardness, Silica, and Fluoride Removal Process Solutions



Heavy Metal Removal Process Solutions



Oil Removal Process Solutions

MBR Process Solutions

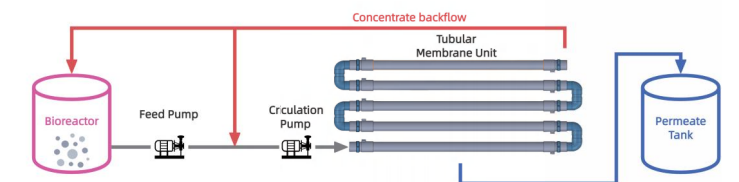
Overview: The MBR (Membrane Bioreactor) process combines membrane filtration technology with biological treatment, offering an efficient solution for water treatment. The application of PEK tubular membranes in the MBR process provides superior solid-liquid separation, retaining activated sludge and increasing its concentration, thereby improving the removal efficiency of BOD, COD, and other contaminants. With the excellent anti-fouling properties, high flux, and durability of PEK tubular membranes, this technology is well-suited for various types of MBR systems, including external MBR, airlift MBR, and anaerobic MBR processes.

External MBR(Side Stream MBR)

External MBR systems are capable of handling higher concentrations of sludge, utilizing the microporous filtration principle of membranes to retain activated sludge. This helps increase the microbial population in the reactor, enhancing the degradation of organic matter. The system requires minimal pre-treatment, eliminating the need for secondary sedimentation tanks and subsequent filtration facilities. It features a short process and high efficiency.

Technical Features:

- *Membrane surface flow velocity: 3 m/s to 5 m/s
- *Suitable for MBR with high MLSS ranging from 12,000mg/L to 40,000mg/L
- *Operating flux: 70 to 150 LMH
- *Energy consumption per cubic meter of treated water: 1.5 - 4 kWh/m³
- *External membrane equipment for easy operation and maintenance

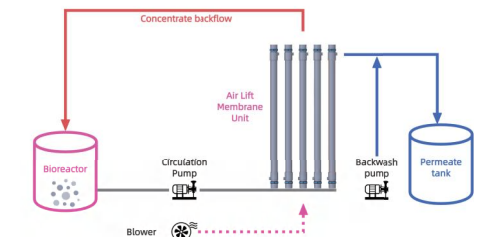


Air Lift MBR

The Airlift MBR system is a wastewater treatment solution that combines membrane filtration technology with biological degradation treatment. The principle involves using an air lift device to mix sludge and water in the reactor, driving the water through the tubular membrane filtration units. This enables biological degradation and membrane separation of the wastewater. In this system, rising bubbles facilitate good mixing for the biological reaction while driving water flow through the membrane modules. After biological degradation by microorganisms, suspended solids and dissolved substances in the water are retained by the membrane filtration units, and the separated water meets higher treatment standards.

Technical Features:

- *Membrane surface flow velocity: 0.4 m/s to 0.8 m/s
- *Suitable for MBR with moderate MLSS ranging from 8,000mg/L to 12,000mg/L
- *Operating flux: 30 to 50 LMH
- *Energy consumption per cubic meter of treated water: <0.5 kWh/m³
- *External membrane equipment for easy operation and maintenance

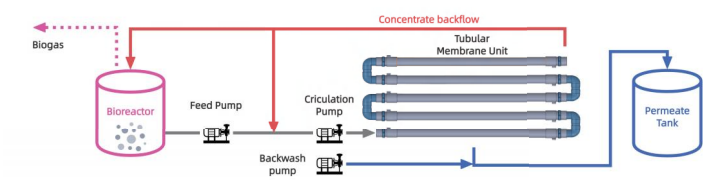


Anaerobic MBR (AnMBR)

The Tubular Membrane Anaerobic MBR (AnMBR) combines anaerobic biological degradation with membrane filtration technology, making it suitable for the treatment of high-concentration organic wastewater. The AnMBR system operates in an anaerobic environment, where anaerobic microorganisms degrade the organic pollutants in the wastewater. Through the metabolic action of these microorganisms, organic matter is converted into methane, carbon dioxide, and other gases. Meanwhile, the tubular membrane or other membrane modules are used for solid-liquid separation, preventing solid matter, suspended solids, and macro-molecules from entering the treated water.

Technical Features:

- *Membrane surface flow velocity: 1 m/s to 3 m/s
- *Suitable for high COD systems, with COD removal efficiency >95%
- *The MBR with MLSS ranging from 10,000mg/L to 20,000mg/L
- *Operating flux: 50 to 70 LMH
- *Energy consumption per cubic meter of treated water: 1.0 to 2.0 kWh/m³
- *Compared to traditional anaerobic processes, the hydraulic retention time is shortened, improving organic matter degradation efficiency

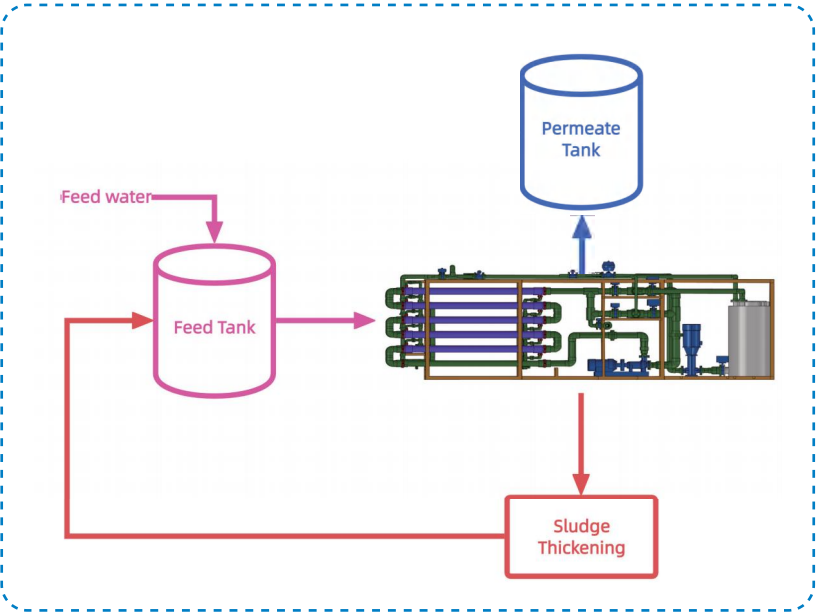




Suspended Solids Removal Process Solutions

Overview: Tubular membranes utilize the cross-flow filtration principle with a high surface flow velocity and excellent anti-fouling properties to directly treat high-concentration suspended solids and high-viscosity fluids (30-50 g/L) without the need for any pre-treatment equipment or chemical additives. The process flow is simplified, making operations convenient. The membrane effluent meets the water quality requirements for NF/RO systems, ensuring the efficiency and stability of subsequent deep treatment.

- Applications:**
- Industrial wastewater
- Municipal wastewater
- New energy
- Fermentation liquid clarification
- Semiconductors
- Food and beverage industry, etc.



Key Features:

High Operating Flux

The operating flux range is from 100 LMH to 300 LMH.

Excellent Effluent Quality

The turbidity of the permeate is below 0.5 NTU, and SDI₁₅ is less than 3, ensuring high-quality water output.

No Coagulant or Flocculant Dosing Required

No additional coagulants or flocculants are needed, reducing chemical usage and lowering operational costs.

Tolerates High Suspended Solids Concentration

The system can tolerate suspended solids (SS) concentrations in the feed water up to 30,000 mg/L to 50,000 mg/L, making it suitable for treating high-suspended solids wastewater.

Simplified Process, No Extra Pre-treatment Required

The system design simplifies the process by eliminating the complex pre-treatment steps in conventional processes, and no additional pre-treatment units are needed.



480m³/d Tubular Membrane Treatment System for Chip Grinding Wastewater



425m³/d External MBR System for Landfill Leachate



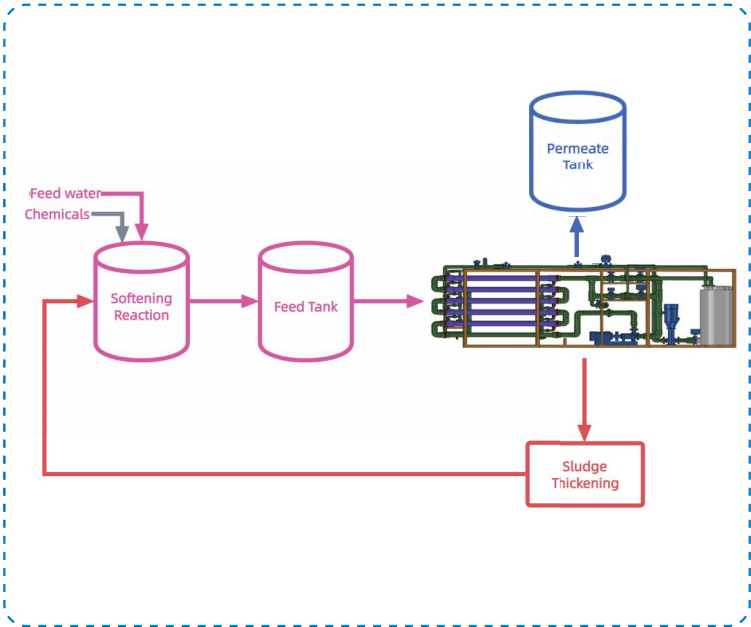
120m³/h Tubular Membrane Separation System for Oligoxylan

Hardness, Silica, and Fluoride Removal Process Solutions (PEK Softening Process)

Overview: High-hardness wastewater often contains excessive amounts of calcium, magnesium, silica, or fluoride, which can cause scaling or corrosion in nanofiltration, reverse osmosis systems, and evaporators. The PEK softening process uses only conventional acid and alkali chemicals, without the need for coagulants or flocculants. It achieves continuous concentration and sludge removal through PEK tubular membranes, significantly simplifying the process flow. This process not only simplifies operation but also efficiently removes hardness, ensuring the long-term stable operation of subsequent deep treatment equipment.

Applications:

- Reclaimed water reuse
- Industrial wastewater
- Power, Photovoltaic, and Chemical Plant Cooling Water Blowdown
- RO brine softening for silica, fluoride, and hardness removal



Key Features:

High Operating Flux

The operating flux range is from 150 LMH to 300 LMH.

Extreme Filtration Under Highly Alkaline Conditions

Efficient filtration under strong alkaline conditions, ensuring excellent effluent quality with total hardness <50 mg/L, calcium and magnesium ions <10 mg/L, total silica <10 mg/L, and fluoride ions <1 mg/L.

Simplified Process, Small Footprint

A short process flow with a small footprint, further replacing traditional high-density sedimentation tanks, multi-media filters, and hollow fiber membranes.

No Coagulant or Flocculant Addition Required

The system does not require the addition of coagulants or flocculants, reducing chemical usage, simplifying the operational process, and lowering operational costs.



235m³/h Tubular Membrane Hardness Removal System for Chemical Plant Reclaimed Water reuse



40m³/h Coking RO Brine Silica Removal System



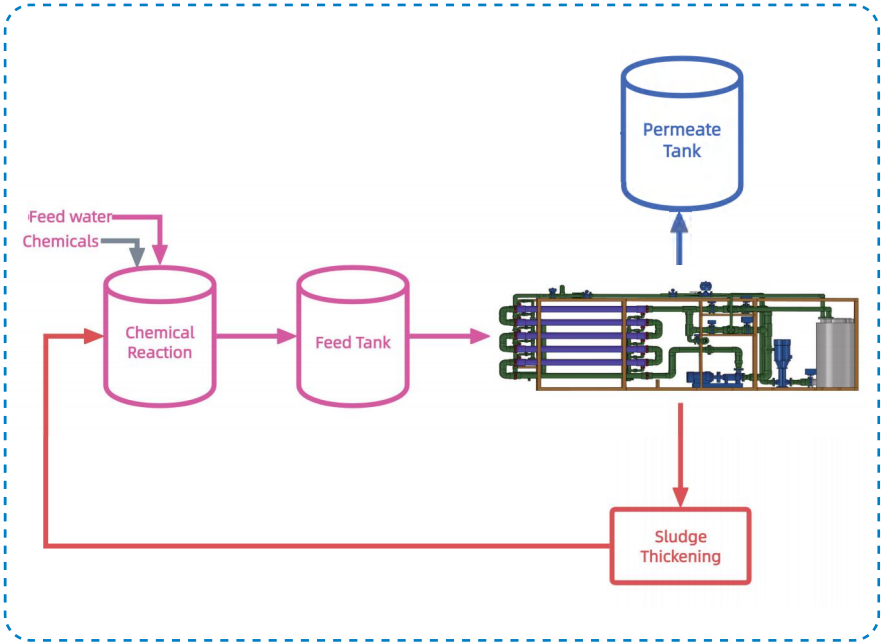
52m³/h Power Plant Cooling Water Blowdown Softening and Hardness Removal Unit



Heavy Metal Removal Process Solutions

Overview: Heavy metal wastewater primarily originates from industrial processes such as mining, metallurgy, electroplating/electronics, chemicals, and machinery manufacturing, containing non-degradable heavy metal ions. By adjusting the pH of the wastewater, heavy metals are precipitated, and then filtered and separated through PEK tubular membranes, ensuring that the treated water meets discharge standards and complies with environmental requirements.

- Applications:
- New energy
- Electronics
- Metallurgy
- Electroplating
- Mining
- Wastewater treatment in industries with high heavy metal contamination



Key Features:

Efficient Heavy Metal Ion Removal

PEK tubular membranes offer high separation performance, effectively removing heavy metal ions such as lead, cadmium, copper, zinc, and others from wastewater, ensuring water quality meets the required standards.

Long-Term Stable Operation

Due to the superior material properties of PEK tubular membranes, they are capable of long-term operation with a service life of over 5 years.

High Operating Flux

The operating flux range is from 150 LMH to 500 LMH.

Tolerance to High-Concentration Wastewater

These membranes are resistant to wastewater containing high concentrations of heavy metals and are less prone to fouling and clogging, making them suitable for treating water with high suspended solids or high pollution levels.

No Need for Complex Chemical Additives

During the heavy metal removal process, PEK tubular membranes do not require complex chemical additives, such as coagulants or flocculants, reducing the use of chemical additives and lowering operational costs.



▲ 1350m³/d Iron-contaminated Wastewater Heavy Metal and Hardness Removal Project for a Steel Plant



▲ 50m³/h Phosphoric Acid Iron Washing Water Clarification and Heavy Metal Removal System for a New Energy Company



▲ 3000m³/d PCB Wastewater Copper Removal Project

Oil Removal Process Solutions

Overview: In the oil and gas industry, the treatment of oil-contaminated wastewater has always been a challenge. PEK tubular membranes, with their hydrophilic and oleophobic properties, efficiently capture suspended oils, dissolved oils, and emulsified oils, with a retention rate of ≥99%. Additionally, PEK membranes are resistant to strong alkaline cleaning and offer good capacity recovery. The process flow is short, with minimal chemical usage, and the system can be fully automated, greatly simplifying operation and maintenance.

Efficient Oil Removal

PEK tubular membranes achieve ≥99% retention of suspended oils, dissolved oils, and emulsified oils, ensuring the effluent meets discharge standards.

Strong Cleaning Recovery

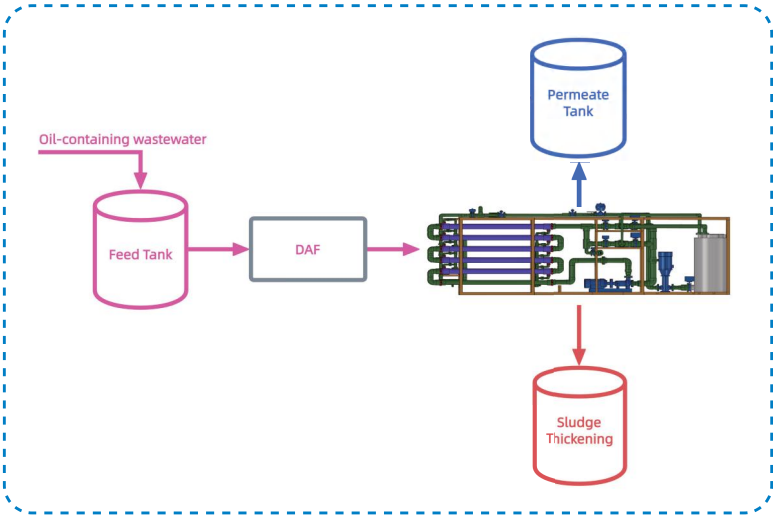
PEK membranes are resistant to strong alkaline cleaning, maintaining high flux in highly polluted environments and reducing membrane fouling and maintenance frequency.

Simplified Operation

The process flow is short, with minimal chemical usage, and the system can be fully automated, reducing operational costs and improving efficiency.

Long Lifespan and Stability

PEK membranes are highly resistant to chemical corrosion and possess strong mechanical strength, with a service life of over 5 years.



Applications:

- Oilfield produced water
- Fracturing flowback fluid
- Petrochemical refining
- Emulsions
- Various oil-contaminated wastewater

Parameter	Oil Content (mg/L)	Suspended Solids (mg/L)	Particle Size (μm)	Acid-Resistant Bacteria (CFU/mL)	Mesophilic Bacteria (CFU/mL)	Iron Bacteria (CFU/mL)
Influent Quality	< 1000	< 1000	< 20	< 1000	< 10000	< 10000
Effluent Quality	< 5	< 1	< 1	< 10	< 100	< 100
Removal Rate	99.5%	99.9%	-	99%	99%	99%



▲ 200m³/d Oil and Gas Mud Filtration Oil Removal System



▲ 500m³/d Oilfield Produced Water Oil Removal Project



▲ 1200m³/d Oilfield Produced Water Oil Removal Skid-mounted Explosion-proof System



▲ 10000m³/d PetroChina Oilfield Produced Water Oil, Impurity Removal and Demineralization Project



Industrial Wastewater Zero Liquid Discharge(ZLD)

Plum Membrane's industrial wastewater zero Liquid discharge membrane system aims to assist industries in achieving wastewater resource utilization and zero discharge goals. It covers various challenging wastewater treatment processes to ensure efficient, environmentally friendly, and sustainable production operations.



Circulating/Cooling Water Blowdown Reuse Process

Simplified and Efficient Softening: The process uses softening combined with PEK tubular membrane filtration, resulting in a short process flow and effluent total hardness <50 mg/L, ensuring effective treatment.

High-Efficiency Concentration, Improved Recovery Rate: The HRCC (High Recovery Continuous Concentration) technology is applied, with reverse osmosis recovery reaching over 90% in a single step, significantly reducing wastewater discharge.

Fully Automated Intelligent Control: The fully automated intelligent operating system supports unmanned operation with only scheduled inspections, enhancing system reliability and operational efficiency.

Applications:

Petrochemical industry

Steel industry

Power industry

Chemical industry

Pharmaceutical industry

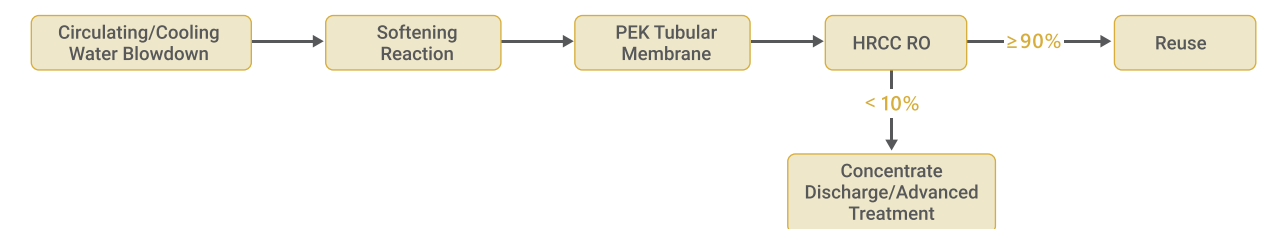
Influent Quality:

High suspended solids content

Contains oils and organic matter

High hardness and salt accumulation

Process Flow:



▲ 400 m³/h Circulating Water Blowdown Treatment Project for a Photovoltaic Company in Yunnan (Total Water Recovery Rate >90%)

Mine Water Zero Liquid Discharge (ZLD) Process

Applications:

Coal mining industryMetal minesNon-metal minesIntegrated mining areas

Influent Quality:

High suspended solids (SS) concentrationHeavy metal ionsHigh hardness and salinityOil and greaseSoluble organic compounds: Sulfates, chlorides

Key Features:

**Simplified and Efficient Pre-treatment Process**

The process integrates softening and PEK tubular membrane filtration, shortening the flow path. The treated water achieves hardness<50 mg/L and total silica<10 mg/L, without the need for coagulants or flocculants.

**Precise Salt Separation via Two-Stage Nanofiltration**

The two-stage nanofiltration process ensures effective salt separation, with a sulfate-to-chloride ion ratio>10:1 in the concentrate and >1:60 in the permeate, ensuring high-efficiency salt and impurity separation.

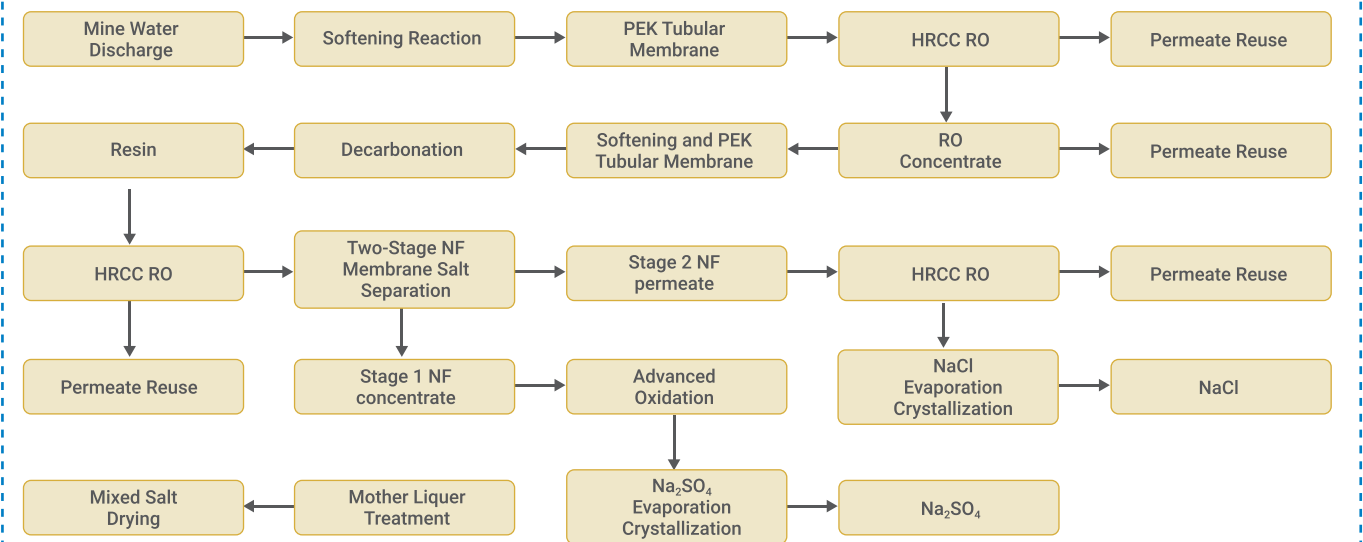
**Mother Liquor Recovery and Salt Reduction**

Equipped with a mother liquor recovery system, the process reduces waste salt generation, maintaining a salt concentration of less than 5%, thereby enhancing resource utilization.

**High-Efficiency Concentration and Recovery**

The HRCC (High Recovery Continuous Concentration) process significantly enhances reverse osmosis recovery, achieving over 90% recovery in one step, optimizing conventional concentration processes.

Process Flow:



150m³/h Mine Water Zero Liquid Discharge Treatment System for a Coal Mine in China National Coal Group

Coal Chemical Wastewater Zero Liquid Discharge (ZLD) Process

Applications:

Coal-to-liquid (CTL)Coal-to-gas (CTG)Coal-to-olefinsCoal gasification and liquefactionCoal chemical industrial parks

Influent Quality:

High salinityHigh organic contentHeavy metals and ammonia nitrogenHigh suspended solidsStrong corrosivenessSignificant fluctuations

Key Features:

**Efficient Separation and Resource Utilization**

The process uses ultrafiltration (UF) to remove COD, combined with nanofiltration (NF) for salt separation. This enables the extraction of sodium sulfate (purity≥99%) and sodium chloride (purity≥98.5%), facilitating the resource recovery of crystallized salts.

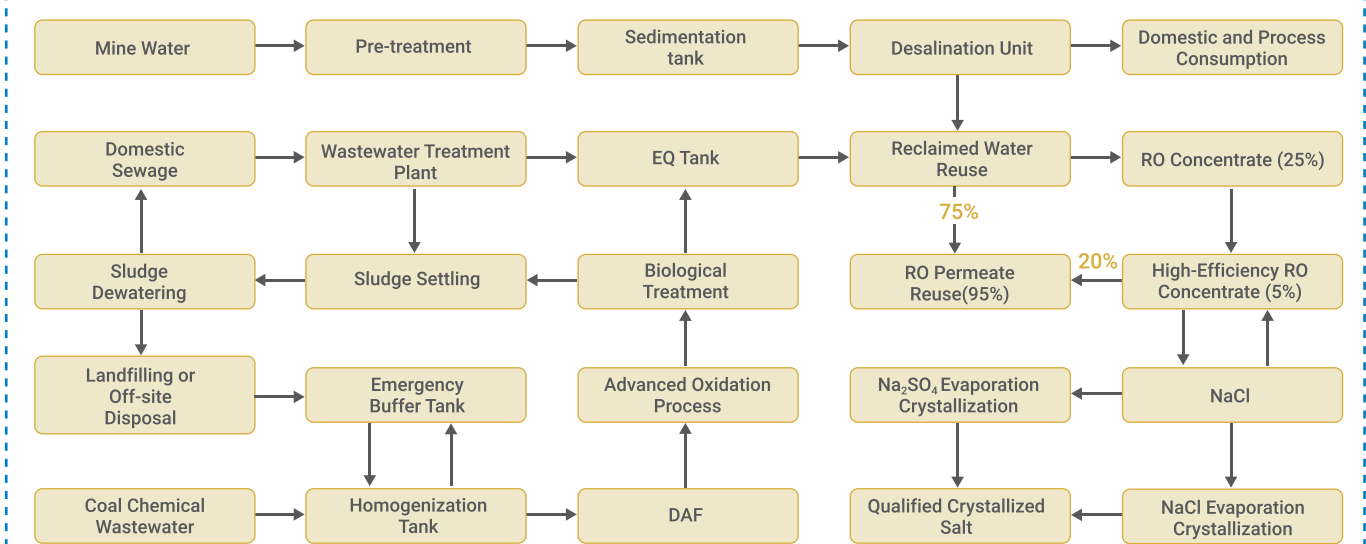
**Evaporation and Crystallization Brine Recovery**

The system is equipped with a brine recovery device that enhances the resource utilization rate of salts to over 95%, maximizing resource recovery.

**Low Salinity Waste Rate**

Through precise salt separation and recovery processes, the overall salinity of the system is controlled to below 5%, ensuring efficient operation and minimizing waste salt discharge.

Process Flow:



60m³/h Coal Chemical RO Brine and 4 m³/h Crystallization Brine UF+NF – Separation of Monovalent and Divalent Salts

25m³/h Coal Chemical Concentrated Brine UF+NF – Separation of Monovalent and Divalent Salts

Reclaimed Water Reuse and RO Brine Zero Liquid Discharge (ZLD) Process

The diagram consists of two horizontal rows of rounded rectangular boxes. The top row is labeled 'Applications:' and contains five boxes: 'Industrial parks', 'Power plants', 'Petrochemical industry', 'Metallurgical industry', and 'Chemical plants'. The bottom row is labeled 'Influent Quality:' and contains five boxes: 'High salinity', 'High toxic organic pollutants', 'Hardness and suspended solids', 'Microbial contamination', and 'Significant water quality fluctuations'.

```
graph LR; subgraph Applications; A1[Industrial parks]; A2[Power plants]; A3[Petrochemical industry]; A4[Metallurgical industry]; A5[Chemical plants]; end; subgraph Influent_Quality [Influent Quality]; I1[High salinity]; I2[High toxic organic pollutants]; I3[Hardness and suspended solids]; I4[Microbial contamination]; I5[Significant water quality fluctuations]; end;
```



A new 235 m³/h reclaimed water reuse unit and a 106 m³/h RO brine zero liquid discharge unit were installed for a technology company in Inner Mongolia.

Zero Liquid Discharge for Desulfurization Wastewater in Power Plants

Applications: Coal-fired power plants Gas-fired power plants Combined heat and power plants, and other industrial power plants

Influent Quality: High sulfate concentration High hardness High suspended solids High COD and organic content Highly corrosive



Gansu Power Plant, 2×350MW Unit, 10 m³/h Desulfurization Wastewater Zero Liquid Discharge Project

Landfill Leachate Full-Scale Treatment - Ammonia Stripping Process

Applications:

Municipal solid waste landfills

Industrial waste landfills

Waste incineration plants

Hazardous waste landfills

Integrated waste treatment parks

Influent Quality:

High organic pollutant content

High ammonia nitrogen content

Heavy metals and toxic substances

High salinity

Suspended solids and particulate matter

Aged Landfill Leachate: Aged leachate has high ammonia nitrogen content (3500-3900 mg/L) and low COD (around 5000 mg/L), making it difficult for biological treatment. The ammonia nitrogen is reduced to below 1000 mg/L through an ammonia stripping pre-treatment unit. Fresh leachate is mixed with the pretreated aged leachate according to the carbon-to-nitrogen ratio and fed into the MBR system. The MBR effluent is treated by nanofiltration, where 80% meets discharge standards. The remaining 20% is concentrated and treated by two-stage membranes separation, recovering humic acid and crystallized salts, achieving a final 99.5% water recovery rate that meets discharge standards.

Design Influent and Effluent Water Quality:

No.	Parameter	Unit	Design Influent Quality	Design effluent Quality	Removal Rate
1	NH ₃ -N	mg/L	≤3500	≤875	≥75%
2	TN	mg/L	≤4300	≤1675	≥61%
3	pH	-	6-9	6-9	--

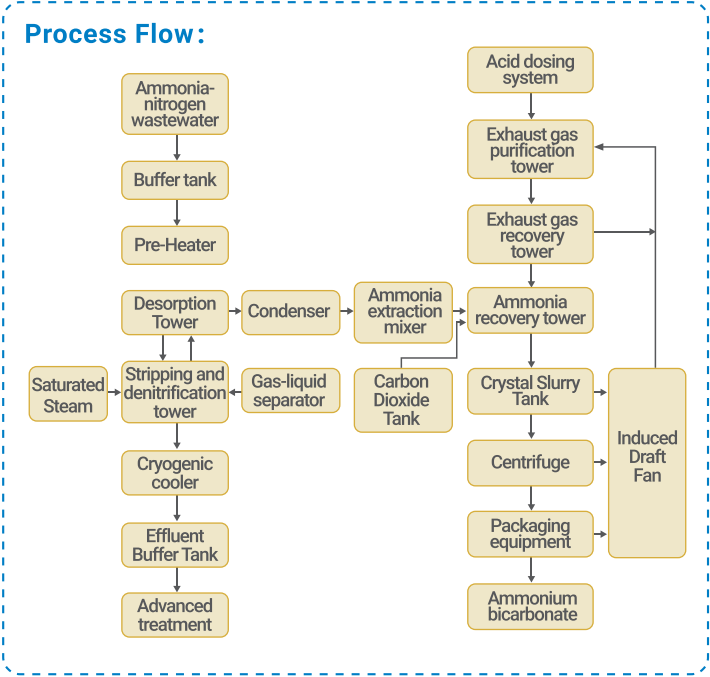
Key Features:

- **Advanced Condensation and Absorption Optimization**

The process uses advanced condensation and absorption technologies to achieve process and heat integration, reducing operational costs.
- **High Flux, Low Resistance, and High Separation Efficiency**

The system utilizes tower trays with high flux, low resistance, high separation efficiency, and particle resistance.
- **Ammonia Stripping Tower with Tower Trays**

The entire set of ammonia stripping towers uses tower trays instead of packing. The tower trays are treated with anti-scaling treatment to resist scaling and clogging, ensuring zero maintenance for the main tower and stable treatment performance.



Self-Developed Control System
The entire process is managed by a self-developed control system, achieving process safety and automation.



2000 m³/d Ammonia Stripping Project for Ammonium Bicarbonate Preparation in Shanghai



400 m³/d Pilot Ammonia Stripping Project for Ammonium Bicarbonate Preparation in Shanghai

Landfill Leachate Full-Scale Treatment - Full Nanofiltration treatment Process

Applications:

Landfill leachate

Kitchen waste leachate

Influent Quality:

High ammonia nitrogen

High COD

Carbon-nitrogen ratio difficult to meet biochemical requirements

Key Features:

- **Full Nanofiltration Treatment Process**

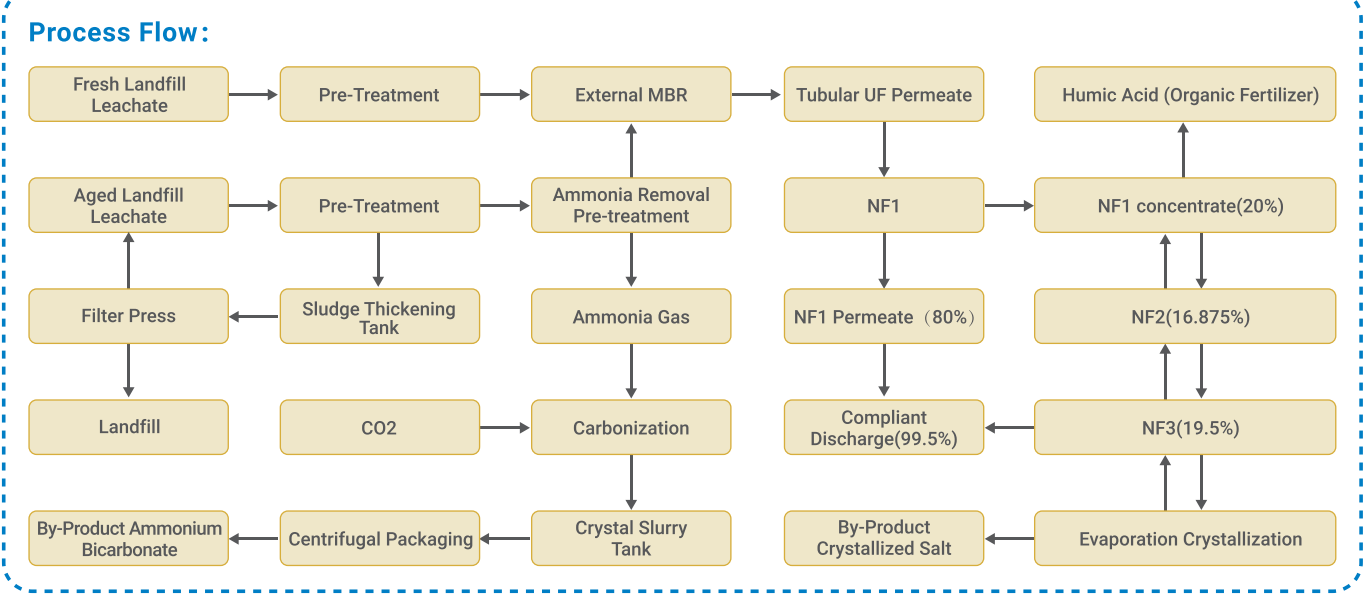
The process utilizes a full nanofiltration approach, without the use of RO membranes, eliminating high-salinity brine generation.
- **System Recovery Rate >97%:**

The total system recovery rate is over 97%, with actual recovery rates reaching up to 99.5%.
- **“N+1” Design for Membrane System**

The membrane system follows the “N+1” design concept, allowing for fully automated, unmanned operation.

Design Influent and Effluent Water Quality:

Unit	Project	COD _{Cr} (mg/L)	BOD ₅ (mg/L)	NH ₃ -N (mg/L)	TN (mg/L)	SS (mg/L)	NO ₃ -N (mg/L)
3200 m³/d Leachate System	Influent	800~1000	20~30	≤10	40~50	≤2	20~30
640 m³/d Concentrate System	Influent	3500~4000	20~30	≤10	40~50	≤2	20~30
Standard Discharge	Effluent	40~60	20	≤8	≤20	0	15



3200m³/d Landfill Leachate and 640 m³/d Concentrate Nanofiltration Full-Scale Treatment System



425m³/d Leachate and 300 m³/d Leachate Concentrate Nanofiltration Full-Scale Treatment System

Resource Utilization of Waste Salt and Fly Ash Treatment

Applications: Industrial waste salt recycling Fly ash washing wastewater resource utilization

Influent Quality: High salt content High levels of heavy metals High hardness

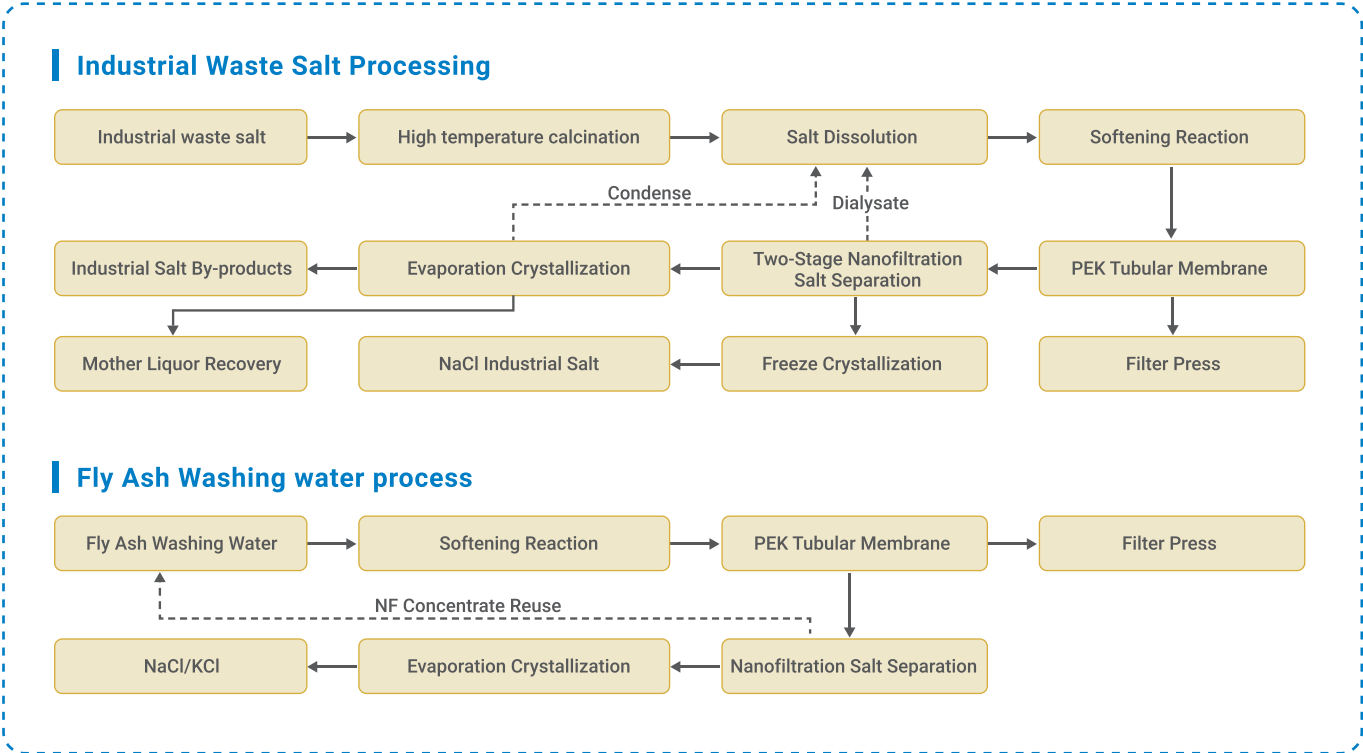
Key Features:

Softening for Heavy Metal and Impurity Removal

PEK tubular membranes are used for clarification and filtration. The chlorine content in the precipitate is reduced to less than 1%, effectively removing pollutants at the source and reducing pollution levels.

Two-Stage Nanofiltration Technology

The two-stage nanofiltration process efficiently separates monovalent and divalent salts in solutions or washing water. The chloride-to-sulfate ion ratio in sodium chloride is greater than 60:1, improving the purity of crystallized salts and reducing the mobility of pollutants, thus cutting off exposure pathways.



▲ 200kg/h Industrial Waste Salt Resource Utilization Project



▲ 50,000 tons/year Fly Ash Washing Wastewater Resource Utilization Project

Lithium Extraction from Salt Lakes and Ore

Ore-Based Lithium Extraction

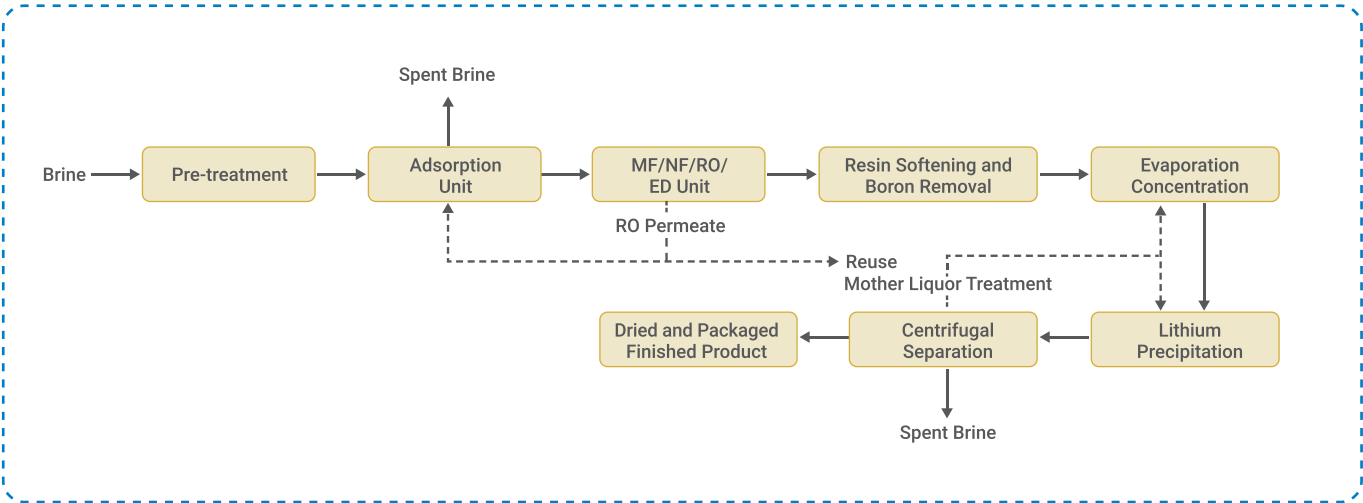
Influent Quality:

- Sulfuric acid leaching results in high sulfate ion concentrations.
- The introduction of sodium fluoride leads to fluoride contamination in the effluent, increasing treatment complexity.
- Associated minerals introduce various impurity ions into the leachate, making lithium separation more challenging.

Salt Lake Lithium Extraction

Influent Quality:

- Domestic salt lakes have high TDS and low lithium concentrations (0.02%–0.085%).
- High magnesium-to-lithium ratios (generally exceeding 60%).
- Brine contains complex elements such as boron, potassium, magnesium, and sodium, making lithium separation more difficult.



Key Features:

PEK tubular microfiltration membranes are used for clarification

producing suspended solids of<1mg/L, which helps enhance the effectiveness of the adsorbent.

Multistage Nanofiltration Continuous Salt Washing

Maximizes effective separation of monovalent and divalent salts, reducing the magnesium-to-lithium ratio.

High-Recovery RO Concentration Technology

Reduces waste volume, increases lithium concentration, minimizes evaporation losses, lowers energy consumption, and enhances water resource recovery.

Membrane-Based Lithium Precipitation Mother Liquor Treatment

Effectively recovers lithium carbonate from mother liquor, improving overall lithium yield.



▲ Pilot Lithium Extraction case



Fluid Membrane Separation

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Fluid Membrane Separation

PLUM MEMBRANE TECHNOLOGY

普朗膜
PLUMEM

Plum Membrane specializes in efficient separation and purification, with a wide range of applications in fermentation liquid extraction (e.g., lactic acid, amino acids, antibiotics), natural product separation (e.g., kudzu root, monk fruit, stevia leaves, tea beverages), seasoning purification (e.g., soy sauce, vinegar, cooking wine), and sugar purification. With extensive industry experience and advanced membrane technology, we provide tailored solutions for fluid separation, focusing on the sterilization, concentration, and purification of fermentation liquids and amino acids. Our solutions ensure high purity and efficiency, enhancing production effectiveness and product quality for our clients.

Customized Solutions

High Purity and High Efficiency



Traditional Sugars & Functional Sugars



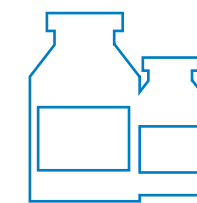
Lactic Acid



Amino Acids



Bio-pharmaceuticals



Seasonings



Plant Extraction



Dilute Sugar Liquid Concentration and Reuse Process

Overview: In the sugar production process, we employ multi-stage continuous concentration technology to concentrate low-concentration dilute sugar liquid (5%–8%) to 20%–35%. The operating pressure is flexibly adjusted according to the feed concentration at different stages, achieving efficient concentration while maintaining the original temperature of the liquid, reducing subsequent evaporation steam consumption, and achieving energy-saving and consumption-reducing production. This process not only improves the recovery rate of dilute sugar liquid but also ensures that the permeate is colorless, with a low COD value, making it suitable for reuse in the front-end production, reducing emissions, and realizing a green, circular, and sustainable production process.

Key Features:

- **High Precision and Stability**

The membrane concentration equipment has a high retention rate for sugar liquids, delivering excellent concentration performance, with permeate COD<500 mg/L to meet reuse requirements.
- **Low Energy Consumption**

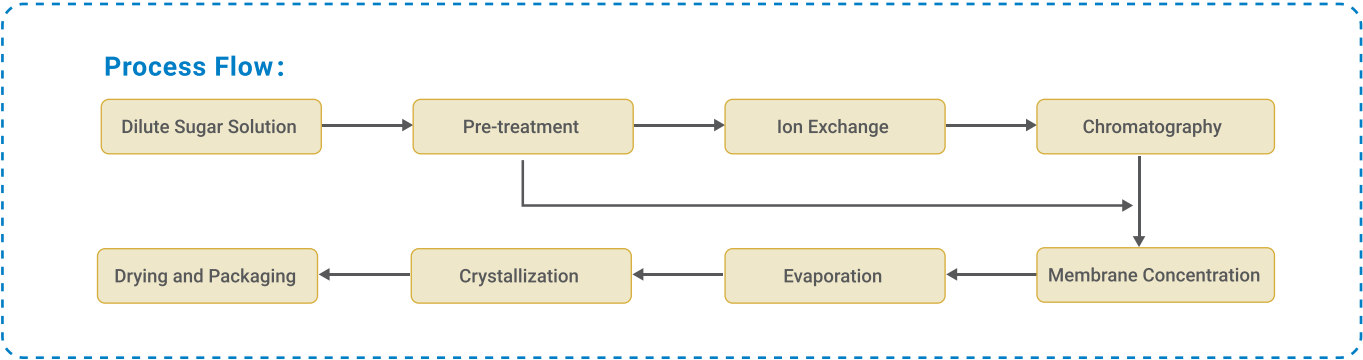
The cost of concentrating and dehydrating per ton of water is only 3-5 RMB.
- **Automation and Clean Production**

The equipment is highly automated, reducing labor intensity, and realizing closed, clean operation.
- **No Phase Change**

The concentration process does not involve phase changes, preventing the destruction of effective and heat-sensitive components.
- **Fast and Efficient**

The concentration speed is fast, and the process operates stably.
- **Space and Cost Savings**

The membrane modules offer a large filtration area while occupying minimal space, reducing both investment and operational costs.



▲ 45 m³/h Maltitol Concentration System at a Biotechnology Company



▲ 5 m³/h Allulose and Glucose Concentration System



▲ Glucose Concentration Liquid Recovery System in Oligosaccharide Production at a Company in Henan

Ultrafiltration Membrane Clarification Process for Starch Milk Hydrolysis Liquor

Overview: Plum Membrane has developed a tubular membrane impurity removal system that combines PEK tubular membranes with concentrated liquid treatment technology. This system improves the light transmittance and clarity of saccharification liquids, enhances pre-treatment quality and stability, extends the service life and regeneration cycle of ion exchange resins, and reduces the consumption of activated carbon. The high-temperature, food-grade sanitary membrane modules ensure stable system operation. After liquefaction and saccharification of corn starch milk, suspended proteins are removed, and the liquid is clarified before entering the ion exchange tank. A small amount of concentrated liquid is treated and reused as Feed-stock in the system or sent directly to the ion exchange process, achieving efficient recycling and reducing resource waste.

Key Features:

- **High-Precision Filtration**

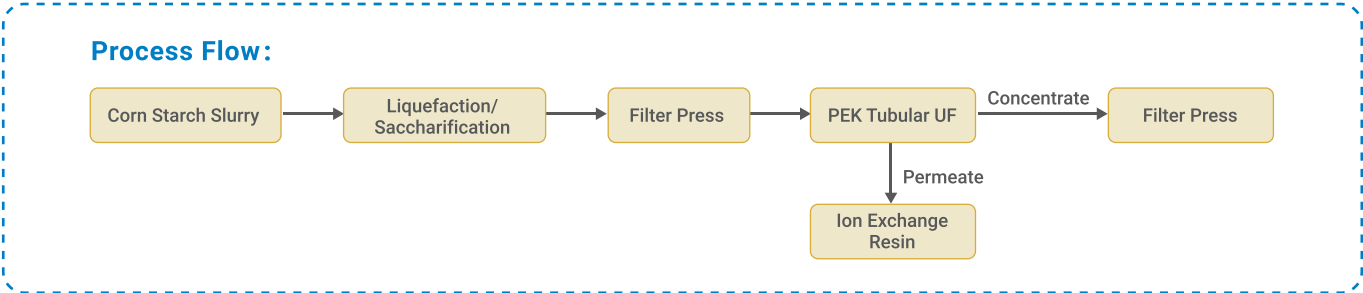
Compared to traditional plate-frame treatments, tubular membranes can retain fine proteins and impurities, ensuring high purity of saccharification liquids.
- **Compact Design**

The system occupies minimal space, improving on-site layout efficiency.
- **Fully Automatic Cleaning**

Automated control reduces manual intervention, minimizes operational errors, and ensures maintenance-free operation.
- **Multi-Pore Size Selection**

Adapts to different saccharification liquid characteristics, supporting high viscosity, high temperature, and other special conditions.
- **Clean Production**

Large volumes of treatment can be completed quickly, reducing activated carbon use and improving hygiene conditions.



▲ 40 m³/h Fructose Saccharification Ultrafiltration Equipment for a corn processing company



▲ 60 m³/h Fructose Saccharification Clarification Equipment for a corn processing company in Northeast China

Alotose Membrane Separation and Purification Process

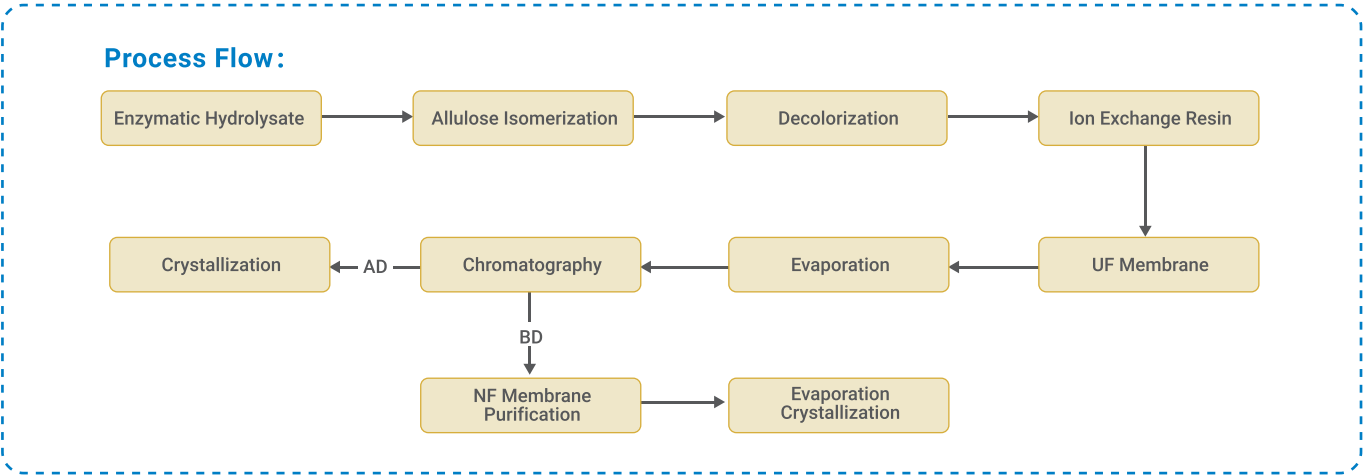
Overview: The process begins with the conversion of fructose syrup to an alotose mixture using isomerase. After decolorization and ion exchange, crude alotose saccharification liquid is obtained. To further improve the purity of alotose, membrane separation technology is employed to effectively remove impurities such as proteins, pigments, and polysaccharides, ensuring the final product's purity and quality.

Technical Features:

- 

Specialized Membrane Combination and Continuous Separation Technology
This continuous separation process combines ultrafiltration and nanofiltration membranes, avoiding recirculation, reducing contamination risk, and ensuring stable product quality.
- 

High Recovery Rate
The ultrafiltration membrane achieves more than 99% recovery of sugar molecules, while the nanofiltration membrane effectively removes disaccharides and higher sugars, ensuring over 85% efficient recovery of alotose.



▲ Ultrafiltration Separation Equipment for Alotose at a biotechnology company

Continuous Purification Filtration Process for High Fructose Syrup (HFCS)

Overview: High fructose syrup (HFCS) is a sugar substitute with superior flavor and taste compared to sucrose. Depending on the fructose content, it is classified into three types: F42, F55, and F90 (high-fructose syrup). Through the continuous purification filtration process, the syrup's purity and stability are ensured, improving product quality and making it suitable for use in various industries such as food and beverages.

Key Features - High Fructose Syrup (HFCS):

- 

Efficient Purification
Nanofiltration membranes effectively remove most oligosaccharides, furfural, and other impurities.
- 

Compliance with Testing
TLC (Thin Layer Chromatography) testing shows negative results, with oligosaccharide content less than 0.01%.
- 

High Recovery Rat
The total recovery rate of the product exceeds 70%, reducing resource waste.
- 

Quality Standards
The purified HFCS complies with national quality standards, ensuring product stability and market suitability.

Key Features - High Fructose Syrup (HFCS 90):

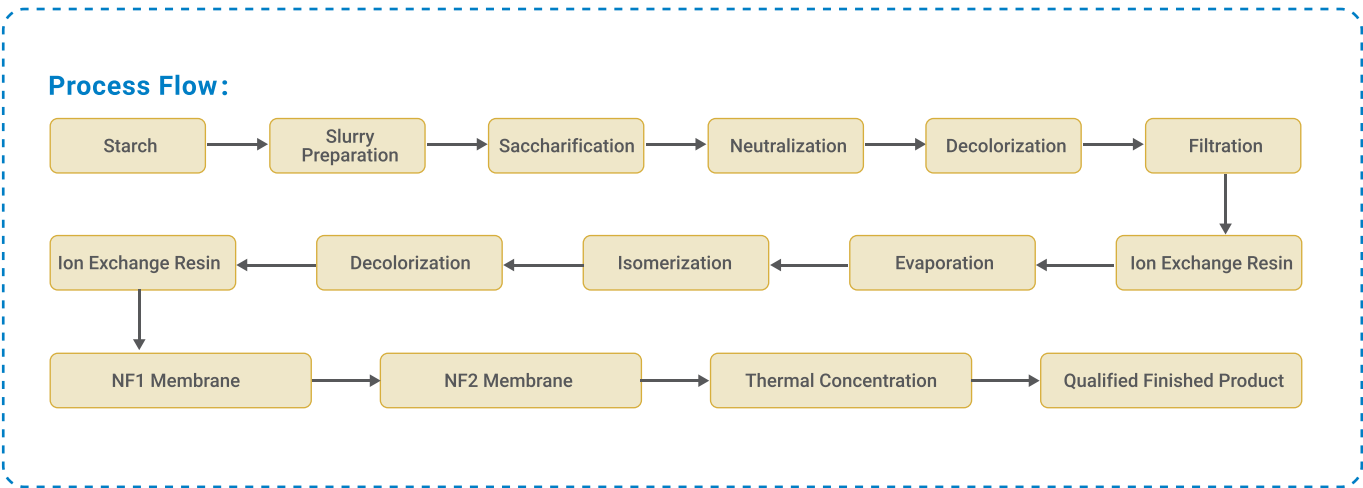
- 

Efficient Purification
Nanofiltration membranes effectively remove disaccharides and higher sugars.
- 

Compliance with Testing
Fructose purity can reach above 99.5%.
- 

High Recovery Rate
The total recovery rate of the product exceeds 50%.
- 

Quality Standards
The purified HFCS complies with national quality standards, ensuring product stability and market suitability.



▲ Continuous Purification Filtration Equipment for High Fructose Syrup



▲ 10 m³/h (20% sugar content) Continuous Purification Filtration Equipment for High Fructose Syrup



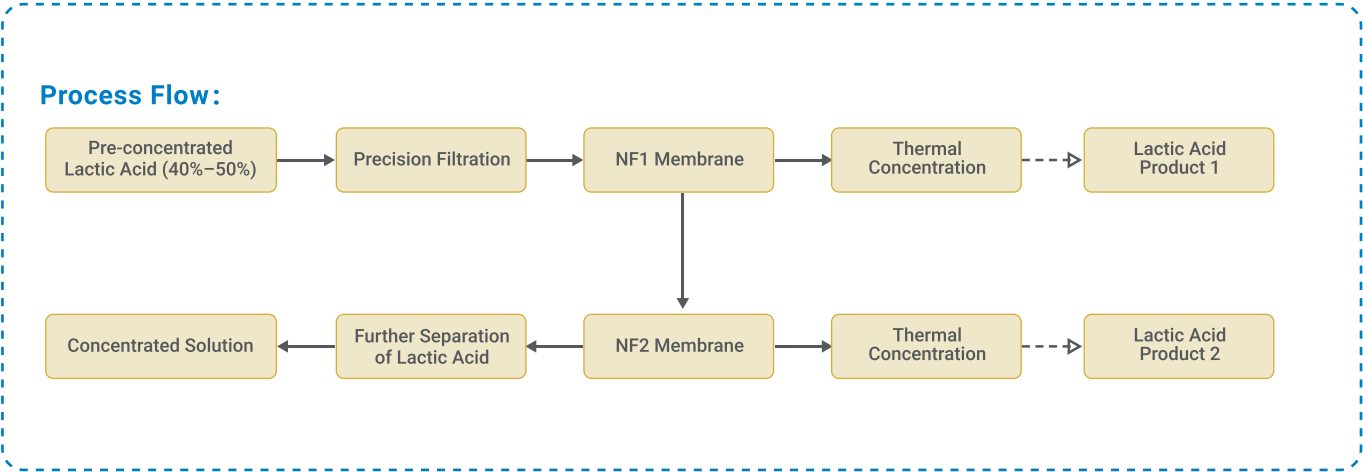
▲ 9 m³/h (25% sugar content) Continuous Purification Filtration Equipment for High Fructose Syrup

Lactic Acid Decolorization, Purification, and Nanofiltration Process

Overview: The lactic acid-specific nanofiltration membrane system developed by Plum Membrane addresses common issues in conventional processes, such as low extraction efficiency, high production costs, low product purity, and short membrane lifespan. This system has been operating stably for many years in multiple lactic acid production enterprises, offering advantages such as long service life and low operational costs. It significantly enhances production efficiency and product quality, providing substantial economic benefits to customers.

Key Features:

- Efficient Separation and Purification**
The system operates stably even when lactic acid concentration reaches 40%–50%, effectively decolorizing and removing residual sugars and impurities.
- Product Quality Assurance**
During the subsequent thermal concentration process, product quality remains stable, ensuring consistency and high purity of the final product.
- Cost Optimization**
Compared to traditional processes, operational costs are significantly reduced, improving overall production efficiency.
- Two-Stage Nanofiltration Technology**
The two-stage continuous separation and purification process ensures a product recovery rate of over 98%.



▲ 10,000-ton/year Sodium Lactic Acid Nanofiltration Equipment for a lactic acid enterprise



▲ 50,000-ton/year Lactic Acid Ester Nanofiltration Equipment for a biotech company



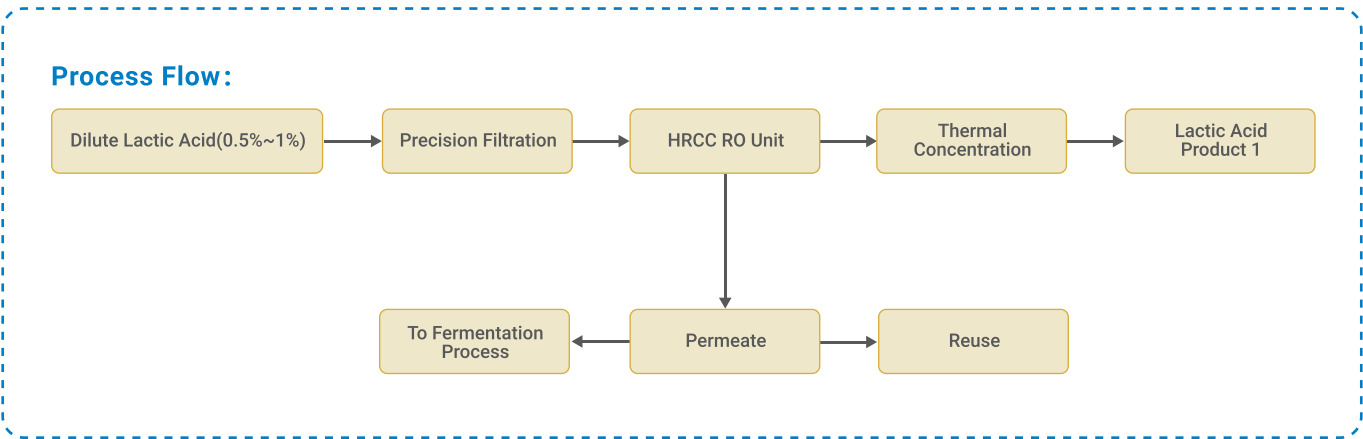
▲ 13 m³/h Lactic Acid Nanofiltration Equipment

Lactic Acid Evaporation and Condensate Membrane Recovery System

Overview: During the evaporation and concentration process of lactic acid, condensate water may contain trace amounts of lactic acid (around 0.5%–1%). Direct discharge or further concentration could lead to resource waste or excessive costs. Plum Membrane's specialized concentration technology recycles this dilute lactic acid, reducing resource waste while significantly lowering production costs.

Key Features:

- High-Efficiency Lactic Acid Recovery**
Utilizes high retention, acid-resistant membrane modules to concentrate lactic acid from 0.5%–1% to 10%–20%, achieving a recovery rate of over 95%.
- Resource Recycling**
The concentrated membrane filtrate can be returned to the front-end process, reducing discharge and realizing efficient resource circulation.
- Energy and Cost Reduction**
The membrane concentration process consumes 3–6 kWh per ton of water, with investment costs only 20%–70% of evaporative concentration costs, while operational costs are reduced to 5%–15%.



▲ 40 m³/h Dilute Lactic Acid Membrane Concentration System for a lactic acid enterprise



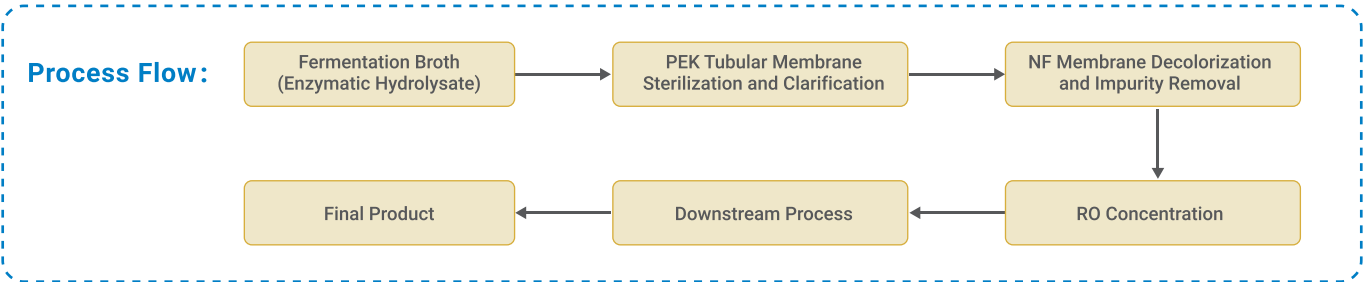
▲ 55 m³/h Dilute Lactic Acid Membrane Concentration System for a biotech company

Amino Acid Fermentation Broth (Enzyme Hydrolysate)

Overview: Amino acid fermentation broth is a complex multiphase system containing microbial cells, metabolic by-products, and unused culture media. Impurity amino acids often share similar chemical properties with the target amino acids, complicating downstream processing. Plum Membrane's self-developed fully automated continuous filtration membrane integration process is specifically designed for amino acids (such as isoleucine, leucine, tryptophan, threonine, L-theanine, etc.) produced through fermentation and enzymatic hydrolysis. This process ensures efficient separation and purification, ensuring stable product quality and high operational efficiency.

Key Features:

- Efficient Separation and Purification**
The membrane system efficiently removes impurity amino acids, enabling precise recovery of target amino acids.
- Low Energy Consumption**
Optimized membrane processes reduce energy consumption and improve production efficiency.
- Stable High Quality**
Ensures consistent product quality that meets market and customer demands.
- Reduced Wastewater Discharge**
Compared to traditional processes, membrane technology reduces wastewater discharge, achieving a greener production process.



▲ Leucine and other amino acids: Sterilization, decolorization, and concentration membrane equipment



▲ Membrane separation equipment for Serine, citrulline



▲ Membrane separation and purification equipment for L-Alanine



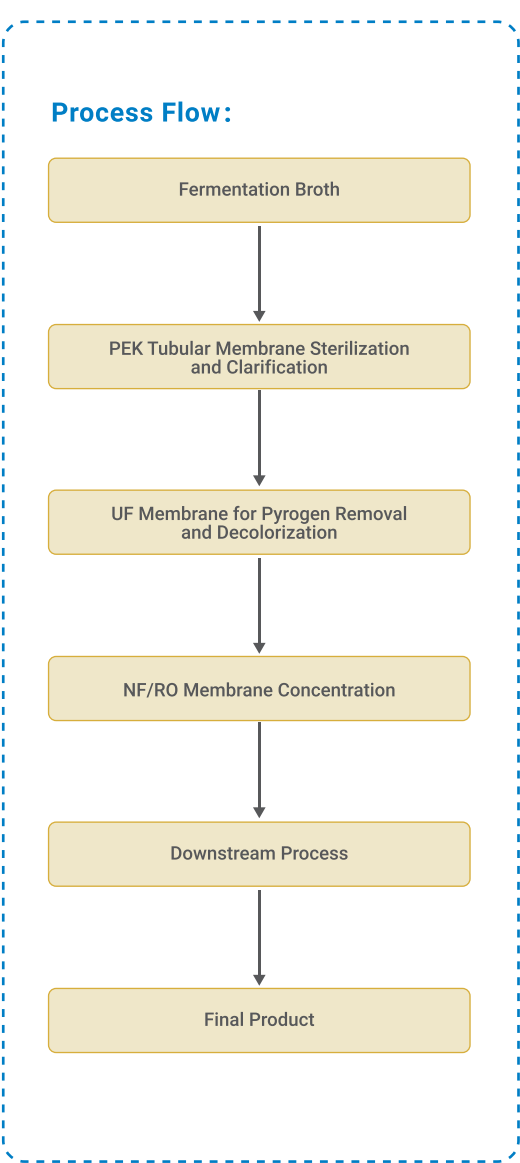
▲ Membrane separation equipment for M-hydroxyphenylalanine

Biopharma

Overview: Biopharmaceuticals are derived from natural biological substances such as microorganisms, plants, and animals. With advances in biotechnology, synthetic biological substances, such as genetically engineered microorganisms and immunologically derived animal products, have become more prevalent. Biopharmaceuticals are known for their high pharmacological activity and low toxicity, containing essential nutrients like proteins, nucleic acids, and carbohydrates. Plum Membrane technology uses efficient membrane separation systems to extract and purify biological raw substances, effectively removing impurities while retaining active ingredients, ensuring high purity and safety in biopharmaceutical production.

Technical Features:

- Tubular Membrane Efficient Clarification Filtration**
The membrane system efficiently sterilizes and removes impurities, resulting in clear, transparent filtrates.
- Nanofiltration & Reverse Osmosis Efficient Concentration**
Fast concentration speeds with low cost per ton of treated water.
- Ultrafiltration High-Efficiency Purification**
Optimized membrane processes remove heat sources and pigments, enhancing product quality.
- Reduced Wastewater Discharge**
Compared to traditional processes, membrane technology reduces wastewater discharge, enabling reuse or compliance with discharge standards.



▲ Nucleoside (Acid) Extraction: Membrane separation equipment for nucleosides (acids)



▲ Antibiotic Separation: Membrane separation equipment for antibiotics



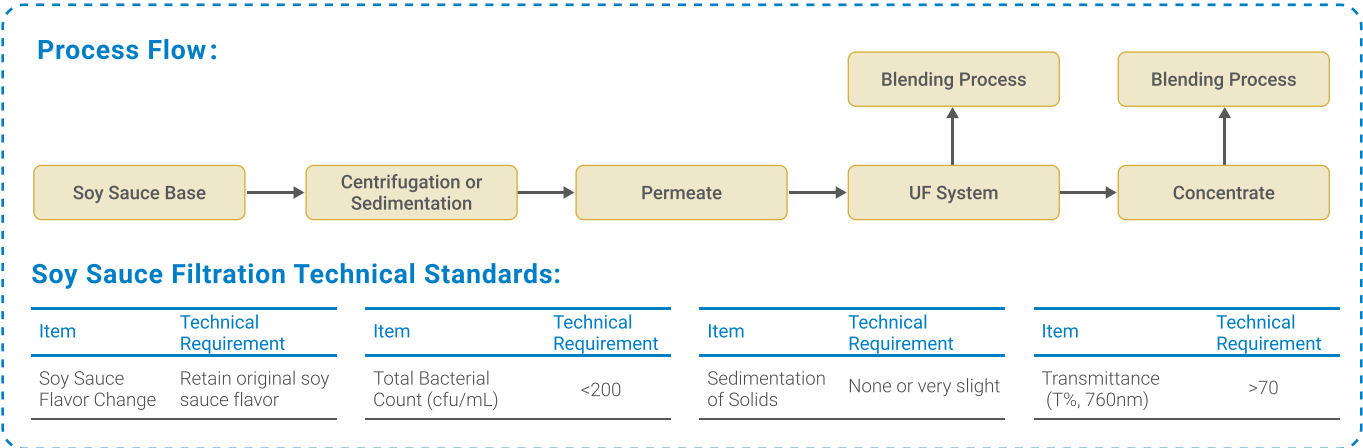
▲ Pesticide Concentration & Separation: Membrane separation equipment for pesticide concentration and separation

Seasonings

Overview: Conventional filtration methods, such as plate-frame filtration, hollow fiber membranes, or ceramic membranes, face challenges when processing high-viscosity and heavily contaminated products like soy sauce and vinegar. These challenges often lead to poor filtration results, high labor intensity, and short equipment lifespan. Plum Membrane has developed an automatic continuous filtration ultrafiltration membrane system that efficiently removes bacteria and impurities, ensuring clear, transparent soy sauce and vinegar. The system achieves nearly 100% retention of suspended solids while preserving essential components such as small proteins, organic acids, pigments, and flavors. It meets international advanced standards, ensuring consistent and stable product quality.

Key Features:

- **Stable Operation**
Multiple fully automated ultrafiltration membrane systems have been operating stably in large seasoning companies for over a decade, with membrane modules remaining unchanged, demonstrating long-term reliability.
- **Low Energy Consumption**
The filtration process consumes only 1-2 kWh per ton of soy sauce, significantly lowering energy costs.
- **Zero Wastewater Discharge**
The cleaning water from the system can be recycled, achieving zero wastewater discharge during production.
- **Product Quality Assurance**
All product testing indicators meet the design specifications, ensuring consistent product quality.

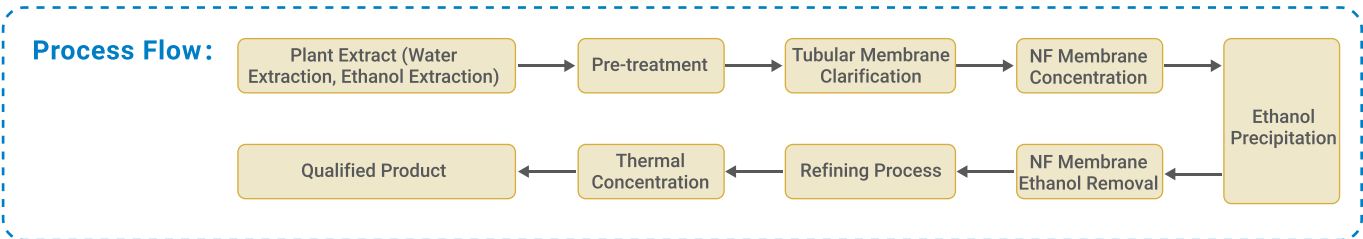


▲ Domestic Soy Sauce Company: Sterilization and impurity removal membrane separation system for phases 1-5.

Plant Extracts

Overview: Plum Membrane's continuous membrane separation and concentration system, known for its excellent anti-pollution capacity and easy cleaning features, is widely used across various industries. The optimized design of the continuous process addresses the common issues of bacterial contamination and high energy consumption in traditional batch membrane systems, enabling large-scale continuous production. Applications include plant extractions such as tea, stevia, eucommia, upgrades of vinegar and soy sauce fermentation products, sterilization and clarification of juices and alcoholic beverages, and the filtration, purification, and concentration of plant extracts like xylooligosaccharides (XOS) and xylitol.

- **Pure Physical Separation, Ensuring Product Quality**
The separation, purification, and concentration processes used by Plum Membrane are purely physical, ensuring no new impurities are introduced, preserving the product's quality. Substances are transported through pipes that meet sanitary food-grade standards, ensuring safety and reliability.
- **High Recovery and Energy Saving Advantages**
With efficient separation and concentration technologies, the product recovery rate can reach over 98%. Moreover, membrane concentration consumes only 1/10 of the energy cost compared to thermal concentration, making it ideal for substances sensitive to oxidation and fragrance.
- **Addressing Traditional Process Defects**
Traditional extraction and concentration processes often face issues such as low product efficiency, high acid and alkali consumption, high water usage, significant energy consumption, environmental pollution, and low hygiene standards, all of which compromise product quality. Plum Membrane technology effectively addresses these challenges.
- **Fully Automated Operation**
The system supports fully automated, continuous operation, simplifying operation and reducing labor intensity. The equipment operates stably, with low failure rates and high production efficiency.
- **High-Performance Membranes**
The system uses world-leading, high-precision sanitary-grade membrane modules that meet food-grade and FDA requirements. This ensures stable operation, high product purity, and reliable quality.
- **Environmental and Resource Recovery**
The membrane separation process prevents the introduction of contaminants, with minimal wastewater discharge. Water and solvents can be recycled, promoting resource savings and meeting environmental protection requirements.



▲ Cistanche Extract Filtration System

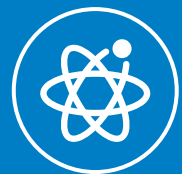
▲ Corn Cob Xylooligosaccharides (XOS) "Full Membrane Method" Production Process

▲ Chicory and Jerusalem Artichoke Xylofructose "Full Membrane Method" Production Process

▲ Traditional Chinese Medicine Extract Filtration System

▲ Hebei Scutellaria Extract Filtration System

▲ Tea Extract Filtration System



Core Technology

01

Pre-treatment –
Based on PEK Tubular Membrane Pre-treatment Technology

02

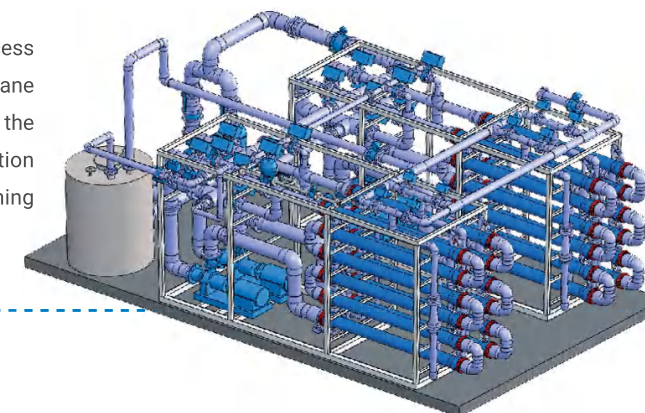
Nanofiltration Section –
Continuous Ultrafiltration & Nanofiltration Salt Separation Technology

03

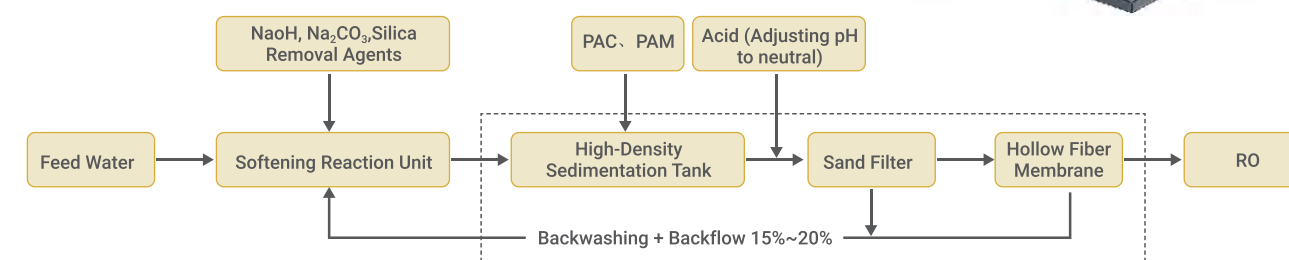
Concentration Section –
High Recovery Continuous Concentration Technology (HRCC Technology)

Pre-treatment – Based on PEK Tubular Membrane Pre-treatment Technology

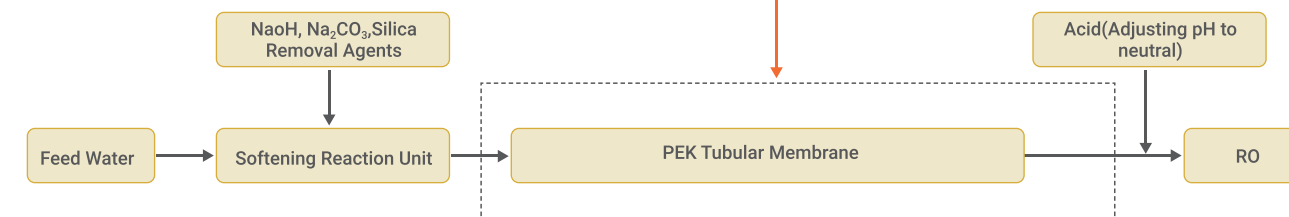
Overview: The PEK tubular membrane softening and silica removal process (referred to as the "PEK Softening Process") developed by Plum Membrane employs highly efficient softening and silica removal agents, eliminating the need for coagulants or flocculants. By utilizing continuous concentration and sludge removal technology, the process achieves effective softening and silica removal, making it ideal for treating high-turbidity wastewater.



Conventional Softening Process



PEK Tubular Membrane Softening Process



High Adaptability
Capable of handling high-turbidity wastewater with suspended solids (SS) concentrations up to 50,000 mg/L, demonstrating strong anti-pollution capability.



Stable Process
With a simple, reliable flow, the system features strong membrane tube durability, resistance to fiber breakage, and extended service life.



Energy Saving
Compared to conventional methods, acid and alkali consumption for softening is reduced by 15%-20%, lowering both operational pressure and investment in downstream membrane systems.



Easy Maintenance
The system is simple to clean and maintain, ensuring stable operation, long service life, and consistent water quality output.



Chemical Savings
By adjusting the pH after production, the need for repeated acid treatments is eliminated, significantly reducing chemical consumption.



Space and Resource Efficiency
The system has a compact design with a small footprint and intelligent control, reducing the need for additional operators.



No Need for Coagulants or Flocculants
The system operates without PAC and PAM, preventing organic fouling in downstream systems, reducing environmental impact, and cutting chemical usage and operating costs.



Outstanding Softening Effect
Under highly alkaline conditions, the water hardness is reduced to below 50 mg/L, calcium and magnesium ion to below 10 mg/L, and total silica content to below 20 mg/L, ensuring efficient softening results.

Nanofiltration Section – Continuous Ultrafiltration & Nanofiltration Salt Separation Technology

Overview: This process combines ultrafiltration with two-stages nanofiltration salt separation. Utilizing anti-fouling, wide-channel spiral-wound ultrafiltration membranes with molecular weight cutoffs between 1000-5000 Da, the system effectively intercepts large organic molecules and helps reduce COD (chemical oxygen demand). In two-stages nanofiltration, the Donnan effect causes chloride ions to permeate against their concentration gradient, ensuring effective separation of monovalent and divalent salts.

Key Features:



Physical Decolorization and COD Removal

The system uses ultrafiltration for COD removal, without introducing any chemicals, simplifying the process.



Significant Salt Separation Effect

The mass ratio of sulfate to chloride in the concentrate side reaches 10:1, and the ratio of chloride to sulfate in the permeate side reaches 60:1.



High Purity Crystallized Salts

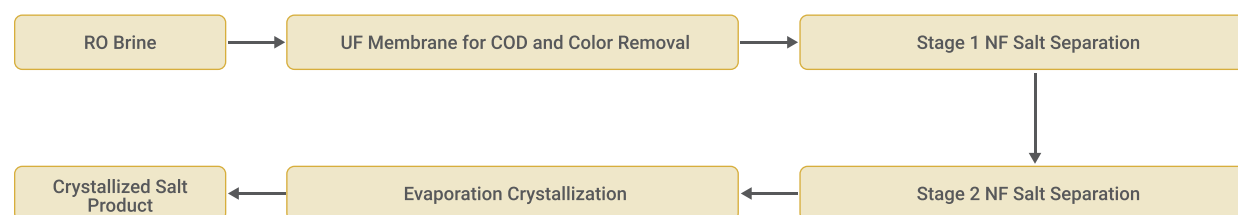
Sodium sulfate (purity $\geq 99\%$) and sodium chloride (purity $\geq 98.5\%$) are extracted separately, enabling the resource recovery of crystallized salts.



Low Salt Content

Through precise salt separation and mother liquor recovery, the system maintains impurity salt rates below 5%, ensuring efficient operation and reducing impurity discharge.

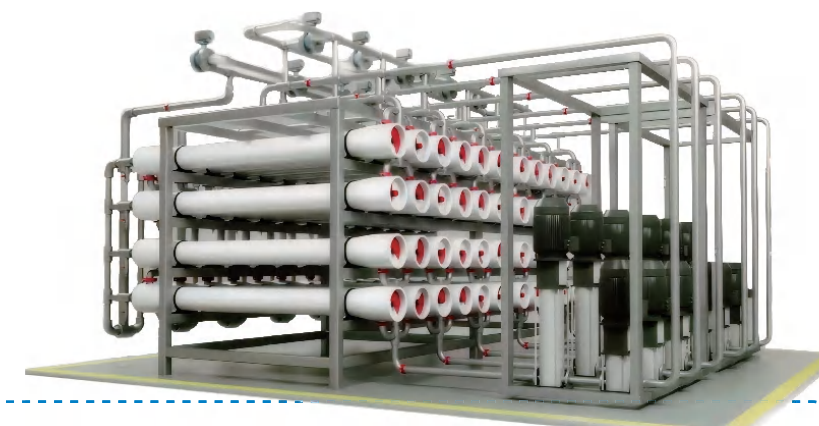
Process Flow:



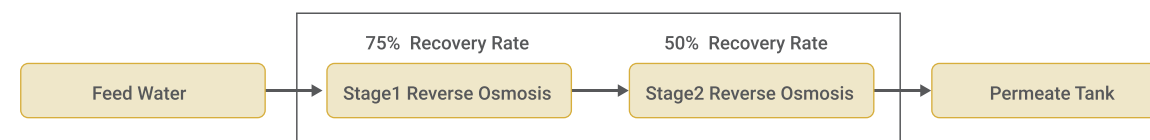
▲ Ultrafiltration & Nanofiltration Salt Separation Photos (Feed, Ultrafiltration Concentrate, Ultrafiltration Permeate, Primary Nanofiltration Concentrate, Secondary Nanofiltration Permeate).

Concentration Section – High Recovery Continuous Concentration Technology (HRCC Technology)

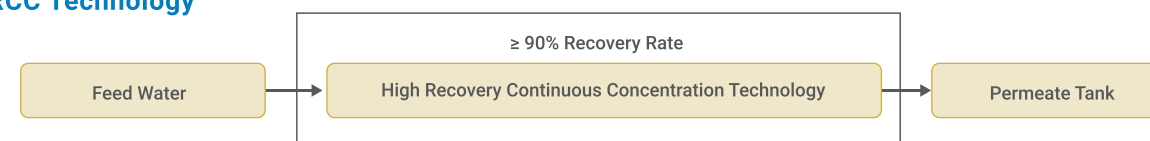
Overview: The HRCC Technology is specifically designed for efficiently treating high-concentration wastewater. The system uses a combination of standard reverse osmosis (RO) membranes and concentrate RO membrane modules, applying a staged pressurization method to overcome the osmotic pressure of the concentrate. This allows staged concentration, increasing Total Dissolved Solids (TDS) and significantly reducing brine discharge while lowering energy consumption. With multiple operating pressures, the system ensures continuous feed and permeate flow without the need for cleaning interruptions, improving operational efficiency. It can adapt to variations in feed water quality, maintaining stable high-quality permeate and effectively controlling energy consumption and operational costs.



Conventional RO Concentration Process



HRCC Technology



High Concentration Capacity

The staged pressurization design, combined with RO and concentrate RO membrane modules, concentrates brine to 5-10 times (depending on water quality), enhancing TDS concentration and reducing brine discharge, meeting high-salinity and high-pollution wastewater treatment needs.



High Efficiency and Energy Saving

The staged pressurization technology overcomes osmotic pressure, reducing energy consumption. Compared to traditional methods, this design optimizes energy efficiency, lowering overall operating costs.



Compact Design – Space and Investment Saving

By optimizing system layout and eliminating the need for intermediate water tanks, the system reduces both equipment footprint and investment costs, ideal for industrial sites with space limitations.



Automated Control and Smart Adjustment

The system features intelligent automated control, adjusting operational parameters based on water quality changes to ensure stable, efficient operation, minimizing manual intervention.



Simple Cleaning and Maintenance

The cleaning process runs concurrently with system operation, with intelligent cleaning management adjusting cleaning cycles based on fouling levels, reducing downtime and extending equipment lifespan.



Continuous Operation, Reduced Downtime

The system operates continuously, minimizing downtime and ensuring stable long-term operation, improving overall treatment efficiency.



High Water Recovery Rate

Achieving a single-pass recovery rate of over 90%, the system enhances water resource utilization and maximizes treatment efficiency, making it suitable for high-efficiency industrial wastewater treatment.

Industrial Wastewater Treatment Case List

No.	Client	Application	Capacity	Date
1	Wanwei Group	Reclaimed Water Reuse	360 m³/h	2023
2	Tongwei Group	Reclaimed Water Reuse	400 m³/h	2023
3	Jingmei Energy	Desulfurization Wastewater ZLD	120 m³/h	2022
4	Chalco Group	Thin Water Recovery	80 m³/h	2023
5	Shaanxi Coking Group	Coking Wastewater Silica Removal	40 m³/h	2022
6	Yanchang Petroleum Group	Oilfield Produced Water	50 m³/h	2023
7	China National Coal Group	Mine Water ZLD	150 m³/h	2023
8	Shandong Minghua Group	Brine Resource Recovery	10 m³/h	2022
9	Sichuan Dongyuan	Vanadium Ore Wastewater ZLD	600 m³/d	2022
10	ChinaCoal Group	Brine Ultrafiltration & Nanofiltration Salt Separation	60 m³/h	2018
11	ChinaCoal Group	Crystallization Mother Liquor Salt Separation	4 m³/h	2018
12	Mengwei Group	Reclaimed Water & RO Brine ZLD	326 m³/h	2020
13	Jinhe Group	Circulating Water Blowdown	50 m³/h	2020
14	ChinaCoal Group	Brine Ultrafiltration & Nanofiltration Salt Separation	25 m³/h	2019
15	Weifang Special Steel	Tire Bead Wire Acid-Alkali Wastewater ZLD	1350 m³/d	2019

No.	Client	Application	Capacity	Date
16	Weifang Special Steel	Welding Wire Acid-Alkali Wastewater ZLD	1200 m³/d	2019
17	Veolia Group	Landfill Leachate ZLD	3200 m³/d	2019
18	Veolia Group	Landfill Leachate ZLD	425 m³/d	2017
19	Guangji Pharma	VB2 Crystallization Mother Liquor Membrane Separation	25 m³/h	2016
20	China National Energy Group	RO Brine Salt Separation	24 m³/d	2017
21	Sinochem Bluestar	Fluorochemical Wastewater Recovery & Reuse	240 m³/d	2015
22	Huayi Group	Fluorochemical Wastewater Recovery & Reuse	240 m³/d	2014
23	Juhua Group	Fluorochemical Wastewater Recovery & Reuse	240 m³/d	2016
24	Dongyue Group	Fluorochemical Wastewater Recovery & Reuse	480 m³/d	2018
25	Wanhao Group	Fluorochemical Wastewater Recovery & Reuse	720 m³/d	2012
26	Dongyue Chemical	Chemical Wastewater Desalination & Salt Recovery	1500 m³/d	2017
27	Huaheng Biotech Group	Amino Acid Concentration & Salt Separation	1500 m³/d	2015
28	PetroChina	Oilfield Produced Water	10000 m³/d	2011
29	Guangxi Chemical Research Institute	Glyphosate Salt-Containing Wastewater Reuse	150 m³/d	2016
30	Sanchuan Chemical Co., Ltd.	Fluorescent Whitening Agent wastewater for NaCl Recovery	1200 m³/d	2011

Tubular Membrane Case list

No.	Location	Capacity	Application	Process
1	Hubei	100 m³/d	VB2 Crystallization Mother Liquor	Hardness Removal
2	Jiangsu	40 m³/h	RO Brine	Hardness Removal
3	Jiangsu	40 m³/h	Circulating Water Blowdown Reuse	Hardness Removal
4	Shanxi	40 m³/h	Desulfurization wastewater gypsum recycling	Hardness Removal
5	Jiangxi	50 m³/h	Electroplating Wastewater ZLD	Heavy Metal Removal
6	Inner Mongolia	235 m³/h	Reclaimed Water Reuse	Hardness Removal
7	Inner Mongolia	100 m³/h	RO Brine ZLD	Hardness Removal
8	Inner Mongolia	6 m³/h	Crystallization Mother Liquor Treatment	Impurity Removal
9	Anhui	5 m³/h	Caustic Cleaning Wastewater Reuse	Impurity Removal
10	Shandong	1200 m³/d	Acid & Alkali Cleaning Wastewater Reuse	Heavy Metal Removal
11	Shandong	1350 m³/d	Acid & Alkali Cleaning Wastewater Reuse	Heavy Metal Removal
12	Anhui	52 m³/h	Circulating Water Blowdown Reuse	Hardness Removal
13	Jiangsu	100 m³/h	Electroplating wastewater ZLD	Heavy Metal Removal
14	Inner Mongolia	100 m³/h	Mine Water Treatment	Silica Removal
15	Sichuan	150 t/d	Landfill Leachate Treatment	Hardness Removal
16	Shaanxi	30 m³/h	Coking Wastewater Treatment	Silica Removal
17	Sichuan	40 m³/h	Vanadium Ore Wastewater Treatment	Heavy Metal Removal
18	Shaanxi	50 m³/h	Oilfield Produced Water Treatment	Oil Removal
19	Anhui	300 m³/h	Mine Water Treatment	Impurity Removal
20	Anhui	30 m³/h	Mine Water RO Brine Treatment	Hardness Removal
21	Shaanxi	40 m³/h	Mine Water RO Brine Treatment	Silica Removal

No.	Location	Capacity	Application	Process
22	Anhui	20 m³/h	Power Plant Cooling Water Blowdown Treatment	Hardness Removal
23	Yunnan	400 m³/h	Circulating Water Blowdown Reuse	Hardness Removal
24	Sichuan	40 m³/h	Electroplating Wastewater ZLD	Heavy Metal Removal
25	Shandong	80 m³/h	RO Brine ZLD	Impurity Removal
26	Shandong	10 m³/h	20% Hydrochloric Acid Treatment	Impurity Removal
27	Shandong	10 m³/h	Waste Salt Resource Utilization	Hardness Removal
28	Gansu	10 m³/h	Desulfurization Wastewater ZLD	Hardness Removal
29	Shandong	65 m³/h	Municipal Reclaimed Water Reuse	Hardness Removal
30	Shandong	100 m³/h	Circulating Water Blowdown Treatment	Impurity Removal
31	Hebei	58 m³/h	Battery Wastewater Treatment	Hardness Removal
32	Zhejiang	10 m³/h	Electroplating Wastewater Treatment	Heavy Metal Removal
33	Anhui	20 m³/h	Circulating Water Blowdown Treatment	Hardness Removal
34	Foshan	425 m³/d	Landfill Leachate Treatment	External MBR
35	Qingyuan	150 m³/d	Landfill Leachate Treatment	External MBR
36	Wengyuan	100 m³/d	Landfill Leachate Treatment	External MBR
37	Shaoguan	150 m³/d	Landfill Leachate Treatment	External MBR
38	Jiangxi	300 m³/d	Landfill Leachate Treatment	External MBR
39	Shenzhen	480 m³/d	Wafer Grinding Process Water Treatment	Impurity Removal
40	Ningxia	168 m³/d	Monocrystalline Silicon Grinding Process Water Treatment	Impurity Removal
41	Russia	100 m³/h	Oilfield Produced Water Treatment	Oil & Iron Removal

LIST OF FLUID MEMBRANE SEPARATION CASES

Location	Application	Process
Guilin	Stevia, Monk Fruit Membrane Extraction & Separation	Tubular Membrane + NF + RO
Jiangxi	Stevia Membrane Separation	Tubular Membrane + NF + RO
Chengdu	Tea Extraction & Concentration	Tubular Membrane + NF + RO
Chengdu	Pine Needles, Kudzu, etc. Membrane Separation & Concentration	Tubular Membrane + Concentration
Guangxi	Stevia, Monk Fruit Separation, Concentration, Purification	Membrane Separation, Decolorization, Concentration, De-alcoholization
Shandong	Honeysuckle Membrane Separation & Purification	Tubular Membrane + NF Membrane
Zhejiang	Traditional Chinese Medicine Extraction & Separation	Membrane Separation, Concentration, De-alcoholization
Tianjin	Pig Blood Plasma Protein Concentration	RO Concentration
Hubei	Fluorescent Whitening Agent	Membrane Separation & Concentration
Hebei	Fluorescent Whitening Agent	Membrane Separation, Membrane Desalting
Hebi	Xylo-Oligosaccharides	Tubular Membrane, NF, RO Concentration
Hunan	Glucose Syrup Membrane Separation & Purification	Membrane Separation, Membrane Decolorization, Concentration
Henan	Stalk Hydrolysis Liquid Recovery of Oligosaccharides	Tubular Membrane, Membrane Decolorization & Concentration
Shandong	Straw Extraction of Xylo-Oligosaccharides	Tubular Membrane + UF + NF + RO
Gansu	Inulin, Fructooligosaccharides	HRCC RO Concentration
Shandong	Corn Cobs Hydrolysis Liquid for L-Arabinose Production	Tubular Membrane, RO Concentration
Shandong	Allulose Membrane System	Tubular Membrane for Impurity Removal

Location	Application	Process
Tianjin	Fructose Hydrolysis Liquor	Tubular Membrane for Impurity Removal
Shandong	Hydrolysis Liquor Separation & Purification	Tubular Membrane + UF + NF
Zhejiang	Rubredoxin, β -Alanine, Serine, Citrulline, Glycine, etc.	Tubular Membrane, NF, RO
Nanjing	Nucleotide Fermentation Liquor Membrane Separation & Purification	Tubular Membrane, NF Membrane, RO
Luoyang	Amino Acid Impurity Removal Membrane Filtration	NF Membrane for Decolorization & Purification
Luoyang	p-Hydroxyphenylglycine Fermentation Liquor	Tubular Membrane for Impurity Removal, NF Decolorization, RO Concentration
Tianjin	Threonine Fermentation Liquor Membrane Separation & Purification	Tubular Membrane for Impurity Removal, Membrane Decolorization, Concentration
Shandong	Glucuronic Acid Fermentation Liquor	Membrane Separation, Membrane Decolorization, Concentration
Sichuan	S-Infusion Production by Fermentation	Membrane Sterilization, Separation, Decolorization, Concentration
Guangdong	Fermented Soy Sauce, Vinegar Treatment	Tubular Membrane for Impurity Removal
Shandong	Fermented Soy Sauce, Vinegar Treatment	Tubular Membrane for Impurity Removal
Shandong	Lactic Acid Fermentation Liquor Extraction, Separation & Purification	NF Membrane Decolorization
Shandong	D-Lactic Acid Fermentation Liquor Extraction, Separation & Purification	NF Membrane Decolorization
Longjiang	Lactic Acid NF Membrane System, Dilute Lactic Acid Concentration	NF Membrane Decolorization, Membrane Concentration
Henan	Lactic Acid Fermentation Liquor Extraction, Separation & Purification, Dilute Lactic Acid Concentration	NF Membrane Decolorization, Membrane Concentration
Guangxi	Dextran Iron	NF Membrane Desalting & Purification
Hubei	Dextran Iron	NF Membrane Desalting & Purification

OUR CLIENTS

Each of our clients has unique needs. Based on the specific application scenarios of our clients, we provide flexible, customized membrane technology solutions. Whether it is the treatment of high-concentration wastewater or the efficient separation of Fluids, our tubular membrane technology and process solutions are precisely tailored to meet customer requirements, enhance production efficiency, and reduce operational costs.

