江苏久吾高科技股份有限公司
JIANGSU JIUWU HI-TECH CO.,LTD

CONTACT INFORMATION

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China membrane industry leading enterprise in the field of ceramic membrane

China ceramic membrane standard drafting unit

The first listed enterprise in China's ceramic membrane industry

久吾高科
JIUWU HI-TECH

Stock：300631

INTELLIGENT CERAMIC MEMBRANE MANUFACTURER

COMPANY INTRODUCTION

- Jiangsu Jiuwu Hi-Tech Co., Ltd. was established in 1997 and is a high-tech enterprise specializing in the researchand development of new materials and comprehensive solutions. It was listed on the A-share growth enterprise board of the Shenzhen stock exchange in March 2017. The company is one of the first batch of recognized national high-tech enterprises, one of the first batch of specialized and new "little giant" enterprises in the country, a national single champion in manufacturing industry, and a leading enterprise in the field of ceramic membrane in the Chinese membrane industry. It has won four National Science and technology progress awards, one the state technological innovation award and the Chinese patent excellence award.

- Over the past 20 years since its establishment, the company has established a complete business industry chain from new materials research and development, technology development, process design, complete equipment manufacturing to providing comprehensive, project operation, and other aspects. The company is constantly seeking for breakthroughs in the manufacturing of new materials such as ceramic membrane, organic membrane, adsorbent and industrial by gypsum. Based on this, we provide comprehensive solutions for three major fields: new energy services, industrial fluid separation, water treatment and resource utilization. In particular, it has achieved breakthrough innovative applications in many subdivisions such as lithium extraction from salt lakes, battery cathode materials, comprehensive treatment of waste salt, bio-ethanol fuel, chlor-alkali chemicals, and biological products. At present, the company's products are exported to more than 40 countries and regions worldwide, and have been widely recognized by domestic and foreign customers.

- As a banner of China's national industry, the company has always been market-oriented and leading innovative development. Adhering to the two-wheel drive of new materials and comprehensive solutions, create value for customers, and safeguard the future for humanity.

1997
Established

2000+
Global Clients

7
Draft Membrane Industry Standards

14+
First Set Project

5
National Science and Technology Awards

200+
Authorized Patent

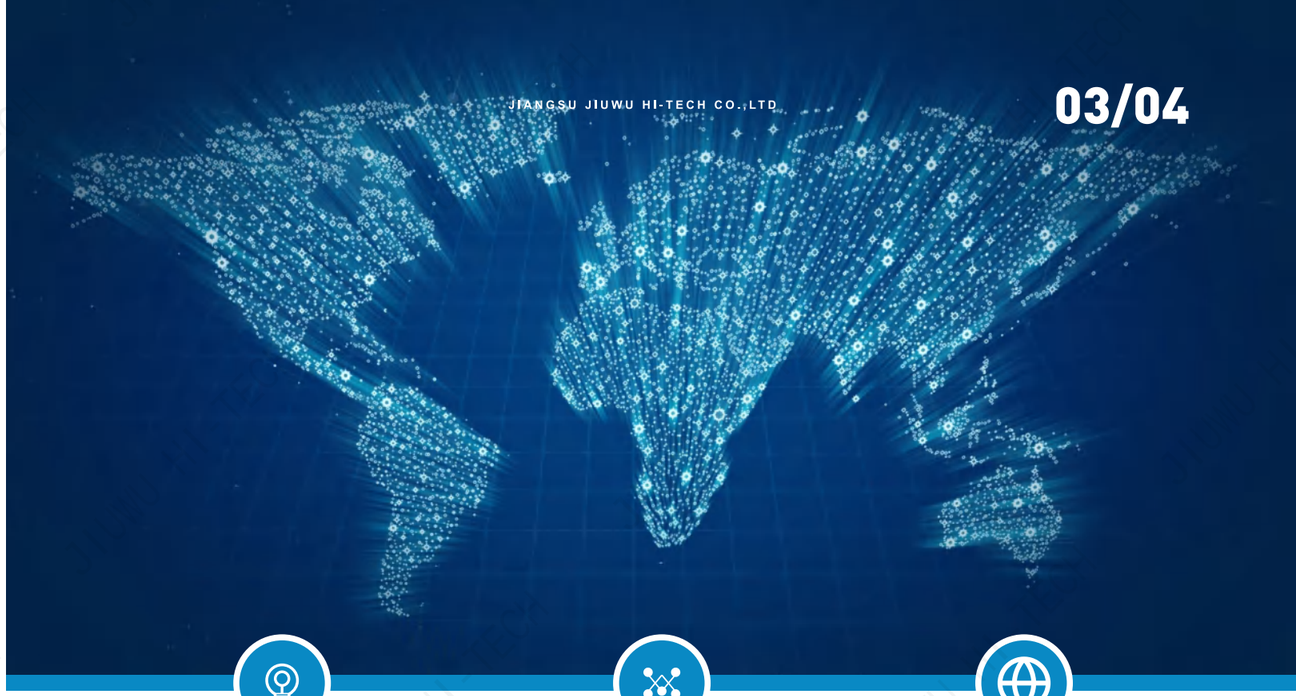
HONORARY QUALIFICATIONS

The company is the deputy director unit of China membrane industry association, and has established long-term strategic cooperation relations with Nanjing Tech University and research institutes of major universities. Through years of effort and practice, we have established a leading research and development center for separation materials, equipment, and applications in China, dedicated to the scientific research and development of separation technology and applications, as well as the transformation of achievements.

- Specialized, refined, and innovative "Little Giant" enterprise
- National high-tech enterprise
- National patent excellence award
- National intellectual property demonstration enterprise
- Outstanding enterprise award in China membrane industry

- Jiangsu province patent gold award
- Nomination award for Nanjing mayor's quality award
- Jiangsu separation membrane environmental engineering technology research center
- National and local joint engineering research center for inorganic membrane
- The production line project of ceramic membrane complete device was listed in the "National Torch Plan"

- The company has won four national science and technology progress awards and one the state technological innovation award
- The company's ceramic filter membrane products and complete equipment have been rated as the national manufacturing single champion product
- The company was rated as the leading enterprise in the field of ceramic membrane in China's membrane industry



Innovative Enterprises

Jiuwu Hi-Tech is one of the first batch of recognized national high-tech enterprises, high-tech enterprises of the National Torch Program, and "Little giants", which is the top performer among specialized, high-end and innovation-driven SMEs that provide distinctive products or services.

First in China

With the support of the national "Ninth Five Year Plan" scientific and technological breakthrough project, Jiuwu Hi-Tech successfully broke the foreign monopoly of ceramic membrane, and created a precedent for the industrialization of ceramic membrane in China.

Leading the Industry

Jiuwu Hi-Tech has successively developed a series of inorganic ceramic products, such as multi- channel ceramic membrane, high packing density ceramic membrane, ceramic nanofiltration membrane and smal-pore ultrafiltration membrane, filling the domestic gap and reaching the advanced level of the international vanguard, becoming a leading enterprise in the field of ceramic membrane in the Chinese membrane industry with independent intellectual property rights.

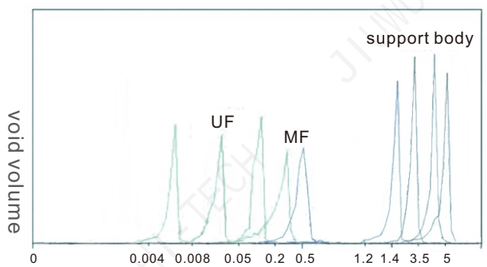
TUBULAR CERAMIC MEMBRANE

Inorganic ceramic membrane is a precision filter material with porous structure, which is made of alumina, titanium oxide, zirconia and other inorganic ceramic materials through high-temperature sintering. It is composed of asymmetric distribution with porous support layer, transition layer and membrane layer. The filtration accuracy covers microfiltration, ultrafiltration, and small pore size (≥ 2nm), which can be widely used for separation in pharmaceutical, food, chemical and other production processes.

01 Advantages of Ceramic Membrane

Advantages of tubular ceramic material

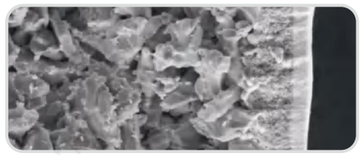
- Chemical, acid, alkali, oxidation and organic solvent resistance
- High temperature resistance, good high-temperature disinfection and steam sterilization
- High mechanical strength, wear-resistant, washable, and recoil resistant
- Dry storage, convenient for storage and maintenance
- No material degradation, no dissolved matter
- Biological inertness, antibacterial
- Good reproducibility, reusable



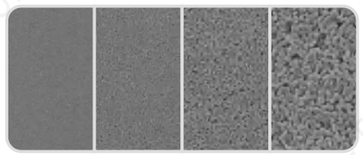
Advantages of tubular membrane

- High permeability, long service life, and low cost
- Narrow aperture distribution and high separation accuracy
- The support body has high strength and small deviation, excellent acid and alkali corrosion resistance, low loss rate
- Modification of the membrane layer to achieve hydrophilic / hydrophobic directional regulation control
- Rich products with separation accuracy ranging from 2nm to 5000nm
- Intelligent ceramic membrane production line, more stable mass production products, lower cost
- Offer customised services for specialised ceramic membranes to meet different application scenarios

02 Preparation Technology Features



Micromorphology of ceramic membrane cross section



Surface micro morphology of ceramic membrane

- Selected high-purity and high-quality Al_2O_3, ZrO_2, and TiO_2 as raw materials
- The international advanced production formula enhances the hydrophilicity of the membrane, and the Ceramic membrane has better flux
- Advanced dispersion technology to prepare nanoparticles, taking into account the uniformity and strength of ceramic membrane
- Automation and standardization of production processes, achieving traceability throughout the entire quality process

03 Ceramic Membrane Element

Specification of tubular ceramic membrane element

Section Geometry											
Type	12	12	25	25	25	25	25	30	30	30	30
Channel quantity	1	7	7	9	23	19	37	7	19	37	61
Channel OD(mm)	8.0	2.7	5.5	5.5	3.6	3.3	2.0	6.0	4.0	3.0	2.0
Length(mm)	1000	1200	1178	1178	1178	1178	1178	1200	1200	1200	1200
Active area(m^2)	0.025	0.071	0.178	0.178	0.300	0.231	0.274	0.158	0.286	0.362	0.460

Section Geometry								
Type	30	40	40	40	40	40	40	50
Channel quantity	19	19	37	61	91	19	37	91
Channel OD(mm)	4.0	6.0	4.0	2.5	2.0	6.0	4.0	3.5
Length(mm)	1200	1200	1200	1200	1200	1200	1020	1200
Active area(m^2)	0.286	0.430	0.502	0.575	0.686	0.430	0.427	1.200

Parameters of tubular ceramic membrane element

	Usual membrane pore size(nm)	Membrane material	Pure water flux ($L.h^{-1}.m^{-2}$)	molecular cut off (kDa)	Transmembrane pressure gap
Small aperture UF	4	TiO_2	≥100	10	3~10
	8	TiO_2	≥300	40	3~10
UF	50	ZrO_2	≥600	300	1~5
MF	200	Al_2O_3	≥800	——	≤3
	500		≥1000	——	≤3
	1200		≥1200	——	≤2
	1400		≥1500	——	≤2
	5000		≥3500	——	≤2

Filtering method	Terminal or cross flow
Pore size(nm)	2~5000
Material	Al_2O_3,$Zr0_2$, TiO_2
pH range Burst	0~14
Pressure(Mpa)	≥6
Length(mm)	250~1500
Membrane area(m^2)	0.05~1.2
Operating temperature(°C)	≤350
Organic solvent	insensitive
Porosity(%)	30~35

*Pure water flow test method:Refer to the method specified in HY/T064-2002 for testing, with a transmembrane pressure difference of 0.1MPa and a temperature of 25°C

04 Ceramic Membrane Module

Parameters of tubular ceramic membrane module

Membrane module(core)	1	3	7	19	37	61	91	138	241	860
Fill area(m^2)	~0 . 6	~1.8	~4.0	~10.0	~20.0	~35.0	~50.0	~80.0	~135.0	~480.0
Module material	SUS304(L),SUS316(L),Ti,PVC,FRPP									
Design pressure level	Pn6, Pn10 ,Pn16, Pn25, Pn40 ,Pn64, Pn100									
Length(mm)	250-1500									
Sealing material	EPDM rubber, fluororubber, silicone rubber, polytetrafluoroethylene, perfluoroether									
Module sealing form	Integral seal, O-ring seal, single cone seal, double cone seal									
Interface type	Flanges, clamps, and flexible joints									
Standard	GB,HG,ISO,DIN,ASME,JIS									

05 Ceramic Membrane System

Basic function

System filtration	Online back wash
System circulation	System rinsing
System top material	CIP cleaning
System washing water	Thermostat control

Basic configuration

Main system	Accessory
Membrane filtration	The system is equipped with PLC/DCS automatic control, Jiuwu autonomous program control software, electrical control cabinet, instruments, valves, circulation tanks, circulation pumps, feed pumps, pipelines, etc
Back wash system	
CIP cleaning	
PLC/DCS control	

System features

- Ceramic membrane system has high loading density, small floor area and large capacity of single equipment
- The separation process is simple, with few supporting devices, easy operation, and easy integration with other processes
- No filter aid, no solid waste generated
- Long service life, normal operation for more than 5 years
- Automated control, saving labor costs

06 Application Reference

Ceramic membrane continuous filtration system of a threonine production enterprise in Inner mongolia

Ceramic membrane continuous filtration system of a dicarboxylic acid production enterprise in Ningxia

800t/h brine refining system for a food salt production enterprise in Jiangsu

Catalyst separation continuous ceramic membrane coupling system

Continuous washing system for ceramic membrane of ultrafine powder

Digital extraction system of membrane method for a health wine production enterprise in Hubei province

HIGH PACKING DENSITY COLUMNAR CERAMIC MEMBRANE

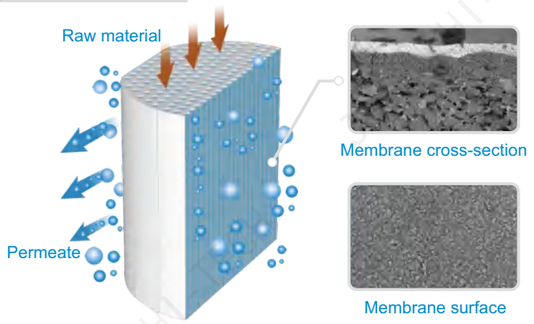
01 High Packing Density Columnar Ceramic Membrane Module

Advantages

- Inorganic ceramic material, sturdy and durable, with a long service life
- Large single component area, high filling density, and high water yield
- Better chemical resistance, suitable for a wider range of application scenarios and chemical cleaning conditions
- The inner diameter of the membrane element channel is 2- 4mm, with stronger SS tolerance and enhanced recoil effect
- Proprietary flow channel design, optimized inlet and outlet water distribution, and high operating efficiency
- High mechanical strength, capable of high-pressure filtration and backwashing
- Low requirements for inlet water quality, resistant to fluctuations in inlet water quality
- The membrane layer has high accuracy, narrow pore size distribution, good water quality, anti pollution and easy cleaning

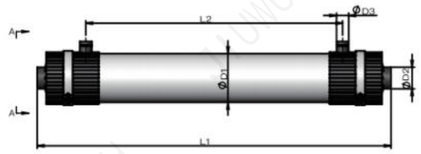
Introduction of high packing density columnar ceramic membrane

High packing density columnar ceramic membrane is an inorganic ultrafiltration membrane for water treatment developed on the basis of Jiuwu traditional tubular ceramic membrane and flat ceramic membrane technology. high loading column ceramic membrane is made of high- strength Al_2O_3 by roasting at high temperature, which has good high- temperature resistance, chemical corrosion resistance and excellent mechanical strength. compared with the traditional multi-channel tubular ceramic membrane, the filtering area of a single tube of high filling column ceramic membrane can reach 10-25m²,with greater loading density and processing capacity, it can effectively remove solid suspended solids, bacteria, and colloids, and can be applied in multiple fields such as civil safety water use, municipal water supply and wastewater treatment, emergency water supply, water reuse, industrial process wastewater, etc.



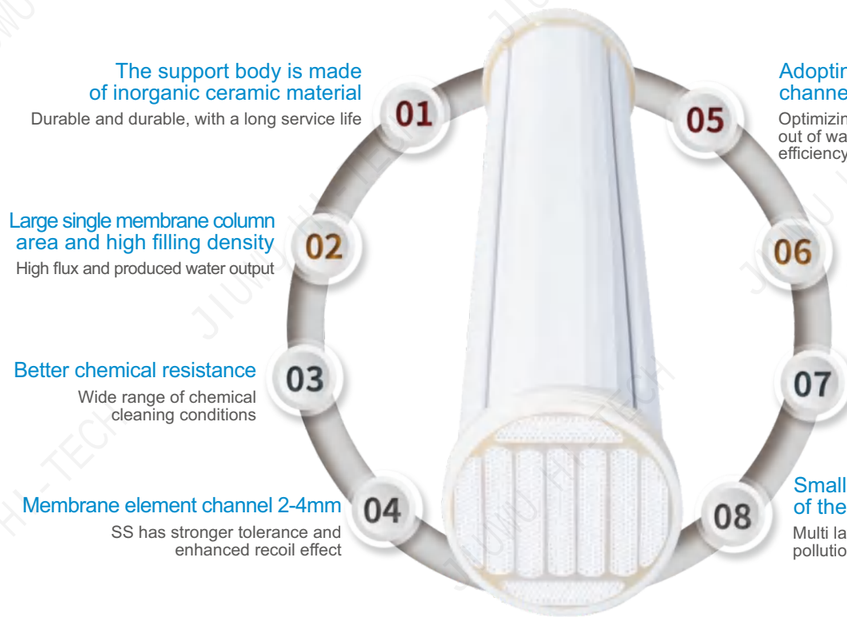
Specification	HCCM-10	HCCM-12	HCCM-15	HCCM-25
Membrane are(m^2)	10	12	15	25
Module dimension (L1×L2×D1，mm)	1452×1030×205	1452×1030×205	1752×1330×205	1710×1260×250
Inlet and outlet interfaces (D2、D3,mm)	60			
Produced water output (m^3/h)	0.8~2.5	1~3	1.2~3.8	2~6.3
Pore size(nm)	30、50、100			
Membrane flux diameter (mm)	2~4			
Membrane material	a-Al_2O_3、ZrO_2			
Sealing material	Sealing ring or sealant, fluororubber, EPDM rubber, perfluoroether rubber or epoxy resin, etc			
Membrane module material	UPVC、SS、FRP			
Filtration form	Internal pressure, dead end filtration, micro cross flow filtration			
Reservation	Dry preservation			

*The water production is the experimental reference value, and the actual water production varies depending on the material situation



◀ High packing density columnar ceramic membrane module

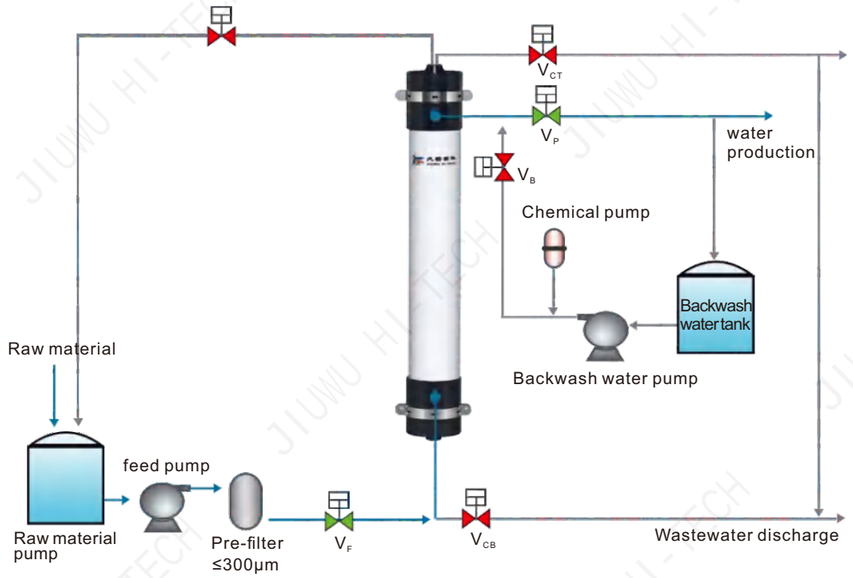
Advantages of high packing density columnar ceramic membrane



02 High Packing Density Columnar Ceramic Membrane System

Basic function

System filtration, system circulation, system rinsing, online backwashing, multi mode cleaning (BW/CEB/CIP), interlocking automatic control, etc



Remark : V_B :Backwash valve V_{CB}:Backwash discharge valve V_{CB}:Backwash discharge valve
V_{CT}:Concentrated water discharge valve V_F :Inlet valve V_P :Water production valve

Red: close Green: open

System features

- The system is simple, the materials are controllable, and the overall system cost is low
- Standardized modular design, simple and easy to implement process design
- The system is easy to install, flexible to operate, automatically controlled, and saves labor costs
- The filtration form is dead end filtration or micro cross flow filtration, with low energy consumption
- High filtration accuracy, without wire breakage, stable water quality, and meeting process requirements
- Small footprint, saving land and reducing civil engineering costs

03 Typical Application Areas

Fields

Municipal sewage treatment

Industrial wastewater treatment

Drinking water treatment

RO/NF Pretreatment

FLAT CERAMIC MEMBRANE

Flat ceramic membrane is a kind of asymmetric plate membrane with porous structure made of inorganic ceramic materials such as Al_2O_3 by special process. The filtration precision covers microfiltration and ultrafiltration, and the filtration form is usually suction filtration. flat ceramic membrane not only has the excellent performance characteristics of inorganic membrane, but also has better cost and operation cost, making it widely used in membrane bioreactor (MBR), integrated treatment device, municipal sewage treatment, Industrial wastewater treatment, water purification, industrial separation and other fields.

01 Specifi Cation and Model of Flat Ceramic Membrane Element

Type	FCM20	FCM25	FCM50
Dimension(L×W×T, mm)	600×145×6	500×250×6	1000×250×6
Element weight (kg)	0.7	1	1.9
Active area (m^2)	0.174	0.25	0.5

*customization accepted

Advantages

- Strong regeneration performance and strong impact load resistance
- Narrow aperture distribution and high separation accuracy
- Long service life and higher resistance to pollution
- Strong energy-saving and efficiency enhancement, low unit efficiency
- Good tolerance, wider application, easy to clean
- High reuse rate and environmentally friendly

02 Specification Parameters of Flat Ceramic Membrane Module

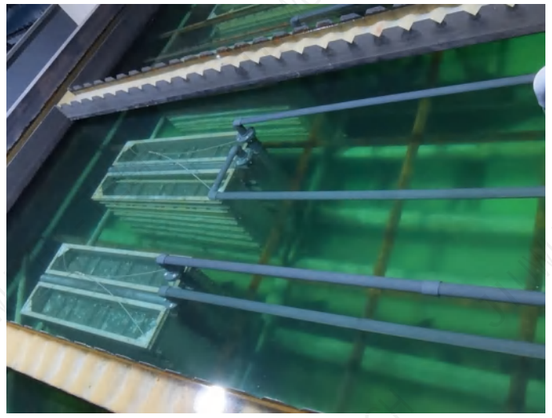
Module Model	Element spec	Quantity(pc)	Active area(m^2)	Water production (m^3/d)	L×W×H(mm)	Weight(kg)
FCMM-2	FCM-25	10	2.5	2~5	300×320×1200	15
FCMM-6	FCM-20	34	6	7~14	710×570×450	32
FCMM-12	FCM-15	68	12	8~10	710×570×600	64
FCMM-25	FCM-50	50	25	15~35	920×320×1800	200
FCMM-50	FCM-50	100	50	30~70	1720×320×1800	310
FCMM-100	FCM-50	200	100	60~140	1720×720×1800	630
FCMM-200	FCM-50	400	200	120~280	1720×720×3250	1185

*The size of the membrane module can be customized, and the water yield is the experimental reference value. The actual water yield varies depending on the material situation

Usage condition		
	pH range permitted	2~12
	MLSS(mg/L)	3,000~12,000
	Temperature resistance	0~40°C
	Operating pressure	-0.06~0.2MPa
	Cleaning method	online clean water backwashing, online explosive gas flushing, online chemical cleaning, offline chemical soaking, and offline high- pressure water flushingSUS304(L)
	Support material	SUS304(L)
	Aeration pipe material	UPVC
	Collecting pipe diameter	Dn20~50

* The size of membrane components can be customized
* The parameter water yield is based on laboratory data of pure water at room temperature and pressure, and the actual water yield varies depending on the material situation

03 Flat Ceramic Membrane System



System features

- The flat Ceramic membrane system has a long service life and has been operating normally for more than 5 years
- Stable quality meets the water treatment requirements of various industries
- The modular system can be used as an integrated device, thereby saving space
- Simple separation, few supporting equipment, and easy integration with other processes
- Support aeration cleaning, backwashing, chemical cleaning, high-pressure flushing, etc

System configuration

Main system	Components
Inlet, production, and concentrated water systems	The system is equipped with PLC automatic control, Jiuwu autonomous program control software, electrical control cabinet, instruments, valves, suction pumps, blast aeration, etc
Backwash system	
Aeration system	
Chemical cleaning system	
Automatic control system	

04 Membrane Regeneration Solution

Usual pore size (um)	Membrane material	End closing	Pure water flux ($L.h^{-1}.m^{-2}$)
0.1	Al_2O_3	Epoxy resin bonded ABS end	⩾500
0.2			⩾1000
0.5			⩾1800

* Pure water flux testing method: Refer to the method specified in GB/T 39717-2020 for testing, with a suction pressure of 100Kpa and a temperature of 25°C

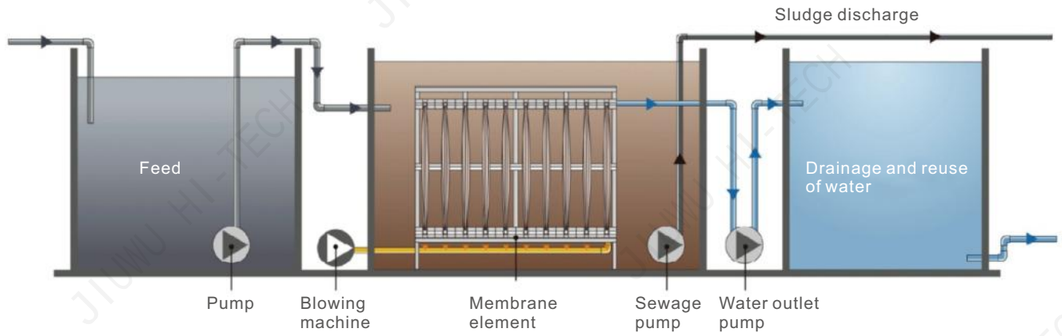
Filtrition method	External inlet and internal suction type
Pore size(um)	0.05~1
Membrane material	Al_2O_3、ZrO_2、TiO_2
pH range	2~12
Operating Tempreture(°C)	10~60
Bending strength(Mpa)	≥40
Aperture ratio(%)	≥40

05 Flat Ceramic Membrane System

Ceramic membrane cleaning agent specification

Commodity name	Introduction	Removing substances	Application	Dosage	Appearance
JWCC01	Strong alkalinity, rapid penetration, strong emulsifying, dispersing, and chelating abilities	Oil based organic colloids, inorganic colloids	Water treatment chemical industry	1-2% (1.5%mass ratio)	White particulate solid
JWCCF3	Strong oxidizability, removing heavily polluted organic dirt	Heavy organic matter	Pharmaceutical industry, food industry	1% (volume ratio)	Colorless liquid
JWCCF4	Strong acidity, removing inorganic salt scale such as oxides and silica colloids	Inorganic scale	Water treatment chemical industry	0.5% (mass ratio)	White particulate solid

06 Typical Application: Membrane Bioreactor MBR



*The MBR process upgrading and renovation can be used for municipal reuse such as landscape, chlorine greening, irrigation, and miscellaneous use

MBR technology features

- Simple process, compact structure, reducing footprint by 50%
- Controllable effluent quality and cost
- Prefabricated design and construction, easy to maintain and expand
- Strong shock load resistance and stable operation
- Long sludge age reduces sludge emissions

07 Typical Application Areas

Wastewater Treatment

- Membrane bioreactor(MBR)
- Municipal sewage treatment
- Integrated processing device
- Industrial wastewater treatment

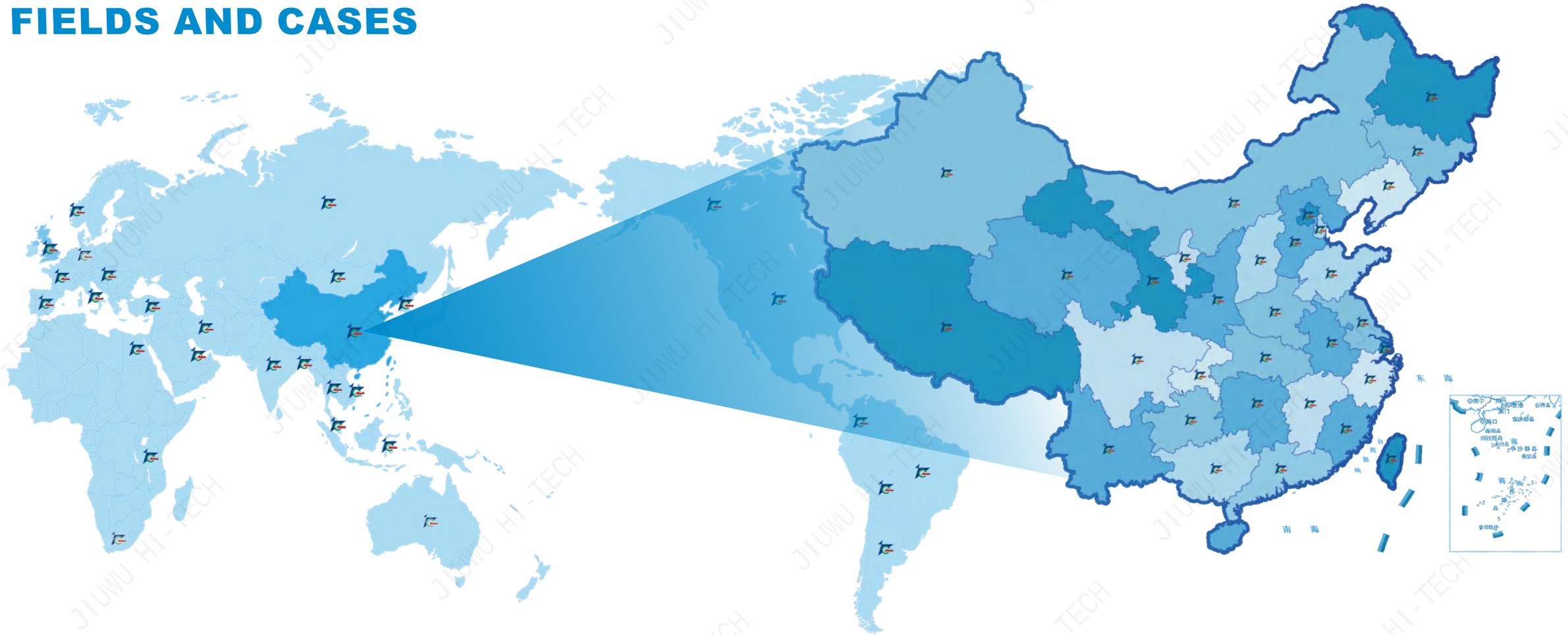
Water Purification

- Tap water supply process
- Rural drinking water renovation
- Seawater desalination
- Pretreatment of reverse osmosis process
- Emergency water supply technology

Industrial Separation

- Processing of raw materials for new energy batteries
- Concentration and enrichment of rare metals
- Purification of new materials

APPLICATION FIELDS AND CASES



Chemical Industry Process Reengineering

- Separation of petrochemical catalysts
- Coal chemical oil water separation
- Chlorine alkali chemical brine refining
- Purification of fine chemical products

Food Industry Digital Purification

- Natural product extraction
- Membrane resin sugar production
- Separation and purification of starch sugars
- Improvement of soy sauce and vinegar standards

Fine Separation in the Pharmaceutical Industry

- New biological materials
- Chinese herbal medicine extraction
- Antibiotic separation and purification
- Amino acid/organic acid separation and purification
- Separation of enzyme preparations and enzyme catalytic processes

Water Treatment and Resource Recycling

- Wastewater hardness removal
- Waste oil regeneration and emulsion recovery
- Civil safety water
- Municipal water treatment
- Waste acid and alkali recovery

Process Gas Purification

- Flue gas desulfurization
- Gas-solid separation

New Energy/New Material

- Purification of raw materials for new energy batteries
- Clean production of solar energy
- Desalination and purification of new materials
- Concentration and enrichment of rare metals
- Membrane separation coupling of Ethanol fuel