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

久吾高科

THE GLOBAL LEADER IN MEMBRANE SEPARATION

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江苏久吾高科技股份有限公司

JIANGSU JIUWU HI-TECH CO.,LTD

時鈞題

written by Shi Jun

科技创新、机制创新，双轮驱动；

TECHNOLOGICAL INNOVATION, MECHANISM INNOVATION, DUAL WHEEL DRIVE;

学科发展、产业发展，相互促进。

DISCIPLINE DEVELOPMENT, INDUSTRIAL DEVELOPMENT, PROMOTE EACH OTHER;

徐南平

Xu Nanping

二〇〇七年三月

March 2007

Founder

Chemical engineer, Educator, Senior academician of Chinese Academy of Sciences **Shi Jun**

Academician of the Chinese Academy of Engineering, former Vice Minister of the Ministry of Science and Technology, Director of Suzhou National Laboratory, Founder of Jiuwu HI-TECH **Xu Nanping**

In 1997, China's chemical higher education generation master, senior academician of Chinese Academy of Sciences, professor of Nanjing University of Technology Mr. Shi Jun, together with academician of Chinese Academy of Engineering Mr. Xu Nanping led their team to undertake the national "the 9th Five-Year plan" on research and development of China's independent ceramic membrane products, Jiuwu HI-TECH was born.

Since its establishment, Jiuwu HI-TECH has adhered to the patriotism of serving the country through science and technology and the spirit of striving for technological innovation, inheriting and carrying forward Mr. Shi Jun's professional ethics and style, It is precisely because of Academician Xu Nanping's efforts to lead the team to gather strength and continuously carry out original and leading technological breakthroughs that Jiuwu HI-TECH has made a significant breakthrough in breaking the foreign technological blockade and achieving brilliant achievements in product sales worldwide.

If a country does not make technological progress, there will be no bright future; If we cannot firmly grasp the core technology in our own hands, we cannot achieve independence and autonomy. In the journey of realizing the Chinese Dream, Jiuwu people are willing to contribute and use their own efforts to lay the foundation, pillars, and beams for the realization of national rejuvenation and national strength.

Since its establishment for more than 20 years, Jiuwu HI-TECH has pioneered the application of membrane technology in multiple fields, becoming a leading enterprise in the ceramic membrane field of China's membrane industry. Born and raised in innovation, Jiuwu HI-TECH will surely create a new situation for high-quality development of the enterprise in the future.

Founder

MISSION

Develop advanced separation technology,

promote production, save energy, protect the environment,

create value for customers, and safeguard the future for humanity

HOPE

To become the leader of the global membrane separation industry

VALUE

Customers are the first object of service

Innovation is the primary driving force

Integrity is the first brand

Strivers are the first wealth

Corporate Customers

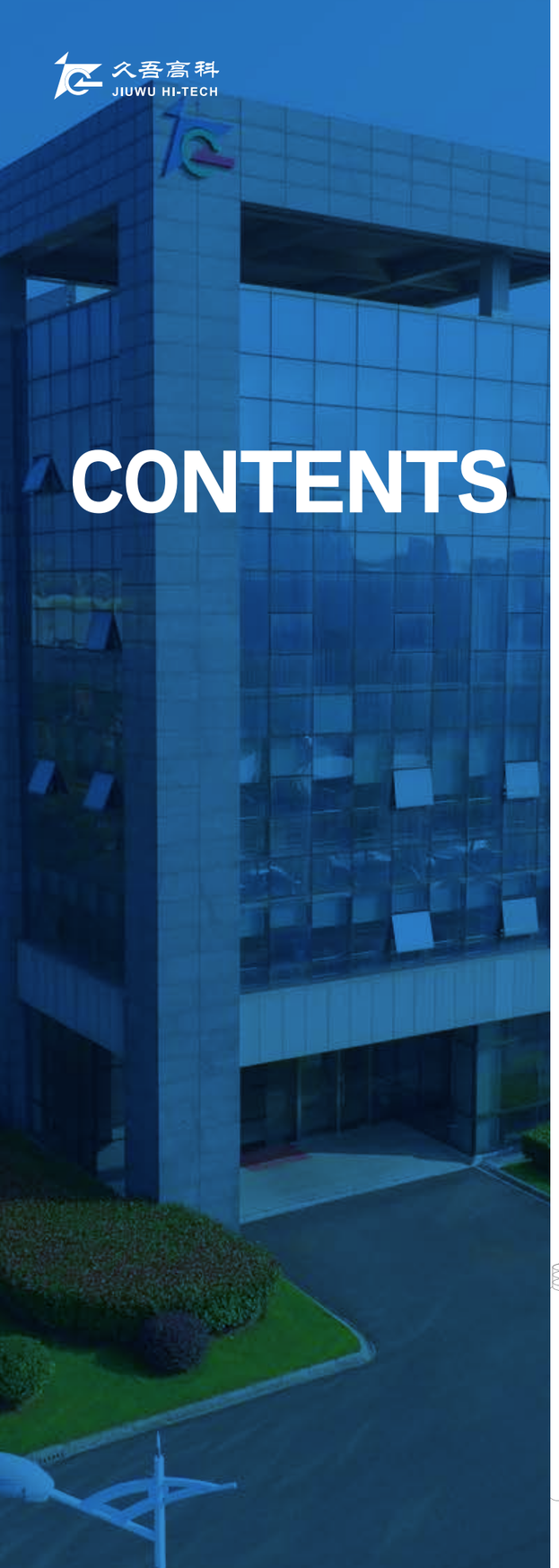
Chairman’ s Address

Secretary of the Party Committee and chairman of JIUWU HI-TECH Dang Jianbing

Since JIUWU HI-TECH establishment in 1997, we have taken the mission of "developing advanced separation technology, promoting production, saving energy, protecting the environment, creating value for customers and safeguarding the future for mankind" , adhering to the core values of "Customers are the first service object, innovation is the first productive force, integrity is the first brand, and strivers are the first wealth". With the goal of "committed to becoming the leader of the global membrane separation industry", all employees are diligent and dedicated, striving to forge ahead, and have made outstanding contributions in promoting the healthy development of the membrane industry and promoting the technological revolution of the membrane industry.

Exquisite and meticulous craftsmanship, we are down-to-earth; Mind the world, we aim high. Facing the future, we have only one goal: to promote development with innovation, with "integrity and quality" to shape the excellent brand of Chinese national membrane industry! We are convinced that the increasingly mature JIUWU HI-TECH will provide customers and society better products and more quality service in a more stable pace and with the mission of time and tide wait for no man to lead the membrane industry forward. Uphold good faith, continue to struggle, JIUWU HI-TECH is willing to work with you hand in hand to create a more brilliant Future.

Chairman’s Address



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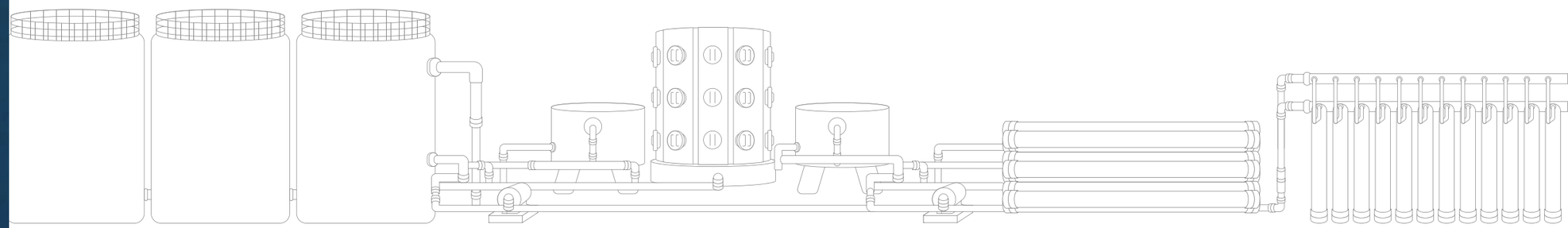
Committed to overcoming difficulties to become leader in the membrane industry

PART 02

Proficient in membrane technology and customized processes as needed

PART 03

Achieve customer value and actively give back to society



PART 01 COMPANY PROFILE

Jiangsu Jiuwu HI-TECH Co., Ltd. founded in 1997 and is a high-tech enterprise specializing in the research and development of new materials and overall solutions. It was listed on the A-share Growth Enterprise Board of the Shenzhen Stock Exchange in March 2017.

JIUWU HI-TECH 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.JIUWU HI-TECH is constantly seeking for breakthroughs in the manufacturing of new materials such as Ceramic membrane, organic membrane and adsorbent. Based on this, we provide comprehensive solutions for four major fields，such as new energy services, industrial fluid separation, water treatment and resource utilization, and industrial waste gypsum 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, biological Ethanol fuel, Chlor alkali chemical industry, and biological products. At present, the products of JIUWU HI-TECH 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. Adhere to the dual wheel drive of new materials and overall solutions, create value for customers, and safeguard the future for humanity.

1997 ESTABLISHED IN

2000+ WORLDWIDE CUSTOMERS

7 SETTING MEMBRANE INDUSTRY STANDARDS

5 NATIONAL LEVEL TECHNOLOGY AWARDS

14+ FIRST UNIT (SET) PRODUCT

200+ GRANTED PATENTS

Honors and Qualifications

Jiuwu is the vice president unit of the China Membrane Industry Association and has long-tem strategic cooperative relationships with Nanjing Tech University and research institutes of major universities. After years of effort and practice, we have established a leading R&D center for separation materials, equipment and applications in China. We are dedicated to technological R&D and achievement transformation of separation technology and application.

- Specialized, refined, and innovative "little giant" enterprise
- Jiangsu Province Patent Gold Award
- National Patent Excellence Award
- National Intellectual Property Demonstration Enterprise
- Nanjing Mayor's Quality Award "Nomination Award"
- National Local Joint Engineering Research Center for Inorganic Membrane
- The production line project of Ceramic filtration membrane complete equipment has been included in the "National Torch Program "

JIUWU HI-TECH has won four State Science and Technology Advancement Awards and one State Technological Innovation Award

JIUWU HI-TECH's ceramic filtration membrane products and complete equipment have been rated as the National Single-Champion Product in manufacturing industry

JIUWU HI-TECH has been rated as a leading enterprise in the ceramic filtration industry in China

Development History

In 1997 JIUWU HI-TECH was born in No.5 Xinmofan Road, Nanjing, Jiangsu Province, which pioneered the industrialization of ceramic membrane in China

In 2000 JIUWU HI-TECH's first generation of 'ceramic membrane industrial production line' officially settled in Nanjing National High-tech Industrial Development Zone

In 2009 JIUWU HI-TECH introduced financial capital, carried out business integration and formed a complete industrial chain

EXPLORE AND EXPAND OPEN A NEW CHAPTER

In 2012 JIUWU HI-TECH's second generation of 'ceramic membrane industrial production line' officially settled in Sanqiao area of Nanjing Pukou Economic Development Zone

In 2017 JIUWU HI-TECH successfully landed on the GEM of A-share Shenzhen Stock Exchange (300631.SZ) and became the first listed company in the domestic ceramic membrane industry

In 2019 JIUWU HI-TECH's third-generation 'ceramic membrane industrial production line' was officially settled in Qiaolin Area of Nanjing Pukou Economic Development Zone

In 2021 JIUWU HI-TECH's third-generation 'ceramic membrane industrial production line' was identified as the intelligent manufacturing demonstration workshop in Jiangsu Province

In 1999 **Water treatment field:** successful application of the first domestic industrial system for oily wastewater treatment

In 2002 **In the field of biopharmaceuticals:** the first industrial system for extracting threonine from ceramic membranes in China was successfully applied

In 2004 **In the field of biopharmaceuticals:** the first domestic industrialization system for extracting cephalosporin antibiotics using ceramic membranes was successfully applied

In 2005 **In the field of petrochemical industry:** successful application of the first domestic catalytic reaction device

In 2006 **In the field of petrochemical industry:** the first domestic brine refining system was successfully applied

In 2008 **In the food and beverage industry:** the first domestic health wine industry membrane integration system was successfully applied

In 2012 **In the field of municipal water supply:** the first domestic ceramic membrane tap water project was successfully applied

In 2014 **Water treatment field:** successful application of the world's first zero discharge membrane integrated system for papermaking and pulp wastewater

In 2015 **Water treatment field:** successful application of the first domestic oilfield reinjection water treatment ceramic membrane system project

SEEKING AND EXPLORING CONSTANTLY CREATE NEW IDEAS AND PROPOSE UNIQUE INSIGHTS

In 2016 **Gas Separation Field:** Successful Application of the World's First Ship Engine Exhaust Gas Membrane Desulfurization Project

In 2017 **Carbon Emission Reduction Field:** Successful Application of the World's First Steel Industry Tail Gas to Ethanol Project

In 2018 **New Energy Field:** Successful Application of the World's First 10000-ton Salt Lake Integrated membrane Lithium Extraction Projec

In 2020 **Solid waste disposal field:** Successful application of the first national project for resource utilization of waste salt and salt based acid and alkali production

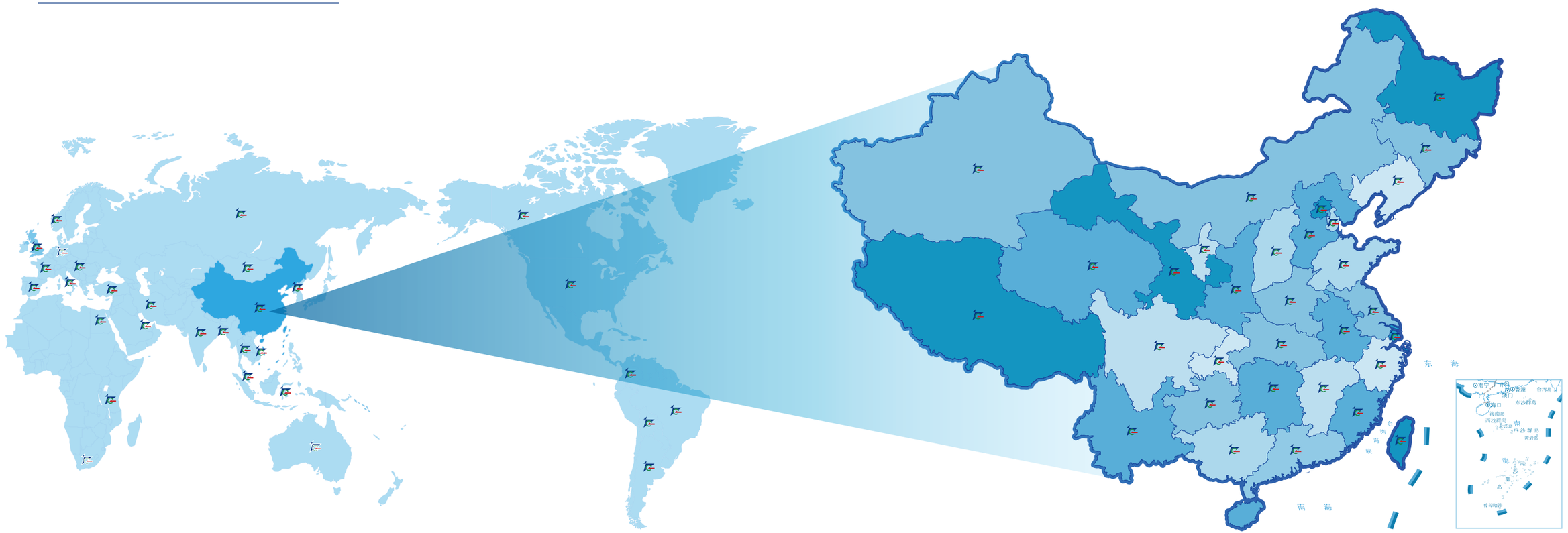
In 2021 **Titanium dioxide field:** Successful application of the first industrial project of building gypsum made of titanium gypsum in China

Water treatment field: Successful application of large-scale PVA wastewater zero discharge EPC project

In 2022 **Zero discharge field of wastewater:** Successful application of the first domestic project for zero discharge of iron phosphate wastewater precipitation reaction coupled ceramic membrane separation

New energy field: The company has successfully put into operation a lithium adsorbent new material production line with fully independent intellectual property rights

Business Area



2000+

Global Customers

40+

countries and regions

After more than 20 years of continuous struggle, JIUWU HI-TECH actively expands new areas and innovative business model,adhere to new materials and overall solutions with tdual wheel drive. To achieve sustainable and high-quality development of JIUWU HI-TECH, creating value for customer , guarding the future for humanity.

30+

Province, city, autonomous region, municipality directly under the Central Government

At present, JIUWU HI-TECH 's products have been exported to over 40 countries and areas, including Argentina, Australia, Canada, Malaysia, the United States, Mongolia, India, Vietnam, Indonesia, South Africa, etc. JIUWU HI-TECH focuses on deep cultivation in the Chinese area, Currently, the business covers 34 provinces, autonomous regions, and municipalities directly under the central government.High quality products and service received unanimous recognition from domestic and foreign customers,Market share of products is leading in China,even around the world.

Led By The CPC

On April 28, 2020, the Committee of Jiangsu Jiuwu High-tech Co., Ltd. was officially inaugurated. At present, JIUWU HI-TECH's party committee has a total of more than 100 party members, including 4 party branches and 10 party groups. Party members are distributed in various departments of JIUWU HI-TECH's scientific research, business, management and production, which has opened the red engine for rapid development of Jiuwu High-tech, marking that the party building work of Jiuwu Hi-Tech has entered a new historical stage.

Wang Zhenwei, member of the Standing Committee and Minister of Organization Department of Pukou District, Nanjing City, and Dang Jianbing, the Secretary and Chairman of JIUWU HI-TECH's Party Committee, jointly unveiled for Jiuwu HI-TECH Party Committee.

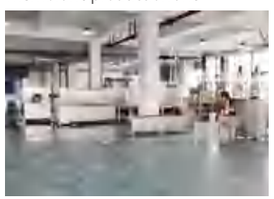
Build a Position

Inherit the glorious tradition of 'the Party branch is organized on a company basis', build the branch on the front line, build the branch on major scientific research projects, urgent and dangerous engineering projects, and give full play to the vanguard and exemplary role of party members.

Tackling Party Group for the production of adsorbent in Xizang Jiuwu

Tackling Party group for the development of adsorbent

Tackling Party group for the construction of intelligent ceramic membrane production line



Tackling Party group for the development ang production of organic membrane

Leadership Care

On December 13, 2014, General Secretary Xi Jinping inspected the JIUWU HI-TECH's demonstration project-the world's first zero discharge project for pulp and paper wastewater, and highly praised it

On November 29, 2009, then Premier of the State Council Wen Jiabao inspected the JIUWU HI-TECH's new products

On August 2, 2016, then Secretary of the Jiangsu Provincial Committee of the CPC, Li Qiang inquired about the project operation status on-site

Technology R&D

Talent Team

The innovation team of JIUWU HI-TECH's R&D center is composed of multidisciplinary personnel. There are 157 employees, including 31 with senior titles and 24 with doctoral degrees. There are nearly 10 talents of Provincial& Prefectural Level, such as Jiangsu provincial "333 Talents Project", Jiangsu provincial "Six Talent Peaks", "Double Innovation" Doctor of Jiangsu Province. The center has the ability to engage in major basic research, major engineering research and major scientific and technological achievements transformation.

R&D Direction

JIUWU HI-TECH's research and development direction covers basic research based on separation materials and separation processes, new material research and development, application research and development, equipment research and development and other research and development systems.

Undertake Major Scientific Research Projects

JIUWU HI-TECH has undertaken more than 20 national and provincial level scientific research projects such as the national '863' plan and the national key research and development plan.

R&D Platform Construction

JIUWU HI-TECH has built 7 innovative R&D platforms at the provincial level or above, and has established industry-university-research cooperation platforms with multiple universities and research institutes.

Intellectual Property (Patents + Standards)

JIUWU HI-TECH has applied for 313 patents, and has 200 + national authorized patents, including 72 invention patents. It has presided over the drafting of all 5 industry standards, 1 national standard and 1 group standard related to ceramic membranes, and participated in the preparation of 11 national standards, 3 industry standards and 2 group standards. It has undertaken 5 projects such as "Key Projects of Jiangsu Province Intellectual Property Strategy Promotion Plan" and "Jiangsu Province Patent Implementation Plan Project" and won the honorary titles of "National Intellectual Property Demonstration Enterprise" and "Advanced Collective of National Separation Membrane Standardization Work."

5 industry standards, 1 group standard

Project Delivery

JIUWU HI-TECH has a group of senior industry experts and professional technical personnel who have been practicing in fields such as new energy services, industrial fluid separation, water treatment and resource utilization, and industrial waste gypsum resource utilization for many years.JIUWU HI-TECH delivers products and solutions to customers perfectly with optimized engineering design, diversified supply chain, lean production and manufacturing, complete quality management system, high-quality engineering implementation, information-based engineering operation, and efficient engineering project management.

In 2008
JIUWU HI-TECH earned offcial accreditation of ISO9001:2008 Quality Management System

In 2013
JIUWU HI-TECH earned offcial accreditation of ISO 14001:2004 Environmental management system

In 2015
JIUWU HI-TECH earned offcial accreditation of OH&S 18001 occupational health and safety management system

Project design

JIUWU HI-TECH has a group of experienced professional designers, the average work experience of more than eight years, covering the process, pipeline, equipment, electrical, automatic control, civil construction and budget and other professional. We adopt the mainstream engineering design tools and software, and establishes a sound design management system and design integration platform to achieve multi-professional and efficient collaborative work.In the project plan and project implementation, we follow the material characteristics according to the site environment, and take the best cost-effective solution as the guiding principle.We strictly prioritize design and combine design, procurement, and construction to highlight operability and construction controllability, saving investment costs and creating value for customers from the source.

Manufacturing

JIUWU HI-TECH has advanced production and manufacturing technology of new materials, membrane modules and complete sets of equipment, with 28000m² intelligent membrane material production base and 50000m² modern equipment production plant. JIUWU HI-TECH uses modern professional production and testing equipment to produce new materials, membrane modules and complete equipment that meet customer requirements. We ensure the timely delivery of products with high quality, and ensures the continuous, stable and efficient production of customers.

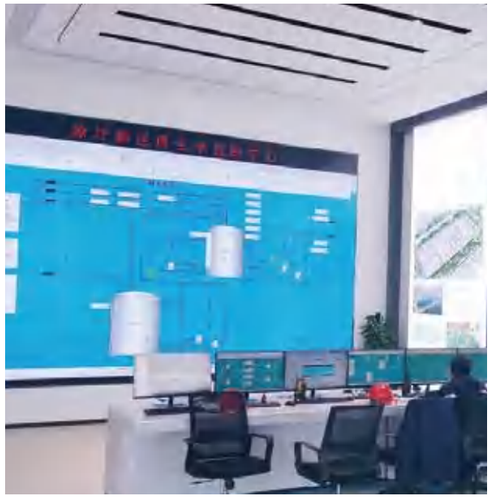
Project Implementation

To meet customer needs, the company has developed a strict engineering management system, adopting a project manager responsibility system, and using professional project management software as information assistance to ensure that responsibilities are assigned to each position and person, and project progress is controllable. During the project implementation process, safety and quality management is strictly implemented to ensure the safety and quality of the entire construction process, and to maximize customer benefits.

Customer Service

JIUWU HI-TECH adheres to the core value of "customer is the first service object",provides the highest quality service to our customers through providing the best service.Relying on advanced technology and a comprehensive service system，content covers pre-sale services（Technical advice and research and development、Process design, etc)、in-sale services (Design、Production-manufacturing、 Installation and commissioning、Remote debugging and maintenance、Operations delivery, etc) and after-sale services（Operation and maintenance、Part supply、Troubleshooting、Technical training, etc)，continuously providing professional and thoughtful services to customers，continuously creating value for customers.

Remote debugging and maintenance



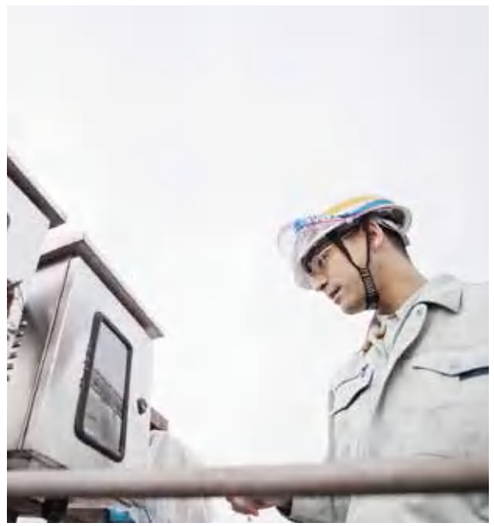
Engineering Operations

Technical training

7X24 HOURS

JIUWU HI-TECH cherishes every opportunity to serve customers. We built 7×24-hour service response, instant remote service, 48-hour on-site repair, and accessory replacement service system, striving to satisfy every customer.

Technical consultation and Research



Engineering maintenance

After sales service-- Cleaning and diagnosis

PART 02 NEW MATERIALS

Ceramic Membrane

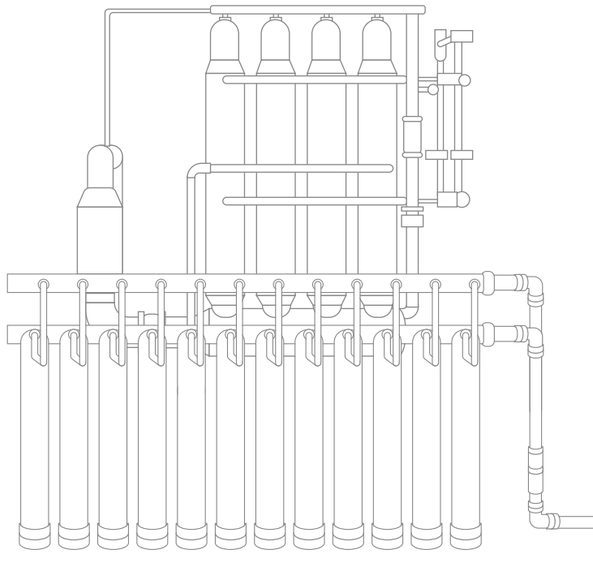
- Tubular ceramic membrane
- High packing density columnar ceramic membrane
- Flat ceramic membrane

Organic Membrane

- Spiral organic membrane
- Hollow fiber membrane
- Organic tubular membrane

Adsorbent

- Titanium-based lithium adsorbent
- Aluminum-based lithium adsorbent



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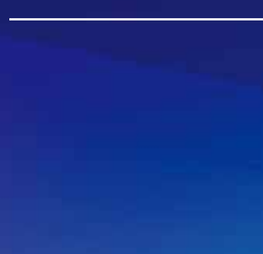
JIUWU HI-TECH

Ceramic Membrane



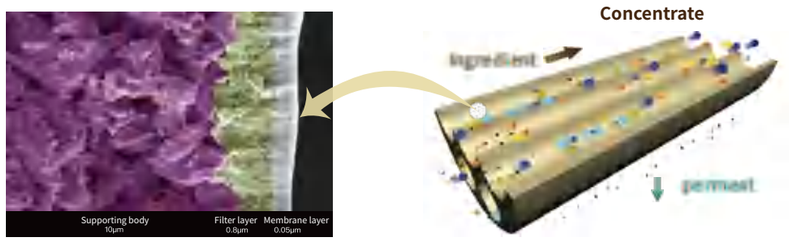
Tubular ceramic membrane

High packing density columnar ceramic membrane

Flat ceramic membrane

Tubular ceramic membrane

The inorganic ceramic membrane is a precision filter material with a porous structure with a high-temperature sintering of inorganic ceramic materials such as alumina, titanium oxide, and zirconia. It consists of porous support layers, transition layers and membrane layers, and is asymmetric distribution. The filtering accuracy covers micro filter, ultrafiltration and small pores (≥2nm), and the membrane can be widely used in fields such as pharmaceutical, food, chemical and other production process separation and special water treatment.



Membrane filtration principle diagram

Tubular ceramic membrane element specification parameters

Section geometry	Circular、Hexagon
Outer diameter	12mm、25mm、30mm、40mm、50mm And so on
Number of channels	1、7、9、19、23、37、61、91 And so on
Channel diameter	2.0mm、2.5mm、3.0mm、4.0mm 6.0mm、8.0mm And so on
Membrane length	500mm、1178mm、1200mm And so on
Single membrane area	0.02~1.2 m^2
Separation accuracy	2~5000nm

▲ 0.5 m^2 Ceramic membrane experiment equipment

Technical advantages

- High infiltration flux, long service life;
- Intelligent production, lower cost;
- Inorganic sealing, safe and stable;
- On demand customization, personalized services;
- High support body strength, stable membrane layer;
- The pore diameter distribution is narrow and the separation accuracy is high.

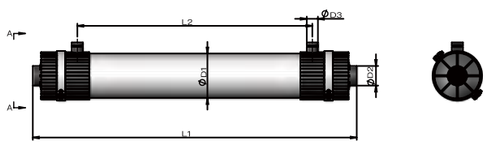
High packing density columnar ceramic membrane

High packing density columnar ceramic membrane is an inorganic ultrafiltration membrane developed on the basis of Jiuwu traditional tubular ceramic membrane and flat ceramic membrane technology, which made by roasting high-strength α-Al_2O_3 at high temperature. It can remove suspended solids, bacteria, colloids, and other substances effectively and be widely used in various fields such as resident water safety, municipal water supply, wastewater treatment, emergency water, reclaimed-water reuse, lithium extraction from Salt Lake and so on.

Specification parameters of High packing density columnar ceramic membrane

membrane module type	HCCM-10	HCCM-12	HCCM-15	HCCM-25
membrane area（m^2）	10	12	15	25
membrane module size（L1×L2×D1，mm）	1452×1030×205	1452×1030×205	1752×1330×205	1710×1260×250
inlet and outlet interface size（D2、D3，mm）	60			
water yield（m^3/h）	0.8~2.5	1~3	1.2~3.8	2~6.3
membrane pore size（nm）	30、50、100			
Membrane channel diameter（mm）	2~4			
membrane material	α-Al_2O_3、ZrO_2			
Sealing form and material	sealing ring or gluing、FKM、EPDM、FFKM or epoxy resin, etc			
membrane module material	UPVC、SS、FRP			
filtering method	dead-end filtering、weak cross flow filtration			
preservation methods	dry storage			

*The water yield is the reference value for the experiment, the actual water yield varies depending on the material situation



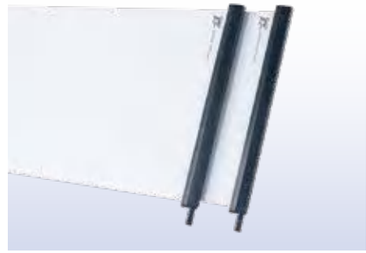
◀ High packing density columnar ceramic membrane module

Technical advantages

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

Flat ceramic membrane

Flat ceramic membrane is an asymmetric plate-shaped membrane with porous structure made by inorganic ceramic materials such as Al_2O_3 through a special process. The filtration accuracy includes microfiltration and ultrafiltration, and usually the filtration form is suction filtration. Flat ceramic membranes not only have the excellent performance characteristics of inorganic membranes, but also are more cost-effective in cost of construction and operating, which making them widely applicable in multiple fields such as membrane bioreactors (MBRs), integrated processing equipment, municipal sewage treatment, industrial wastewater treatment, water purification, industrial separation.



Specification parameters of flat ceramic membrane element

Type	FCM20	FCM25	FCM50
Overall dimensions（L×W×T，mm）	600×145×6	500×250×6	1000×250×6
Weight of membrane element（kg）	0.7	1	1.9
Effective membrane area（m^2）	0.174	0.25	0.5

*Other specifications can be customized

Technical advantages

- Narrow pore size distribution, high separation accuracy;
- Long operation life and stronger anti-pollution ability;
- Strong regeneration performance, strong impact load resistance;
- Other specifications can be customized;
- High reuse rate , environmentally friendly;
- Good tolerance, wider application, easy cleaning.

Specification parameters of flat ceramic membrane module

Membrane module type	Membrane element specification	Number (piece)	Membrane area (m^2)	Water yield (m^3/d)	Length * Width * Height (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

Organic Membrane

Spiral Organic Membrane

(UF/NF/RO)

Hollow fiber membrane

column membrane
curtain membrane
(UF)

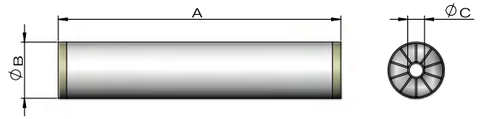
Organic Tubular Membrane

Non-woven Tubular Membrane
Sintered Tubular Membrane
(MF/UF)

Spiral Organic Membrane

Spiral organic membrane is produced through the combination of highly stable membranes and advanced automated production processes. Jiuwu HI-TECH has exploited whole series of spiral organic membrane covering ultrafiltration, nanofiltration and reverse osmosis. These products have been widely used in the process separation of pharmaceutical, food, chemical and other industries, as well as the standard discharge, upgrading and reconstruction of discharge, reuse of reclaimed water, zero discharge, and resource utilization.

Spiral organic membrane Element



A=1016.0mm(40”)
B=201.9mm(7.95”)
C=28.6mm(1.125”)

Typical ultrafiltration membrane element specifications

Model	Materia	Effective Membrane Area（ft^2/m^2）	Flow Channel（mil）	Molecular Weight Cut Off（Da）
UF-8040F31	PES, PS, PVDF	365/33.9	31	1000~50000
UF-8040F46		284/26.4	46	
UF-8040F90		167/15.5	90	

Typical nanofiltration membrane element specifications

Type	Model	Desalination Rate of $MgSO_4$（%）	Flux GPD (m^3/d)	Effective Membrane Area (ft^2/m^2)	Flow Channel (mil)
High Rejection Rate Nanofiltration Membrane	NF1-8040F31	98.0	9000（34. 1）	365/33.9	31
	NF3-8040F31				
High Flux Nanofiltration Membrane	NF2-8040F31	96.0	10500（39.7）	365/33.9	31
	NF4-8040F31				

Typical reverse osmosis membrane element specifications

Type	Model	Desalination Rate of NaCl（%）	Flux GPD （m^3/d）	Effective Membrane Area （ft^2/m^2）	Flow Channel (mil)
Membrane for Brackish Water Desalination	BW-8040F31	99.5	10500（39.7）	400/37.1	31
Fouling Resistant Membrane for Brackish Water Desalination	BWFR-8040F31	99.5	10500（39.7）	400/37.1	31
Membrane for Seawater Desalination	SW-8040F31	99.7	6500（24.6）	380/35.3	31

Technical Advantages

- Excellent membrane performance ensures good separation performance;
- Strong pollution resistance, high flux and stability;
- High level of production automation ensures stable product quality;
- Full range of spiral membrane products and customizable services;
- Can provide products with high resistance, such as high pressure resistance, high temperature resistance, acid and alkali resistance, and solvent resistance spiral membrane.

Hollow Fiber Membrane

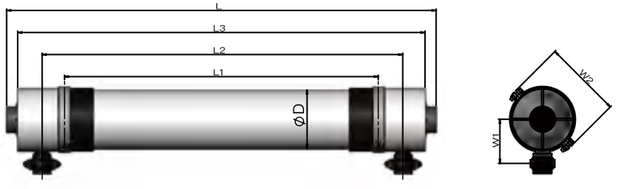
Jiuwu hollow fiber membranes are prepared using high-grade PVDF resin as raw material, based on advanced production processes and hydrophilic modification technology, with a nominal pore size of 30nm. We have developed two modules, Ultrafiltration and MBR, with excellent performance. The product has been widely used in fields such as river purification, reclaimed water reuse, industrial wastewater pretreatment, municipal wastewater treatment, drinking water, and seawater desalination.

Hollow Fiber Membrane—Specification parameters of curtain membrane element

Model	Total Membrane area (m²)	Number of Elements	Material	Size (L*W*H, mm)	Outlet/inlet size	Water treatment capacity (m³/d)
M960	960	48	Top: 304 stainless steel. ABS resin Frame: 304 stainless steel	2600×1400×2410	DN65	190~770
M720	720	36		2000×1400×2410		140~580
E480	480	24		1400×1400×2410		95~380
E240	240	12		1300×1400×2410	DN40	45~190
E180	180	12		1300×700×1910		35~145

Hollow Fiber Membrane—Specification parameters of cylindrical membrane element

Model	Total Membrane area (m²)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	D (mm)	W1 (mm)	W2 (mm)
JW™-PVDF-2660	33	1860	1500	1610	1710	165	125	250
JW™-PVDF-2860	51	1860	1500	1630	1820	225	180	342
JW™-PVDF-2880	77	2360	2000	2130	2320	225	180	342



◀ Hollow fiber column membrane module

Technical advantages

- Small membrane pore size and high porosity;
- Excellent pollution resistance;
- Excellent mechanical properties;
- Strong chemical resistance and stability;
- Advanced Packaging Technology;
- Customizable services.

Organic Tubular Membrane

Jiuwu organic tubular membrane is categorized into two types: sintered tubular membrane and non-woven tubular membrane, involving materials such as PVDF, PES, etc. The separation accuracy of the membrane layer covers 10kD~0.2 μm. The inner diameter of membrane tubes, of which non-woven tubular membranes are available in 6mm, 8mm and 10mm, and sintered tubular membranes are available in 8mm, 12.7mm and 25.4mm. The size of the module are 4-inch, 6-inch and 8-inch, in addition, non-standard membrane module with different materials and specifications can also be customized. The products have been used in processes such as hardness removal of softening, powder cleaning, acidic and alkaline liquid reuse, as well as in applications such as Landfill leachate , reinjection water for oilfield, and plant extraction process.

Advantages of Non-woven Tubular Membranes

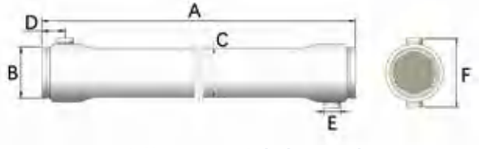
- Double-layer non-woven body to withstand higher operating pressure;
- Uniform ultra-thin separation layer, uniform pore size, high separation accuracy;
- Open flow channel, free of dead corner, strong pollution resistance;
- The flow channel is wide, and the concentration of activated sludge in the influent water can reach 15~30g/L.

Advantages of Sintered Tubular Membrane

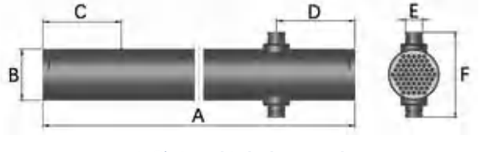
- Special membrane mosaic structure, gived excellent wear resistance;
- Strong anti-pollution, can be backwashed, more stable operation flux;
- Open flow channel for high viscosity, high solids systems;
- Excellent chemical resistance for a wide range of applications, easy to clean.

Typical Tubular Membrane Module Specifications

	Model number	Membrane area (m²)	Membrane tube inner diameter (mm)	Number of Membrane Tubes	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)
Non-woven Tubular Membranes	JW-TU-F-8630-F	15.2	8	201	3000	168.3	160	90	60	250
	JW-TU-F-8830-F	27.2	8	365	3000	219.1	210	90	73	330
Sintered Tubular Membrane Advantages	JW-TU-F-12618-P	2.59	12.7	37	1828.8	168.3	337	337	73	282
	JW-TU-F-12818-P	4.25	12.7	61	1828.8	219.1	337	337	73	363



▲ Non-woven tubular membrane



▲ Sintered tubular membrane

Adsorbent

Titanium-based lithium adsorbent

Aluminum-based lithium adsorbent

The adsorption coupled membrane process is one of the most promising technologies for lithium extraction from salt lake brine, with advantages such as high efficiency, energy conservation, environmental protection, and simple operation. However, the core material adsorbent often has problems such as low adsorption capacity, poor selectivity, and high loss rate, which limits the application of this technology. Through long-term technological breakthroughs, Jiuwu High-Tech has greatly improved the performance of adsorbents. It has taken the lead in developing titanium-based and aluminum-based lithium adsorbents, with high mass transfer efficiency and fully independent intellectual property rights. We have also built 6000 tons per year adsorbent production lines of the project, achieving a three-step strategy of investment, production, and sales for the same year. In the future, our production lines will be expanded in a timely manner based on the market demand for lithium extraction from salt lakes, further to enhance the capacity of adsorbents.

Third generation titanium-based lithium adsorbent

Third generation aluminum-based lithium adsorbent

Product advantages

Product type	Applicable process	High adsorption capacity	Excellent adsorption selectivity	Low dissolution loss rate
Third generation aluminum-based lithium adsorbent	Lithium extraction from old brine with high magnesium lithium ratio; Lithium extraction from raw brine with high sodium lithium ratio	Adsorption capacity above 10.0mg/g	Effectively separate magnesium lithium, sodium lithium, boron lithium, and other ions	Annual loss rate less than 5% (Industrialized operation)
Third generation titanium-based lithium adsorbent	Lithium extraction from alkaline brine	Adsorption capacity above 12.0mg/g	Effectively separate magnesium lithium, sodium lithium, boron lithium, and other ions	Comprehensive annual loss rate less than 10% (pilotscale experiment)

PART 02 OVERALL SOLUTION

New Energy Services

- Lithium extraction from salt lakes
- Photovoltaic materials
- Fuel ethanol
- New energy and environmental protection

Industrial Fluid Separation

- Ultrafine powder, catalys
- Chlor-alkali chemical industry
- Biological fermentation products
- Food & Beverages, Natural Products

Water Treatment and Resource Utilization

- Industrial water treatment and comprehensive utilization of resources
- Industrial Park Integrated Services
- Water environment comprehensive treatment
- Waste Disposal and Resource Utilization

Industrial Waste Gypsum Resource Utilization

- Titanium Gypsum
- Phosphogypsum
- Salt Gypsum

New Energy Services

- Lithium extraction from salt lakes
- Photovoltaic materials
- Fuel ethanol
- New energy and environmental protection

Lithium extraction from salt lakes

Technical introduction

The company is committed to the research and development of lithium extraction technology from multiple types of salt lakes and lithium-containing brine, and is in the leading position in the industry in lithium adsorption materials, membrane separation technology, lithium extraction process development and engineering of different types of salt lakes, and is one of the very few domestic service providers that have mastered the core materials, process technology, commissioning, installation and operation of lithium extraction with "adsorption + membrane" separation and coupling. At present, the company can provide a variety of economically beneficial product routes for various types of lithium-containing solutions, such as lithium chloride (low potassium) refined products, LiOH products, Li2CO3 products, etc.

The innovation process of lithium extraction from salt lakes

Lithium adsorbent achieves leapfrog development

2018 The aluminum-based lithium adsorbent resin was successfully developed
2019 It successfully developed a solution for lithium extraction from natural brine
2020 The titanium-based lithium adsorbent material was successfully developed
2021 The third-generation annular adsorbent was successfully developed

Membrane material — **Adsorbent** — **Industrialization**

Membrane technology innovation for lithium extraction from salt lakes

2013 Development of membrane lithium xtraction technology
2016 Study on lithium extraction process from brine by all-membrane method
2018 The engineering of lithium extraction from salt lakes by integrated-membrane method was completed
2022 High-precision lithium chloride preparation technology will be developed

Intellectual property and industrialization

2018 The Minmetals Salt Lake 10,000-ton lithium carbonate project was completed
2019 The lithium extraction patent won the gold medal of the membrane industry patent award
2020 The adsorbent products were mass-produced
2022 Full process of direct lithium extraction technology for all types of salt lakes

Core technology

- Magnesium-lithium separation and lithium concentration technology using membranes;
- Sorbent technology for extracting lithium from high sodium raw halogen;
- Sorbent technology for extracting lithium from high magnesium aged brine;
- Bipolar membrane technology for lithium hydroxide production;
- Electrodialysis for boron removal and boric acid recovery technology;
- Lithium recovery technology for lithium immersion mother liquor;
- Ceramic membrane pretreatment technology;
- Soda refining technology;
- Lithium extraction technology from underground brine;
- Lithium Extraction Technology from Oilfield Produced Water.

Case 1: Lithium extraction from natural brine

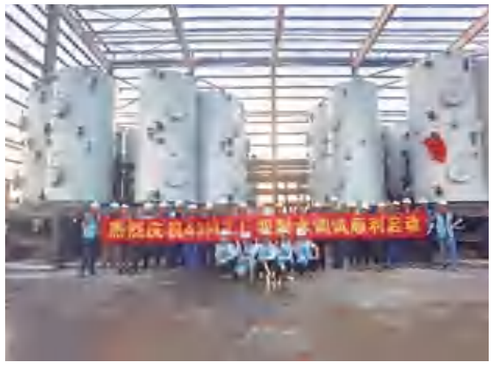
In July 2021, Yiwei Lithium Energy established a joint venture company Jinhai Lithium Industry (Qinghai) Co., Ltd. in Qinghai with Jinkunlun Lithium Industry, a subsidiary of Dahua Chemical, to jointly develop lithium resources in Dachaidan Salt Lake.In January 2022, Jinhai Lithium signed a 1,000-ton lithium chloride EPC contract with Jiangsu JIUWU HI-TECH to directly produce high-purity lithium chloride from the natural brine of Dachaidan Salt Lake using the "adsorption + membrane method" original halide extraction technology.

Main process

Pretreatment + Lithium Extraction by Adsorption + Membrane Purification + Evaporation Crystallization.

Technical advantages

- The third generation lithium extraction adsorbent of Jiuwu is adopted to realize the direct lithium extraction from the original halogen;
- Organic membrane materials produced by Jiuwu HI-TECH are adopted, and all key separation materials are localized;
- The first set of domestic salt lake natural brine direct production of high purity lithium chloride, industrial plant has a significant demonstration effect.




Jinhai Lithium Industry's annual production of 1000t/d battery grade lithium chloride
"adsorption + membrane method" natural brine lithium extraction project

Case 2: Lithium extraction from aged brine

In 2016, Jiuwu HI-TECH collaborated with Minmetals Salt Lake and the Qinghai Salt Lake Research Institute of the Chinese Academy of Sciences to conduct research on gradient coupled membrane method for lithium extraction from salt lakes; In 2017, an EPC contract was signed with Minmetals Salt Lake for the 200-ton lithium carbonate project's magnesium lithium separation pilot project; In 2018, 10000 tons of lithium carbonate were signed with Minmetals Salt Lake. The contract for the complete set of magnesium lithium separation equipment for the project will only take 8 months to complete project construction and commissioning, achieving the offline production of the current year's products.

Main process

Pretreatment +membrane integration (nanofiltration +reverse osmosis) +electrodialysis +lithium precipitation

Technical advantages

- The world's first integrated membrane salt lake lithium extraction industrialization device directly separates magnesium and lithium from aged brine through membrane integration process, producing qualified battery grade lithium carbonate;
- In the field of lithium extraction from salt lakes, this project has set multiple records, including the first filling of industrial magnesium lithium separation technology, the shortest construction period in China, and the largest scale of a single membrane device in Asia.




Minmetals Salt Lake Annual Production 10000t/a Battery Grade Lithium Carbonate Integrated membrane
Method Aged Brine Lithium Extraction Project

Photovoltaic materials-Recovery of silicon material cutting fluid

Silicon materials are widely used in the electronics and new energy industries, such as photovoltaic silicon wafers, semiconductor wafers, glass panels, etc. During the processing of silicon materials, a large amount of wastewater is generated, and the content of pollutants is high. In the entire process of silicon material cutting fluid recovery, such as the preparation of raw materials for silicon material production, the purification and grading of cooling liquid for silicon processing waste liquid recycling, the preparation of process pure water, comprehensive wastewater treatment and reuse, Jiuwu HI-TECH has developed a series of process package technologies to help silicon material production enterprises achieve green and sustainable development.

Technical advantages

- Advanced separation technology makes process separation more efficient;
- Low loss rate of silicon materials, high water reuse rate, increase corporate profits;
- Exclusive cooling liquid membrane purification and classification process, saving the amount of cooling liquid used;
- The system is mature, stable in operation, saves electricity consumption, and reduces emissions;
- Small footprint, high degree of automation.

Case presentation

10GW photovoltaic cutting fluid recycling project for a certain enterprise in Jiangsu Province

Fuel ethanol

The traditional production process of fuel ethanol mostly uses grains and crops such as corn and cassava as raw materials, which is difficult to solve the development problem of "not competing for food and land with people". The production cost of non grain ethanol and biomass ethanol is relatively high, and the market competitive advantage is relatively low. The production process using industrial exhaust gas as raw material has low cost and produces high value-added protein powder, turning waste into treasure, and is a revolutionary new technology for fuel ethanol; It can effectively reduce CO_2, particulate matter, and NOX emissions caused by combustion, reduce greenhouse gas emissions, and is of great significance for protecting the ecological environment and achieving "carbon peaking and carbon neutrality".

Separation of fuel ethanol production process

In response to the difficulties in achieving continuity and complex process control in fermentation, as well as a series of issues such as complex gas fermentation systems, severe membrane pollution, and difficult membrane regeneration, Jiuwu HI-TECH and customers have jointly developed a ceramic membrane separation technology coupled fermentation process. From feasibility demonstration of small-scale and pilot research and development to industrial application, we have successfully achieved the transformation of research and development achievements. This technology can effectively separate microorganisms and product ethanol, maintain strain vitality, reduce product feedback inhibition, and thus enable the continuous operation of the fermentation process.

Technical advantages

- Ceramic membrane separation coupled fermentation process;
- Ceramic membranes are more resistant to pollution, easy to clean, and easier to achieve long-term operation, reducing cleaning frequency;
- The ceramic membrane system has a high level of automation, making process regulation more flexible and stable;
- Realize continuity of production, simplify processes, and reduce production costs.

A ceramic membrane separation coupled fermentation process system for an annual production of 45000t/a fuel ethanol in a certain enterprise in Hebei Province.

New energy and environmental protection

Zero discharge of iron phosphate wastewater

At present, the production process of iron phosphate mainly adopts the ammonium method and sodium method, and each ton of iron phosphate produces 50m³~70m³ of production wastewater. Iron phosphate wastewater has the characteristics of high TDS, low pH value, high COD, high temperature, and high impurity ions (iron, manganese, magnesium, calcium). The traditional process for treating iron phosphate wastewater has shortcomings such as poor pre-treatment efficiency, severe membrane pollution, low product salt quality, unstable reused water quality, and high reagent consumption. The industry urgently needs to develop reliable zero discharge technology for iron phosphate wastewater to ensure the stable operation of the iron phosphate production process.

In response to the demand for zero discharge of wastewater from the production of iron phosphate, Jiuwu HI-TECH has independently developed sedimentation reaction coupled ceramic membrane separation technology, deep deionization technology, membrane method acid water reuse technology, and efficient membrane integrated concentration technology. It has achieved the successful operation of the first domestic sedimentation reaction coupled ceramic membrane separation zero discharge project for iron phosphate wastewater.

Technical advantages

· **Advanced preprocessing technology:**
Can reduce metal ions such as calcium, magnesium, iron, and manganese to 1ppm, while effectively removing COD and reducing subsequent membrane system loads;

· **System operation and stable water quality:**
The system is mature, resistant to water quality fluctuations, stable production water quality, and conductivity of recycled water ⩽ 10 μS/cm;

· **Saving medication costs:**
Efficient reuse of over 80% of acidic washing water, saving a large amount of ammonia reagent and sulfuric acid used for pH adjustment;

· **Savings in civil engineering investment:**
The process flow is short, reducing the volume of the reaction tank and reducing the floor area.

8000t/d iron phosphate production wastewater zero discharge project of a certain enterprise in Shandong Province

A 20000t/d zero discharge project for iron phosphate production wastewater from a certain enterprise in Henan Province (Phase I + Phase II)

Treatment of wastewater from fuel ethanol production

According to statistics, every ton of ethanol produced produces 20 tons of wastewater. Fuel ethanol wastewater is an organic wastewater with high concentration, high temperature, high suspended solids, and complex composition. The wastewater contains a large amount of volatile acids with a pH value of 4-5. Directly discharging these wastewater can cause serious environmental pollution. How to economically and efficiently treat fuel ethanol wastewater has always been one of the important challenges that enterprises urgently need to solve.

Main process

Anaerobic digestion + two-stage AO biochemical method + MBR + dual membrane system process + advanced oxidation + high-pressure reverse osmosis.

Technical advantages

· The process has strong impact resistance, impact load resistance, low investment, stable operation, low energy consumption, and can recover energy;

· Adopting ozone oxidation, hydrolysis acidification, and internal circulation aeration technology in biofilters to ensure the up-to-standard discharge of wastewater;

· It can achieve 70% to 100% wastewater reuse, used for cooling circulating water replenishment, boiler replenishment, and generating biogas for recycling.

A 1500t/d fuel ethanol production wastewater deep treatment and water reuse project for a certain enterprise in Hebei Province.

Industrial Fluid Separation

- Ultrafine Powder、Catalyst
- Chlor-alkali Chemical Industry
- Bio-fermentation Products
- Food and Beverage、Natural Products

Ultrafine Powder、Catalyst

For the purification of nanopowders that dispersed target materials, catalysts and nonferrous metals, traditional washing methods such as press filtration and centrifugation have shortcomings of easy material leakage, high filtration resistance in the later stage, turbid filtrate, large washing water volume, high labor intensity, and inability to achieve continuous production.

Application points and core technologies

· Recycling and washing technology of powder by membrane;

· Overall solution for treatment of washing wastewater;

· Petrochemical catalyst separation-continuous ceramic membrane coupling technology.

Application product

New nanomaterials: lithium batteries, graphene, semiconductor materials, etc.
Catalyst: target materials, nickel, molecular sieve, etc.
Other ultrafine powders:zirconium oxide, indium oxide, silver oxide, aluminum hydroxide, aluminum oxide, titanium oxide, ultra-pure nonferrous metals, etc.

Technical advantages

· Extremely high-precision filtration, high rejection rate for nano-level ultrafine powders and no loss of valuable powders;

· Excellent cleaning effect, low impurity content, extremely high purity preparation of ultrafine powder;

· Effective removal of impurity ions in the slurry, small washing volume, saving water and electricity by 30%;

· Simple device, stable process, small footprint;

· Continuous production, easy to achieve automation and intelligence;

· Equipped with reverse osmosis equipment to prepare purified water, with low total operating cost.

Catalyst separation-continuous ceramic membrane coupling system

Ultrafine powder ceramic membrane continuous washing system

Chlor-alkali Chemical Industry

Jiuwu HI-TECH's inorganic membrane brine purification solution (CBS process) exists mature technology and can provide stable and reliable high-quality brine for a long time. It has been used in ion membrane caustic soda equipment with a cumulative capacity of 17.5 million tons, implemented 100+ projects and customers successfully, and exported to Europe, America, Southeast Asia, South America and other places, it has become the preferred process for chlor-alkali enterprises. The CBS process utilizes the characteristics of ceramic membrane inorganic materials

Application points and main process

Salt water refining (high-quality food salt, chlor-alkali salt): dissolved salt + refining reaction technology + ceramic membrane technology + post-processing technology.

Membrane denitrification: pretreatment + nanofiltration membrane salt separation technology.

Advantages of CBS process

· Short process, no pretreatment system, especially suitable for organic membrane transformation projects;
· Resistant to pollution, can adapt to high magnesium raw salt, and low requirements on the quality of raw salt;
· Inorganic materials, more than 5 years lifetime under high pressure;
· Stable membrane material and filtration accuracy, high mechanical strength, and high temperature and pressure resistance;
· Fully enclosed operation, no salt spray, easy to achieve 6S management;
· Strong regeneration ability and high flux recovery rate;
· All-titanium equipment, more than 20 years lifetime, and without any maintenance costs;
· Highly automated, it can realize one-click start and stop and unattended operation.

A brine refining and membrane denitrification system used by a certain enterprise in Anhui Province for an annual production of 60000 t/d tons of ionic membrane caustic soda

Application points and main process

	Ceramic membrane process	Organic membrane process with preconditioner	Organic membrane process without preconditioner
Project	Ca and Mg removal simultaneously	Remove Mg first and then Ca	Remove Mg first and then Ca
Refining reaction	no	yes	no
Pickling regeneration cycle	⩾15 days	10~15days	2~3days
Equipment material	Ti	CS/HRL	CS/HRL
Equipment lifetime	⩾20 years	~10years	~10years
Filter pore size	50nm	200~500nm	200~500nm
Salt water quality	Quite stable	Initial instability	Initial instability
Membrane tube maintenance	No special requirements	0.5% $NaHSO_3$ soak	0.5% $NaHSO_3$ soak
Raw salt adaptability	All kinds of salt are suitable and can be mixed or used alone	Ca and Mg upside-down salt is not suitable, high salt stability requirements	Ca and Mg upside-down salt, well salt and fine brine are not suitable, high salt stability requirements

Advantages of membrane denitrification

· Accurate online residual chlorine detection system ensures that free chlorine in the system is zero;
· Efficient heat exchange process improves system heat utilization efficiency and ensures constant inlet water temperature;
· High-quality nanofiltration membrane materials ensure the rejection of sodium sulfate under high salt concentrations;
· Qualified fresh salt water is directly transported to the nanofiltration membrane equipment, greatly reducing system energy consumption;
· The system can adapt to fluctuations in production materials, ensure the quality of water entering the nanofiltration membrane, and extend the life of the nanofiltration membrane;
· Pretreatment + membrane filtration unit module integration;
· With high nitrate brine post-treatment technology, according to demand, can obtain glauber salt, sodium sulfate powder, gypsum, etc.

800t/h brine refining system for a food salt manufacturer in Jiangsu Province

Biofermentation products

Separation and purification of fermentation broth is an important part of the production process of biofermentation products, which will directly affect the overall cost and product quality and yield. The composition of fermentation broth is very complex, generally containing mycelium, particulate matter, soluble impurity, residual solid bacilli solid culture medium, ash, water and target products, etc. The traditional separation techniques mainly include adsorption, precipitation/sedimentation, solvent extraction, isoelectric point, ion exchange, etc., which are mainly characterized by the problems of low yields, poor control of product quality, complicated processes, long time-consumption, high energy consumption and serious pollution. Nowadays, membrane separation and purification technology has become the mainstream application in biofermentation industry.

Application

Crude separation: cell recovery, protein filtration, removal of mycelium.
Fine separation:clarification, separation, decolorization, desalination, concentration, desolvation (including dehydration).
Resource utilization: acid and alkali recovery, mother liquor recovery, enzyme recovery.
Process wastewater treatment: standard discharge, deep treatment, water reuse, zero discharge and resource utilization.

Core Technology

Ceramic membrane continuous filtration system of a threonine producer in Inner Mongolia

Ultrafiltration decolorization of an amino acid project in Shandong Province

Organic membrane treatment of amino acids project in Inner Mongolia

Ceramic membrane continuous filtration system of a dibasic acid producer in Ningxia

Application Products

- Amino acid and derivative
- Enzyme preparation and biological product
- Chemical raw materials and pharmaceutical intermediates
- Biochemicals
- Vitamins and probiotics
- Other products

Technical advantages

- Good chemical stability, high filtration efficiency, pure physical filtration process, no need to add any filter aid;
- Good stability, good anti-biofouling capability, high temperature and pressure designability, acid and alkali corrosion production conditions;
- Ceramic membrane filtration has a long service life and slow membrane flux decay, general service life of 5 to 8 years;
- Organic membrane filtration can realize molecular weight cutting off and desalination with superior performance and high yield, which can reach more than 98.5%;
- Compared with centrifuge and plate frame filtration, the membrane filtration transmits lower impurity content, higher product purity and lower burden of follow-up processes;
- Compared to outdated processes, it can significantly reduce system investment, reduce system footprint, save engineering support, and save energy consumption;
- High degree of automation, reducing personnel investment and labor intensity, optimizing the production environment;
- Simple operation and maintenance of membrane system, high recovery rate of one-time cleaning.

Membrane integrated system of a pharmaceutical company in Zhejiang Province

Organic membrane purification system of a vitamin producer in Hebei Province

Food & Beverage、Natural Products

The initial material of food & beverage, natural products is complex, often containing microorganisms, fiber, tannin, oil, pigment, inorganic salts, phenols, proteins, pectin and other impurities, the traditional filtration and purification process is difficult to effectively remove the impurities or purify the product. The overall solution of membrane integration technology can effectively utilize the matching of membrane materials and resins with natural product molecular weight and charge, select and enrich effective ingredients, thereby achieving product filtration, separation, and purification, improving product quality and yield, reducing operational costs, and maintaining human health.

Applications

Crude separation: filtration and sterilization, dehydration, concentration and separation & purification.
Fine separation:soy sauce desalination, separation of monosaccharides and disaccharides, grading, decolorization, desalination, concentration, desolvation (including dehydration).
Resource utilization: acid and alkali recovery, tank bottom liquid product recovery mother liquor recovery,
Process wastewater treatment: standard discharge, deep treatment, water reuse, zero discharge and resource utilization.

Core Technology

Ceramic membrane, organic ultrafiltration, nanofiltration, reverse osmosis, electrodialysis, continuous ionization, SMB

Ceramic membrane continuous filtration system of a plant extraction manufacturer in Guangxi

Ceramic membrane + organic membrane integrated system of a food additive manufacturer in Hebei Province

Ceramic membrane filtration system of a soy sauce manufacturer in Guangdong Province

Ceramic membrane fine separation system of a sugar alcohol manufacturer in Shandong Province

Application Products

Technical Advantages

- The membrane material meets the requirements in the food industry;
- The separation process does not require filter aid and chemicals, and no other substances are introduced;
- No phase change process at room temperature, no destruction of heat-sensitive products, better preservation of the flavor of the product;
- Improvement of product quality and yield;
- Membrane Concentration for Energy Savings and Reduced Production Costs;
- Microorganisms can be completely trapped, eliminating the need for high temperature sterilization;
- Mature and reliable processes and systems, stable operation and easy integration;
- Simple operation, good controllability, realizability of fully automatic control;
- Small footprint, high level of hygiene.

Membrane digital extraction system of a health wine producer in Hubei Province

Electrodialysis desalination system of a soy sauce manufacturer in Guangdong Province

Ceramic membrane continuous filtration system of an oral liquid manufacturer in Jilin Province

久吾高科
JIUWU HI-TECH

Water Treatment and Resource Utilization

- Industrial Water Treatment And Comprehensive Utilization Of Resources
- Industrial Park Comprehensive Services
- Comprehensive Treatment Of Water Environment
- Waste Disposal And Resource Utilization

鞍山钢铁集团 ANBEN STEEL GROUP
太钢集团 TISCO
HBIS 河北钢铁
马钢 MA STEEL masteel.com.cn
BAOWU 中国宝武
安徽长江钢铁股份有限公司 ANHUI CHANGJIANG STEEL CO.,LTD
中国石油
中国石化 SINOPEC
中化
中国化学工程股份有限公司 CHINA NATIONAL CHEMICAL ENGINEERING CO, LTD.
OJI PAPER 王子造纸
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TORAY
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JAC 江淮汽车
广汽 HONDA
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无棣众诚热电有限公司

Industrial Water Treatment and Comprehensive Utilization of Resources

Industrial wastewater treatment - pulping and papermaking wastewater

The organic pollutants and inorganic salts in pulp and paper wastewater are high in content, high in hardness, complex in composition, difficult to treat, and high in cost. The company has independently developed a zero discharge process technology with membrane collection as the core, achieving significant technological breakthroughs in the field of pulp and paper wastewater treatment, and achieving a pioneering achievement in the full reuse of wastewater and the resource utilization of waste salt. This technology has won the second prize of the 2019 National Science and Technology Progress Award and has been widely applied in large enterprises such as Oji Paper, Nine Dragons Paper, and AsiaSymbol, achieving good economic and environmental benefits.

Main process

Advanced treatment of wastewater, reuse of reclaimed water, zero discharge of wastewater, and resource utilization of waste salt.

The first demonstration project for zero discharge of pulp and paper wastewater in China It used Jiuwu independent core processes

The world's first 40000 t/d slurry tail water zero discharge project in Nantong Economic Development Zone was officially put into operation in January 2014, achieving full wastewater reuse and waste salt resource utilization

A 25000t/d wastewater zero discharge project of a papermaking enterprise

Industrial wastewater treatment--petroleum and chemical wastewater

Petroleum and chemical wastewater has the characteristics of high salinity, high concentration of organic matter, unstable pH, numerous biologically difficult to degrade substances, and high hardness. In order to reduce pollutant emissions and improve water resource utilization, based on conventional biochemical processes that meet discharge standards, we have successfully developed a technology for the reuse and zero discharge of petrochemical tail water, which has been successfully applied in the industry. Reducing pollution emissions, improving water resource utilization, and achieving high-quality recovery of waste salt are the trends.

Main process

The main process is biochemical + physicochemical + chemical hardening + ceramic membrane + membrane concentration and salt separation + freezing crystallization

Technical advantages

· Adopting ceramic membrane technology for impurity removal, with a short process and less land occupation;

· Adopting salt separation technology to achieve high-quality salt recovery;

· Using frozen crystallization technology to recover sodium sulfate crystals, the product meets the industrial grade first-class standard.

A 3000t/d PVA wastewater zero discharge and waste salt resource utilization project for a certain enterprise in Anhui Province

Industrial wastewater treatment--oily wastewater and waste oil regeneration

A large amount of oily wastewater is discharged during the production process of industries such as oil extraction, petrochemical, coal chemical, steel, and mechanical processing. In addition, the regeneration rate of waste lubricating oil in China is less than 10%, and 70% to 90% of the components in waste lubricating oil can be recycled through recycling and regeneration. The company's overall solution centered on ceramic membranes has been successfully applied to the treatment of oily wastewater and waste oil regeneration, enabling it to meet the discharge standards. After advanced treatment, it can achieve the recycling of water resources and waste oil, and also achieve the resource utilization of waste oil. The main sub areas include: oil and gas field produced water, fracturing fluid, waste emulsion disposal, coal chemical oil-water separation, and waste lubricating oil regeneration.

Core technology

Oil Separation, Air Flotation, Ceramic Membrane Separation Technology, Membrane Bio-Reactor (MBR), Advanced Oxidation

Technical advantages

· High separation accuracy, achieving one-step instant separation and purification;

· High separation efficiency and low operating cost;

· High integration, short process, and small footprint;

· The membrane cleaning cycle is long, and the cleaning flux recovery effect is good and stable;

· Long service life and high level of automation.

A Ceramic Membrane Separation and Purification System for Waste Lubricating Oil in a Jiangsu Enterprise

A Ceramic Membrane Disposal System for Waste Emulsion in a Steel Enterprise in Liaoning Province

Ceramic membrane treatment system for desulfurization wastewater from a certain gas field in Sinopec

Industrial wastewater treatment--titanium dioxide wastewater

The production process of titanium dioxide can be divided into sulfuric acid method and chlorination method. The sulfuric acid method produces a huge amount of wastewater, and the chlorination method wastewater contains difficult to treat components such as ferric chloride, resulting in high treatment costs. Traditional lime neutralization and other technologies cannot achieve the recovery of valuable substances such as water resources, sulfuric acid, titanium dioxide, and metatitanic acid in wastewater, which seriously restricts the development of the industry.

Main process

Zero discharge treatment process for post-treatment water using sulfuric acid method, Zero discharge treatment process for post-treatment water using chlorination method, Chlorination slag water treatment process

Technical advantages

- **Inorganic ceramic materials:** Long service life, and not affected by high acid and alkali, high temperature, high pressure and other working conditions;
- **High water quality:** SS ⩽ lppm, turbidity ⩽ 0.5NTU, stable water quality;
- **Save occupation:** replaced the sedimentation tank, high integration, small construction area;
- **Simple operation:** Short technical process, few control points, and can achieve DCS automatic control;
- **Circular economy:** Titanium dioxide powder is fully recovered, and the produced water is recycled, especially by combining the chlorination titanium dioxide process with the caustic soda process to form a circular environmental protection and energy-saving industrial chain.

A 1500t/d chlorination slag water zero discharge project of a certain enterprise in Hebei Province

Zero discharge project of 9000t/d chlorinated titanium dioxide post-treatment water for a certain enterprise in Henan Province

Industrial wastewater treatment--pharmaceutical and food wastewater

The characteristics of pharmaceutical and food industry wastewater are complex composition, high organic content, high toxicity, deep color, high salt content, and poor biochemical properties. The water quality and quantity fluctuate greatly, making it difficult to treat industrial wastewater. The main application points include: meeting discharge standards, upgrading standards, reclaimed water reuse, zero discharge, and resource utilization.

Core technology

Efficient anaerobic coupled MBR technology, advanced oxidation technology, softening and hard removal technology, and integrated technology for reclaimed water reuse

Technical advantages

- To achieve stable and standardized treatment of high salt and high COD wastewater;
- The water quality of the produced water is stable, achieving wastewater reuse.

A 2500t/d wastewater discharge and reclaimed water reuse project for a certain enterprise in Ningxia

Industrial wastewater treatment--metallurgical industry wastewater

The main characteristics of metallurgical wastewater are large water volume, diverse types, complex and variable water quality. The selection of treatment methods for metallurgical wastewater should be tailored according to the water quality, quantity, and effluent quality requirements of metallurgical wastewater. Jiuwu HI-TECH has developed key technologies such as membrane integrated high magnification concentration, salt separation, and waste salt resource utilization, successfully solving the problems of wastewater discharge and application difficulties in the metallurgical industry.

Technical advantages

· High-efficiency dual-membrane technology, short process, less occupied;
· High magnification concentration of wastewater, the amount of evaporation is small, and the energy consumption is low;
· Effective ion deployment, Utilization of waste salt resources.




A zero emissions project of 3000t/d metallurgical wastewater in Inner Mongolia

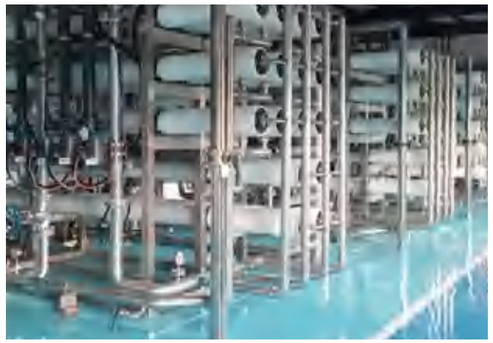
Industrial wastewater treatment--printing and dyeing wastewater

Printing and dyeing wastewater has the characteristics of large water volume, high organic pollutant concentration, deep chroma, large alkaline, large water quality, and complex composition. It is one of the difficult industrial wastewater. Improving wastewater reuse rate and reducing pollutant emissions are urgent issues that need to be addressed in the industry. Jiuwu HI-TECH has independently developed the ceramic membrane direct filtration technology for alkali recovery of desizing wastewater, which has been widely applied and achieved good economic benefits. We have developed efficient biochemical coupled advanced oxidation process and membrane integrated coupled freezing crystallization process for wastewater reduction and reuse, achieving standard discharge and reuse of wastewater, as well as resource utilization of waste salt.

Technical advantages

· Stable and high-quality recycled water quality;
· After the high-power concentration, the scale of the evaporator is small;
· High quality by-product salt with high economic benefits.

A ceramic membrane direct filtration system for 400t/d desizing wastewater from a certain enterprise in Jiangsu Province

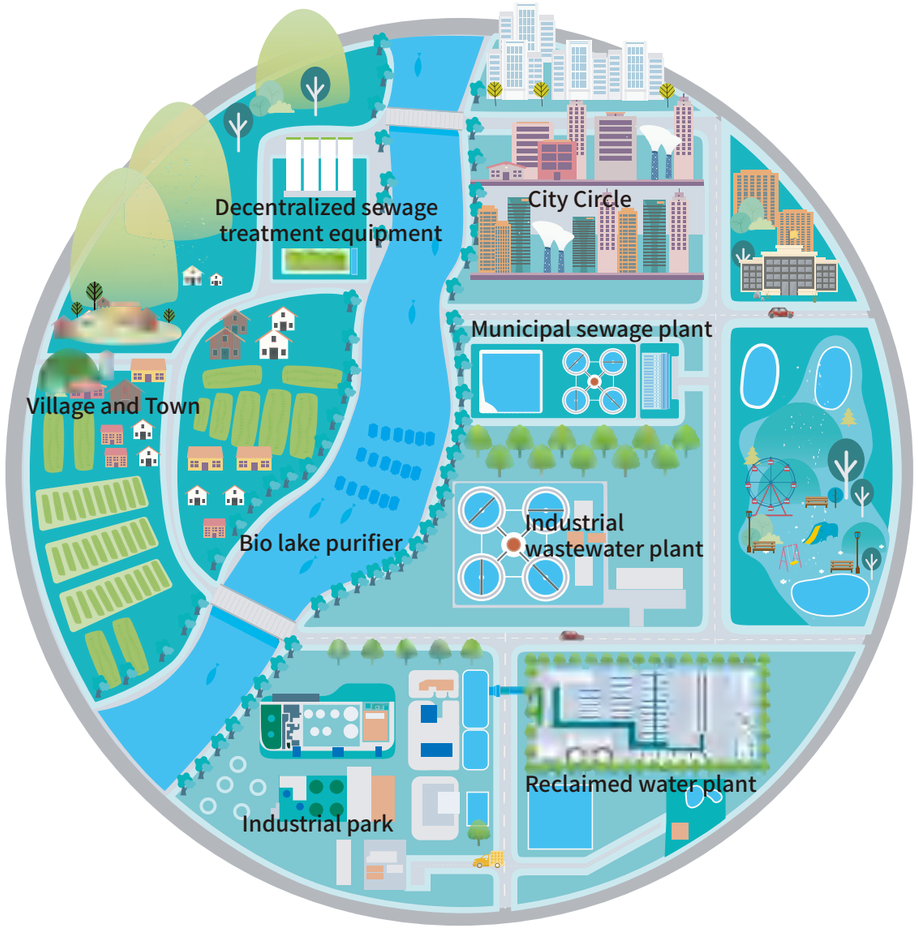


A 3000t/d printing and dyeing wastewater zero emissions project in Jiangsu enterprise

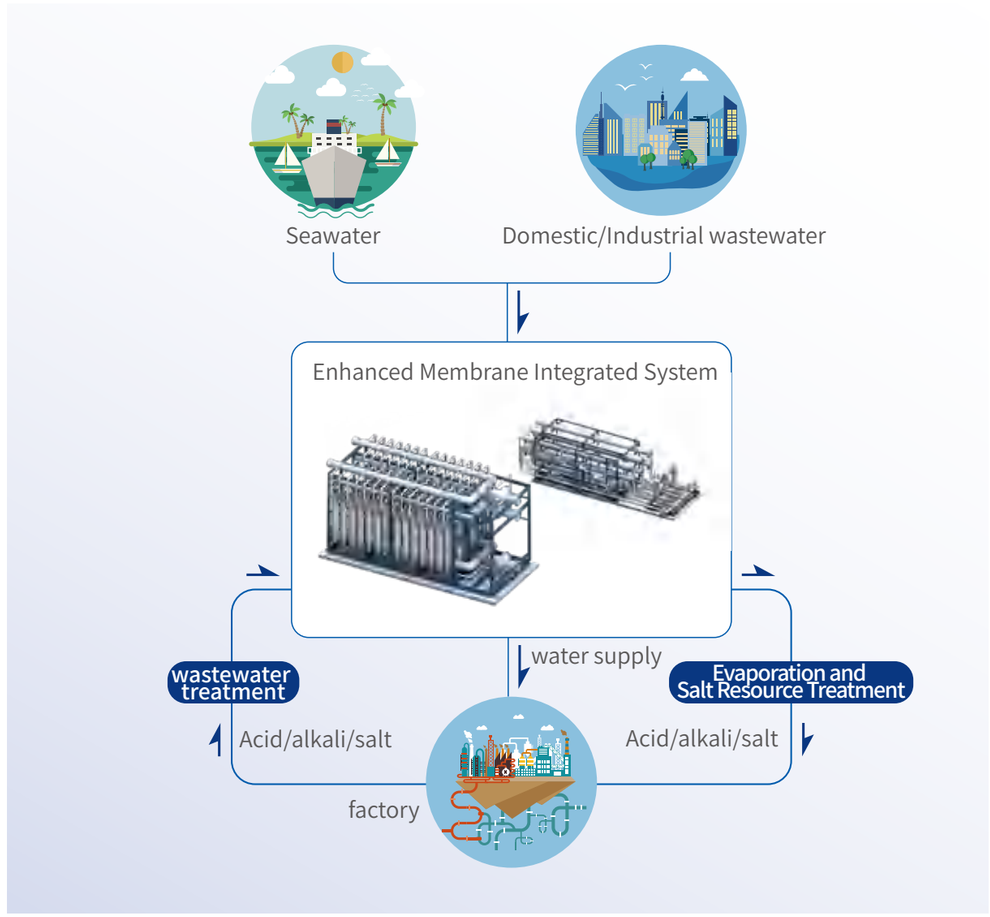
A 20000t/d printing and dyeing wastewater deep treatment and reclaimed water reuse project in a certain enterprise in Fujian Province

Comprehensive services for industrial parks

Based on industrial parks at home and abroad, Jiuwu HI-TECH strives to provide customers with whole-process solutions for the park environment, providing water services, wastewater treatment and upgrading, reclaimed water reuse and zero discharge, waste salt resource utilization, comprehensive environmental improvement, ecological construction and other fields, multi-elements, and all-round comprehensive environmental treatment services. The company has won the honorary titles of "Leading Enterprise in the Field of Industrial and Park Water Treatment of the Year" and "Benchmarking Enterprise of Reclaimed Water Reuse" for many times, and has always practiced environmental protection responsibilities with practical actions, adhering to the concept of comprehensive treatment of environmental elements such as overall solutions, building a comprehensive service system of "ecological, intelligent, integrated,demonstrative" industrial park water treatment, and striving to become an excellent industrial park environmental comprehensive service provider.

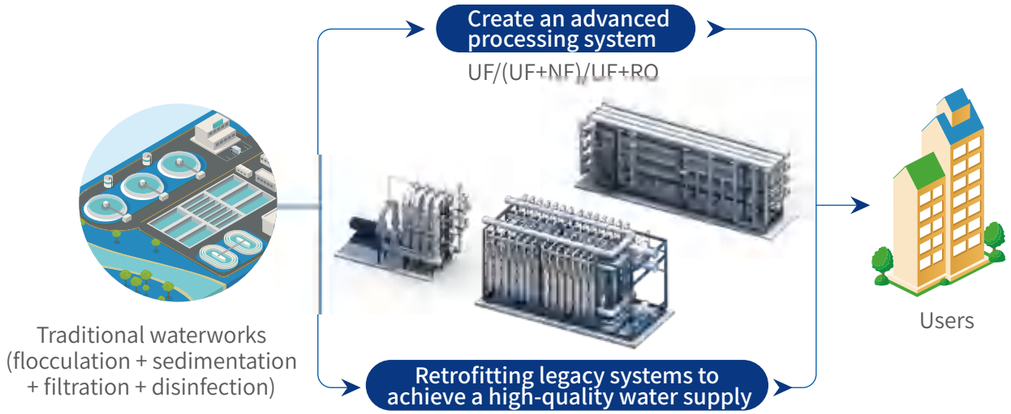


Expert in integrated management of industrial water resources



Water Services--Advanced treatment

The traditional treatment process of "flocculation + sedimentation + filtration + disinfection" can gradually fail to meet people's requirements for drinking and industrial water, and membrane treatment technology is gradually becoming the key technology of water purification. Jiuwu HI-TECH has successfully developed membrane water treatment technologies such as organic ultrafiltration + nanofiltration process, high-flux ceramic membrane process, as well as integrated modular water purification equipment and mobile water purification vehicles, which are widely used in the upgrading of new water plants, old water plants, the transformation of centralized water supply plants in the park, decentralized water supply, emergency water supply, etc.



10000-ton water supply system

1000-ton water supply system

Emergency water supply or distributed water supply integrated equipment

Integrated treatment for industrial wastewater

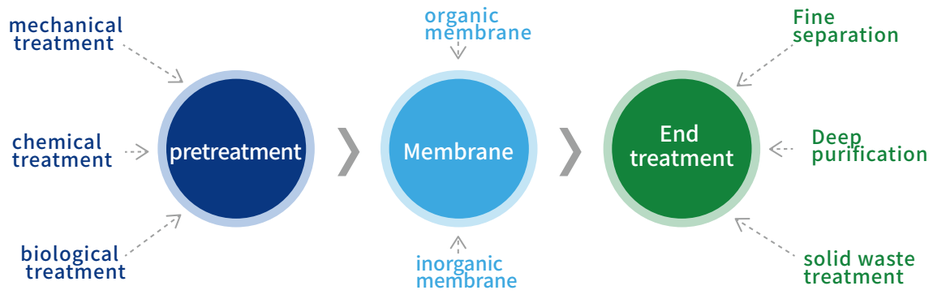
There are many industrial enterprises in the industrial park, and the composition of the sewage discharged is complex and difficult to treat. With the rapid development of industry, the sewage treatment of industrial parks is becoming more and more difficult. In recent years, China has paid more and more attention to environmental protection, and the awareness of social environmental protection has also been continuously enhanced. In this context, it is urgent to carry out scientific design of sewage treatment ideas and strengthen the collection, treatment and recycling of sewage in industrial parks. According to the characteristics of industrial wastewater, Jiuwu High-tech has developed a series of treatment technologies such as MBR, high efficiency denitrification, advanced oxidation coupling biological carbon reduction, membrane reuse, and has been applied on a large scale.

Core technology

Fiber reinforced composite MBR membrane technology, high efficiency denitrification technology, advanced oxidation coupling biological carbon reduction technology, membrane reuse technology.

The 50000t/d sewage upgrading project of a development zone in Jiangsu Province adopts MBBR+ ozone catalytic oxidation + denitrification treatment to ensure that the effluent water quality meets the surface Class IV standard

Reclaimed water reuse and zero discharge



Core process mainly based on membrane integration technology

- Sand filtration、activated carbon、resin
- Medication softening
- Fenton、catalytic oxidation
- biochemistry
- Inorganic ceramic membranes (microfiltration, ultrafiltration, nanofiltration)
- Organic membranes (ultrafiltration, nanofiltration, reverse osmosis)
- Special membrane
- electrodialysis
- MVR
- Ultra high pressure reverse osmosis
- Bipolar membrane

Leading the New Trend of Wastewater Resource Utilization in Petrochemical Parks

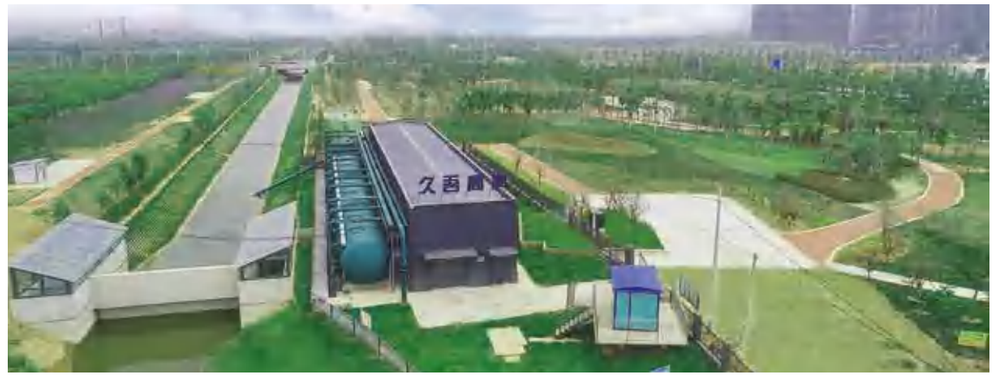
The 100000t/d sewage resource utilization demonstration project in Lianyungang Petrochemical Park reduces over 20 million tons of wastewater annually

Comprehensive management of water environment

The concept of comprehensive management of water environment is to ensure the safety of flood control and drainage, clean and excellent water quality, healthy ecosystem, and clean and beautiful environment, transforming the river from "single function" to "comprehensive function", from "engineering water conservancy" to "ecological water conservancy", and from "traditional water conservancy" to "modern water conservancy". The comprehensive management of water environment in Jiuwu HI-TECH mainly adopts methods such as water system connectivity, clean water supply, source control and pollution interception, dredging and obstacle removal, bank slope improvement, internal governance, river channel improvement, water quality purification, aeration and oxygenation, ecological restoration, landscape improvement, river and lake management and living environment improvement. A large number of projects have been constructed in Nanjing, Suzhou, Lianyungang, Hefei, Suzhou, Shandong, Xinjiang, and other places.

Core technology

Biological lake purification technology, in-situ phosphorus and nitrogen removal technology, integrated membrane biological carbon and nitrogen removal technology.



Xiaoxian Daihu Water Diversion and Purification Project (Class III Water)

Lianyungang Zhuji River Integrated Domestic Sewage Treatment Station Project

Service projects for improving the water environment of Gaowang River tributaries such as Dingxiang River and Male River

Waste disposal and resource utilization

Utilization of waste salt resources

Jiuwu HI-TECH's comprehensive treatment technology for waste salt is at a leading level in China, breaking through the technical bottleneck of harmless disposal of waste salt. It has independently developed feasible technical routes and environmental protection equipment for the utilization of waste salt resources. The implementation of the project is in line with national industrial policies and local industrial planning, which can effectively alleviate the pressure on waste salt disposal, drive local economic development, and solve environmental problems. This technology is widely used in industries such as zero discharge of industrial wastewater, industrial production, and ash fly treatment.

Technical advantages

- Realized the harmless treatment of waste salt, with significant economic and social benefits;
- Independently developed ion blending technology to achieve efficient ion selection and concentration;
- Developed bipolar membrane preparation technology for acid and alkali, which can achievewaste salt resource utilization and circular economy.

Integrated technology for harmless treatment and resource utilization of high salt and high concentration organic waste brine

Organic matter reduction

- Incineration technology
- Advanced oxidation process
- Membrane purification technology

Salt purification and concentration

- High concentration brine nanofiltration salt separation technology
- MVR/Freeze Extraction Technology
- Electrodialysis membrane concentration technology

resource utilization

- Application Technology of Industrial Two Alkali Raw Materials
- The bipolar membrane technology for preparing acid and alkali meets the requirements of industrial products and can be directly utilized

20000t/a Waste Salt Comprehensive Treatment Project of a Jiangsu Enterprise

Waste acid (alkali) recycling and utilization

The industrial production process generates a large amount of wastewater and consumes a large amount of acid-base solution, which on the one hand leads to water scarcity, and on the other hand, the treatment of high concentration acid-base complex wastewater also increases the treatment cost. To achieve sustainable development, the resource reuse of waste acid (alkali) has become an important means.

core technology

Ceramic membrane + acid resistant organic membrane + nanofiltration + reverse osmosis + bipolar membrane + electrodialysis.

Technical advantages

- Developing acid (alkali) resistant special membrane materials to address the pain points of enterprises;
- Develop customized solutions for different types of waste acid (alkali) for different application industries;
- The integrated membrane process achieves the recovery of waste acid (alkali) and reuse in the production line, reducing the comprehensive treatment cost of subsequent wastewater and increasing the economic benefits of the enterprise.

1500t/d waste acid recovery project of a leading electrode foil enterprise in Xinjiang

Industrial Waste Gypsum Resource Utilization

- Titanium gypsum
- Phospho-gypsum
- Salt-gypsum

徐州虚竹建材科技有限公司　山东傲达新型建材有限公司

Industrial by-product gypsum is a waste produced in the process of industrial production. The main component is $CaSO_4 \cdot 2H_2O$.How to use high value-added and resource utilization is the primary problem that restricts the sustainable development of various industries. Jiuwu HI-TECH has a mature membrane integration technology, gypsum crystal promoter and other core technologies. At the same time, Jiuwu HI-TECH developed a combination of process equipment combined with "pre -processing + high value-added resource" to produce a variety of industrial gypsum. We can produce different varieties of industrial gypsum, such as high strength gypsum, β-series building gypsum, anhydrite(II), etc. Among them, the "JIUWU MCM Titanium Gypsum Resource Use Technology " passed the industry identification and was evaluated to position the "International Advanced Level" and "Nanjing Innovation Products", and was included in the "National Industrial Resources Comprehensive Use Advanced Applicable Craft Technology Equipment Catalog (2021 Edition) ", the first pioneer in China.

Traditional red gypsum

JIUWU MCM Titanium Gypsum

Appraisal of scientific and technological achievements in the titanium dioxide and gypsum industry

PART 03 SOCIAL RESPONSIBILITY

Since the establishment of the company, Jiuwu HI-TECH has been striving to inherit social responsibility, and hopes to create a harmonious social environment and become the representative of ethnic enterprises. The company adheres to the dual wheel drive strategy of new material research and development and overall solutions, creating value for customers and benefits for society. The company actively creates a justice and equity business atmosphere. We have a good relationship with the government and other companies where the company is located. We jointly support the development of public industries and establish a better social environment.

In the process of building the corporate culture system, we continuously integrate the awareness of charity and public welfare, assist in the construction of public welfare facilities to the best of our ability, carry out charity donation activities, participate in poverty alleviation and relief, and give gratitude and feedback to society with the power of Jiuwu. Jiuwu High-Tech actively participates in various social welfare service activities such as earthquake relief, donation for education, caring for left behind children, organizing volunteer services for left behind elderly people, and voluntary blood donation.

Jiuwu High-Tech is committed to "becoming a leader in the global membrane separation industry". In the future, the company will continue to uphold the core values of "customers are the first service object, innovation is the first productivity, integrity is the first brand, and strivers are the first wealth". We will strive to promote the construction of a social responsibility system, fulfill our obligations and make due contributions to the development of the country, nation, and society.

Charitable activity

Establish a volunteer team


Taking care of left-behind children


Visit the nursing home

Cultural activity

Care with heart, careful training, for employees to achieve personal value to provide a platform and protection


Popular Science Education – Into technology


Safe Month campaign


Training for incoming college students


Corporate cultural activities--Employee travel


Striding activity


Autumn long-distance running competition

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Legal declaration