膜天愿世界每一滴水都纯净！

MOTIAN HOPES EVERY DROP OF WATER PURE

山东招远膜天集团有限公司

SHANDONG ZHAOYUAN MOTIAN GROUP CO.,LTD.

地　址（ADD）：山东省招远市温泉路132号

No.132 WenQuan Road ,Zhaoyuan city,

邮　编（P.C.）：265400

电　话（TEL）：（0535）8113295　8118512　8118533　8112236

传　真（FAX）：（0535）8112404

服务热线（HOT LINE SERVICE）：08535118519

电子信箱（E-mail）：postmaster@chinamotian.com

网址（http）：//www.chinamotian.com

MOTIAN

中空纤维超滤膜组件及装置

Hollow Fiber UF Membrane Module and Equipment

山东招远膜天集团有限公司

SHANDONG ZHAOYUAN MOTIAN GROUP CO.,LTD.

MOTIAN 山东招远膜天集团有限公司
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膜天集团简介

膜天集团是以"山东招远膜天集团有限公司"为核心层，以"山东省招远膜天工程安装有限公司"、"山东省招远膜天塑料制品有限公司"、"山东省招远市膜天饮料有限公司"、"招远市膜技术研究开发有限公司"为紧密层组成的企业集团。

集团集分离膜制作、水处理工程设计安装、塑料制品加工、钢架结构工程施工及线路管道安装、科技开发于一体，尤其在分离膜技术领域取得了长足发展。

集团已形成以水处理设备产品为主导，辅以ABS耐腐蚀工程塑料管材管件及阀门系统、各种塑料制品、啤酒保鲜容器、静电消除器、家用净水器等十余个系列五百多个品种的立体产品构架，各类产品在化工、电子、电力、医药、冶金、采油、纺织、食品等领域中得到了广泛应用，并多次荣获国家、省部级科技进步奖和优秀新产品奖。

集团拥有现代化的生产条件、独到的专业技术和过硬的质量管理，于1998年12月通过了"ISO9001"国际质量体系认证，企业质量行为得到了符合国际质量标准体系的监控和规范，并在同行业中率先通过ISO14001环境管理体系认证，GB/T28001 1996职业健康安全管理体系认证。

膜天集团以科学的管理、雄厚的经济实力和技术实力、完善的售后服务赢得了良好的市场信誉，同时也得到了国家及省有关部门的高度重视。国家科委、中国膜工业协会、山东省科委等机构相继指定企业为"国家火炬计划实施单位"、"国家科技成果重点推广计划项目技术依托单位"、"中国膜工业协会膜配套装备专业委员会主任委员单位"、"山东省膜工程技术开发中心"、"山东省高新技术企业"、"国家火炬计划重点高新技术企业"、"山东省消费者满意单位"、"国家863计划项目实施单位"、"国家废水处理用膜组件及系统处理装置产业化示范工程项目承接单位"。

MOTIAN GROUP INTRODUCTION

Being an enterprise group,MOTIAN Group includes:Shandong Zhaoyuan MOTIAN Group Co.,Ltd. Shandong Zhaoyuan MOTIAN Engineering Installation Co.,Ltd.Shandong Zhaoyuan MOTIAN Plastic Product Co.,Ltd. Shandong Zhaoyuan MOTIAN Drinking Co.,Ltd.Zhaoyuan Membrane Technology Research and Development Co.,Ltd.the first is the main.

MOTIAN Group is jointly engaged in producing seperation membrane products,designing and installing water treatment project,processing plastic products,installing and laying line and plumbing, science and technology developing,especially,the company has gained excellent success in the feild of seperation membrane technology.

The water treatment equipment is the main product of our company,the others includes more than 10 series and 500 products:ABS Anti-corrosion engineering plastic pipe,fittings and valves, various plastic products,Beer fresh container,Electrostatic eliminator,MOTIAN brand water purifier, Drinking pure water etc.The products are widely used in chemical,electronic,electron power, medicine,metallurgy,oil extraction,textile,food etc.They have won the prizes of science and technology progress and excellent new products awarded by provincial, ministrial and national government.

MOTIAN Group has special technique,modernized producing condition and excellent quality management,the company passed through ISO9001 international quality attestation in 1998;our company is the first company who passed through ISO14001 Environmental Management System Certification and GB/T28001 1996 Occupational Health Safety Management System Certification in the same trade.

With scientific management,strong economic strength and good post sale service,the group has excellent repute both at China and abroad and is high trusted by China authorities.The group was designated by the name of "The Member of China National Torch Plan","The National Torch Plan Major High and New Technology Enterprise","The Member of Science and Technology Stress Spreading Plan","The Member of national 863 Plan","Membrane Engineering Technology Developing Center,Shandong Province","Shandong High and New Technology Enterprise","Board of Membrane Equipment Professional Committee of China Membrane Industrial Association",MOTIAN is undertaking the industrial demonstrate project of "membrane module and system treatment equipment for waste water treatment".

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发酵产品中通常含有的需要去除的物质组成情况参见表2

需去除物	分子量	尺寸	选用设备
菌体		100-10000	MF UF
胶体		10-100	MF UF
蛋白质	5000-1000000		UF
多糖	10000-1000000		UF
酶	5000-1000000		UF

生物药品和生物化学药品的常规膜分离工艺流程如下所示：

生产原液——微滤除菌去浊——超滤浓缩

采用截留分子量6000超滤膜进行浓缩分离，具有以下明显的优越性：

1、在常温下操作，克服了热对发酵产品质量的影响，而且收率高。

2、能耗低，操作简单，运行简便。

3、与真空蒸发法、溶剂萃取法、盐析沉淀相比，可节省生产成本。

4、生产的酶制剂纯度提高，除去了小分子杂质。

D 超滤膜在医药工业中典型应用实例：

中空纤维超滤膜在医疗用水制备中的应用

医疗用水根据使用目的不同大致可分为四种：

1、普通用水（含氯，用于药剂制作会使试药剂产生异味，沉淀和浑浊）

2、精制水（可用于制剂和试液的配制）

3、无菌精制水（可用于眼药水的配制，含热源）

4、注射用水（除必须满足精制水的标准外，无菌实验和发热物质试验必须合格）在医疗用水中，无菌水占重要地位。目前常用的无菌水制造方法主要有：

A：煮沸法：能够灭菌，但不能去除细菌的尸体、发热物质、有机物和盐类。

B：蒸馏法：可获得无菌的高纯度水，但能耗高，与水共沸和近沸点物系去除率低。

C：过滤法：将预过滤柱、活性炭吸附柱、离子交换柱、微孔过滤膜等组合能够制得无菌的纯水。但水质不够稳定，系统再生频繁，费用高。

D：紫外线杀菌法：用紫外线冷杀菌效率较低，当紫外线灯有水垢时，也会降低杀菌效果，同时也存在发热质的问题。

常规处理方法的不同组合可以满足不同原水水质的处理要求，但由于工艺过程复杂，流程长，不易控制，出水水质指标不够稳定，而且常规水处理设备占地面积大、设备投资高、运行费用大、劳动强度大等缺陷，已逐步被不断发展起来的新的水处理方法所取代。其主要处理技术有电渗析法、微滤法、超滤法和反渗透法等膜分离技术。

反渗透法能够去除可溶性的金属盐、有机物、细菌、胶体粒子、发热物质等，因此经反渗透处理可以得到无菌的高纯度水。而微滤和超滤在医疗用水制备中则可作为有效的预处理和终端处理措施。在有效组合上述三种技术的基础上，可以制备出各种符合要求的医疗用水，其一般工艺流程如下：

原水—预处理—微孔过滤—反渗透—活性炭过滤—离子交换系统—终端超滤—注射用水

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MOTIAN UF MEMBRANE TECHNOLOGY:

UF membrane technology is a mechanical membrane separation process taking sieving as principle and taking pressure as driving force.It is widely used in separating,concentrating and purifying substance.

Hollow Fiber UF Membrane is a finished dissyrmmetric semipermeable membrane made of highmolecular material by special technology.It Presents hollow capillary tube shape.(or hollow fiber shape),microporous covers tube wall densely. Feed liquid is flowing in or out the membrane under the influence of pressure,dissolvent or small molecular can permeat membrane and become product liquid by collection,while large molecular(such as protein,enzyme,nucleic acid,polysaccharide), colloid particle(such as emulsion,microsome)and bacterium are cut off out of the membrane and are taken off by the circulating flowing feed liquid to become concentrating liquid,thatis the process of separating,concentrating and purifying substance.

UF membrane separating,concentrating and purifying substance has outstanding advantages as below:

a:No change of phase in the process of UF,operating at normal atmospheric temperature,saving energy,no any pollution to separate substance,especially suitable for separating heat-sensitive substance(such as biologic product,thallus, protein).

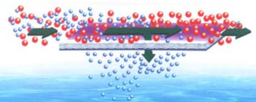
b:Chemicals resistant,wide PH range

c:Simple separating process of UF,easy to operate,low maintain cost,easy to clean.

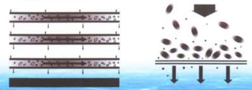
The using public like it very much for its outstanding saving energy effect,simple equipment,easy to operate and control selecting proper separating membrane can instead of traditional separation and filter methods of drum vaccum pump filter,frame filter press,centrifugal separation,menstruum extraction,absorption,regeneration,flocculation,copolymerization, sediment,evaporation.

The experts predict that membrane technology and integrated technology of membrane and other technology will instead of traditional separation technology to a great extent in the century.It can save energy,reduce products cost, inprove product quality.Membrane technology can be widely used in chemical,oil,oil chimical,biology chemical,environment engineering,metallurgy,food,medicine,electronic,medical treatment.selecting and using membrane separation tecbnology is your solving scheme for reducing products cost.

Figure : Principle of Membrane Permeate,Separate object and SEM of the membrane.



Principle of membrane permeable



A. cross flowing UF　　B. General Filter

Conceptual diagram of filter flowing wethod

MOTIAN UF MEMBRANE PRODUCTS

MOTIAN Group Company is one of the first enterprises who produce and develop UF Membrane in China.with over ten years producing history,the company has most advanced hollow fiber UF Membrane production line and production technology in China.it has complete series products,the quality of the products is stable,post-sales service is perfect.

MOTIAN UF membrane includes multiplacate products with diffrent material,cut off molecular weight and structure.MOTIAN can supply standard UF membrane product,and also supply membrane products as per customer's requirement to satisfy customers.the UF membrane products of MOTIAN include:PS,Polyacrylonitrible,PVDF.

PS hollow fiber UF membrane has advantages of acid-resitant alkali-resitant,modest permeatable performance,wide range of cut-off molecular.It includes internal and external pressure membranes,outer pressure UF membrane has advantages of lower molecular weight,stable cut-off performance,it is especially suitable for concentration,separation and no heat source water preparation.

PAN hollow fiber UF membrane is a hydrophilic membrane,it has good permeatable performance,stable cut-off molecular weight,modest performance of acid-resistant and alkali-resistant,good solvent-resistant performance,it is widely used in water sanitization.

PVDF hollow fiber membrane has advantages of good acid-resistant,alkali-resistant,good tenacity,smooth surface,good resistance to absorption and pollution,easy to clean,it is used in the resistance to pollution industrial.

The Main Technical Index:

Material / Name	PS			PAN	PVDF
Cut-off molecular weight	6000	20000	67000	50000	100000
Structure & fitter methed	hollow fiber outer pressure		hollow fiber & capillary internal pressure		
Fiber internal/external diameter (mm)	0.20/0.40		0.8-1.0/1.2-1.5		
Max working Temperature (℃)	45				50
Extension of PH	2-13			2-10	2-13

Photograph of Hollow Fiber Membrane

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MOTIAN UF Membrane Module:

MOTIAN Company produce standard and large UF membrane modules as per customer's requirement.

The standard UF Membrane Module:It is made up as per national industrial standard,it can become a part of your new system,or instead of your old membrane system.The shell material of the standard UF membrane module is transparent organic glass or ABS,the end top and center pipe are ABS,the end sealed material is epoxy resin,the diversion net is PE or PP.it's suitable for small equipment.

Conceptual diagram of standard UF Membrane Module

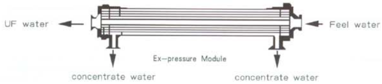

Figure:External Pressure Membrane Module

The Feed water comes into module by center pipe of distribution ,radial flows in it,part of feed water permeat hollow fiber membrane wall under the influence of differential pressure came into inner hole and become UF water,and then flow out of module from the other end after collcetin,the remanet feed water flows out of module from the bilateral concentrating outlet.

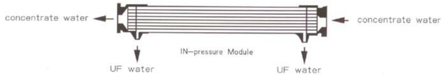

Figure:Internal Pressure Membrane Module

The feed water passes through the inner wall of the hollow fiber membrane under the influence of fixed pressure, solvent and small molecular solute permeate membrane wall and becomes UF water after collecting,the high molecular weight substance and colloid particle in the feed water are prohibited on the surface of the membrane and taken off by the circular feed water and then become concentrating water.

Conceptual Diagram Of Cross Section Of The Module

Large Membrane Module:It's a special module for large water treatment engineering,it has advantages of high capacity, resistance to pressure and pollution,the shell material of the module is UPVC and stainless steel,the end sealed material is epoxy resin,the diversion net is PE or PP.It's stuitable for large equipment.

Φ160mm UF Membrane Module

The Main Technical Index of standard UF Membrane Module

Type	Cut-off Molecular Weight (MW)	Outline Dimension(mm)	Material	InitialCapacity of Product Water (>L/hr) 25℃(0.1MPa)	Operating Pressure (MPa)	Operating Temperature (℃)	Fastness to PH	Membrane Area(m²)
UF$_1$OB8S	6000/20000	80*800	PS & PVDF	150/200(0.2MPa)	≤0.30	5-45	2-13	11.0
UF$_1$OB8L		80*110		250/300(0.2MPa)				22.0
UF$_1$OB9L		90*1100		300/400(0.2MPa)				28.0
UF$_1$IB8S	67000, 100000	80*800		500	≤0.30			4.0
UF$_1$IB8L		80*1100		700				6.0
UF$_1$IB9L		90*1100		800				7.0
UF$_2$IB8L	50000	80*1100	PAN	800			2-10	6.0
UF$_2$IB9L		90*1100		900				7.0

The Main Technical Index of large UF Membrane Module

Type	Cut-off Molecular Weight (MW)	Outline Dimension(mm)	Material	Initial capacity of Product water (>L/hr) 25℃(0.1MPa)	Operating Pressure (MPa)	Operating Temperature (℃)	Fastness to PH	Membrane Area(m²)
UF$_1$IB10-05	50000, 67000, 100000	Φ101*1100	PS, PVDF/PAN	1100	≤0.30	5-45	2-13/2-10	15.0
UF$_1$IB125L		Φ125*1092		1600				15.0
UF$_1$IB160S		Φ160*1090		2500				25.0
UF$_1$IB160L		Φ160*1500		3300				33.0
UF$_1$IB200S		Φ220*1090		5000				50.0
UF$_1$IB200L		Φ220*1500		7000				70.0

Running Parameter of Membrane Module

Operation Conditions of Membrane Module:

Name \ Type	Large Membrane Module (B125)	Standard Membrane Module (UF$_1$IB9L)
Max inlet granule	<5um	<5um
Max inlet suspension	5mg/L	5mg/L
Range of PH	2-13	2-13
operating Temperature	5-45℃	5-45℃
Running way	misdirection filter,back wash and other's	misdirection filter,back wash and others
cleaning water	UF water	UF water
Max inlet pressure	0.3MPa	0.3MPa
Max differencial pressure of permeating membrane	0.2MPa	0.2MPa

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Water Treatment Process Design Parameters

Name \ Type		Large Membrane Module (B125)	Standard Membrane Module (UF$_1$IB9L)
UF water flux initial/design (suggestion)		1600/800 (pre-treatment), 1200 (Terminal treatment)	800/400 (Pre-treatuent), 600 (Terminal treatment)
Backwash pressure		0.2MPa	0.2MPa
concentration water flux		≥150Lm²·hr	≥150Lm²·hr
Backwash frequency		2-8 h	2-8 h
Backwash Period		30-60s	30-60s
Chemical detergent	Cleaning frequency	as per requirement	as per requirement
	Cleaning medicine	citric (or HCl);NaOH+NaCl	citric (or HCl);NaOH+NaCl

Differencial Pressure of permeating membrane=(Feed Pressure + Concentration pressure)/2-UF water pressure

Notice:All of the above Parameters are just for the water treatment process of tap water and deep well water,otherwise please consult with MOTIAN Company.

Installation Methods of Membrane Module suggested to customers:

1.Module stands vertically,built up multiply,liquid accessing module from the underneath of it is convenient to exhaust air.

2.You'd better install high and low pressure protector on the large UF equipment and feed water frequently to raise water pressure gradually and avoid lashing.

3.You'd better install cleaning system separately to large UF equipment,cleaning water can get from UF water storage tank.

4.Filter with misdirection flow methods,concentrating water is 1/5-1/7 times of feed water.

Notices:

1.UF membrane must run with specified pressure and temperature,if not,creep,split and damage can be occured.

2.Because the cut-off substance depositing on the surface of the membrane can drop the UF speed and cut-off performance,so the UF equipment must be fixed with balanced pressure clean system,backwash and chemical clean systems.

3.The actual UF speed is far lower than specified speed for the different quality of the feed liquid,so we should design UF speed as per test data when we treat special liquid.

4.Buck-and-boost pressure must be stable,otherwise resin epoxy can be taken off and the fiber can be broken.

Common rules of affecting UF speed:

1.The lower density solution,the faster UF speed.(such as concentrating enzyme)

2.The filler speed of small molecular weight solute is faster than that of larger molecular weight solute.long-chain molecule is easier to permeat membrane than ball molecule

3.The flux of high flow speed and temperature solution is higher,but the temperature is no more than 45℃.

4.When the density of solution is very low or preparing water or ultra-water,raising pressure can raise flux.

Installation size:

Type	A	B	D0	D1	D2	D3
UF,OB8S	618	800	T50 × 3	Φ 25	T50 × 3	Φ 25
UF,OB8L	918	1100	T50 × 3	Φ 25	T50 × 3	Φ 25
UF,OB9L	910	1100	T50 × 3	Φ 29	T50 × 3	Φ 29
UF,IB160	978	1258	T70 × 3	Φ 40	T59.5 × 3	Φ 47.5
UF,IB200						

Installation size of UF, IB25L membrane module:

Installation size of UF,IB10—05 stainless steel casing membrane module:

Common Methods of cleaning Membrane Module

The membrane can be polluted and blocked up because the separation substance and impurity can deposite on the surface of the membrane in the process of UF,So the UF system must contains the process of cleaning membrane,The effective cleaning is the important ways and means to extend the using life.The cleaning methods include chemical cleaning and phisical cleaning:

Common Methods of Cleaning Membrane:

Phisical cleaning method	Balanced pressure cleaning method	Close the valve of UF water,open the outlet valve of concentration water, wash the surface of membrane by raising flow speed.It can eliminate most of the swampy impurity on the surface of membrane.	Notice:Chemical cleaning is a cleaning membrane method of chemical medicine and impuity on the surface of membrane reacting on each other.The principle of selecting chemical medicine as below: 1.The chemical medicine so mustn't react on membrane and the other material of module 2.The selected medicine mustn't pollute secondary.
	Ultra water cleaning method	The soluability of ultra water is strengthen the loose filth on the surface of the membrane can be cleaned with UF water first,and then cleaned with cyclic pure water.	
	Back wash cleaning method	The cleaning water comes into membrane from the outlet of product water and permeat membrane,flow to outlet of concentration water.It can eliminate the mulch effectively. But it must be prevented from excess pressure to avoid destroying membrane and sealed adhesive point.	
Chemical cleaning method	Acik-solution cleaning	Common solutions include chlorhydric acid,citric acid,oxalic acid. the PH value of acid-solution is 2 to 3 cyclic cleaning or cyclic cleaning after soaked 0.5h to 1h can eliminate inorganic impurity effectively.	
	Alkali solution cleaning	The common main alkali is NaoH,the PH value of solution is about 10 to 12,cyclic cleaning or cyclic cleaning after soaked 0.5h to 1h can eliminate impurity and grease effectively.	
	oxide cleaning agent	Cleaning UF membrane with the water solution of 1%-3% H_2O_2,500-1000mg/l NaClO can eliminate faith,bacterium.H_2O_2 and NaClO is the common germicide.	
	containing enzyme detergent	0.5%-1.5%pepsin and trypsin can eliminate protein,polysaccharide,grease effectively.	

Preservation of the Module:

The module can be preserved 1 to 3 days(accoring to the environment temperature)without any chemical,just preserve it with full water.The module can be preserved for long time if it is filled with different antiseptic according to different industry after be cleaned and drawed off the solution.The antiseptic can be 1% formaldehyde solution with 10-15% glycerine, the proportion of glycerine can be raised in winter as following :10% at C—-5℃,20% at -6℃-10℃,30% at -11℃—15℃, 50% below -16℃

Notice:The module mustn't be preserved in dry.

MOTIAN UF EQUIPMENT:

Motian standard UF equipment is built up multiply with modules of diffrent cut - off molecular weight and material,it includes internal and external pressure UF equipment.The equipment is built Jointly with machine,electron,meter. The operating ways include hand control and automatic cleaning.The capacity of single equipment is designed as 1t/h to 40t/h,and also can be designed as per customer's requirement.

Figure: UF EQUIPMENT

The Type and Performance of Hollow Fier UF Equipment:

Type	Product water capacity (t/h)	Power (kw)	Number of module	Outline dimension (mm)
UF,EIB8-1	1	0.25	3	770*440*1320
UF,EIB8-2	2	0.25	6	810*570*1330
UF,EIB8-3	3	1.5	8	800*560*1338
UF,EIB9-5	5	1.5	8	980*790*1720
UF,EIB9-10	10	3	12	1250*790*1720
UF,EIB125-20	20	3	16	2200*1280*1750
UF,EIB125-40	40	3	32	3040*1720*1750
UF,OB8-1	1	0.25	6	810*570*1330
UF,OB8-2	2	1.5	8	800*560*1338
UF,OB9-3	3	1.5	8	980*790*1720
UF,OB9-5	5	3	12	1250*790*1720

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Application of Membrane Technology:

A: Application in preparation of ultra pure water:
- Primary Purification water for industry.
- Pre-treatment for preparing ultra pure water.
- Pre-treatment for desalination of sea water.
- Terminal treatment of ultrapure water for electronic industry.(such as electronic tube,kinescope).

B: Application in food and drinking industry:
- Preparation of drinking and drinking water.
- Clearifying and preparing mineral water.
- Clarification and separation of fruit juice.
- Purifying low wine.
- Processing food and recuperating useful substance.
- Eliminating protein.
- Application in sugar industry.

C: Application in ferment industry:
- Separating and refining enzyme.
- Concentration and refinement of enzyme.

D: Application in medicine industry:
- Water treatment for medicine.
- Separation and refinement of extractive solution of traditional Chinese medicine.
- Separation and refinement of blood product.
- Eliminating heat source for aseptic water and syringe water in medicine.

E: Application in enviroment potection industry:
- Deep treatment of waste water in industry.
- Recoverying waste water in city and industry.
- Recuperating useful substance of waste water.