

全球流体装备的领跑者

**Depamu**  
德帕姆

## 超临界流体设备

Supercritical Fluid Equipment

## 气凝胶专用设备

Aerogel Special Equipment



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**PACESETTER OF FLUID  
EQUIPMENT IN THE WORLD**  
全球流体装备的领跑者







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## E 企业简介

Enterprise Profile

德帕姆（杭州）泵业科技有限公司地处国家级杭州钱塘新区，2003年成立；是一家集研发、生产、销售于一体的高新技术企业，主要产品有超临界流体设备、CO<sub>2</sub> 专用泵（柱塞/隔膜）、计量泵、低温泵、气动隔膜泵、螺杆泵、石油化工泵、成套化学加药装置、水汽取样装置、水处理设备等。

公司从德国引进先进技术，自成立以来专注流体输送设备的研制开发，许多专利一直代表着世界先进水平，已通过美国API认证、欧盟CE认证、挪威船级社DNV认证，同时也是行业内标准起草单位。

目前，产品已广泛应用于航天、新材料、制药、生物科技、食品、保健品、精细化工、环保水处理、印染以及核电等行业。已成为中石油、中石化、中海油和中粮集团的一级供应商，并与多家世界500强大型企业建立长期战略合作伙伴关系。

是世界最具竞争力的流体装备制造及服务商，打造德帕姆百年世界品牌。



## E 企业资质

Enterprise Qualification Certificates



高新技术企业证书  
New High-tech Enterprise



杭州市企业高新技术研发中心  
Hangzhou Enterprise High-tech  
Research And Development Center



浙江制造认证证书  
Hangzhou Enterprise High-tech  
Research And Development Center



ISO体系认证  
System Certification



环境管理体系认证  
System Certification



职业健康安全体系认证  
System Certification



API



新型超大流量火炬证书  
Certificate Of Honor



发明专利  
Patent For Invention



发明专利  
Patent For Invention



发明专利  
Patent For Invention



发明专利  
Patent For Invention



发明专利  
Patent For Invention



# D 精细化管理 elicacy Management

公司秉承“创新、进取”的企业精神，凭借着优秀的员工团队、精良的设备、先进的工艺、一流的标准，严格的管理、完善的服务使生产的“Depamu”超临界流体装备走在行业的前端。打造行业内最具影响力的重点高新技术企业。

Adhering to the enterprise spirit of minnovation and progression", "depamu" supercritical fluid equipment have been at the forefront relying on the excellent team, superior equipment, advanced process, top-ranking standard, strict management and perfect service, which has then made us the most influential high-tech enterprises in the industry.



成品检测  
Finished Product Inspection



焊接技术  
Welding Technology



CO<sub>2</sub> 高压往复泵测试中心  
Supercritical Pump Testing Center

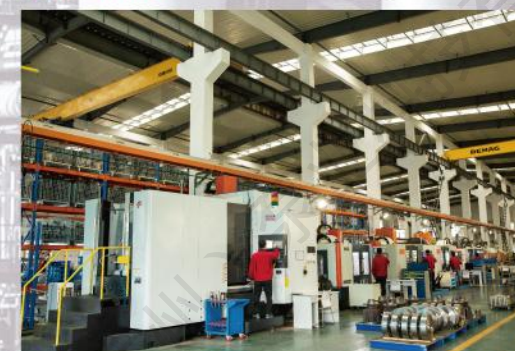
检测车间 Inspection Workshop



卓越团队 Excellent Team



精工车间 Precision Machining Workshop



超临界装置测试 Supercritical Device Testing





## 超临界流体设备装置

Supercritical Fluid Equipment

### 超临界流体概述 Introduction Of Supercritical Fluid

超临界流体一般指用于溶解物质的超临界状态溶剂，在一定的温度与压力下，该溶剂处于气态和液态平衡点，流体密度与饱和气体密度相同，界面消失的点称为临界点，温度、压力高于其临界点的状态称为超临界流体状态。通常也把处于温度超过临界温度而不论其压力和密度是否超过临界值状态的流体都归之为超临界流体。

Generally, supercritical fluid refers to a solvent under supercritical state used for dissolving substances. Under a certain temperature and pressure, this solvent stays at the balance point of gas state and fluid state, the fluid density is the same as the saturated gas density, and the point where the interface disappears is called the critical point. The state where the temperature and pressure are higher than the critical point is called the supercritical fluid state. Generally, the fluid when the temperature exceeds the critical temperature, regardless of whether the pressure or density exceeds the critical value or not, is also called supercritical fluid.

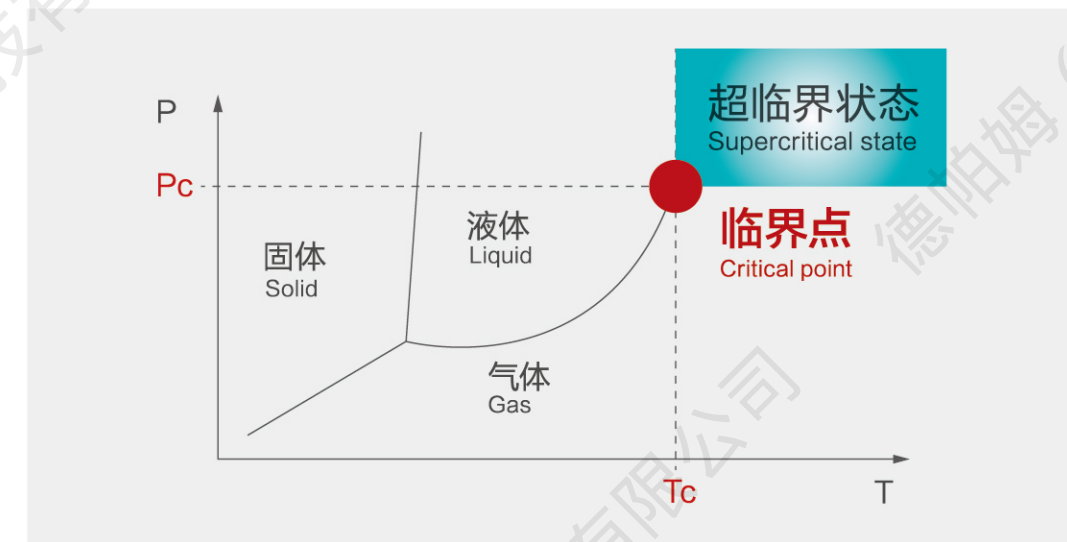


## 超临界流体设备装置

Supercritical Fluid Equipment

### 最常见的超临界状态的物质有 Most Common Substances At Supercritical State

- ▶ 二氧化碳( $\text{CO}_2$ )临界温度 $31.19^\circ\text{C}$ ，临界压力 $7.38\text{MPa}$
- ▶ 乙醇( $\text{CH}_3\text{CH}_2\text{OH}$ )临界温度 $243.1^\circ\text{C}$ ，临界压力 $6.17\text{MPa}$
- ▶ 水( $\text{H}_2\text{O}$ )临界温度 $374.2^\circ\text{C}$ ，临界压力 $22.13\text{MPa}$
- ▶  $\text{CO}_2$ , supercritical temperature  $31.19^\circ\text{C}$  and supercritical pressure  $7.38\text{MPa}$
- ▶  $\text{CH}_3\text{CH}_2\text{OH}$ , supercritical temperature  $243.1^\circ\text{C}$  and supercritical pressure  $6.17\text{MPa}$
- ▶  $\text{H}_2\text{O}$ , supercritical temperature  $374.2^\circ\text{C}$  and supercritical pressure  $22.13\text{MPa}$



### 产品应用 Product Application

- |             |   |
|-------------|---|
| 超临界流体萃取     | Supercritical fluid extraction                            |
| 超临界流体印染     | Supercritical fluid printing and dyeing                   |
| 超临界流体干燥     | Supercritical fluid drying                                |
| 超临界流体清洗     | Supercritical fluid washing                               |
| 超临界流体制备超细微粒 | Supercritical fluid used for preparing ultrafine particle |
| 超临界水氧化技术    | Supercritical water oxidation technology                  |
| 超临界流体色谱     | Supercritical fluid chromatography                        |
| 超临界流体中的化学反应 | Supercritical fluid used in chemical reaction             |





超临界流体设备装置  
Supercritical Fluid Equipment

产品特点 Product Characteristics

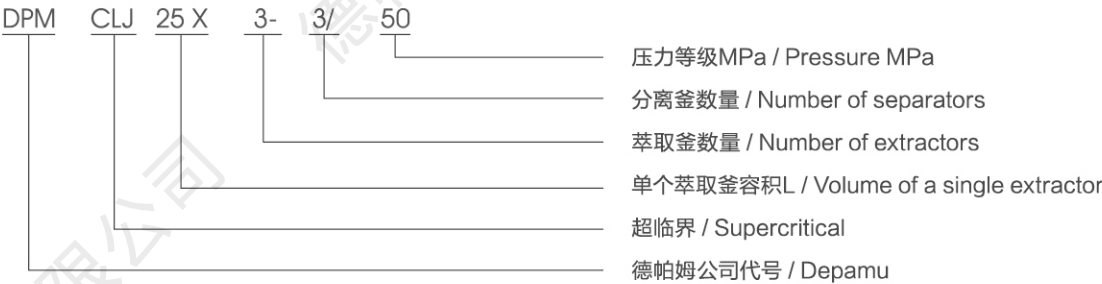
- ▶ 智能控制: PLC智能控制, 彩色触摸屏显示、通过数字比例控制技术, 装置流程、压力、温度、流量等重要参数可在触摸屏上直接设定、记忆、存储, 可实现远程自动控制。也可自动控制与手动控制相结合, 使压力控制精度大大提高, 使萃取出的组分纯度更高;
- ▶ 整体布局: 结构合理, 采用模块化设计, 安装维护十分方便;
- ▶ 萃取釜快开结构: 使用卡箍式快开结构(30L以上萃取设备), 并使用气动或液压提升釜盖, 节省了换料时间; 密封材料不溶胀, 可重复使用, 提高了设备的利用率;
- ▶ 干燥、净化器: 可完成CO<sub>2</sub> 气体的干燥、净化问题; 可自动活化净化剂; 设有捕捉剂入口, 加入不同捕捉剂可以使少量未分离物质在捕捉剂的帮助下使之与CO<sub>2</sub> 分离;
- ▶ CO<sub>2</sub> 专用泵: 填料具有耐高压, 密封性能好, 使用寿命长; 采用冷却泵头和冷却连接体, 使输送CO<sub>2</sub> 流体更加安全可靠, 无相变; 结构简单, 维护方便, 性价比高;
- ▶ CO<sub>2</sub> 氧化回收功能: 提高了CO<sub>2</sub> 利用效率, 达到零排放;
- ▶ 制冷系统: 室内外分离系统, 消除了压缩机所产生的噪声及散发的热量; 采用高效节能换热器, 大大压缩了制冷系统的占地面积;
- ▶ 制热系统: 制热方式可选用蒸汽和电加热, 加热效率高, 使用寿命长;
- ▶ 自动等压切换功能: 釜体更换不需要平压, 萃取完成后马上换釜, 既节约了平压时间, 同时也增加了设备的产能;
- ▶ 热冲洗功能: 釜体平压时, 由于CO<sub>2</sub> 降压使料篮温度非常低。严重影响CO<sub>2</sub>的气化, 从而延长平压(CO<sub>2</sub>回收)时间, 并且物料结块取料非常困难, 该功能可以完全解决此类问题。

- ▶ Intelligent control: PLC intelligent control, color touch screen display, digital proportional control technology, device flow chart, pressure, temperature, capacity and other important parameters can be set, memorized and stored directly on the touch screen, which can accomplish remote automatic control. Can combine automatic control and manual control to greatly improve the pressure control precision and make the extracted components purer.
- ▶ Overall layout: with rational structure, modular design, convenient installation and maintenance design philosophy;
- ▶ Extraction kettle quick-opening structure: use the clamp quick-opening structure (extraction equipment above 30l), and use pneumatic or hydraulic kettle cover, which has saved refilling time; seal material will not swell, and reusable, which has then improved the utilization rate of the equipment;
- ▶ Drying and purifying device: which can complete the CO<sub>2</sub> gas drying and purification process, can automatically activate the scavenger; which has entrance for trapping agent, used for few substances remaining in the CO<sub>2</sub>, can be separated from CO<sub>2</sub> by adding different trapping agents.
- ▶ Special pump for CO<sub>2</sub>: the packing is with high pressure resistance, good sealing performance and long service life. Adopts cooling pump head and cooling spacer, which has then made the transmission of CO<sub>2</sub> fluid safer and more reliable and without phase change; with simple structure, convenient maintenance and high cost-effective;
- ▶ CO<sub>2</sub> oxidation and recycling function: improved the utilization efficiency of CO<sub>2</sub> and achieved zero emission;
- ▶ Refrigerating system: the indoor and outdoor separation system eliminates the noise and heat generated by the compressor. Energy-efficient heat exchanger has been used, which has greatly reduced the foot space of the refrigerating system.
- ▶ Heating system: steam and electric heating can be chosen as heating methods, which is with high heating efficiency and long service life;
- ▶ Automatic isobaric switching function: no isobaric balanced is required for kettle body replacement, the kettle can be changed once extraction was completed, which not only saves the isobaric balanced time, but also increases the production capacity of the equipment;
- ▶ Hot flushing function: when the kettle body is isobaric balanced, the temperature of the material basket is very low due to the depressurization of CO<sub>2</sub>, which will severely affect the gasification of CO<sub>2</sub>, and thereby prolong the time for isobaric balanced (CO<sub>2</sub> recovery), furthermore agglomeration reclaiming of materials is very difficult, this function can completely solve such problems.



超临界流体设备装置  
Supercritical Fluid Equipment

产品代码 Product Model



实验用超临界 CO<sub>2</sub> 萃取仪 / Supercritical CO<sub>2</sub> Extraction Equipment for Experiment

设备型号 Model	萃取釜容积 Extractor Volume	萃取釜数量 Number of Extractors	分离釜数量 Number of Separators	压力等级 Pressure	组合功能 Combination Function	备注 Remarks
DPMCLJ 0.1 x 1-2/50	100ml	1	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 0.3 x 1-2/50	300ml	1	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 0.5 x 1-2/50	500ml	1	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 1.0 x 1-2/50	1L	1	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 1.0 x 2-2/50	1L	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 5.0 x 1-2/50	5L	1	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 5.0 x 2-2/50	5L	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 10.0 x2-2/50	10L	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 25.0 x2-2/50	25L	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement

智能型一体化超临界 CO<sub>2</sub> 实验平台 / Supercritical CO<sub>2</sub> Intelligence Test Platform

设备型号 Model	萃取釜容积 Extractor Volume	萃取釜数量 Number of Extractors	分离釜数量 Number of Separators	压力等级 Pressure	组合功能 Combination Function	备注 Remarks
DPMCLJ 0.5 x 1-2/50	500ml	1	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 1.0x1-2/50	1L	1	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 1.0x2-2/50	1L	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 5+1-2/50	5L, 1L各1	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 5.0 x2-2/50	5L	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ10.0+2-2/50	10L 2L各1	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 10.0 X2-2/50	10L	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement



超临界流体干燥设备  
Supercritical Fluid Extraction Equipment

超临界 CO<sub>2</sub> 干燥设备 (气凝胶制备成套装置)  
Supercritical CO<sub>2</sub> drying equipment (Complete equipment for aerogel preparation)

设备型号 Model	干燥釜容积 Capacity of drying kettle	干燥釜数量 Number of drying still	解析釜数量 Number of analytical still	压力等级 Pressure	理论年产量标准气凝胶毡 Theoretical annual yield standard aerogel blanket
DPMCLJ 500 x 2-2/20	500L	3	2	20MPa	1000 m <sup>3</sup>
DPMCLJ 1000x3-3/20	1000L	3	2	20MPa	2000 m <sup>3</sup>
DPMCLJ 1500 x 3-2/20	1500L	3	2	20MPa	3000 m <sup>3</sup>
DPMCLJ2000x3-3/20	2000L	3	2	20MPa	4000 m <sup>3</sup>
DPMCLJ 2000 x6-2/202	2000L	6	2	20MPa	8000 m <sup>3</sup>
DPMCLJ2600x3-2/20	2600L	3	2	20MPa	5000 m <sup>3</sup>
DPMCLJ2600x6-2/20	2600L	6	2	20MPa	10000 m <sup>3</sup>

超临界乙醇干燥设备 (气凝胶制备成套装置)  
Supercritical ethanol drying equipment (Complete equipment for aerogel preparation)

设备型号 Model	干燥釜容积 Capacity of drying kettle	干燥釜数量 Number of drying still	解析釜数量 Number of analytical still	压力等级 Pressure	理论年产量标准气凝胶毡 Theoretical annual yield standard aerogel blanket
DPMCLJ 370 x15/20	370L	15	3	20MPa	1000m <sup>3</sup>
DPMCLJ 370x30/20	370L	30	6	20MPa	2000m <sup>3</sup>
DPMCLJ600 x15/20	600L	15	3	20MPa	1500m <sup>3</sup>
DPMCLJ600x30/20	600L	30	6	20MPa	3000m <sup>3</sup>
DPMCLJ 1000 x15/20	1000L	15	3	20MPa	2000m <sup>3</sup>
DPMCLJ1000 x30/20	1000L	30	6	20MPa	4000m <sup>3</sup>
DPMCLJ1500x15/20	1500L	15	3	20MPa	3000m <sup>3</sup>
DPMCLJ1500x30/20	1500L	30	6	20MPa	6000m <sup>3</sup>
DPMCLJ2000x15/20	2000L	15	3	20MPa	5000m <sup>3</sup>
DPMCLJ2000x15/20	2000L	30	3	20MPa	10000m <sup>3</sup>

超临界流体萃取设备  
Supercritical fluid extraction

超临界 CO<sub>2</sub> 中试设备 / Supercritical CO<sub>2</sub> PilotPressure Equipment

设备型号 Model	萃取釜容积 Volume Of Extraction Vessel	萃取釜数量 Number of Extractors	分离釜数量 Number of Separators	压力等级 Pressure	组合功能 Combination Function	备注 Remarks
DPMCLJ 25.0x2-2/50	25L	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 25.0x3-2/50	25L	3	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ300x2-2/40	30L	2	2	40MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 300x2-2/50	30L	2	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 300x3-2/50	30L	3	2	50MPa	可配置精馏柱 Possible Equipment with Distillation Column	可根据客户要求组合 Combination as per Customer Requirement

工业化超临界 CO<sub>2</sub> 萃取设备 / Industrial Supercritical CO<sub>2</sub> Extraction Equipment

设备型号 Model	萃取釜容积 Extractor Volume	萃取釜数量 Number of Extractors	分离釜数量 Number of Separators	压力等级 Pressure	备注 Remarks
DPMCU 50x2-2/40	25L	2	2	40MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 50x3-3/40	25L	3	3	40MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 100 x 2-2/40	50L	2	2	40MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 100 x 3-3/40	50L	3	3	40MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 300x2-2/32	100L	2	2	32MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 300x3-3/32	100L	3	3	32MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 600 x 2-2/32	300L	2	2	32MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 600x3-3/32	300L	3	3	32MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 1000x2-2/32	600L	2	2	32MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 1000x3-3/32	600L	3	3	32MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 1500x2-2/32	1000L	2	2	32MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 1500x3-3/32	1000L	3	3	32MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ 2000x2-2/32	1500L	2	2	32MPa	可根据客户要求组合 Combination as per Customer Requirement
DPMCLJ2000x3-3/32	1500L	3	3	32MPa	可根据客户要求组合 Combination as per Customer Requirement



超临界流体萃取设备  
Supercritical Fluid Extraction Equipment

超临界流体萃取概述 Introduction To Supercritical Fluid Extraction

超临界流体萃取是国际上最先进的物理萃取技术,简称SFE (supercritical fluid extraction ),是近代化工分离中出现的高新技术。SFE将传统的蒸馏和有机溶剂萃取结合一体,利用超临界CO<sub>2</sub>优良的溶剂力,将基质与萃取物有效分离、提取和纯化。CO<sub>2</sub>是安全、无毒、廉价的液体,超临界CO<sub>2</sub>具有类似气体的扩散系数、液体的溶解力,表面张力为零,能迅速渗透进固体物质之中,提取其精华,具有高效、不易氧化、纯天然、稳定、无毒、无化学污染等特点。在超临界CO<sub>2</sub>萃取时,被萃取的物质通过降低压力,或升高温度即可析出,不必经过反复萃取操作,所以超临界CO<sub>2</sub>萃取流程简单。因此超临界CO<sub>2</sub>萃取特别适合于对生物、食品、化妆品和药物等的提取和纯化。

Supercritical fluid extraction is the most advanced physical extraction technology in the world, abbreviated as SFE, which is a high and new technology emerging in modern chemical engineering separation. SFE combines traditional distillation and organic solvent extraction, and utilizes the excellent solvent power of supercritical CO<sub>2</sub> to effectively separate, extract, and purify the matrix and extract. CO<sub>2</sub> is one kind of fluid that is safe, non-toxic and inexpensive. Supercritical CO<sub>2</sub> has similar gas diffusion coefficient, liquid dissolving capacity, zero surface tension, and can quickly penetrate into solid materials to extract the essence, which is high efficient, not easily to be oxidized, pure natural, stable, non-toxic, non-chemical pollution and other characteristics. During the extraction by supercritical CO<sub>2</sub>, the extracted material can be separated out by reducing the pressure or raising the temperature, not needed to repeat extraction operations, therefore, the supercritical CO<sub>2</sub> extraction process is simple. Thus, supercritical CO<sub>2</sub> extraction is particularly suitable for the extraction and purification of biology, food, cosmetics and drugs.

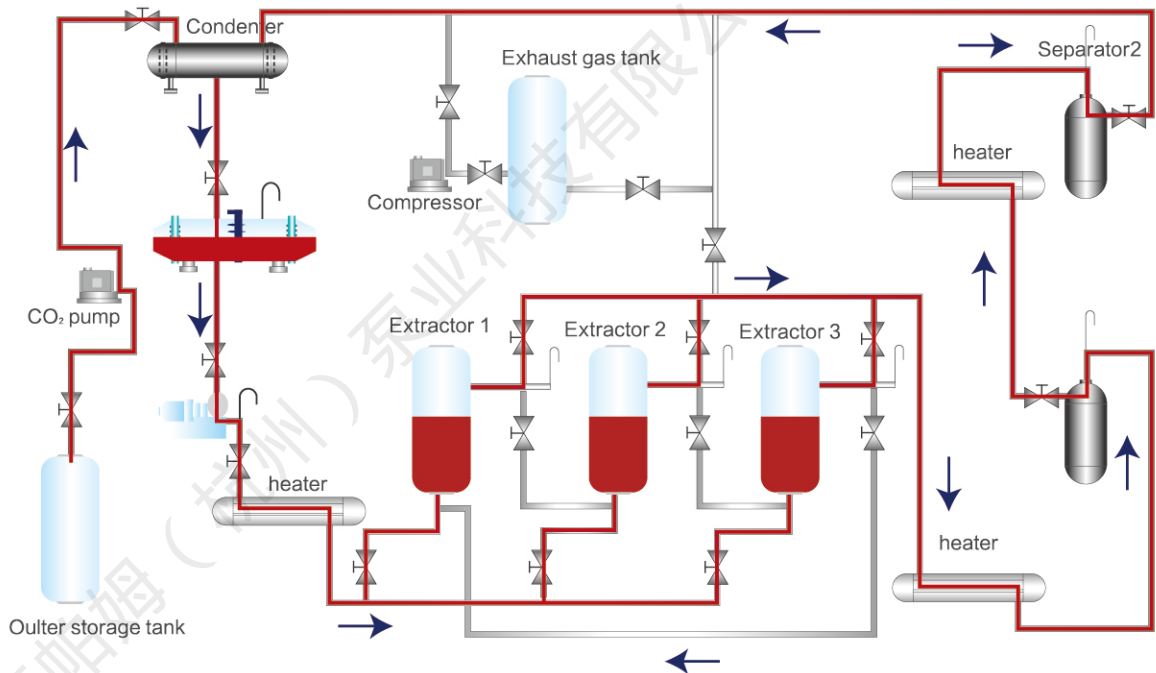


超临界流体萃取设备  
Supercritical Fluid Extraction Equipment

超临界 CO<sub>2</sub> 流体萃取技术应用 / Application of supercritical CO<sub>2</sub> fluid extraction technology

应用领域 / Field	应用类别 / Category	
食品行业 Food Industry	1. 油脂类物质萃取	Extraction of Oils & Fats substances
	2. 香精香料的提取	Extraction of flavors and fragrances
	3. 动植物脂肪和脂溶性成分的提取	Extraction of Animals&Plants Fat or Fat-soluble ingredients
	4. 植物碱提取	Extraction of plant alkaloid
	5. 食用色素提取	Extraction of food colouring
	6. 脱臭、脱色、脱酸和脱除有机溶剂	Deodorization, decoloration, deacidification and organic solvent deprivation
医药行业 Pharmaceuticals Industry	1. 中草药中挥发油和精油萃取	Extraction of volatile oil and essential oil from Chinese herbal medicine
	2. 中草药生物碱的提取	Extraction of plant alkaloid from Chinese herbal medicine
	3. 黄酮类的提取	Extraction of flavonoid
	4. 皂苷类提取	Extraction of saponins
化妆品行业 Cosmetics Industry	1. 天然植物香精油	Essential oil in natural plants
	2. 天然色素的提取	Extraction of natural pigment

超临界流体萃取工艺流程 / Supercritical Fluid Extraction Process





超临界CO<sub>2</sub>流体印染装置  
Supercritical CO<sub>2</sub> Fluid Dyeing Equipment

超临界 CO<sub>2</sub> 流体印染原理 Supercritical CO<sub>2</sub> Fluid Dyeing Principles

超临界二氧化碳染色作为一种新型无水染色技术，具有上染速度快，匀染和透染性好，染色重现性好，工艺流程短、零排放、无污染、染料可重复使用，不添加助剂的特性，已经展现出明显的产业化前景。二氧化碳流体通过高压柱塞泵加压到临界压力，然后通过预热器升温到临界温度，使二氧化碳液体达到超临界状态，然后进入预先装入染料的染料釜中，与染料充分接触并溶解，带有染料成分的超临界CO<sub>2</sub>通过装有纺织物的染色釜中，使染料进入纺织物内部，实现染色过程。完成后改变超临界CO<sub>2</sub>的工作条件，使CO<sub>2</sub>流体溶解能力降低，继而使未尽染的染料与CO<sub>2</sub>流体分离，使染料留在分离釜中，CO<sub>2</sub>完全气化，通过冷凝器冷凝成液体供下一个循环使用。

As one kind of new anhydrous dyeing technology, supercritical CO<sub>2</sub> dyeing is with the characteristic of high dyeing speed, good level dyeing and transfection, good reproducibility of dyeing, short process flow, zero emission, no pollution, dyes can be reused without additives, which has demonstrated quite obvious prospect of industrialization. The CO<sub>2</sub> fluid is pressurized to the critical pressure by the high-pressure plunger pump, and then warmed up to the critical temperature by the preheater, which will then make the CO<sub>2</sub> liquid reaches the supercritical state, and then enter a dyes kettle preloaded with dye so as to get contact with the dye and dissolve fully. When the supercritical CO<sub>2</sub> with dye ingredients passing through the dyeing kettle filled with textiles, it will make the dye entering into the interior of the textiles so as to achieve the dyeing process. After completion, the working conditions of the supercritical CO<sub>2</sub> are changed and the solubility of the CO<sub>2</sub> fluid is reduced. Then the incompletely dyed dye is separated from the CO<sub>2</sub> fluid, so the dye is left in the separation kettle. The CO<sub>2</sub> is completely vaporized and is condensed into a liquid by the condenser for the next cycle.

超临界 CO<sub>2</sub> 流体印染技术特点 Characteristics Of Supercritical CO<sub>2</sub> Fluid Dyeing Technology

- ▶ 超临界CO<sub>2</sub> 印染整个过程不需要水，彻底解决印染企业污水处理问题。染料可重复循环使用，染料的利用率可达到100%，无需添加助剂，大大节约了资源，是一种高效节能环保的高科技技术。
- ▶ 超临界CO<sub>2</sub>印染后的织物颜色鲜亮，不掉色。料的起色牢度，皂洗牢度摩擦度可以达到4级甚至5级。
- ▶ 超临界CO<sub>2</sub>印染技术的工艺重现性好，多批次染色后的织物无色差。
- ▶ 超临界CO<sub>2</sub> 印染技术较传统染色技术省去了传统工艺的多次漂洗和耗时的干燥过程，所需的工艺时间短，工序少。由于工艺上的特点，全部印染过程比传统工艺缩短3-5倍。
- ▶ No water is required for the whole process of supercritical CO<sub>2</sub> dyeing, which has completely solved the problem of sewage treatment in dyeing enterprises. The dyes can be recycled, and the utilization rate of the dyes can reach 100%. No auxiliaries are added, which has saved resources greatly, and it is one kind of high-tech technology which is energy-efficient and environmentally-friendly.
- ▶ The fabric after dyeing with supercritical CO<sub>2</sub> is bright with no color losing. Color fastness and soaping fastness friction of materials can reach 4 or even 5 degrees.
- ▶ The process reproducibility of the supercritical CO<sub>2</sub> dyeing technology is good, and there is no color difference for several batches of fabrics after dyeing.
- ▶ Compared with traditional dyeing technology, supercritical CO<sub>2</sub> dyeing technology eliminates multiple rinsing and drying process of traditional process which is time-consuming, therefore, the required process time is shorter and processes is fewer. Due to characteristics of the process, all dyeing processes are 3-5 times shorter than traditional processes.

超临界CO<sub>2</sub>流体印染装置  
Supercritical CO<sub>2</sub> Fluid Dyeing Equipment



超临界 CO<sub>2</sub> 流体印染技术应用 Application Of Supercritical CO<sub>2</sub> Fluid Dyeing Technology

目前研究表明，超临界CO<sub>2</sub> 流体染色对各种合成纤维(如聚酯纤维、聚酰胺纤维、弹性纤维、聚乙烯纤维、聚丙烯纤维)均能获得良好的效果。而天然纤维(棉、麻、羊毛等)，应常用染料为水溶性染料，是不能溶解在超临界CO<sub>2</sub> 流体中，所以无法以超临界CO<sub>2</sub> 流体作为染色介质。因而要对天然纤维染色要先预处理。目前常用的方法为对天然纤维改性、染料改性，也可以增加共溶剂(甲醇)来实现。

Current research indicates that supercritical CO<sub>2</sub> fluid dyeing can achieve good results in various synthetic fibers (such as polyester fibers, polyamide fibers, elastic fibers, polyethylene fibers and polypropylene fibers). However, since the water-soluble dyes, which cannot be dissolved in supercritical CO<sub>2</sub> fluid are commonly used for natural fibers (cotton, fibre, wool and etc.), therefore, supercritical CO<sub>2</sub> fluid cannot be used as dyeing media. Therefore, it is necessary to pretreat the natural fiber dyeing. At present, modification of natural fibers, modification of dyes, and addition of a cosolvent (methanol) are quite common.

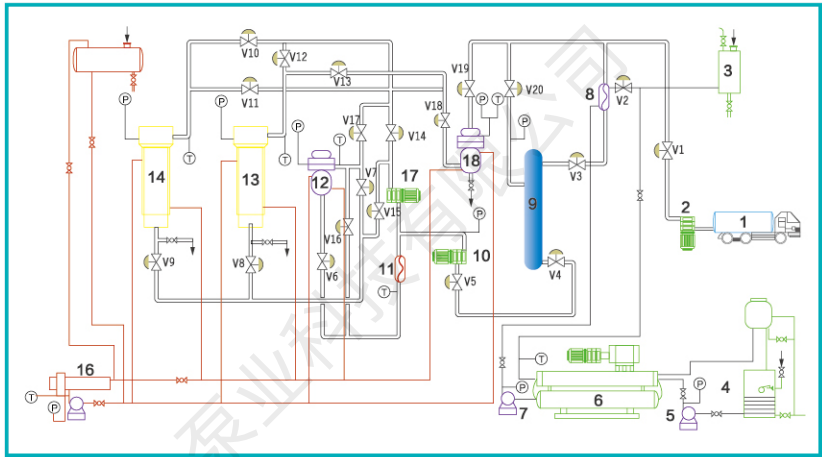


图2 超临界 CO<sub>2</sub> 无水染色工程化染色工艺示意图  
Figure 2 Chart of Supercritical CO<sub>2</sub> Waterless Industrial Dyeing

- |  |                           |                            |                              |  |                                    |
|--|---------------------------|----------------------------|------------------------------|--|------------------------------------|
| 1、CO <sub>2</sub> 罐车<br>CO <sub>2</sub> Tank | 4、凉水塔<br>Cool Water Tower | 7、制冷剂泵<br>Refrigerant Pump | 10、高压泵<br>High Pressure Pump | 13、染色釜 I<br>Dyeing Kettle I                  | 16、导热油单元<br>Heat Transfer Oil Unit |
| 2、液体输送泵<br>Liquid Transfer Pump              | 5、水泵<br>Water Pump        | 8、冷凝器<br>Condenser         | 11、预热器<br>Preheater          | 14、染色釜 II<br>Dyeing Kettle II                | 17、循环泵<br>Circulating Pump         |
| 3、制冷剂高位槽<br>Refrigerant Overhead Tank        | 6、空压机<br>Compressor       | 9、气体储罐<br>Gas Storage Tank | 12、染料釜<br>Dye Kettle         | 15、导热油高位槽<br>Heat Transfer Oil Overhead Tank | 18、分离釜<br>Separator                |



## 超临界乙醇流体干燥设备 Supercritical CO<sub>2</sub> Fluid Drying Equipment

### 超临界乙醇流体干燥原理 Supercritical CO<sub>2</sub> fluid drying principle

超临界乙醇流体干燥技术是利用超临界乙醇流体的特殊性质而开发的一种新型的干燥方法, 它有一个显著的特点就是在干燥的过程中, 即脱除水或其他溶剂的过程, 由于重新建立二氧化碳与被脱除物质的相平衡关系, 被干燥物料不存在因毛细管表面张力作用而导致的微观结构的改变 (如孔道的塌陷等), 因此可以得到粒径较小, 分布均匀的颗粒。

Supercritical ethanol fluid drying technology is one kind of new drying method developed using the special properties of supercritical ethanol fluid. One of the notable feature is that during the process of drying, that is the process of water or other solvents deprivation, due to the reestablishment of the phase equilibrium relationship between CO<sub>2</sub> and the removed material, there is no change in the microstructure of the material to be dried due to the surface tension of the capillary (such as the collapse of the channel). Small particles with evenly distributed particles can be obtained.

#### 高温乙醇干燥法 High Temperature Ethanol Drying Method



二氧化碳干燥法  
CO<sub>2</sub> Drying Method

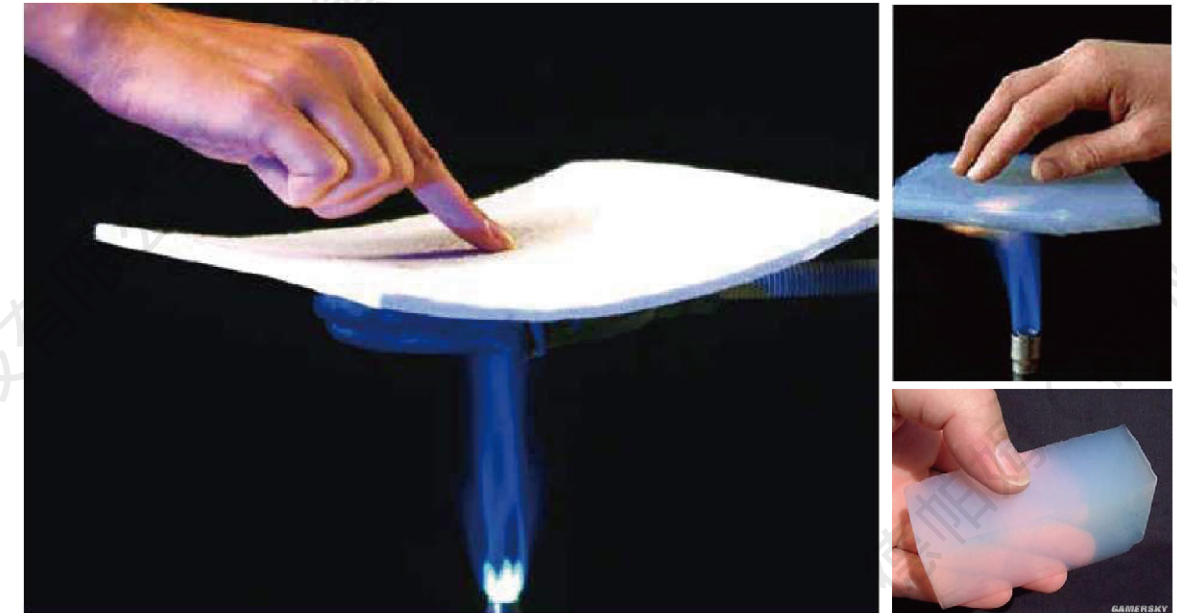


二氧化碳干燥法  
CO<sub>2</sub> Drying Method



高温乙醇干燥法  
High Temperature Ethanol Drying Method

## 超临界CO<sub>2</sub>流体干燥装置 Supercritical CO<sub>2</sub> Fluid Drying Equipment



### 超临界 CO<sub>2</sub> 流体干燥技术特点 Characteristics Of Supercritical CO<sub>2</sub> Fluid Drying Technology

- ▶ 可以在温和的温度条件下进行, 特别适用于热敏性物料的干燥。
- ▶ 能够有效的溶解而抽取大分子量, 高沸点难挥发性物质。
- ▶ 通过改变工作条件可以较容易地把有机溶剂从固体物料中脱去。
- ▶ Can be carried out under mild temperature conditions, especially suitable for the drying of heat sensitive materials.
- ▶ Can effectively dissolve and extract materials with large molecular weight, high boiling point and hard to volatilize.
- ▶ It is easier to remove the organic solvent from solid materials by changing the working conditions.

### 超临界 CO<sub>2</sub> 流体干燥技术应用 Application Of Supercritical CO<sub>2</sub> Fluid Drying Technology

- ▶ 材料开发应用领域: 气凝胶的制备;
- ▶ 医药行业: 抗生素的干燥;
- ▶ 食品行业: 原料中菌体的处理。
- ▶ The field of materials development and application: Extraction of aerogel;
- ▶ pharmaceutical industry: Drying of antibiotics;
- ▶ food industry: Treatment of thallus in raw materials.



# 超临界CO<sub>2</sub>专用泵

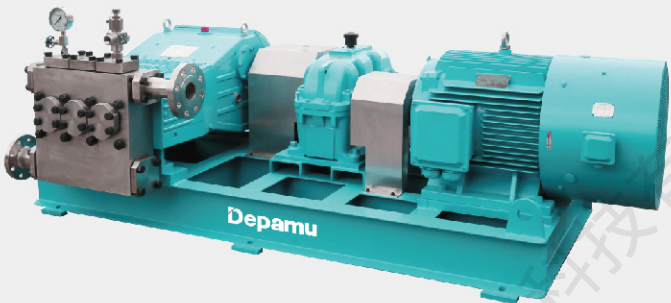
Supercritical CO<sub>2</sub> Special Pump

## CO<sub>2</sub> 专用泵介绍 Introduction To Supercritical Fluid Extraction

德帕姆往复泵堪称世界领先, 按照国际API674标准设计, 许多专利代表着世界先进水平, 产品能满足极为严苛的工况需求, 能精准可靠的输送物料, 满足此类产品的最高需求。具有紧凑结构的往复泵在设备制造领域尤为受到青睐, 这得益于我们扎实的技术基础, 过程隔膜往复泵的设计确保在输送苛刻、有毒、可燃或腐蚀介质中绝无泄漏, 且不受各个领域限制。

Depamu reciprocating pumps, designed according to American Petroleum Institute standard (API674), can represent quality at a worldwide leading level, and many patents the company has obtained can prove that. Products can meet extremely severe working conditions, transport materials accurately and reliably, and meet the highest requirements for pumps of that type. Based on solid technologies, reciprocating pumps in a compact structure are especially popular in the field of equipment manufacturing. The design of process diaphragm pumps ensures no leakage during transportation of toxic, flammable or abrasive media with harsh requirement without restriction from different fields.

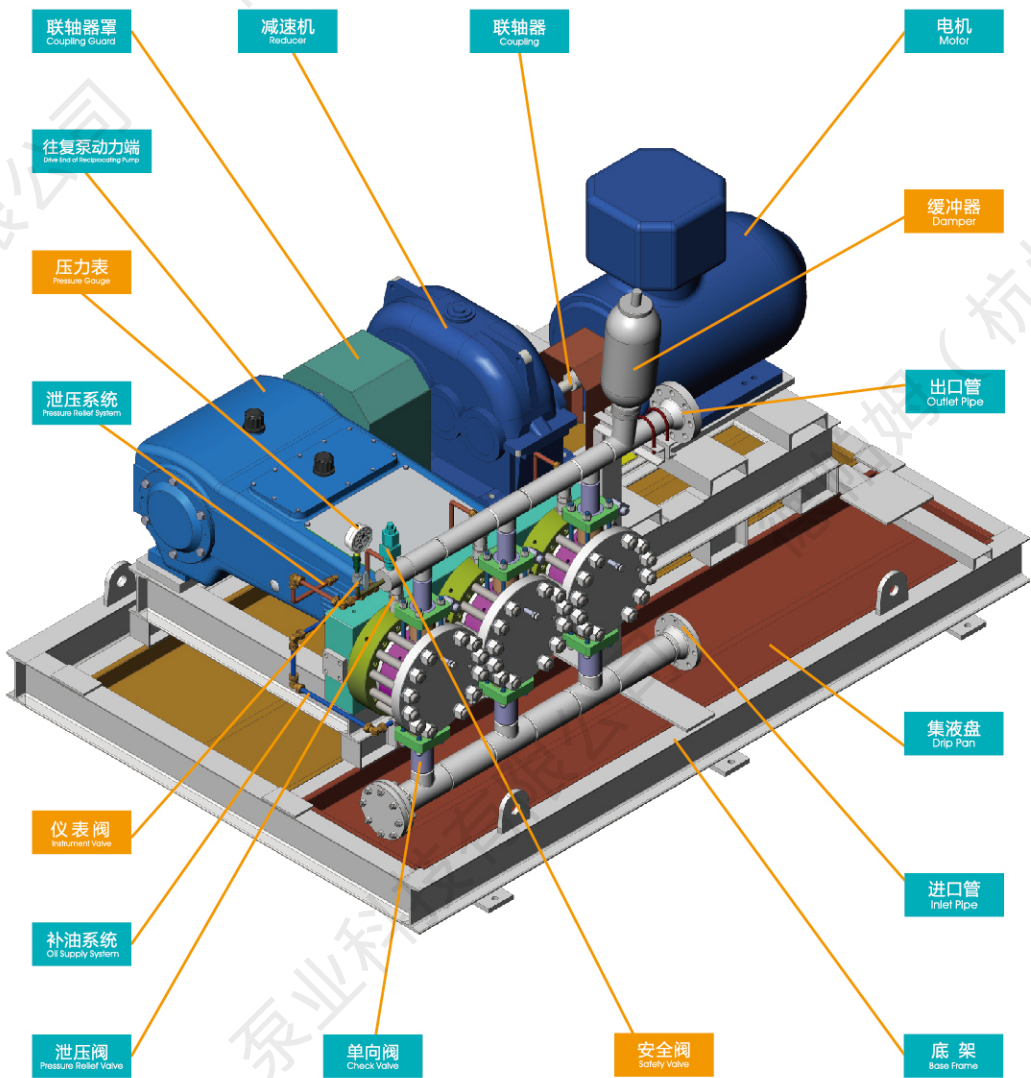
- ▶ 模块化结构, 结构紧凑, 体积小, 重量轻;  
A compact modular structure, a small size and a light weight;
- ▶ 润滑性好, 摩擦系数小, 效率高;  
Good lubricity, small friction coefficient and high efficiency;
- ▶ 动力端传动平稳可靠、噪音小;  
Stable and reliable transmission at drive end with low noise;
- ▶ 组装形式: 卧式、立式、固定式、移动式;  
Assembly Forms: Horizontal, vertical, stationary and mobile;
- ▶ 动力源: 电动机、柴油机、太阳能;  
Power Sources: Motor, diesel engine or solar energy;
- ▶ 减速机构型式: 双斜齿轮式、蜗轮蜗杆式、减速机式、皮带轮式;  
Deceleration Mechanism Types: Double helical gear, worm and gear, reducer and belt pulley;
- ▶ 过流材料有合金钢、不锈钢、双相钢、钛、哈氏合金等;  
Materials of wetted parts can be alloy steel, stainless steel, dual-phase steel, titanium, Hastelloy, etc.;
- ▶ 根据客户要求个性化设计。  
Personalized customization is available according to customer requirements.



二氧化碳输送泵  
Carbon Dioxide Delivery Pump

# 超临界CO<sub>2</sub>专用泵

Supercritical CO<sub>2</sub> Special Pump



注: 此图为往复泵典型安装图, 浅蓝色框中为常规配件, 黄色框中为可选件, 客户根据工况需要选配。  
Note: The above is a typical installation chart for a reciprocating pump, in which, the blue blocks are standard accessories while the yellow ones are optional customers can select based on specific working condition.

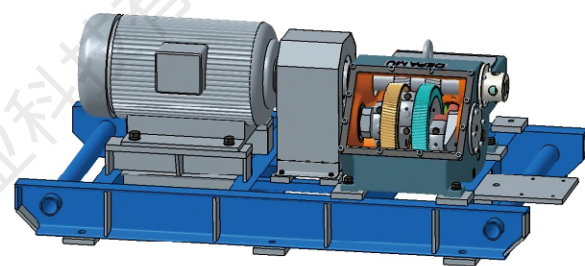


## 超临界CO<sub>2</sub>专用泵 Supercritical CO<sub>2</sub> Special Pump

### 双斜齿轮减速机构的特点

Characteristics of Double Helical Gear Reduction Mechanism

- ▶ 低轴力, 自我调整, 轴承使用寿命长;  
Low axial force, self adjusting, long service life of bearing;
- ▶ 特殊的柱塞定线设计和短小的十字头设计, 结构紧凑, 传输精度高;  
Special plunger alignment design and short cross design, compact structure, high transmission precision;
- ▶ 双斜齿轮提供了非常简洁的设计和最大效率, 这种设计使占用面积最小化和功率最低化;  
Double helical gear provides a very compact design and maximum efficiency, this design can minimize the occupying space and power minimization;
- ▶ 由于设计带有双斜齿轮, 使得曲柄轴和小齿轮免于轴的负载, 平滑的传输装置使得使用寿命长和低噪音;  
The crank shaft and pinion free from axial load because of design with double helical gears, smooth transmission device makes use life long and noise low;
- ▶ 曲柄轴经锻造和喷丸硬化处理, 减小应力, 使得结构坚固, 疲劳强度高;  
Crankshaft is forged and shot peening hardened, which can reduce stress, make the firm structure, and fatigue strength will be high;
- ▶ 往复的压力推进润滑油作用于十字头销和连杆滑动轴承, 不需要额外的润滑系统;  
The pressure of the reciprocating push lubricating oil, which act on the cross-head pin and connecting rod bearing, no need of extra lubrication system;
- ▶ 齿轮由压力和温度开关检测, 因此预防了低油位和超载;  
Gear is tested by pressure and temperature switches, which prevent low oil level and overload;
- ▶ 所有油密封可以从外部维修从而使得维修简便, 维修不需要放油。  
All oil seals can be repaired from outside, which make maintenance easily, oil is not need when repair



### 皮带轮传动的特点

The Characteristics of Belt Pulley Drive

- ▶ 能缓和载荷冲击, 运行平稳、低噪音、低振动;
- ▶ 结构简单、调整方便;
- ▶ 具有过载保护功能。
- ▶ 不足之处: 有弹性滑动现象, 传动效率较低和不能保持准确的传动比。
- ▶ Able to ease load impact and operate stably with low noise and vibration;
- ▶ A simple structure renders convenient adjustment;
- ▶ With the function of overload protection;
- ▶ Disadvantages: Existence of an elastic slip phenomenon, low transmission efficiency and inability to accurately retain a certain transmission ratio.

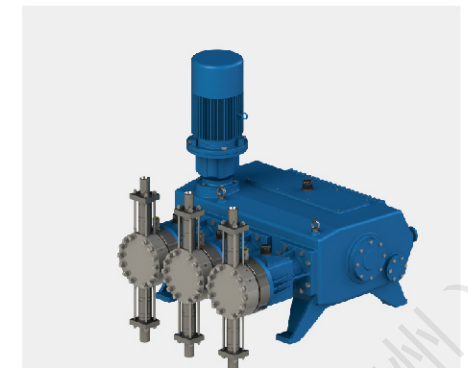


## 超临界CO<sub>2</sub>专用泵 Supercritical CO<sub>2</sub> Special Pump

### 涡轮蜗杆传动的特点

Characteristics of Worm Gear and Worm Drive

- ▶ 单级速比大, 结构紧凑;
- ▶ 运转平稳, 噪音低, 振动小;
- ▶ 轴可以垂直布置而互不相交;
- ▶ 可以防止逆转;
- ▶ 不足之处: 摩擦力大, 有轴向力, 传动效率偏低。
- ▶ With a high single-stage transmission ratio and a compact structure;
- ▶ Able to operate stably with low noise and vibration;
- ▶ Shafts can be arranged vertically without crossing;
- ▶ Able to avoid reversing;
- ▶ Disadvantages: Big friction, existence of axial force, and a rather low transmission efficiency.



### 减速机传动的特点

Characteristics of Reducer Drive

- ▶ 传动效率高, 传动比稳定;
- ▶ 传动平稳、能缓冲吸振;
- ▶ 散热好、性能可靠、寿命长;
- ▶ 不足之处: 占地面积较大。
- ▶ A high transmission efficiency and a stable transmission ratio;
- ▶ Able to drive stably, reduce pulsation and absorb vibration;
- ▶ Good heat dissipation, reliable performance and a long service life;
- ▶ Disadvantages: A rather large footprint.

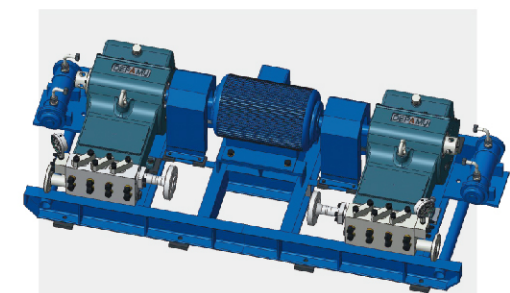


### 减速机传动的特点

Characteristics of Reducer Drive

- ▶ 多泵头设计, 有效降低脉冲, 更适用于大流量高压, 长期稳定运行;
- ▶ 模块化设计, 不拆泵头及管路, 可以直接更换填料, 大大降低用户的维护成本;
- ▶ 双斜齿轮提供了非常简洁的设计和最大效率, 这种设计使使用面积最小化和功率最低化;
- ▶ 可根据工况需要做成多泵头高压力的过程隔膜泵。

- ▶ Under the multi-head design, effectively reducing pulsation, the pump is more suitable for application to occasions with a large flow and a high pressure, and can operate stably for a long time;
- ▶ The modular design allows for direct packing replacement without dismantling of pump head or pipeline, which greatly cuts down user maintenance cost;
- ▶ The design of double helical gears achieves simplicity and a maximum efficiency, which minimizes the footprint and the power;
- ▶ It can be converted to a multi-head high pressure process diaphragm pump according to specific working condition.





## 超临界CO<sub>2</sub>专用泵 Supercritical CO<sub>2</sub> Special Pump

### 柱塞式液力端的特点

Characteristics of Plunger Hydraulic End

柱塞采用航空金刚玉喷涂工艺，摩擦小，硬度高；密封采用进口盘根配合特殊的内隔套结构，加上特殊设计的回流机构，降低液力端的泄漏；

Aviation emery spraying process, adopted for plunger, realizes small friction and high hardness; sealing is made via imported packing with a special internal separation sleeve structure; sealing in that way, together with a specially designed backflow mechanism, lowers the possibility of leakage at hydraulic end;

- ▶ 流量大、工作压力高，脉动小。
- ▶ 强劲高效的动力端，具有先进的强制润滑系统，可调偏心的联轴器，机损小，运行稳定可靠。该结构获国家专利，专利号：ZL20172114323351 三柱塞往复泵。
- ▶ 高性能的缸套密封性能，密封结构采用德国特若弗德先进技术，密封函具有自密封特性，密封力随运行压力大小自动调整，密封效果优异。
- ▶ 优越的整体陶瓷柱塞，整体陶瓷柱塞与改性PTFE成型组合填料，摩擦系数小，使用寿命长，具有优异密封特性与安全性可以满足苛刻场合的需求。
- ▶ 先进的模块化设计，可以不用拆卸泵头即可以更换柱塞，填料。
- ▶ 单向阀技术，双向球面阀芯，弹簧强制回位组合式单向阀，单向阀性能可靠，稳定，介质流动阻力小，关闭及时，回流量极小。
- ▶ 泵头螺栓技术，具有自定位防松功能泵头螺栓技术，确保高压泵的安全运行。

- ▶ A large flow, a high working pressure and low pulsation;
- ▶ A strong and high-efficiency power end, an advanced forced lubrication system and adjustable eccentric couplings ensure stable and reliable pump running with small damage. A state patent has been granted for the pump structure with the Patent No. ZL20172114323351 and the Patent Name Three-plunger Reciprocating Pump.
- ▶ Good sealing performance of cylinder liner in a sealing structure adopting advanced German technology; packing, featuring self-sealing, shows excellent sealing performance with a sealing force automatically adjustable based on operation pressure;
- ▶ Quality integral ceramic plungers and mold combined modified PTFE packing render a low friction coefficient and a long service life, and can meet harsh conditions due to outstanding sealing performance and safeness; The advanced modular design allows for direct replacement of plunger and packing without dismantling of pump head;
- ▶ Check valve technology, double-guide ball valve spool and combined check valve with forced-return spring ensure reliable and stable check valve performance, low media flow resistance, timely shutoff and very little backflow.
- ▶ Pump head bolt technology with self-positioning anti-loose function ensures safe running of a high-pressure pump.



## 超临界CO<sub>2</sub>专用泵 Supercritical CO<sub>2</sub> Special Pump

### 过程隔膜式液力端的特点

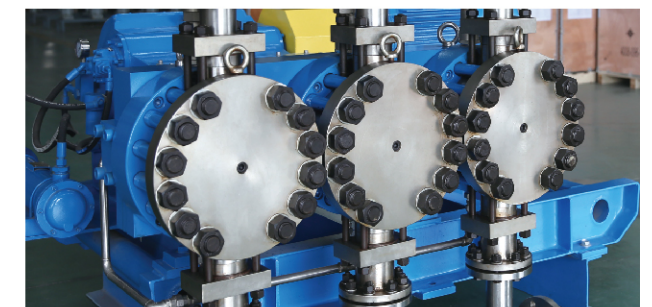
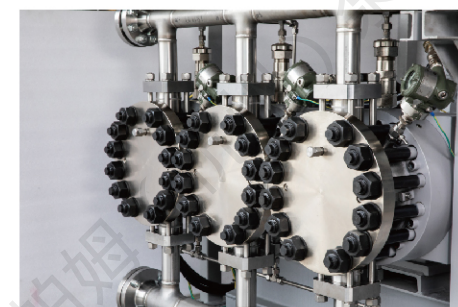
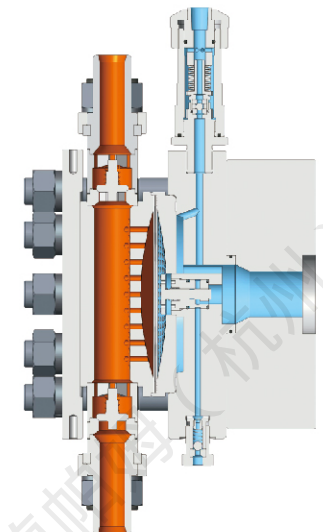
Characteristics of Process Diaphragm Hydraulic End

具有发明专利的过程隔膜泵是我公司在原有先进计量泵的结构基础上研制而成，产品融合了液压隔膜泵及柱塞泵的优点，结构紧凑、效率高、承载压力高，克服柱塞泵易腐蚀、易泄漏的缺点。

Process diaphragm pumps with an invention patent, developed by Depamu based on the structure of its original advanced metering pumps, retain the advantages of hydraulic diaphragm pumps and plunger pumps, like a compact structure, a high efficiency and a high bearing pressure; besides, process diaphragm pumps have overcome the shortcomings of plunger pumps, easy corrosion and easy leakage.

- ▶ 采用隔膜将输送介质和液压油完全隔开，确保介质零泄漏。适用于有腐蚀性、剧毒性、精度要求比较高的场合；
- ▶ 排气阀可以自动放出液压腔内的空气；
- ▶ 补偿阀能及时补充液压腔内的液压油，保持液压腔的油量稳定，确保泵的计量精度；
- ▶ 液压驱动油路采用全封闭式设计，杜绝灰尘杂物侵入及人员操作时损坏油路的畅通和安全；
- ▶ 双隔膜泵：具有隔膜泵的一切优点，并具备隔膜破裂检测装置，在一片隔膜破裂的情况下，另一片膜片可继续工作，同时隔膜破裂检测装置可发出报警信号，适用于输送有毒、易燃易爆及强腐蚀等危险介质；
- ▶ 液压金属隔膜式泵头，用于高温、高压场合，最高使用温度可达451℃，压力可达70Mpa；
- ▶ 变频调节，通过变频器调节电机电源的频率，控制电机的转速，从而改变泵速来调节泵的流量。

- ▶ A diaphragm is used to fully separate media from hydraulic oil and ensure no media leakage. A process diaphragm pump is applicable to occasions of corrosive and toxic media transportation requiring high precision.
- ▶ A vent valve can automatically discharge air from hydraulic chamber.
- ▶ A compensation valve can timely replenish hydraulic oil into hydraulic chamber, thus stabilizing the oil volume in hydraulic chamber and ensuring measurement accuracy of the pump.
- ▶ Hydraulic oil circuit, under a fully enclosed design, prevents from entrance of dust and debris, and avoids blocking and insecurity of the circuit arising during manual operation.
- ▶ A double diaphragm pump, carrying all advantages of a diaphragm pump, contains a diaphragm rupture detector as well. When one diaphragm ruptures, the other diaphragm can continue working; meanwhile, the diaphragm rupture detector can send out alarm signals. The pump is applicable to transportation of dangerous media toxic, flammable, explosive and highly corrosive.
- ▶ A hydraulic metal diaphragm pump head is applicable to occasions under a high temperature or a high pressure. The max working temperature can reach 451℃ and the max pressure is up to 70 Mpa.
- ▶ Variable frequency regulation means regulation of motor power frequency via a VFD to control motor speed, thus changing pump speed to regulate pump flow.

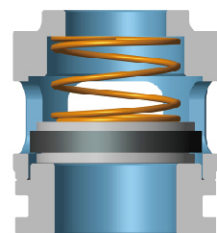




## 超临界CO<sub>2</sub>专用泵 Supercritical CO<sub>2</sub> Special Pump

### 阀体系统 Valve Body System

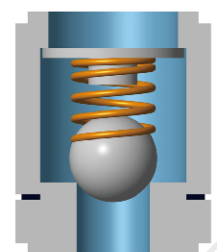
#### 可靠的单向阀技术 Reliable Check Valve Technology



平面加压复位式单向阀 Planar Pressure Reset Type Check Valve

使用压力可达200Bar以上具有结构简单、开启流道宽、逆流小、重量轻、复位快速等特点，适用于注水泵、注醇泵、清洗泵等大流量、高压、低粘度介质。

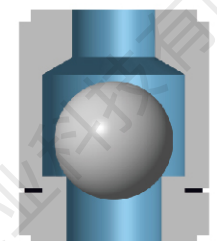
The working pressure can reach more than 200 bar; with the features of a simple structure, wide opening flow way, small reverse current, light weight, rapid reset, etc., the valve is applicable to transportation of media with a large flow, high pressure and low viscosity via injection pumps, alcohol injection pumps and cleaning pumps.



球形加压复位式单向阀 Spherical Pressure Reset Type Check Valve

具有结构简单、自洁能力强、密封性好、运行稳定、流动性好、可输送性能苛刻并带固体颗粒的介质，尤其适用于高精度低流量的场合，广泛应用于流量计量泵要求精确、保压要求高的设备。

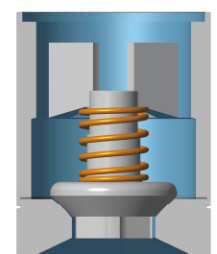
With the features of a simple structure, good self-cleaning ability, good sealing, stable operation and good fluidity, it can be used for transportation of media with strict performance and solid particles, is especially applicable to occasions requiring a high accuracy and a low flow, and widely used in equipment with high demand in accurate flow measurement and pressure retaining.



球形自动复位式单向阀 Spherical Automatic Reset Type Check Valve

具有结构简单、复位快速、密封性好、运行稳定、可输送粘度较高并带固体颗粒的介质，应用于高密封要求、高粘度要求及高压等特殊场合。

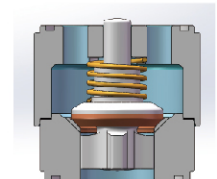
With the features of a simple structure, rapid reset, good sealing and stable running, it can be used to transport media with a high viscosity and solid particles, and is applicable to special occasions with requirement of good sealing, a high viscosity and a high pressure.



双导向锥面复位式单向阀 Double Orientation Cone Reset Type Check Valve

具有复位快速、精准、密封性好、噪音小、磨损小等特点，适用于大流量、高粘度介质的输送，尤其适用于对环境噪音要求苛刻的场合使用。

With the features of quick reset, high precision, good sealing, low noise, low wearing, etc., it is applicable to transportation of media with a large flow and a high viscosity, and is especially suitable in occasions with strict requirement of environment noise.



双导向球面复位式单向阀 Double Orientation Spherical Reset Type Check Valve

具有复位快速、精准、密封性好、高耐磨、高耐腐蚀、噪音小等特点，适用于大流量、有腐蚀性、高粘度、含颗粒介质的输送，特别适用于介质中含大量颗粒的场合使用。

With the features of quick reset, high precision, good sealing, high wear resistance, high corrosion resistance, low noise, etc., it is applicable to transportation of media with a large flow, corrosivity, a high viscosity and particles, and is especially suitable for transportation of media containing many particles.

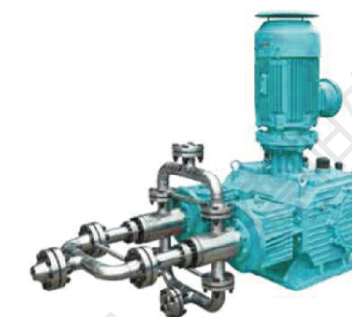
## 超临界CO<sub>2</sub>专用密封系统/CO<sub>2</sub>低温泵 Supercritical CO<sub>2</sub> Special Sealing System /CO<sub>2</sub> Cryogenic Pump

### CO<sub>2</sub> 专用密封系统 CO<sub>2</sub> Special Sealing System

- ▶ 具有专利技术的自动补偿功能的组合式密封圈结构，密封效果好，使用寿命长。
- ▶ 采用高耐磨和特殊配方的改性材料，能适用在-185℃~310℃的宽温度范围内长期使用，寿命更长。
- ▶ 耐化学腐蚀能力强，尺寸稳定性好，不产生溶胀，可重复使用，节省换料时间。
- ▶ The combined seal ring structure with automatic compensation function and patented technology has good sealing effect and long service life.
- ▶ Highly wear-resisting and modified materials with special formula can satisfy long-term use under wide temperature range of -185℃ to 310℃ with longer service life.
- ▶ Strong resistance to chemical attack, good dimensional stability, which will not cause swelling and can save time for reloading and can be reused.



▶ 密封圈 Seal Ring



▶ 二氧化碳低温泵  
Carbon Dioxide Cryogenic Pump

### 二氧化碳低温泵 Carbon Dioxide Cryogenic Pump

- ▶ 采用泵头连接体一体式循环冷却系统，有效的传导柱塞运动产生的热量，适合输送热敏性物品和易受离心力等破坏的物品，具有较高的抗气蚀性能。
- ▶ 先进的柱塞填料密封结构，抗磨损，强度高，寿命长，无泄漏。
- ▶ 采用具有专利技术的斜径密封单向阀结构，零泄漏，使流量更加稳定。
- ▶ 先进的流道设计和多泵头组合设计，是输出的流量均匀，压力稳定。
- ▶ 采用高强度高性能耐腐蚀耐低温的不锈钢材料，承受压力更高，清洁环保。
- ▶ An integrated circulating cooling system with pump head connector has been adopted, which has then effectively transferred the heat generated due to the movement of the plunger piston. The quite strong anti-avitation resistance has made it suitable to convey heat sensitivity materials, and materials easy to be damaged by centrifugal force.
- ▶ Advanced plunger piston packing sealing structure, which is wear-resistant, and with high intensity, long service life, no leakage.
- ▶ Diameter obliqua sealed one-way valve with patented technology has been adopted, which is zero emission and has made the flow more stable.
- ▶ The advanced flow channel design and multi pump head combination design has made the flow exported uniform and has made the pressure stable.
- ▶ Stainless steel materials with high strength, high-performance, corrosion resistance and low-temperature resistant are used, which has then made the pressure upheld higher, and clean and environmentally friendly.



## 气凝胶干燥辅助设备 Aerogel Drying Auxiliary Equipment

配胶线 Aerogel Preparation Line



## 气凝胶干燥辅助设备 Aerogel Drying Auxiliary Equipment



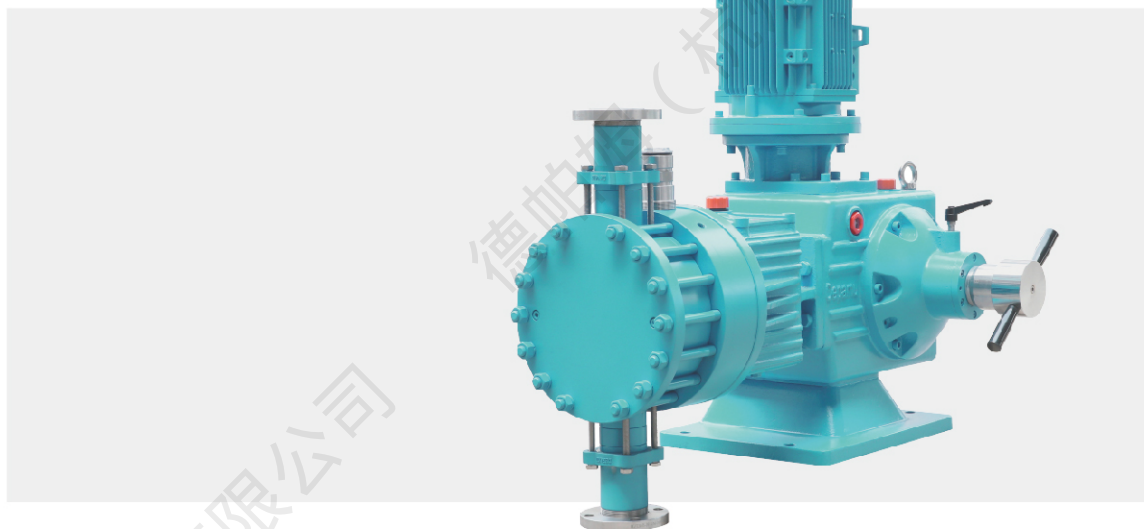
配胶线专用泵 Special Pump With Twisted Wire





## 气凝胶干燥辅助设备 Aerogel Drying Auxiliary Equipment

超临界CO<sub>2</sub>专用泵  
Supercritical CO<sub>2</sub> Special Pump



配胶线专用泵  
Special Pump With Twisted Wire



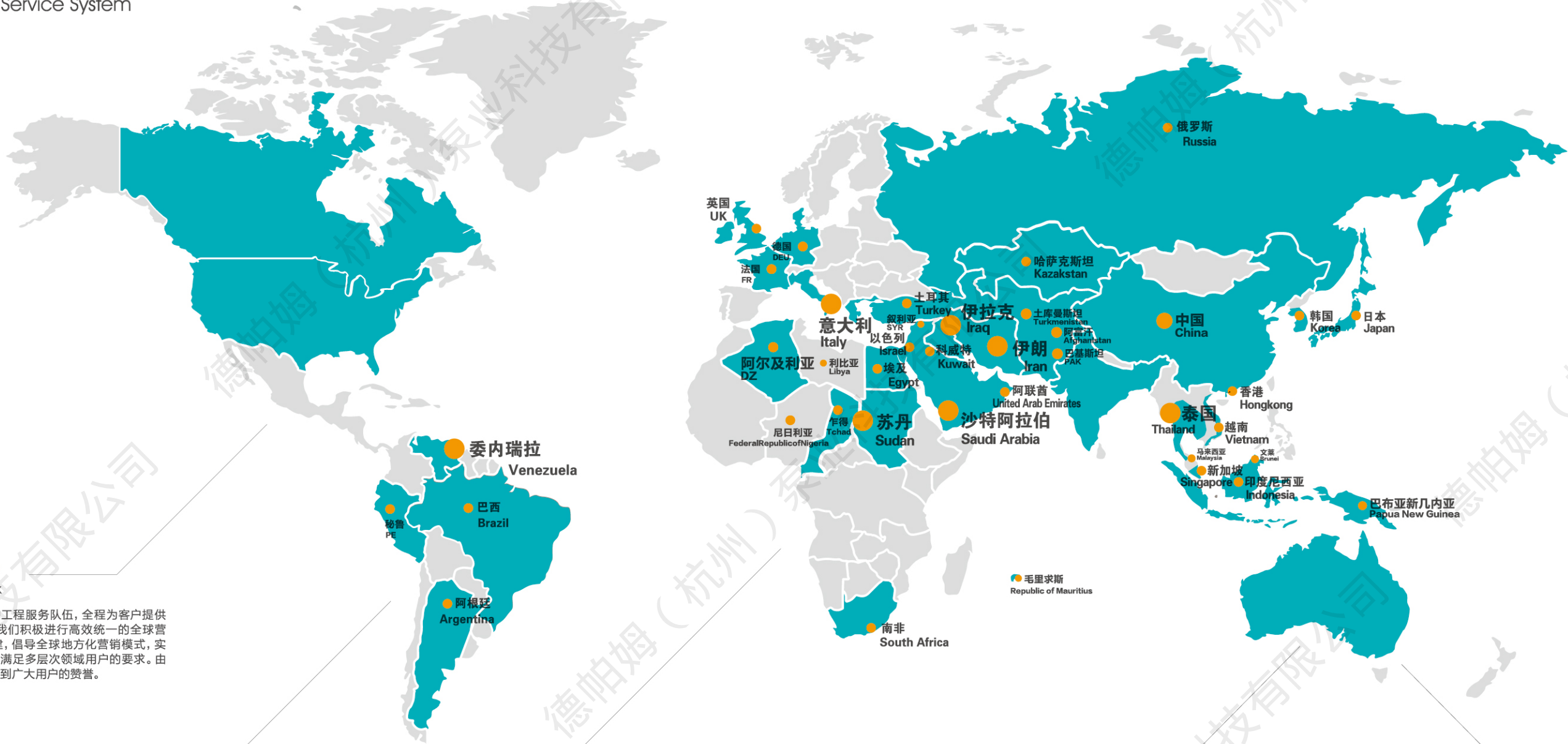
## 气凝胶干燥辅助设备 Aerogel Drying Auxiliary Equipment

淋胶线 Aerogel Showering Coating Line





► 全球化服务体系  
Global Service System



► 营销网络  
Sales Network

公司拥有专业的工程服务队伍，全程为客户提供优质、快捷的服务。我们积极进行高效统一的全球营销与服务网络的构建，倡导全球地方化营销模式，实施品牌经营，迅速地满足多层次领域用户的要求。由此创造的超值服务受到广大用户的赞誉。

► 以客户为中心  
Customer Orientation

真诚的售前售后服务，建立了分布全球的技术服务网络。

► 一体化服务  
Integrated Service

- 振动分析
- 介质评定
- 现场调试
- 系统测试
- 服务维修合同
- 全球化服务
- 运行条件变化诊断
- 现运行泵及系统的延伸及修改

► 可延伸性系统方案  
Solution for Extensible System

- 泵仪表
- 变频器调节流量
- 导向系统操作界面
- 电子控制在线与离线条件下监测系统

► 特殊要求的咨询与工程

Consulting and Engineering with Special Requirements

德帕姆在全世界的应用技术非常广泛，并受益于这些经验。我们已成为一家为流体输送、计量和混合应用提供方案与系统的供应商，我们可以提供个性化定制方案，从最小的独立单元到最大的联机安装，同时为复杂工艺提供技术工程咨询，能满足特殊工艺需要。

- 流体评估
- 独立设计构想
- 安装核算
- 调试与服务
- 研讨会和现场培训