CIS Rigid Composite Membrane

晶元刚性复合膜技术简报

Zero-consumable filtration, online gas-pulse regeneration and absolute pore geometry. 零耗材过滤、气脉冲再生与绝对孔径结构。

Technology Overview 技术概述

Jingyuan CIS (Critical Interface Sintering) rigid composite membrane is a proprietary microfiltration technology designed for demanding industrial fluid applications. The membrane utilizes a self-supporting rigid pore-wall structure manufactured via the CIS process — a critical-interface sintering technique that creates a monolithic, 3D interconnected porous network without internal metal or plastic supports. This rigid geometry maintains stable pore dimensions under pressure fluctuations up to 0.5 MPa, effectively eliminating the unloading effect observed in flexible disposable cartridges where deformed pores temporarily enlarge and release previously captured particles downstream.

晶元 CIS（临界界面熔融成型）刚性复合膜是一种专有微滤技术，面向严苛工业流体应用。膜材采用 CIS 工艺制造的自支撑刚性孔壁结构——通过临界界面烧结形成无内部金属或塑料骨架的一体化三维互通多孔网络。刚性几何结构在 ≤ 0.5 MPa 的压力波动下保持稳定孔径尺寸，有效消除传统柔性抛弃型滤芯因受压变形而短暂扩大孔径、释放已捕获颗粒的卸载效应。

Core Features 核心特性

Feature 特性	Technical Meaning 技术含义	Operational Value 运行价值
Rigid pore wall **刚性孔壁**	Self-supporting monolithic structure with stable pore geometry under pressure fluctuation (0.2 – 0.5 MPa). No internal skeleton or pleated media. Straightness deviation ≤ 1.5 mm/m. 3.0 – 5.0 mm wall thickness. 纯自支撑一体结构，压力波动下（0.2 – 0.5 MPa）孔径几何稳定。无内部骨架，无皱褶滤材。直线度偏差 ≤ 1.5 mm/m，壁厚 3.0 – 5.0 mm。	Less particle release (zero unloading), higher filtration reliability. Eliminates deformation-related secondary contamination downstream. 降低颗粒释放风险（零卸载），提升过滤可靠性。杜绝形变引起的下游二次污染。
Gas-pulse regeneration **气脉冲再生**	N_2 or compressed-air pulse at 0.4 – 0.5 MPa removes filter cake layer in < 30 s. Straight-through microporous channels minimize backflush energy loss, enabling thorough penetration of the 3 – 5	No cartridge replacement downtime. Supports online regeneration without process interruption. Suitable for viscous and hard-to-filter fluids. Design service life ⩾ 3 years.

	mm wall. Designed for transient shock ⩽ 0.6 MPa without fatigue cracking. 0.4 – 0.5 MPa 氮气/压缩空气脉冲 < 30 s 剥离滤饼。直通型微孔结构降低反吹动能损耗，脉冲穿透 3 – 5 mm 壁层实现深层清灰。耐受瞬态冲击 ⩽ 0.6 MPa，无疲劳开裂。	无需换芯停机。支持在线再生，不中断工艺。适合高粘度难过滤物料。设计运转寿命 ⩾ 3 年。
Hydrophobic phase separation 疏水相分离	Membrane substrate is inherently hydrophobic. Free water is blocked at the membrane surface and separated via gravity settling into the collection zone. Tested at inlet free water ⩽ 1,000 ppm: total water removal ⩾ 95% (0# diesel @ 20° C, Karl Fischer coulometry). 膜材基体天然疏水。游离水在膜表面被阻挡，通过重力沉降进入集水区。入口游离水 ⩽ 1,000 ppm 测试条件下，总水脱除率 ⩾ 95%（0# 柴油 @ 20° C，卡尔·费休库仑法）。	Free water controllable to ppm level. Mild emulsion-breaking effect at ⩽ 500 ppm. Not intended as primary dewatering for highly emulsified fluids. 可将游离水控制到 ppm 级。⩽ 500 ppm 轻微乳化条件下具有破乳聚结效果。不建议作为高乳化度油品的主脱水设备。
Dynamic shear option 动态剪切选项	Selected models (JY-DCF7) incorporate rotating membrane discs that generate Taylor-Couette vortices. This shear-induced secondary flow reduces near-membrane concentration polarization and fouling deposition, enabling sustained flux at higher solids loading. 部分型号（JY-DCF7）搭载旋转膜盘，产生泰勒涡二次流。剪切诱导的二次流动降低膜面浓差极化和污染沉积，支持高固含工况下的持续通量。	Extended operation between cleaning cycles for high-solid / high-viscosity streams (e.g., waste oil > 320 cSt @ 40° C, fermentation broth). Reduces CIP frequency and downtime. 延长高固含/高粘度物料（如 > 320 cSt@40° C 废油、发酵液）的清洗周期间隔。降低在线清洗频率和停机时间。

Key Specifications 关键规格参数

Parameter / 参数	Value / 数值
Technology classification / 技术分类	Microfiltration (MF) — not UF, NF or RO / 微滤，非超滤/纳滤/反渗透
Manufacturing process / 制造工艺	CIS — Critical Interface Sintering / 临界界面熔融成型
Filtration precision / 过滤精度	2 / 5 / 10 / 15 / 20 / 25 µm (nominal, per ISO 16890) / 标称精度
Materials / 材质	UHMWPE, PTFE, PVDF (chemically selectable) / 根据化学兼容性可选
Operating ΔP / 运行压差	0.2 – 0.35 MPa
Max allowable working pressure / 最大允许工作压力	0.5 MPa
Backflush pressure / 反吹压力	0.4 – 0.5 MPa (transient shock ⩽ 0.6 MPa) / 瞬态 ⩽ 0.6 MPa

Flow direction / 流型	Outside-in / 外进内出
Max continuous temp / 耐温上限	80° C (continuous) / 连续运行
Design service life / 设计使用寿命	⩾ 3 years (replace at ΔP 0.4 MPa or 20% flow drop) / ⩾ 3 年
Water removal / 除水率	⩾ 95% total, at inlet free water ⩽ 1,000 ppm / 入口游离水 ⩽ 1,000 ppm
Module configurations / 模组件配置	36-el (J-36), 42-el (JY-30970-42), 84-el (JY-30970-84) / 三种规格

Technology Boundary 技术边界

This is microfiltration (MF), not ultrafiltration, nanofiltration or reverse osmosis.
该技术属于微滤，不是超滤、纳滤或反渗透。

✓ **Particles & suspended solids / 颗粒与悬浮固体**

Mechanically captured by rigid pore walls. Effective for rust, scale, catalyst fines, mineral dust > 1 μm. / 刚性孔壁机械拦截，有效去除 > 1 μm 的铁锈、水垢、催化剂粉末、矿尘。

✓ **Free water / 游离水**

Repelled by hydrophobic membrane surface, gravity-separated. ⩾ 95% removal at ⩽ 1,000 ppm inlet. / 疏水膜面排斥，重力分离。

✕ **Emulsified water / 乳化水**

Partial coalescence effect at mild emulsion (⩽ 500 ppm). Not primary dewatering. / 轻微乳化时有部分聚结效果，不建议作为主脱水手段。

✕ **Dissolved ions / 溶解离子**

NOT removed. No ion-exchange or reverse-osmosis mechanism. / 不能去除。无离子交换或反渗透机制。

✕ **Nanoscale solutes / 纳米级溶质**

Beyond MF separation range. Requires UF / NF / RO. / 超出微滤分离范围，需超滤/纳滤/反渗透。

Pain Points Solved 技术解决的行业痛点

1. Particle unloading / bypass / 穿透与卸载

Flexible pleated cartridges deform under high ΔP, temporarily enlarging pores and releasing captured soft particles downstream. CIS rigid walls maintain aperture consistency, delivering stable effluent quality across the full pressure range.

传统柔性皱褶滤芯在高压差下变形扩大孔径，释放软性颗粒。CIS 刚性孔壁在全压力范围保持孔径一致性，出水质量稳定。

2. Irreversible blinding / 不可逆堵塞

Conventional depth media trap particles within the fiber matrix and cannot be backflushed. CIS straight-through channels allow gas penetration through the wall thickness, dislodging deeply embedded contaminants.

传统深层滤材将颗粒锁在纤维内部，无法反吹。CIS 直通型孔道使气流穿透壁层，剥离深层嵌入的污染物。

3. High TCO from consumables / 耗材导致的 TCO 偏高

Disposable cartridge procurement, inventory, replacement labor, and hazardous waste disposal create an ongoing cost burden. CIS membrane ⩾ 3-year lifecycle pays back within the first operating cycle for most customers.

抛弃型滤芯的采购、库存、更换人力和危废处置构成持续性成本负担。CIS 膜 ⩾ 3 年寿命使大多数客户在首个运行周期即收回投资。

沈阳晶元滤膜有限公司 | info@jingyuan.hk cindy@jingyuan.hk | www.jingyuan.hk
Tel: +86-24-86530244 | WhatsApp: +86 13889310698 15640262102 | Jingyuan®