



麦斯创科技股份有限公司

MASS TRANSFER TECHNOLOGY CO.,LTD

国家级专精特新【小巨人】企业 National Little Giant Enterprise (SRUI)

深耕海外化工核心技术，高端化工装备国产替代。

Delve into core overseas chemical technologies ,
Domestic alternatives for premium chemical equipment.

化工填料、塔盘、塔内件、化工装备全球OEM基地。

Global OEM Base of Chemical Packings, Tower Trays, Column Internals & Chemical Equipment.

股票代码Stock No: 873434

MASS TRANSFER-WWW.MT1992.COM

»» PART 企业文化 Corporate Culture

企业使命：Mission

以传质分离技术国产化方案降本增效，为全球化工客户创造可持续长期价值。

Localized mass transfer separation technologies reduce costs, raise efficiency and deliver lasting sustainable value to global chemical partners.

企业愿景：Vision

深耕传质分离领域，打造全球值得信赖的高端化工装备民族智造品牌。

Specializing in mass transfer and separation, we forge a world-trusted national brand for intelligently manufactured premium chemical equipment.

核心价值观：Core Values

技术为本、客户为先、精准求精、合作共赢。

Technology foundation, Customer priority, Precision excellence, Mutual success.

▶▶▶ PART 01-公司介绍 (Company Profile) - 麦斯创科技股份有限公司



创始人吴金初先生自 1992 年深耕化工装备制造领域，2002 年创办海盐新世纪石化设备有限公司，董事长吴佳栋先生自 2006 年接手经营，全面统筹公司各项运营管理工作；公司已于 2022 年 9 月在新三板挂牌上市，2023 年更名为麦斯创科技股份有限公司。

Founder Mr. Wu Jinchu has been deeply engaged in the chemical equipment manufacturing sector since 1992. In 2002, he founded Haiyan New Century Petrochemical Equipment Co., Ltd. Mr. Wu Jiadong, Chairman of the Company, took over the business operations in 2006 and oversees all operational and management matters of the enterprise in an all-round capacity.

The Company was listed on the National Equities Exchange and Quotations (NEEQ) in September 2022, and was renamed Mass Transfer Technology Co., Ltd. in 2023.

业务覆盖：石油炼化、油气处理、煤化工、精细化工、特种化学品、高分子塑料行业、新能源、低碳节能、医药食品、水气处理等领域。

Business Scope: petroleum refining, oil & gas processing, coal chemicals, fine & specialty chemicals, polymer plastics, new energy, low-carbon energy saving, pharma & food, water-gas treatment and related sectors.

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»» PART 02-团队介绍 (Our Team)

公司工艺与机械设计团队成员均具备**国际头部**化工装备企业多年从业背景。依托丰富的**海外公司**项目实操经验，团队持续对工艺流程、设备结构与产品方案迭代优化，打造更高效、可靠的成套分离装备设计方案。All members of the Company's process and mechanical design team have years of working experience at world-leading international chemical equipment manufacturers. Leveraging abundant hands-on experience accumulated from overseas projects, the team continuously iterates and optimizes process flows, equipment structures and product solutions to deliver more efficient and reliable design packages for complete separation equipment.

麦斯创团队可提供一体化全链条解决方案：涵盖分离精馏工艺研发、精馏塔成套设计、悬浮结晶器设计、聚合物脱挥工艺开发与工程设计、模块化成套方案设计，同时自主生产规整填料、散堆填料、塔盘、全套塔内件、降膜再沸器、萃取塔、聚合物脱挥装置等各类分离**核心设备**。MASS TRANSFER delivers integrated full-chain solutions covering R&D of separation and distillation processes, complete distillation column design, suspension crystallizer design, development and engineering design of polymer devolatilization processes, as well as modular package design. Meanwhile, we independently manufacture core separation equipment including structured/random packings, column trays, full sets of tower internals, falling-film reboilers, extraction columns and polymer devolatilization units.

公司设计与销售团队**自有**上海专属办公场地，坐落于上海市闵行区申滨南路 938 号虹桥天街 G 栋 605 室。The Company's design and sales teams have exclusive self-owned office premises in Shanghai, situated at Room 605, Block G, Hongqiao Paradise Walk, No. 938 South Shenbin Road, Minhang District, Shanghai.

»» PART 03-技术介绍 (Technology Overview)

1、分离工艺开发Development of Separation Process

从可行性研究开发，通过小试验证，放大到中试再到给出具体的方案。

From feasibility study and development, to small-scale validation, scaling up to pilot testing, and finally providing specific solutions.

2、工艺/工程设计 Process/Engineering Design

麦斯创工艺/工程设计从模拟验证，水力学计算到提出分离工艺的具体方案。

From simulation verification, hydraulic calculation to proposing specific separation process schemes in the process/engineering design of Mass Transfer.

3、关键设备设计Key equipment design

麦斯创团队根据分离工艺的方案，出具相关关键设备的设计数据表。

According to the separation process plan, the Mass Transfer team has provided design data sheets for relevant key equipment.

»» PART 03-技术介绍 (Technology Overview)

4、关键设备制造Key equipment manufacturing

根据关键设备的设计数据表进行关键设备的制造满足分离工艺流程的需求。

According to the design data sheet of the key equipment, manufacture the key equipment to meet the requirements of the separation process flow.

5、集成式设备制造Integrated equipment manufacturing

将关键设备做成撬装模式，现场配合各种辅助装置，连接进整套装置中即可。

Make the key equipment into a lever mounted mode, coordinate with various auxiliary devices on site, and connect it into the entire set of devices.

6、安装/开车指导Installation/Driving Guide

经验丰富的工程师为客户提供塔内件安装指导、试车指导、开车指导等服务。

Experienced engineers provide customers with installation guidance, commissioning guidance, and start-up guidance for tower internals.

➤➤➤ PART 04-实力介绍 (Corporate Strengths)

➤ 企业荣誉 Corporate Honors

1、 新三板上市企业、国家级高新技术企业、国家级专精特新“小巨人”、国家级科技型中小企业

The New OTC listed enterprise, national high-tech enterprise, and national specialized and innovative "little giant", and National level technology-based small and medium-sized enterprises.

➤ 项目运作能力 Project operation capability

2、 常期千万级项目运营、项目专款专用、企业无贷款压力、现金采购无拖欠供应款。

Regular operation of tens of millions of projects, dedicated use of project funds, no loan pressure for enterprises, and no outstanding supply payments for cash procurement.

➤ 企业规模及产能优势 Advantages in enterprise scale and production capacity

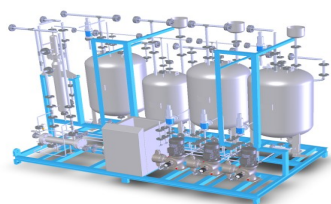
3、 在册员工超过200人（含江西工厂），金属填料、塔盘、塔内件综合制造能力全国前五。

There are over 200 registered employees (including the Jiangxi factory), and the comprehensive manufacturing capacity of metal packings, tower trays, and tower interiors is among the top five in the country.

➤➤➤ PART 05-工艺包及关键设备 (Process Package & Key Equipment)

专注于化工连续生产工艺，并提供专有设备及工程服务。

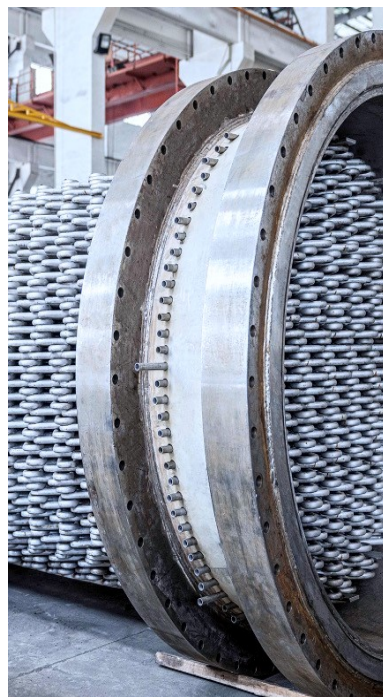
We specialize in continuous chemical production processes, and provide proprietary equipment as well as engineering services.



工艺包 Process Package



- 单元操作工艺包
- Unit Operation Process Package
- 整套装置工艺包
- Complete Plant Process Package



关键设备

Critical Equipment



- 传质分离设备
- Mass Transfer & Separation Equipmen
- 换热设备
- Heat Exchange Equipment
- 结晶设备
- Crystallization Equipment
- 聚合设备
- Polymerization Equipment

»» PART -化工装备 (Chemical Equipment)

6.传质分离设备

6. Mass Transfer & Separation Equipment

6.1金属规整填料

(Metal Structured Packing)

6.2金属散堆填料 Metal Random Packing

6.3金属塔盘(Metal Trays)

6.4金属塔内件(Metal Tower Internals)

6.5水力学测试

(Hydraulic Performance Test)

7.结晶设备Crystallization Equipment

8.换热设备

Heat Exchange Equipment

8.1锤头式冷凝器

Hammerhead Condenser

8.2自循环高压锅炉

8.3降膜再沸器Falling Film Reboiler

8.4Self-circulating High-pressure Boiler

9.熔融结晶Melt Crystallization

9.聚合设备 Polymerization Equipment

9.1、脱挥器Devolatilizer

9.2、混合反应器Mixing Reactor

9.3、静态混合器Static Mixer

10.低碳节能

Low Carbon & Energy Saving

10.1CO₂捕集 CO₂ Capture

10.2自回流热泵

Self-reflux Heat Pump

10.3多效精馏 Multi-effect Distillation

10.4精馏系统能量优化 Energy Optimization of Distillation Systems

10.5间避塔 Partition Wall Column

10.6提产增效Capacity Expansion & Efficiency Improvement

11.工程服务Engineering Services

▶▶▶ PART 6.1-Structured Packing Product introduction 规整填料产品介绍

From imitation to transcendence.

从模仿，到超越。

Structured packing is one of our core abilities. Over 30 years of experience in development, design, and production of this type of packing makes us your best partner to find the optimum solution for your application.

规整填料是我们的核心产品之一。我们在规整填料的开发，设计以及生产领域已有30多年的经验，我们将成为您最好的合作伙伴，为您的应用提供最佳的解决方案。

公司正常金属规整填料原材料库存周转超过1000吨现货。

The company's normal metal regular filler raw material inventory turnover exceeds 1000 tons of spot.

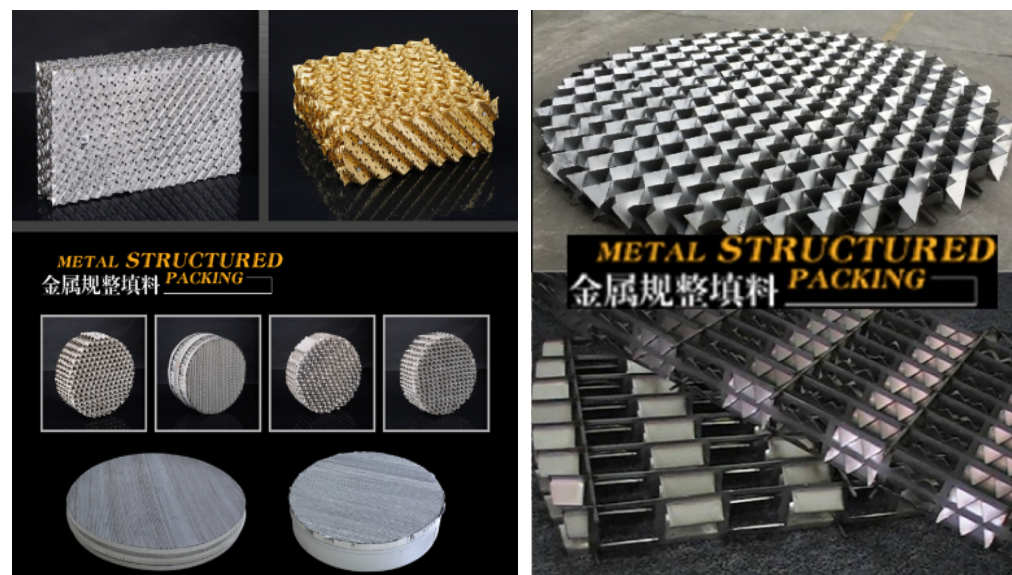
▶▶▶ PART 6.1-Metal Structured Packing

- **孔板填料 (Surface Textured & Perforated Structured Packing)** ▶ 我们可以为您提供最新型的**Plus(P)**高效规整填料。
■ MTMP : 4X/Y、64X/Y、3.5X/Y、100X/Y、125X/Y、2.5X/Y、170X/Y、200X/Y、2X/Y、250X/Y、1.6Y/X、330X/Y、350X/Y、1X/Y、500X/Y、700X/Y、750X/Y、1000X/Y
■ MTMPP : 252Y、352Y、452Y、602Y、752Y
■ MTMPH : 2Y-HC、250Y-HC、1.6Y-HC、350Y-HC、1Y-HC、500X-HC、700X-HC
■ **丝网填料 (Wire Gauze Structured Packing)-MTSP/MTSPP**
■ 250Y、350Y、BX500、BX500PLUS、CY700、CY700PLUS、
■ 1000Y、1500Y、五综网填料等。
■ **格栅填料 (Grid Packing)MTGP/MTFGP**
■ 40Y、64Y、90X、4Y/X、3.5Y/X、3Y/X、2.5Y/X、等同 (EF25A、FG2、FG3、FG4)
■ **压延孔填料 (Expanded Corrugated Structured Packing)**
■ MTRP273、MTRP378、MTRP500、MTRP700
■ **网孔填料(Porous Corrugated Structured Packing)**
■ MTCP483 (1型) 、 MTCP698(2型)

▶ 我们可以为您提供最新型的**Plus(P)**高效规整填料。
We can provide you with the latest PLUS high efficiency structured packing.

▶ 同样也愿意接受客户要求的不同材质、不同厚度的产品。

▶ We are also willing to accept products of different materials and thicknesses as required by customers.



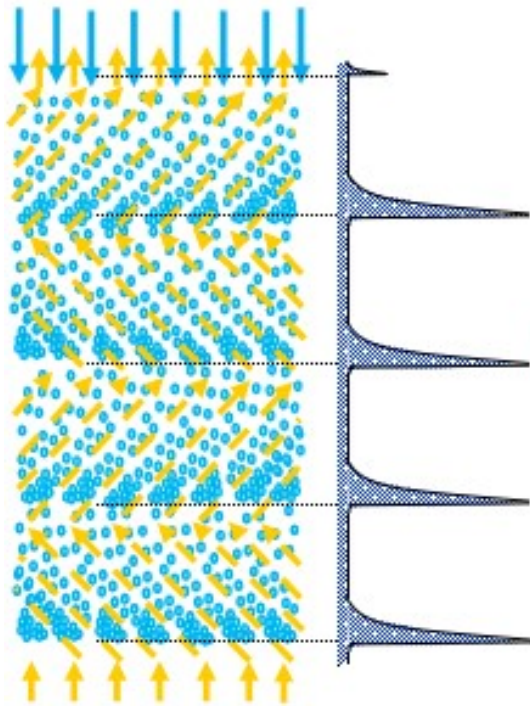
我们可以按客户要求制造相对应的规整填料。
We can customize the structured packing fabrication upon your request.

PART 6.1-Metal Structured Packing-规整Plus填料与普通填料区别

Manufacturing capability - difference between regular Plus packing and Conventional Packing

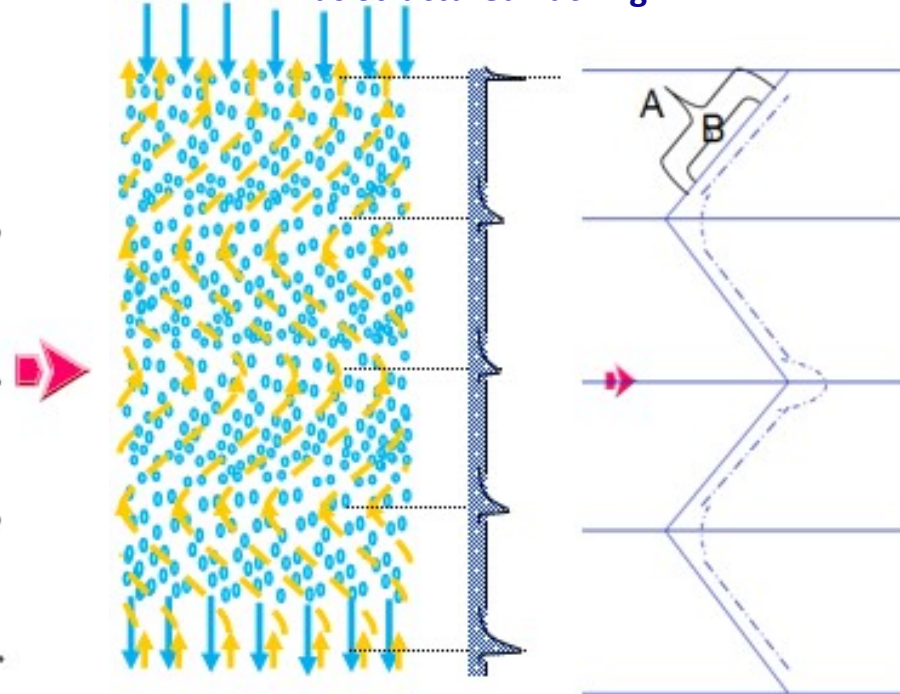
常规填料

Conventional Structured Packing



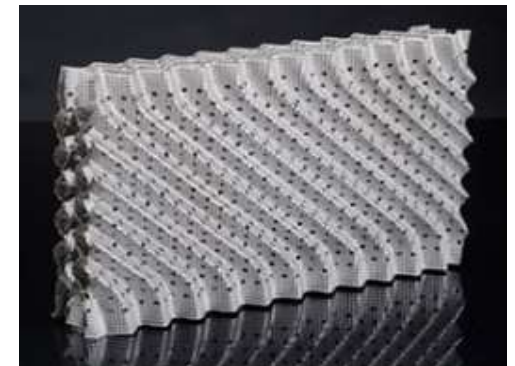
Plus填料

Plus Structured Packing



以A段示意为常规填料
所表示的当量比表面积
Equivalent specific surface area
represented by "A" segment as
conventional structured packing

以B段示意为Plus填料
所表示的当量比表面积
Equivalent specific surface area
represented by "B" segment as
conventional structured packing



Plus填料层间改为平滑过渡结构，持液量明显减小。这样就降低了该处的液泛率，从而大大提高了整个填料床层的处理量。

The smooth flow channels of Plus Structured Packing reduces their hold-up, suppress the local flooding at intersection points, and increase the overall packing capacity.

»» PART 6.2-Random Packing Product introduction散堆填料-产品介绍

Main benefits

Conventional rings for a wide application range
Different geometries and materials available
Ease of replacement and storage
Ideal choice for systems with heavy fouling or corrosion.

主要优点:

具有广泛的应用范围
具有不同几何尺寸和材质
易于更换和存储
非常适合积垢严重或易腐蚀的应用场合.

Main applications

For fractionation, absorption and stripping operations
For gas, refinery and chemical plants

主要应用:

适用于精馏、吸收和汽提的操作
广泛用于天然气、炼油和各类化工厂

公司正常金属散堆填料库存周转超过5000M³。

Our metal random packing inventory turnover is more than 5000m³.

》》 PART 6.2-Metal Random Packing



拉西环
Raschig Ring



鲍尔环
Pall Ring



矩鞍环
Saddle Ring



阶梯环
Cascade M-Ring



纳特环
Nutter Ring



加强鲍尔环
Beaded Pall Ring



扁环
Super Mini Ring



八四内弧环
VSP Ring



哈埃派克
HY-PAK



超级拉西环
Raschig Super Ring

我们可以按客户要求制造相对应的散堆填料。

We are able to customize specific random packing upon client's request.

满足各种不锈钢，合金，热塑性塑料等不同材质的制造需求。

We can supply various stainless steel, alloy, thermoplastic and other materials.

》》》 PART 6.3-制造能力-塔盘系列 Manufacturing Capability – Tower Tray Series

➤ 错流传质塔盘

Staggered Mass Transfer Tray

浮阀塔盘

Float Valve Tray

固阀塔盘

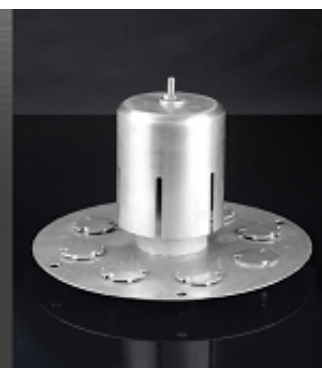
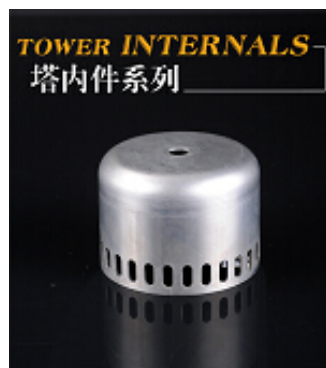
Fixed Valve Tray

筛板塔盘

Sieve Tray

泡罩塔盘

Bubble Cap Tray

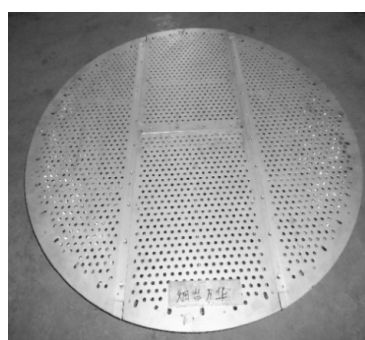
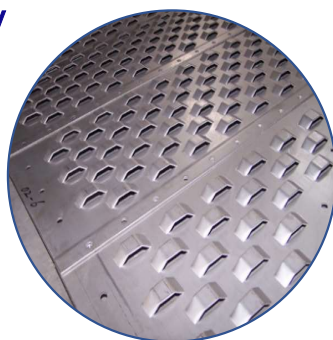


➤ 立体传质塔盘

Stereoscopic Mass Transfer Tray

垂直筛板

Vertical sieve plate



➤ 逆流传质塔盘

Countercurrent Tray

穿流塔盘

Dual Flow Tray

波纹筛板

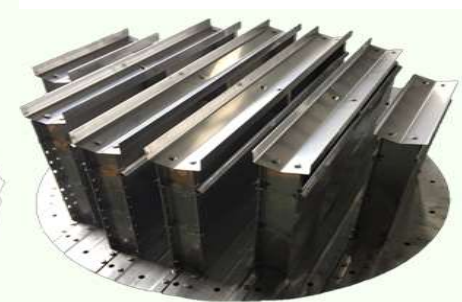
Corrugated Sieve Plate

我们可以提供所有现有常规塔盘的设计与制造。

We can provide the design and manufacture of all existing conventional trays

》》 PART 6.4-制造能力-塔内件系列

- 1—除沫器装置 Mist Eliminator
- 2—填料床层限制器 Bed Limiter
- 3—液体分布器 Liquid Distributor
- 4—液体再分布器 Liquid Redistributor
- 5—液体收集器 Liquid Collector
- 6—气体分布器 Gas Distributor
- 7—高性能填料支撑 High Performance Bed Support
- 8—其他高性能塔内件 Other High Performance Internals
- 9—所有塔内预焊件 All Tower Attachments

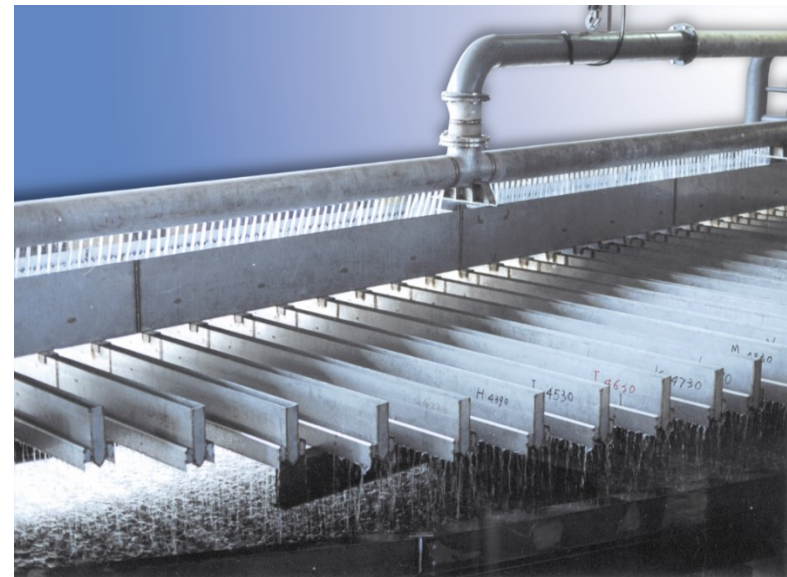


基于强大的技术力量和丰富的工程经验；能根据用户的需要，选择最合适的内件；
提供量身定做的最优化方案；其它类型的塔内件请咨询我们的技术工程师。

Based on the strong technical force and rich engineering experience, we can select the most suitable internals according to the needs of end users, and provide customized and optimized solutions. For other types of tower internals, please consult our technical engineers.

▶▶▶ PART 6.5-制造能力-塔内件测试

- 特性参数：分布器水力学测试平台，可测直径达到17m。
Characteristic parameters: distributor hydraulic test platform, testing diameter up to 17m.
- 水力学测试标准：国标及客户指定标准测试。
Hydraulic test standard: national standard and customer specified test standard.



出厂前的水力学试验（17*17米测试平台） Hydraulic test before leaving factory (17*17 meter test platform)

»» PART -06-Metal Packing

Special service

1、 We can also provide Hastelloy, Monel, pure nickel, pure titanium, duplex stainless steel, super austenite, aluminum, and other alloys.

1、 我们还可以提供哈氏合金、蒙乃尔合金、纯镍、纯钛、双相不锈钢、超级奥氏体、铝、铜等合金。

2、 We are also willing to accept products of different materials and thicknesses as required by customers.

2、 同样也愿意接受客户要求的不同材质、不同厚度的产品。

3、 We can provide paid pickling purification, ultrasonic fully automatic degreasing cleaning, surface sandblasting, carbon steel rust prevention and other treatment services

3、 我们可以提供有偿酸洗纯化、超声波全自动脱脂清洗、表面喷沙、碳钢防锈等处理服务。

4、 We can also design the corresponding specific surface area of ordinary regular filler or Plus regular filler according to the specific surface area required by customers.

4、 我们还可以按客户需要的比表面积填料设计相对应比表面积和普通规整填料或Plus规整填料。

▶▶ PART 07-结晶设备-熔融结晶

熔融结晶

麦斯创是悬浮熔融结晶技术的领先供应商。熔融结晶是根据熔融液中主要组分熔点的差异而进行分离的方法，操作温度低，能在稳定状态下保持连续运行，温度和流量易于测量和控制，纯度和能耗较传统方式更优，是一种节能低碳且环境友好的分离提纯技术。悬浮熔融结晶过程可分为两部分：

结晶：

熔融结晶过程的推动力是熔融液中某一组分的过饱和度或过冷度，其过程分为结晶、发汗、熔融三个阶段。进料进入到结晶器后，与该结晶器外部夹套中通入的冷媒换热并被冷却，在结晶器的内壁就会形成一层过饱和薄膜。结晶器的内壁被刮刀刮动以防止内壁上晶体沉积结壳，从而保持有效的连续操作。局部冷却的液相很快被混合到结晶器内的大体积物料中，使得过饱和度释放给大体积的浆料，从而晶体产生。这提供了稳定和可控的晶体生长环境并生产出大量高纯度晶体，甚至可以发生在杂质较富集的母液中。产生的浆料进入洗涤塔，进行纯晶体和杂质富集母液的完全分离。

分离：

洗涤塔可以高效地从母液中分离纯晶体。用热水（低压蒸汽或其他可用热源）将晶体熔化。纯化后的熔液通过自动控制阀排出系统。进料组成的变化可以被系统内大体积的物料所吸收，并通过简单可靠的仪表实现自动调节。纯化后的产品和母液可以被自动循环回到进料管线，可以实现开车和进料的暂时中断，而不影响稳定操作。

麦斯创悬浮熔融结晶技术，装置布局紧凑，整齐美观，可以远程操作控制，安全可靠，能耗低。可以提供撬装集成装置，降低现场施工成本。

»» PART 07-Crystallization Equipment – Melt Crystallization

Melt Crystallization

MASS TRANSFER is a leading supplier of suspension melt crystallization technology. Melt crystallization achieves separation based on the melting point differences of key components in molten mixtures. It features low operating temperatures and stable continuous running conditions; temperature and flow rates are easy to monitor and control. Compared with conventional separation methods, it delivers superior product purity and lower energy consumption, making it an energy-saving, low-carbon and environmentally friendly purification technology. The suspension melt crystallization process consists of two main stages:

Crystallization Stage

The driving force of melt crystallization is the supersaturation or subcooling of a specific component in the melt. The whole process includes three phases: crystallization, sweating and melting.

Feedstock enters the crystallizer and exchanges heat with cooling medium circulating in the external jacket for cooling, forming a supersaturated liquid film on the inner wall of the crystallizer. Scrapers continuously sweep the inner wall to prevent crystal scaling and ensure steady continuous operation.

Locally cooled liquid is rapidly mixed into the bulk material inside the crystallizer to release supersaturation into the slurry and induce crystal formation. This creates a stable, controllable crystal growth environment for mass production of high-purity crystals, even in impurity-rich mother liquor. The generated slurry flows into the washing column for complete separation of pure crystals and impurity-laden mother liquor.

Separation Stage

The washing column efficiently separates pure crystals from mother liquor. Hot water (heated by low-pressure steam or other available heat sources) melts the crystals. Purified molten product is discharged out of the system via automatic control valves.

Large-volume material inventory inside the system buffers fluctuations in feed composition, with automatic adjustment realized through simple and reliable instruments. Purified product and mother liquor can be automatically recycled back to the feed pipeline. Temporary startup pauses or feed interruptions will not disrupt stable operation.

MASS TRANSFER suspension melt crystallization unit boasts compact, neat and attractive layout, remote operation capability, reliable safety performance and low energy consumption. Skid-mounted integrated units are available to reduce on-site construction costs.

▶▶▶ PART 07-结晶设备-熔融结晶 Melt Crystallization

1、特点和优势:产品纯度高,纯度可以达到色谱纯度99.99%以上

High product purity: The purity can reach over 99.99% chromatographic grade.

2、操作要求低:一般是常压、低温操作,操作简单安全

Low operation requirements: Operates under atmospheric pressure and low temperature generally, featuring simple and safe operation.

3、适用特种物系:用熔融结晶能分离精馏极难分离的同分异构体、手性物质等

Applicable to special systems: It can separate isomers, chiral substances and other components that are extremely difficult to separate by rectification.

4、无需溶剂:结晶过程不需要加入塔器溶剂,避免杂质增多及环境污染

Solvent-free process: No additional tower solvent is required in crystallization, avoiding extra impurity generation and environmental pollution.

5、节约投资:对设备无过高要求,可以降低维护成本

Cost-effective investment: Low demanding on equipment, cutting maintenance costs.

6、节能环保:一般熔融结晶的能耗为精馏的10%-30%

Energy-saving and eco-friendly: The energy consumption of melt crystallization is merely 10%–30% of that of rectification.

»» PART 8.1/2-换热设备-锤头式冷凝器/自循环高压锅炉

Hammerhead Condenser / Self-Circulating High-Pressure Boiler

锤头式冷凝器:是高负荷、低压降的冷凝器，适用于高真空状态下，大量气相需要冷凝的工艺要求。冷凝器安装在精馏塔顶部，节省了设备的安装空间。独特的列管排布方式和液体排出流道，使锤头式冷凝器的压降可以做到1mbar以下，同时可以满足大功率冷凝的要求。**Hammerhead Condenser:**

The hammerhead condenser is a high-load, low-pressure-drop condenser designed for processes requiring large-volume vapor condensation under high vacuum conditions. Installed on top of the distillation column, it saves overall equipment layout space. Featuring a unique tube arrangement and liquid discharge channels, this condenser achieves a pressure drop below 1 mbar while meeting high-capacity condensation demands.

自循环高压锅炉:用气终端的换热器位置处于锅炉的上方，冷凝水可以通过重力作用，自行回流到锅炉中；用汽终端的换热器位置，处于锅炉的下方或同一平面，则需要一台小泵来实现冷凝水的回流。**Self-Circulating High-Pressure Boiler:**If the heat exchanger at the steam consumption end is installed above the boiler, condensate can flow back to the boiler by gravity. If the heat exchanger is positioned below the boiler or on the same horizontal level, a small pump is required to recycle condensate.

特点和优势:无锅筒设计，可以提供更高的压力，安全卫生，无产品污染风险，节能环保，管路系统简单，无需调节阀/疏水阀等相关阀件，终端投资节约，运行费用省，操作简便。**Features & Advantages**

Adopts a drum-free design to withstand higher operating pressures. Safe, hygienic and free from product contamination risks. Energy-saving and eco-friendly with simplified piping systems. No regulating valves, steam traps or other auxiliary valves are needed, cutting initial terminal investment and operational costs while enabling easy operation.

»» PART 8.3-换热设备-降膜再沸器/蒸发器

降膜再沸器/蒸发器

麦斯创提供用于蒸发、浓缩或溶剂回收的降膜蒸发器（再沸器）。

降膜蒸发是将料液自降膜蒸发器的上封头进料口加入，料液经过液体分布器和布膜器，均匀分配到每一根换热管内，在重力和真空诱导以及气流的作用下，形成均匀膜状液体自上而下流动。用在精馏系统中，通常气相和未气化的液体通过底部封头返回到精馏塔内。

降膜蒸发器特别适用于低粘度和低污垢系数的热敏性物质。由于液体在换热管中成薄膜状流动，降膜蒸发器的传热系数较传统的管壳式换热器要大很多，所需的换热面积小，所需的能耗小，还有配合使用自回热技术，多塔配合使用多效蒸发技术，MVR技术等等，对于能耗降低很大的作用。

麦斯创专有的布膜器插入每根列管中。每个布膜器的开槽和相应的开槽角度都经过精心设计，从而在换热管内产生切线流。在最优的静压头的作用下，布膜器能够保证在换热管壁上形成均匀，稳定的液膜（预期的膜厚度）。关键点在于能在管板上保持最优的液体静压头。下插的布膜头能够保证细颗粒物料不在管板与管壁之间的死角堆积。布膜口在液位以下，对安装精度有一定的容忍度。

»» PART 8.3-Heat Exchange Equipment – Falling Film Reboiler / Evaporator

Falling Film Reboiler / Evaporator

MASS TRANSFER supplies falling film evaporators (reboilers) for evaporation, concentration and solvent recovery processes. In falling film evaporation, feed liquid enters through the inlet on the top head of the falling film evaporator. The liquid passes through liquid distributors and film spreaders to be evenly distributed into each heat exchange tube. Driven by gravity, vacuum suction and gas flow, the liquid forms a uniform thin film flowing downward along the tube wall. When applied in rectification systems, vapor and unvaporized liquid are generally returned to the distillation column via the bottom head. Falling film evaporators are particularly suitable for heat-sensitive materials with low viscosity and low fouling factors. As the liquid flows in thin films inside heat exchange tubes, the heat transfer coefficient of falling film evaporators is far higher than that of conventional shell-and-tube heat exchangers. This reduces the required heat transfer area and energy consumption. Combined with self-heat recovery, multi-column multi-effect evaporation and MVR technologies, such equipment delivers remarkable energy savings.

MASS TRANSFER proprietary film spreaders are inserted into each tube. The slots and corresponding slot angles of every spreader are precisely engineered to generate tangential flow inside heat exchange tubes. Under optimal static liquid head, the spreaders can form a uniform and stable liquid film of the designed thickness on tube walls. Maintaining the ideal static liquid head on the tube sheet is critical to performance.

The downward-inserted spreading heads prevent fine solid particles from accumulating in dead zones between the tube sheet and tube walls. The liquid outlet slots are submerged below the liquid level, offering a certain tolerance against installation alignment deviations.

▶▶ PART 9.1-聚合设备-聚合物脱挥

聚合物脱挥

聚合是单体合成高分子的反应，聚合反应后，会有未反应的单体，以及其它溶剂和低聚物杂质，这些通过脱挥系统除去。

脱挥工艺单元是由一个内置静态混合器的预热器和真空脱挥罐组成。

预热器内置混合单元结构，混合和换热同时进行，减少了停留时间，使得聚合物分子量分布更窄，性能更稳定。之后进入真空脱挥罐，物料闪蒸挥发，聚合物中的单体、低聚物和溶剂等挥发物与高聚物分离。然后进入精馏塔中，挥发物通过精馏分离，溶剂和单体返回到反应系统，低聚物不再使用。

麦斯创的脱挥工艺可以使聚合物里的残留物降到极低，能耗也极低，大多数聚合物都可以通过真空脱挥系统除去挥发物杂质，达到品质要求和环保要求。

特点和优势

- 残留量（残留的挥发性有机化合物）非常少
- 由于通过有效的传热设备避免了提高工艺温度和热点，产品免遭破坏
- 由于工艺中的剪切力低，是敏感产品的理想选择
- 由于没有重型旋转设备而降低了能量消耗
- 减少了机械维护
- 由于独特工艺的概念，节约了资金成本

»» PART 9.1-聚合设备-聚合物脱挥Polymer Devolatilization

Polymer Devolatilization

Polymerization is the reaction of monomers to synthesize macromolecules. After polymerization, unreacted monomers, residual solvents and oligomer impurities remain in the product, which are removed via the devolatilization system.

The devolatilization process unit consists of a preheater fitted with internal static mixers and a vacuum devolatilization tank. Equipped with built-in mixing internals, the preheater realizes mixing and heat transfer simultaneously, shortening material residence time, narrowing the polymer molecular weight distribution and stabilizing product performance. The material then flows into the vacuum devolatilization tank for flash vaporization, separating volatiles (monomers, oligomers, solvents) from the high-molecular polymer. The volatiles are sent to a distillation column for rectification separation: solvents and monomers are recycled back to the reaction system, while oligomers are discarded.

MASS TRANSFER devolatilization process can reduce residual volatiles in polymers to an extremely low level with minimal energy consumption. Vacuum devolatilization systems can remove volatile impurities from most types of polymers to meet product quality and environmental protection standards.

Features & Advantages

Core Benefits

Extremely low residual volatile organic compounds (VOCs)

Effective heat transfer equipment eliminates excessive process temperature rise and hot spots, preventing polymer degradation

Low shear force during processing, making it ideal for sensitive materials

No heavy rotating equipment, cutting energy consumption

Reduced mechanical maintenance workload

Unique process design lowers capital investment costs

»» PART 9.2-聚合设备-混合反应器

混合反应器

混合反应器由一系列特殊配置的管束构成。这些管束相互垂直排列，使用高度填充的换热面积，以加强界面的径向混合。水、蒸汽、导热油或其他特殊冷却介质可以用作传热介质。每个管束可设计为具有不同的混合和传热效果的特性，以满足最严格的工艺要求。

特点和优势

- 出色的平推流特性和极窄的停留时间分布
- 因反应的高驱动力而形成的明确定义的混合和较小的反应量
- 低剪切力，可对产品进行温和处理
- 无过热点和无死区
- 有关操作和操作下限的灵活性
- 快速产品转换和快速转变工艺条件
- 设计中考虑到安全性和环境问题
- 无转动件，维护成本极低

»» PART 9.2-聚合设备-混合反应器 Mixing Reactor

Mixing Reactor

The mixing reactor consists of a series of specially configured tube bundles arranged perpendicularly to one another. The densely packed heat exchange surface area enhances radial mixing at fluid interfaces. Water, steam, thermal oil or other special cooling media can be adopted as heat transfer fluids. Each individual tube bundle can be engineered with customized mixing and heat transfer performance to meet the most stringent process requirements.

Features & Advantages

- Excellent plug flow performance and extremely narrow residence time distribution

- Well-defined mixing and small reaction volume enabled by high reaction driving force

- Low shear force for gentle product treatment

- Free of hot spots and dead zones

- Flexible operation range with wide turndown capability

- Fast product grade switching and quick adjustment of process conditions

- Safety and environmental protection fully considered in design

- No rotating parts, resulting in extremely low maintenance costs

»» PART 9.3-聚合设备-静态混合器 Static Mixer

静态混合器是一种安装在管道内部，流体流过实现混合、分散效果的静态混合设备。在非常短的距离内，可靠而有效地混合液体、添加剂和气体。开放式结构不堵塞，用于高粘度物料的混合和分散、气液接触、气体洗涤或湍流混合的应用场合。麦斯创拥有静态混合器的系列产品，具有简安装、易清洗、低维护，压降低的特点。

A static mixer is a stationary mixing device installed inside pipelines to achieve fluid mixing and dispersion as media flows through it. It reliably and efficiently mixes liquids, additives and gases within an extremely short flow length.

Its open structure prevents clogging, making it suitable for mixing and dispersion of high-viscosity materials, gas-liquid contact, gas scrubbing and turbulent mixing applications.

Maxtrong supplies a full range of static mixers featuring easy installation, convenient cleaning, low maintenance and low pressure drop.

»» PART 10-工艺技术-低碳节能Low Carbon & Energy Saving

低碳节能Low Carbon & Energy Saving

10.1 CO₂捕集 CO₂ Capture

10.2 自回流热泵 Self-reflux Heat Pump

10.3 多效精馏 Multi-effect Distillation

10.4 精馏系统能量优化 Energy Optimization of Distillation Systems

10.5 间避塔 Partition Wall Column

10.6 提产增效 Capacity Expansion & Efficiency Improvement

▶▶▶ PART 10.1/2-低碳节能-CO₂捕集/自回流热泵

CO₂捕集

为实现全球温升1.5℃以下的气候目标，需要减少化石燃料的使用和温室气体排放，碳捕集技术已得到广泛关注。

技术应用

精碳捕集，有以单乙醇胺（MEA）溶液作为溶剂的化学吸收法，也有以聚乙二醇为溶剂的物理吸收法，只要降压即可解析出CO₂，可以降低系统能耗。

技术优势：溶解能力更好，更不易挥发的吸收液

自回流热泵

热泵，是一种能使热量从低温物体转移到高温物体的能量利用装置。

技术应用：热泵，是一种能使热量从低温物体转移到高温物体的能量利用装置。

原理就是利用压缩机对媒介压缩升温作为热源提供热量，也就是靠压缩机做功提升低温位热源的品位至高温位，从而达到节省加热能耗的目的。

技术优势：减少大量蒸汽消耗的同时，还能降低循环水用量；投资回收期短，经济效益显著。

»» PART 10.1/2-CO₂ Capture / Self-Reflux Heat Pump

CO₂ Capture

To achieve the climate target of limiting global temperature rise below 1.5°C, reductions in fossil fuel consumption and greenhouse gas emissions are required, making carbon capture technology widely recognized.

Technical Applications

Refined carbon capture adopts two mainstream absorption processes: chemical absorption using monoethanol amine (MEA) solution as the solvent, and physical absorption with polyethylene glycol as the solvent. CO₂ can be desorbed simply by pressure reduction, effectively cutting system energy consumption.

Technical Advantages

Absorbent liquid features superior dissolving capacity and low volatility.

Self-Reflux Heat Pump

A heat pump is an energy utilization device that transfers heat from low-temperature media to high-temperature media.

Technical Principle

A compressor compresses the working medium to raise its temperature and generate heat supply. In short, the compressor elevates low-grade heat sources to high-grade heat through mechanical work, so as to reduce heating energy consumption.

Technical Advantages

Greatly cuts steam consumption and circulating water demand; short payback period with remarkable economic benefits.

»» PART 10.3-低碳节能-多效精馏

多效精馏

多效精馏，由多个不同操作压力的塔串联而成。由于待分离物系的沸点随着压力升高而增大，增大操作压力精馏塔所需的加热能耗也相应增大。调节操作压力，使得高压塔塔顶的温度高于相邻低压塔的温度，这样高压塔顶物流与低压塔釜的物流之间换热，高压塔塔顶蒸汽作为热源给低压塔的再沸器加热。经过换热高压塔的汽化潜热和低压塔的冷凝潜热都被系统利用，不需要外加的制冷或制热系统。

技术应用

多效精馏，由多个不同操作压力的塔串联而成。由于待分离物系的沸点随着压力升高而增大，增大操作压力精馏塔所需的加热能耗也相应增大。调节操作压力，使得高压塔塔顶的温度高于相邻低压塔的温度，这样高压塔顶物流与低压塔釜的物流之间换热，高压塔塔顶蒸汽作为热源给低压塔的再沸器加热。经过换热高压塔的汽化潜热和低压塔的冷凝潜热都被系统利用，不需要外加的制冷或制热系统。

技术优势，多效精馏所需的热量与单塔相比可以减少约 30~40%。

»» PART 10.3-低碳节能-多效精馏Multi-Effect Distillation

Multi-Effect Distillation

Multi-effect distillation consists of multiple distillation columns connected in series with different operating pressures. The boiling point of the mixture to be separated rises with increasing pressure, which in turn raises the heating energy consumption of columns operated at higher pressure.

By adjusting operating pressures, the overhead temperature of a high-pressure column can be set higher than the bottom temperature of its adjacent low-pressure column. Heat exchange then takes place between the overhead stream of the high-pressure column and the bottom stream of the low-pressure column; the overhead vapor from the high-pressure column serves as the heat source to heat the reboiler of the low-pressure column.

Through this heat integration, the latent heat of vaporization from the high-pressure column and latent heat of condensation from the low-pressure column are fully recovered and reused within the system, eliminating the need for external heating or cooling utilities.

Technical Application

Multi-effect distillation adopts a series arrangement of columns with varied operating pressures. As the boiling point of feed mixtures rises along with pressure, higher operating pressure leads to higher heating load. Pressure tuning enables the overhead vapor of the high-pressure column to transfer heat to the bottom reboiler of the low-pressure column. The latent heat from vaporization and condensation is recycled internally, removing the demand for extra heating or cooling equipment.

Technical Advantages

Compared with single-column distillation, multi-effect distillation cuts heat consumption by roughly 30% to 40%.

»» PART 10.4- 低碳节能-精馏系统能量优化

精馏系统能量优化

系统能量优化是基于过程系统能量结构模型，以流程模拟为工具进行节能优化的一种技术。是将装置、公用工程等作为过程系统综合考量，并在此基础上进行系统优化

技术应用

精馏系统能量优化，系统能量优化是基于过程系统能量结构模型，以流程模拟为工具进行节能优化的一种技术。是将装置、公用工程等作为过程系统综合考量，并在此基础上进行系统优化，以获取系统最优解，即系统最优节能策略。

技术优势，将夹点技术、精馏塔优化、热耦合技术、设备优化以及系统压力降变化、泵效率变化、控制回路、能量利用率等综合考量，选取全局最优节能策略，进行节能优化。

»» PART 10.4-精馏系统能量优化Energy Optimization of Distillation Systems

Energy Optimization of Distillation Systems

System energy optimization is an energy-saving optimization technology based on the energy structure model of process systems and supported by process simulation tools. It takes process units and utility systems in to comprehensive consideration as an integrated process system to carry out overall optimization.

Technology Application

Energy optimization for distillation systems relies on the energy structure model of process systems with process simulation as the core tool for energy saving optimization. It comprehensively evaluates all process units and utility facilities within the whole process system to conduct systematic optimization and derive the global optimal solution, namely the optimal energy-saving strategy for the entire system.

Technical Advantages

This technology integrates pinch technology, distillation column optimization, thermal coupling technology and equipment optimization, while comprehensively evaluating system pressure drop variation, pump efficiency fluctuation, control loops and energy utilization efficiency. It selects the globally optimal energy-saving strategy to implement targeted energy-saving optimization.



PART 10.5-低碳节能-隔板塔Partition Wall Column

隔板塔，又叫隔壁塔或间壁塔，是将两个（或多个）精馏塔集成到一个塔壳，实现三元（及以上）物系分离的精馏塔。**Partition Wall Column** Also known as dividing wall column, it integrates two or more distillation columns within a single column shell to separate ternary and multi-component mixtures.

技术应用:隔板塔，又叫隔壁塔或间壁塔，是将两个（或多个）精馏塔集成到一个塔壳，实现三元（及以上）物系分离的精馏塔。**Technical Application** The partition wall column (alternatively called dividing wall column) combines two or more distillation sections into one shell for separating ternary and higher-component systems.

技术优势，比传统精馏塔系统节能约30%，节省设备投资30%，还能节约空间，隔板塔相当于完全热耦合塔，但是在降低设备投资方面优于完全热耦合塔。**Technical Advantages** It delivers approximately 30% lower energy consumption and 30% less capital investment compared with conventional distillation sequences, while occupying a smaller footprint. As a fully thermally coupled distillation unit, it achieves better cost savings on equipment than conventional full thermal coupling configurations.

»» PART 10.6-低碳节能-提产增效

提产增效: 通过设备改造、流程模拟、操作优化、装置标定等技术发掘装置潜能，以技改的形式实现装置脱瓶颈，最终达到提产增效的目的。 技术优势，运用先进流程模拟软件、国际一流物性数据库，通过世界第一梯队的塔内件和设计显著提升装置处理能力。 **Capacity Expansion & Efficiency Improvement**

Capacity expansion and efficiency enhancement unlock the full potential of production units through equipment retrofits, process simulation, operation optimization, and unit performance calibration. Bottlenecks are eliminated via technical revamps to ultimately boost output and cut operating costs.

技术应用: 提产增效，通过设备改造、流程模拟、操作优化、装置标定等技术发掘装置潜能，以技改的形式实现装置脱瓶颈，最终达到提产增效的目的。 **Technical Application**

To realize capacity expansion and efficiency improvement, we tap the latent capacity of the unit via equipment modification, process simulation, operation optimization and unit calibration. Process bottlenecks are removed through technical retrofits to achieve higher production capacity and better economic efficiency.

技术优势: 运用先进流程模拟软件、国际一流物性数据库，通过世界第一梯队的塔内件和设计显著提升装置处理能力。 **Technical Advantages**

Adopts advanced process simulation software and world-class physical property databases. Combined with top-tier column internals and proprietary design solutions, the unit's processing capacity can be significantly upgraded.

»» PART 11-工程服务

工程服务

麦斯创可以为客户提供各方面的工程服务。

根据麦斯创**多年的经验**。客户需要的服务主要有：售前的咨询服务，核心设备的安装指导和开车指导相关服务。

售前咨询服务：

装置运行不好，不达指标的。麦斯创提供现场检查等一系列的服务，找出不达标的原因，提出方案，协助客户完成技改。

装置产能不足，需要提高产能的。麦斯创工程师去现场检查后给出具体的扩产方案，利旧或者更换，给出性价比最高的方案，达到扩产目标。

新建项目，需要技术交流的。根据客户的要求，提供需要的设计方案及工程服务，完成项目建设。

核心设备安装指导：

麦斯创为客户提供关键设备的安装指导，确保客户正确安装，以能达到最好的生产效果，避免因为安装的原因导致设备无法发挥最好的性能。

»» PART 11-工程服务Engineering Services

Engineering Services

MASS TRANSFER provides comprehensive full-range engineering services for clients.

Backed by years of industrial experience, our core service offerings cover pre-sales technical consultation, on-site installation guidance for core equipment, and commissioning support.

Pre-Sales Technical Consultation

Underperforming units failing to meet design specifications

MASS TRANSFER delivers a full set of on-site inspection services to identify root causes of off-spec operation, propose optimization solutions, and assist clients with technical retrofits.

Units with insufficient capacity requiring throughput expansion

Our engineers conduct on-site surveys and deliver customized capacity expansion plans. We propose cost-effective solutions combining equipment reuse and replacement to achieve target production capacity.

New construction projects requiring technical communication

We deliver customized design packages and full engineering services in line with client requirements to complete full project implementation.

Installation Guidance for Core Equipment

MASS TRANSFER provides professional on-site installation supervision for key equipment. This ensures standardized correct installation to deliver optimal production performance and prevent performance loss caused by improper assembly.

»» PART 11-工程服务Engineering Services

工程服务Engineering Services

开车指导服务: Commissioning Guidance Service

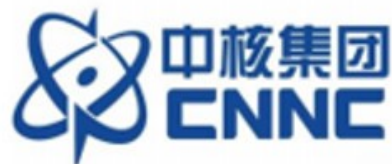
针对麦斯创提供工艺包的客户，会提供开车相关服务，包括试开车及开车前的设备检查，开车后的优化服务等一系列的工程服务；针对只采购设备而开车未达工艺指标的客户，麦斯创会根据经验，提出可能存在的问题以及解决方案。For customers who purchase process packages from **MASS TRANSFER**, we provide full commissioning-related services, including pre-commissioning equipment inspection, trial startup, and post-commissioning process optimization.

For customers who only purchase equipment yet fail to reach process indicators after startup, **MASS TRANSFER** will identify potential problems and deliver corresponding solutions based on abundant industrial experience.

EPC总承包服务: EPC General Contracting Service

麦斯创拥有丰富的项目管理经验。如果客户需要，麦斯创还可以提供一整套的EPC总承包服务。包括分离工艺开发、基础工艺设计和详细设计、基础工程设计和详细设计、关键设备设计及制造、关键设备安装指导、装置试车指导、开车指导等各个环节。**MASS TRANSFER** boasts extensive project management experience. Upon customer demand, we can deliver complete EPC general contracting services covering all phases: separation process development, basic and detailed process engineering design, design and fabrication of core equipment, on-site installation guidance for key equipment, unit trial run supervision, and full startup guidance.

»» PART 12-公司业绩Company Performance





**THANKS
FOR WATCHING!**

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