

TewinCryo®

Zhejiang TewinCryo Liquefy Equipment Co., Ltd.

Industrial Gas Separation Plants H_2 Production Units
CCUS Systems Optimized Solutions and Equipment Provider

Company Profile

TewinCryo®

History

Over **20 years** of experience in R&D, design, sales, manufacturing and assembly of plants for industrial gas separation, liquefaction and exhaust gas recovery.

Locations

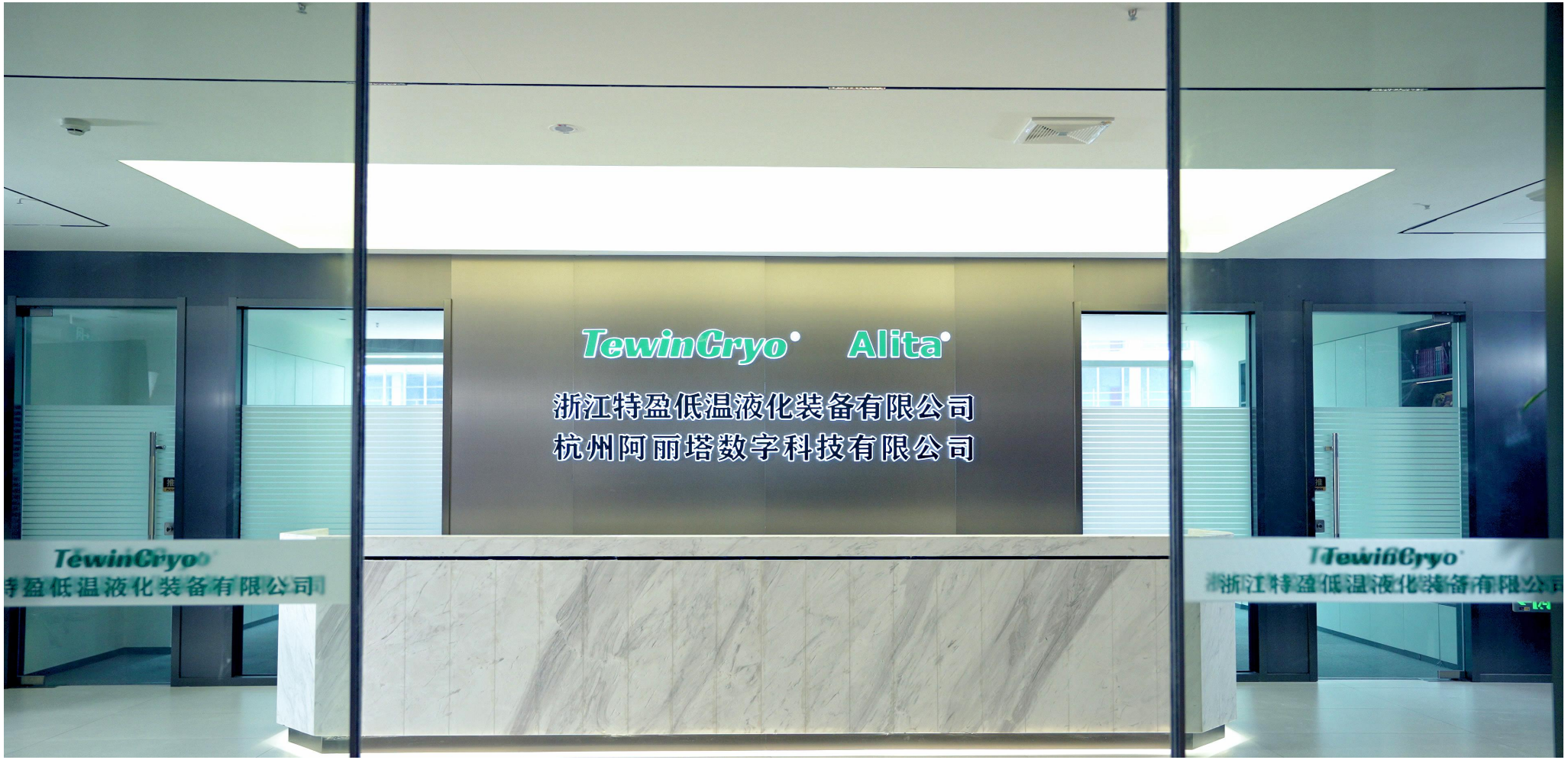
Our HQ and engineering center is in Hangzhou, Zhejiang China, the habor of China‘s ASU industry.

Our factory is located in Quzhou City, Zhejiang China, with a floor space of **48,000 m^2** , near Qujiang riverport.



Hangzhou Office

TewinCryo®



Our HQ and Engineering Center in Hangzhou

Hangzhou Office

TewinCryo®









Quzhou Workshop

TewinCryo®



Quzhou Workshop

Quzhou Workshop

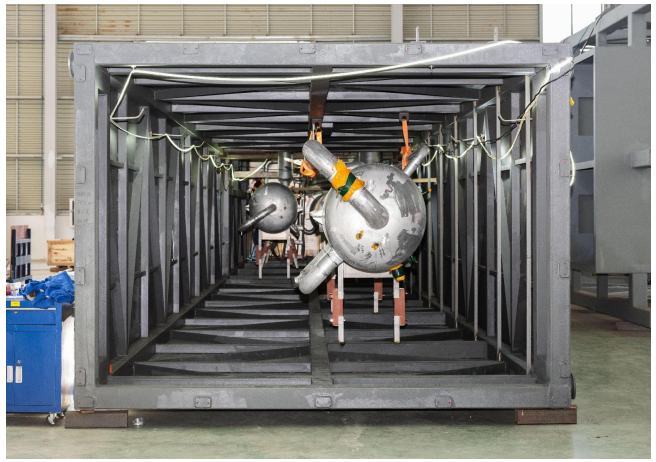
TewinCryo®



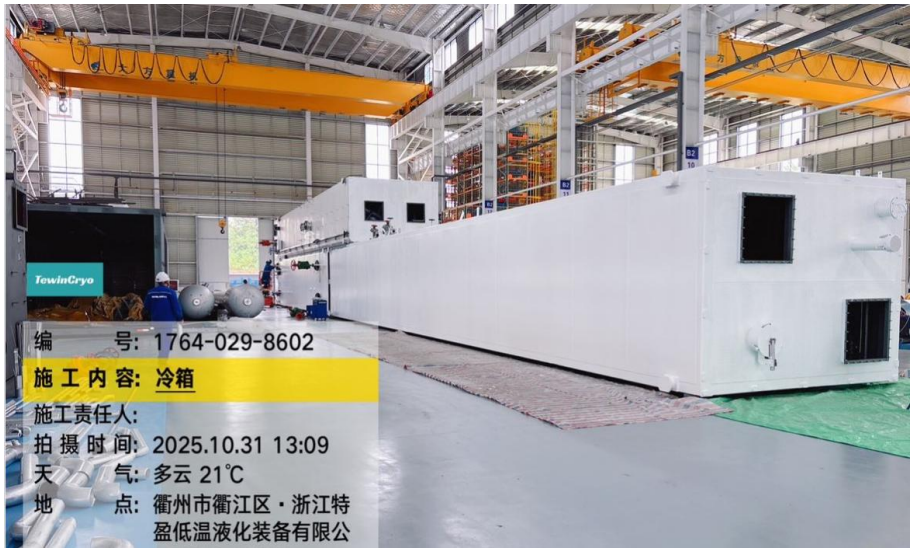


Quzhou Workshop

TewinCryo®



Coldbox



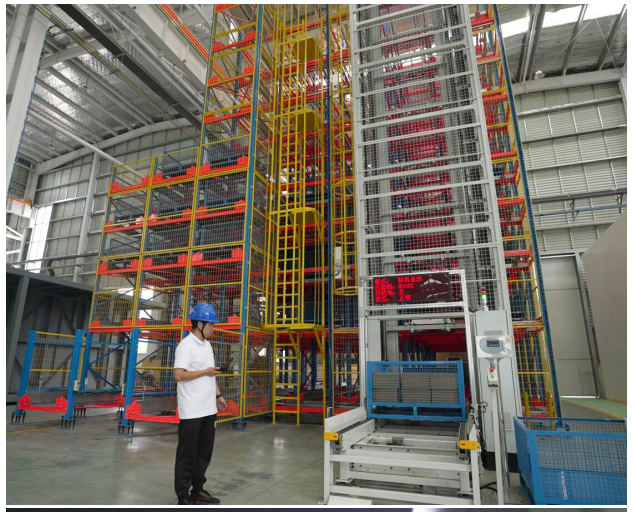
Rectification column



Quzhou Workshop

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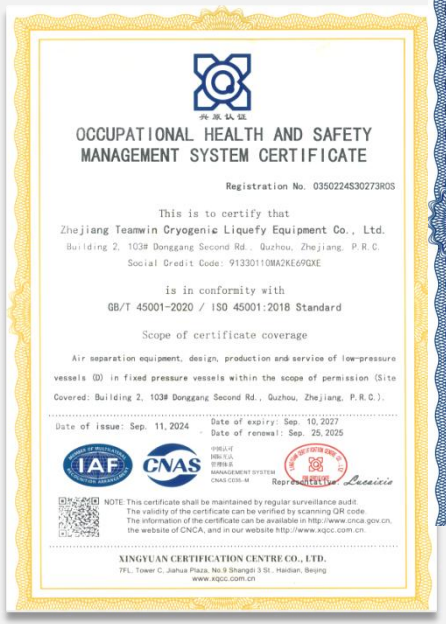






Qualification & Certificates

TewinCryo®



OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM CERTIFICATE

Registration No. 0350224S30273ROS

This is to certify that

Zhejiang Teamwin Cryogenic Liquefy Equipment Co., Ltd.

Building 2, 103# Donggang Second Rd., Quzhou, Zhejiang, P.R.C.

Social Credit Code: 9133011 0MA2KE69GXE

is in conformity with

GB/T 45001-2020 / ISO 45001:2018 Standard

Scope of certificate coverage

Air separation equipment, design, production and service of low-pressure vessels (D) in fixed pressure vessels within the scope of permission (Site Covered: Building 2, 103# Donggang Second Rd., Quzhou, Zhejiang, P.R.C.).

Date of issue: Sep. 11, 2024 Date of expiry: Sep. 10, 2027 Date of renewal: Sep. 25, 2025

NOTE: This certificate shall be maintained by regular surveillance audit. The validity of the certificate can be verified by scanning QR code. The information of the certificate can be available in http://www.cnca.gov.cn, the website of CNCA, and in our website http://www.xqcc.com.cn.

XINGYUAN CERTIFICATION CENTRE CO., LTD.

7FL, Tower C, Jiahua Plaza, No.9 Shangdi 3 St., Haidian, Beijing

www.xqcc.com.cn



QUALITY MANAGEMENT SYSTEM CERTIFICATE

Registration No. 0350224Q30473ROS

This is to certify that

Zhejiang Teamwin Cryogenic Liquefy Equipment Co., Ltd.

Building 2, 103# Donggang Second Rd., Quzhou, Zhejiang, P.R.C.

Social Credit Code: 9133011 0MA2KE69GXE

is in conformity with

GB/T 19001-2016 / ISO 9001:2015 Standard

Scope of certificate coverage

Air separation equipment, design, production and service of low-pressure vessels (D) in fixed pressure vessels within the scope of permission (Site Covered: Building 2, 103# Donggang Second Rd., Quzhou, Zhejiang, P.R.C.).

Date of issue: Sep. 11, 2024 Date of expiry: Sep. 10, 2027 Date of renewal: Sep. 25, 2025

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www.xqcc.com.cn



ENVIRONMENTAL MANAGEMENT SYSTEM CERTIFICATE

Registration No. 0350224E20319ROS

This is to certify that

Zhejiang Teamwin Cryogenic Liquefy Equipment Co., Ltd.

Building 2, 103# Donggang Second Rd., Quzhou, Zhejiang, P.R.C.

Social Credit Code: 9133011 0MA2KE69GXE

is in conformity with

GB/T 24001-2016 / ISO 14001:2015 Standard

Scope of certificate coverage

Air separation equipment, design, production and service of low-pressure vessels (D) in fixed pressure vessels within the scope of permission (Site Covered: Building 2, 103# Donggang Second Rd., Quzhou, Zhejiang, P.R.C.).

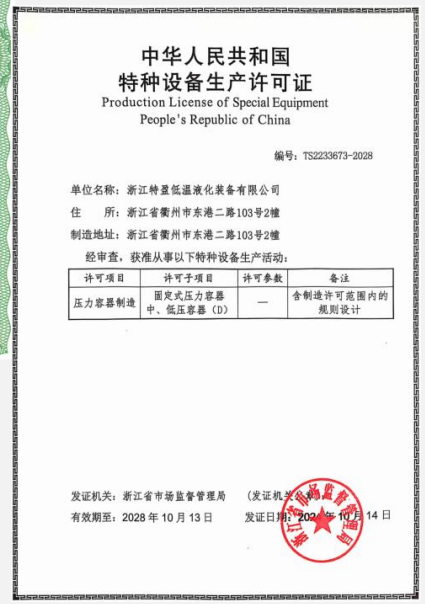
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www.xqcc.com.cn



中华人民共和国
特种设备生产许可证
Production License of Special Equipment
People's Republic of China

编号：TS2233673-2028

单位名称：浙江特显低温液化装备有限公司

住　　所：浙江省衢州市东港二路103号2幢

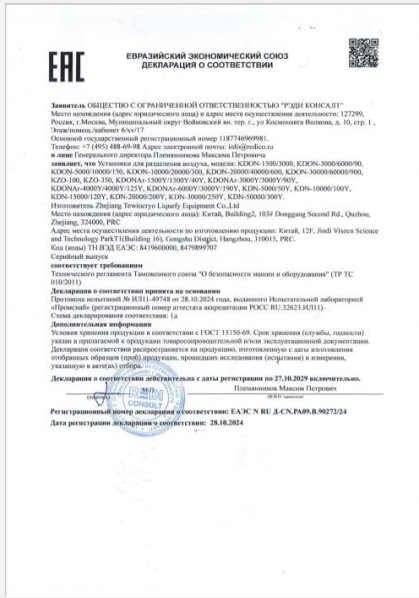
制造地址：浙江省衢州市东港二路103号2幢

经审查，获准从事以下特种设备生产活动：

许可项目	许可子项目	许可参数	备注
压力容器制造	固定式压力容器中、低压容器（D）	—	含制造许可范围内的规则设计

发证机关：浙江省市场监督管理局　　（发证机关盖章）

有效期至：2028 年 10 月 13 日　　发证日期：2024 年 10 月 14 日



EAC

ЕВРАЗИЙСКИЙ ЭКОНОМИЧЕСКИЙ СОЮЗ
ДЕКЛАРАЦИЯ О СООТВЕТСТВИИ

Заявитель ОБЩЕСТВО С ОГРАНИЧЕННОЙ ОТВЕТСТВЕННОСТЬЮ "РЭДИ КОНСАЛТ"
Место нахождения (адрес юридического лица) и адрес места осуществления деятельности: 127299, Россия, г.Москва, Муниципальный округ Войковский вн. тер. г., ул Космонавта Волкова, д. 10, стр. 1 , Этаж/помещ./кабинет 6/xv/17
Основной государственный регистрационный номер 1187746969981
Телефон: +7 (495) 488-69-98 Адрес электронной почты: info@redico.ru
в лице Генерального директора Племянникова Максима Петровича
заявляет, что Установки для разделения воздуха, модели: KDON-1500/3000, KDON-3000/6000/90, KDON-5000/10000/150, KDON-10000/20000/300, KDON-20000/40000/600, KDON-30000/60000/900, KZO-100, KZO-350, KDONAr-1500Y/1500Y/40Y, KDONAr-3000Y/3000Y/90Y, KDONAr-4000Y/4000Y/125Y, KDONAr-6000Y/3000Y/190Y, KDN-5000/50Y, KDN-10000/100Y, KDN-15000/120Y, KDN-20000/200Y, KDN-30000/250Y, KDN-50000/300Y.
Изготовитель Zhejiang Tewincryo Liquefy Equipment Co.,Ltd
Место нахождения (адрес юридического лица): Kurali, Building2, 103# Donggang Second Rd., Quzhou, Zhejiang, 324000, PRC
Адрес места осуществления деятельности по изготовлению продукции: Kurali, 12F, Jindi Viseen Science and Technology Park T1(Building 16), Gongshu Distgct, Hangzhou, 310015, PRC.
Код (коды) ТН ВЭД ЕАЭС: 8419600000, 8479899707
Серийный выпуск
соответствует требованиям
Технического регламента Таможенного союза "О безопасности машин и оборудования" (ТР ТС 010/2011)
Декларация о соответствии принята на основании
Протокола испытаний № ИЛ11-49748 от 28.10.2024 года, выданного Испытательной лабораторией «Промсаб» (регистрационный номер аттестата аккредитации РОСС RU.32623.ИЛ11).
Схема декларирования соответствия: 1a
Дополнительная информация
Условия хранения продукции в соответствии с ГОСТ 15150-69. Срок хранения (службы, годности) указан в прилагаемой к продукции товаросопроводительной и/или эксплуатационной документации.
Декларация соответствия распространяется на продукцию, изготовленную с даты изготовления отобранных образцов (проб) продукции, проведших исследования (испытания) и измерения, указанную в акте(ах) отбора.
Декларация о соответствии действительна с даты регистрации по 27.10.2029 включительно.
Племянников Максим Петрович
(Ф.И.О. заявителя)
Регистрационный номер декларации о соответствии: ЕАЭС N RU Д-CN.PA09.B.90272/24
Дата регистрации декларации о соответствии: 28.10.2024



UDEM

MACHINERY DIRECTIVE ATTESTATION OF CONFORMITY

Technical file of the company mentioned below has been inspected and audit has been completed successfully.

2006/42/EC Machinery Directive Annex VIII has been taken as references for these processes.

Company Name	: **Zhejiang Tewincryo Liquefy Equipment Co., Ltd.**
Company Address	: 12F, Jindi Viseen Science and Technology Park T1 (Building 16), Gongshu District, Hangzhou, 310015, PRC
Related Directives and Annex	: **2006/42/EC Machinery Directive/Annex VIII**
Related Standards	: **EN ISO 12100:2010; EN 60204-1:2018**
Product Name	: **Air Separation Plant**
Report No and Date	: TCF-ZTLE241010-MD
Product Brand/Model/Type	: KDON-1500/3000, KDON-3000/4000/90, KDON-5000/10000/150, KDON-10000/20000/300, KDON-20000/40000/600, KDON-30000/60000/900, KZO-100, KZO-350, KDONAr-1500Y/1500Y/40Y, KDONAr-3000Y/3000Y/90Y, KDONAr-4000Y/4000Y/125Y, KDONAr-6000Y/3000Y/190Y, KDN-5000/50Y, KDN-10000/100Y, KDN-15000/120Y, KDN-20000/200Y, KDN-30000/250Y, KDN-50000/300Y
Certificate Number	: **M.2024.206.C108177**
Initial Assessment Date	: 15.10.2024
Registration Date	: 16.10.2024
Reissue Date/No	: -
Expiry Date	: **15.10.2029**

UDEM International Certification Auditing Training Centre Industry and Trade Inc. Co.
General Manager

The validity of the certificate can be checked through www.udem.com.tr. Upon completion of EC declaration of conformity, it is used solely of the manufacturer's responsibility. This certificate remains the property of UDEM International Certification Auditing Training Centre Industry and Trade Inc. Co. to whom it must be returned upon request. the above named firm must keep a copy of this certificate for 15 years from the registration of certificate. This certificate only covers the product(s) stated above and UDEM must be noticed in case of any changes on the product(s).

Address: Mutlukent Mahallesi 2073 Sokak (Eski 93 Sokak) No:10 Çankaya Ankara - TÜRKİYE
Phone: +90 (312 443 03 90
E-mail: info@udem.com.tr www.udem.com.tr

UDEM-ED-MA-ADI- 14.08.2024/03.01.2024

Innovation & Honor

TewinCryo®

More than 100 patents and software copyright









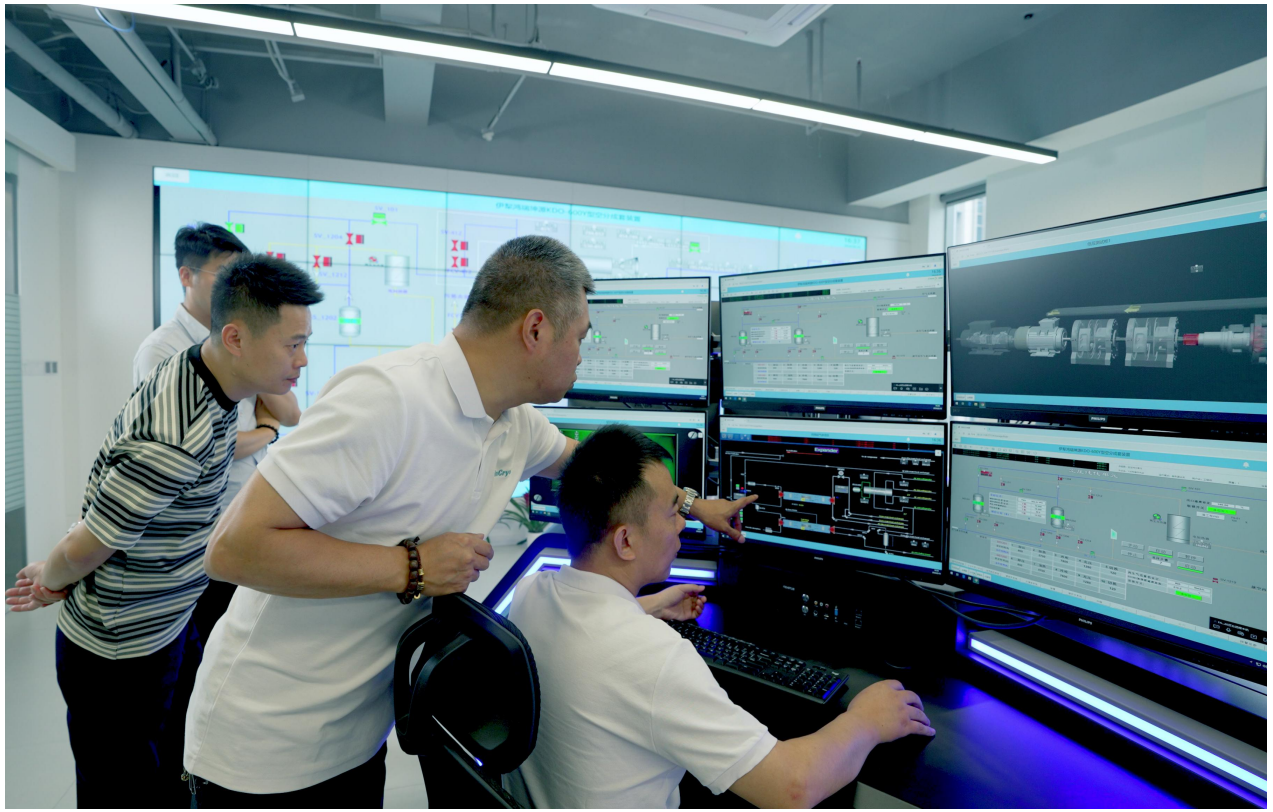






Innovation & Honor

TewinCryo®



Alita®

provide **24/7** service for your plant!

01 Remote Training

02 Remote diagnosis

03 Remote guidance

04 Remote operation

Business & Market

TewinCryo®

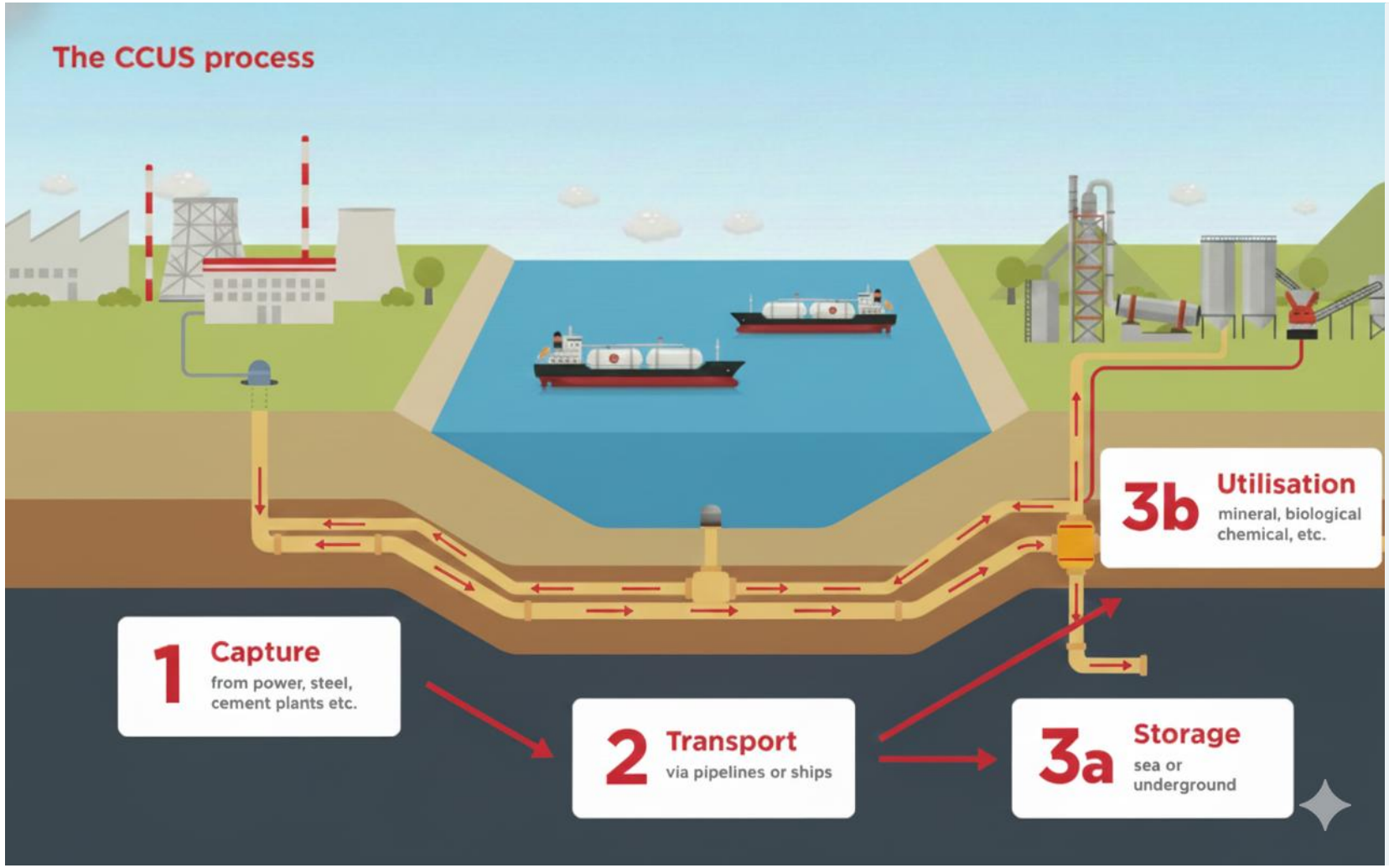


Business Product Lines:

- ✓ Air separation plants (O_2, N_2, Ar, Noble gases)
- ✓ Liquefaction plants (LO_2, LN_2, NG etc.)
- ✓ Argon recovery plants
- ✓ H_2 Production Plants
- ✓ CO_2 recovery, purification & separation system
- ✓ PSA nitrogen plant and oxygen plants

Carbon Capture, Utilisation & Storage

TewinCryo®



CCUS

Carbon Capture

Separate and capture CO_2 from the exhaust gases of thermal power plants, steel plants, cement plants, and similar facilities

Utilisation

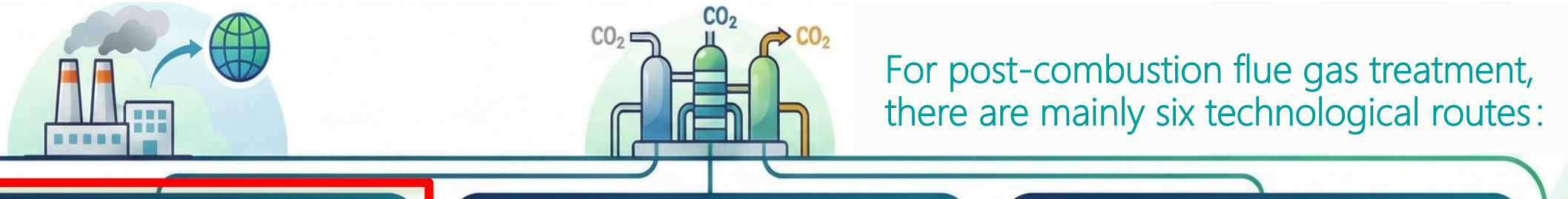
Utilize the captured CO_2 in enhanced oil recovery, chemical synthesis, building materials, biological conversion, fruit and vegetable agriculture, dry ice production, and other fields.

Storage

Permanently inject and sequester CO_2 into deep geological formations beneath the seabed or underground, such as saline aquifers or depleted oil fields.

Compare the Carbon Capture Route

TewinCryo®



For post-combustion flue gas treatment, there are mainly six technological routes:

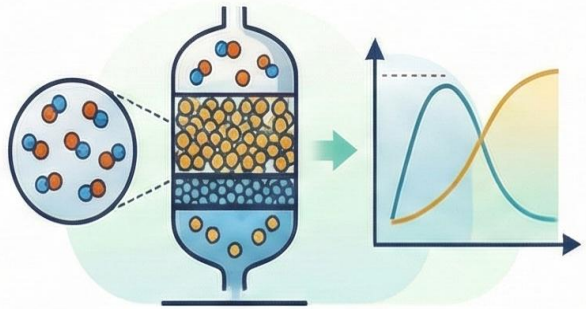
① Chemical Absorption



Fast absorption rate, high efficiency, mature technology, simple equipment.

Large absorbent consumption, high energy demand, prone to equipment corrosion.

② Adsorption



Simple process, mature technology, low pollution, reliable operation.

High process energy consumption, high equipment investment.

③ Cryogenic Separation



Reasonable process and high product purity.

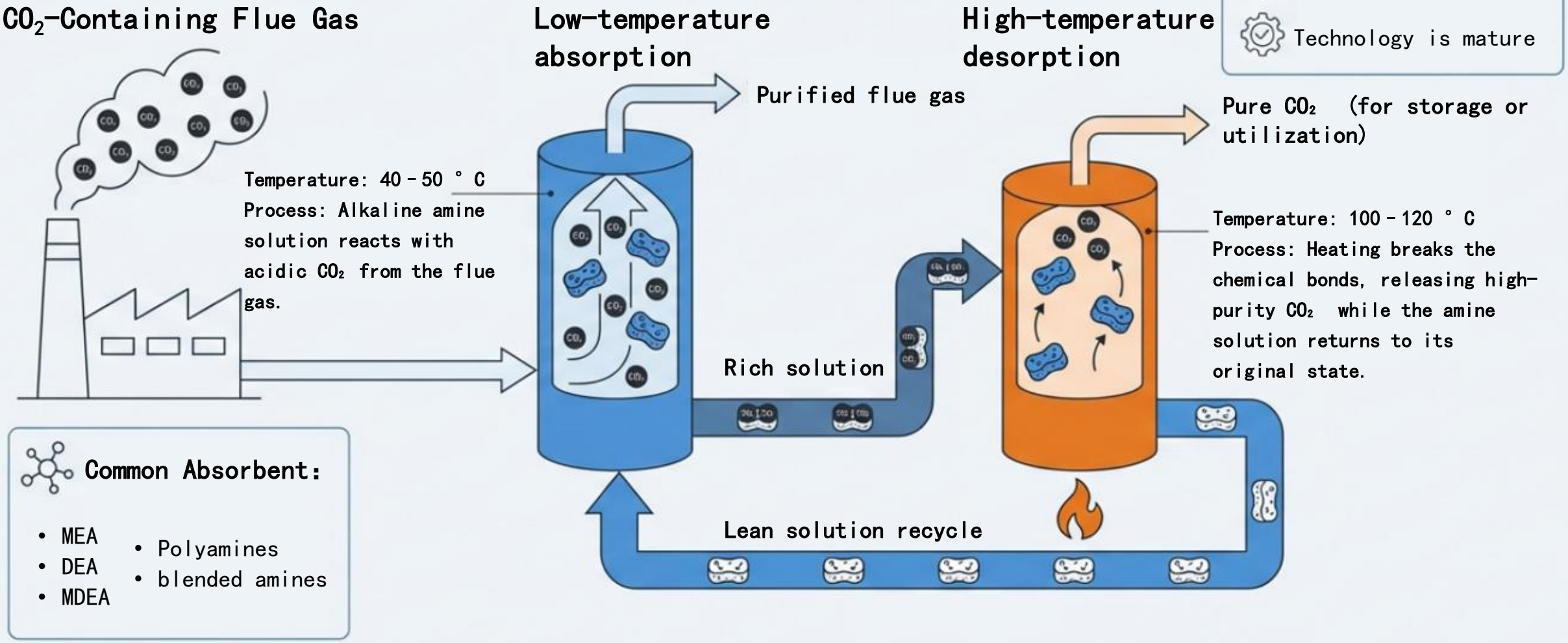
High equipment investment, complex process, suitable for high-concentration CO_2.

Technological Routes	Core Advantages	Core Drawbacks
④ Membrane separation	Simple process, low energy consumption	Stringent feed-gas requirements
⑤ Electrochemical method	Low equipment investment, recovery cost	Difficult to manufacture and operate
⑥ Hydrate-based separation	Mild conditions, wide applicability	Immature, at the experimental stage

Organic Amine Chemical Absorption

Key Indicators:

- CO_2 capture rate: >90%
- CO2 purity: >99%
- Technology is mature



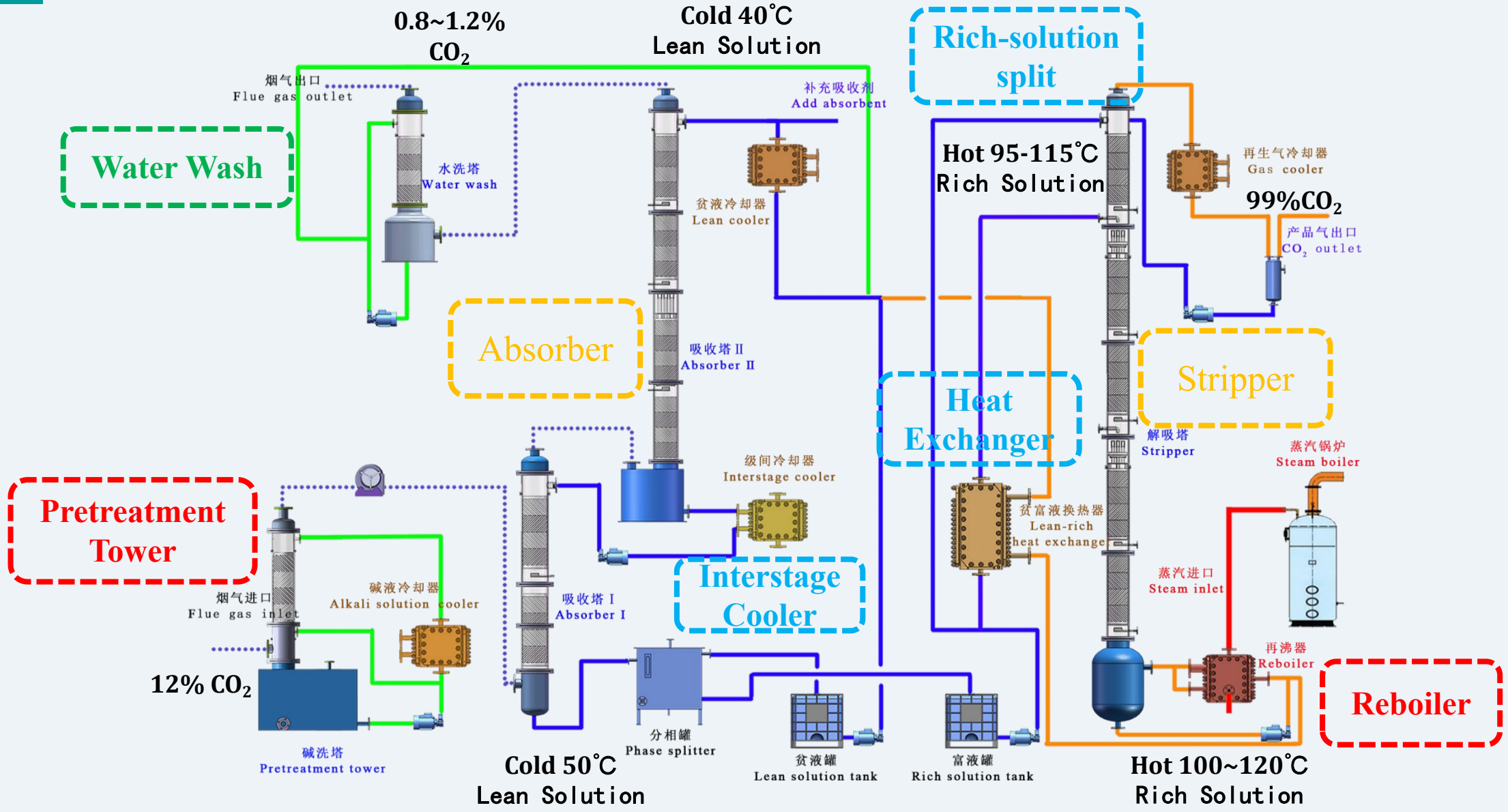
Common Absorbent:

- MEA
- DEA
- MDEA
- Polyamines
- blended amines

Conclusion: Organic amine chemical absorption is currently the mainstream technology for large-scale, high-efficiency CO_2 capture; it is relatively mature and has been demonstrated in industrial plants both domestically and abroad.

Flow Diagram

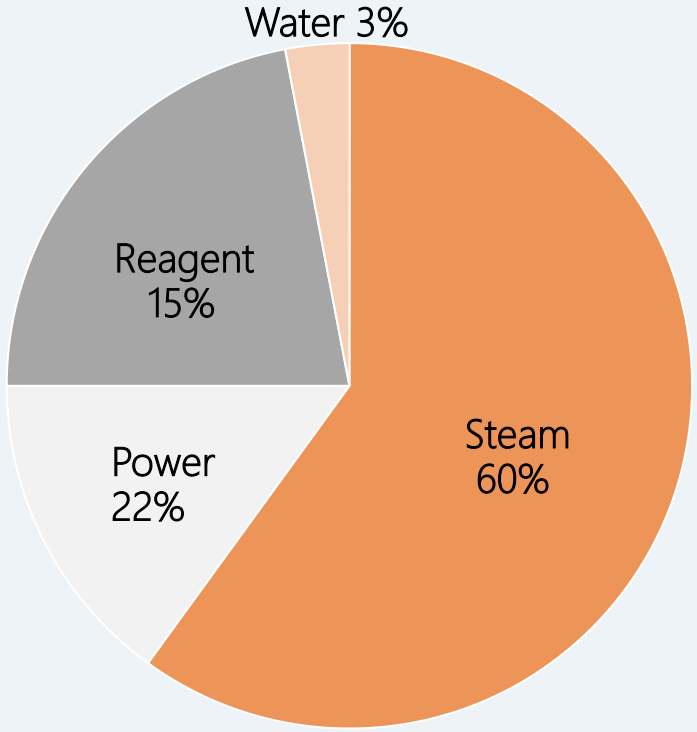
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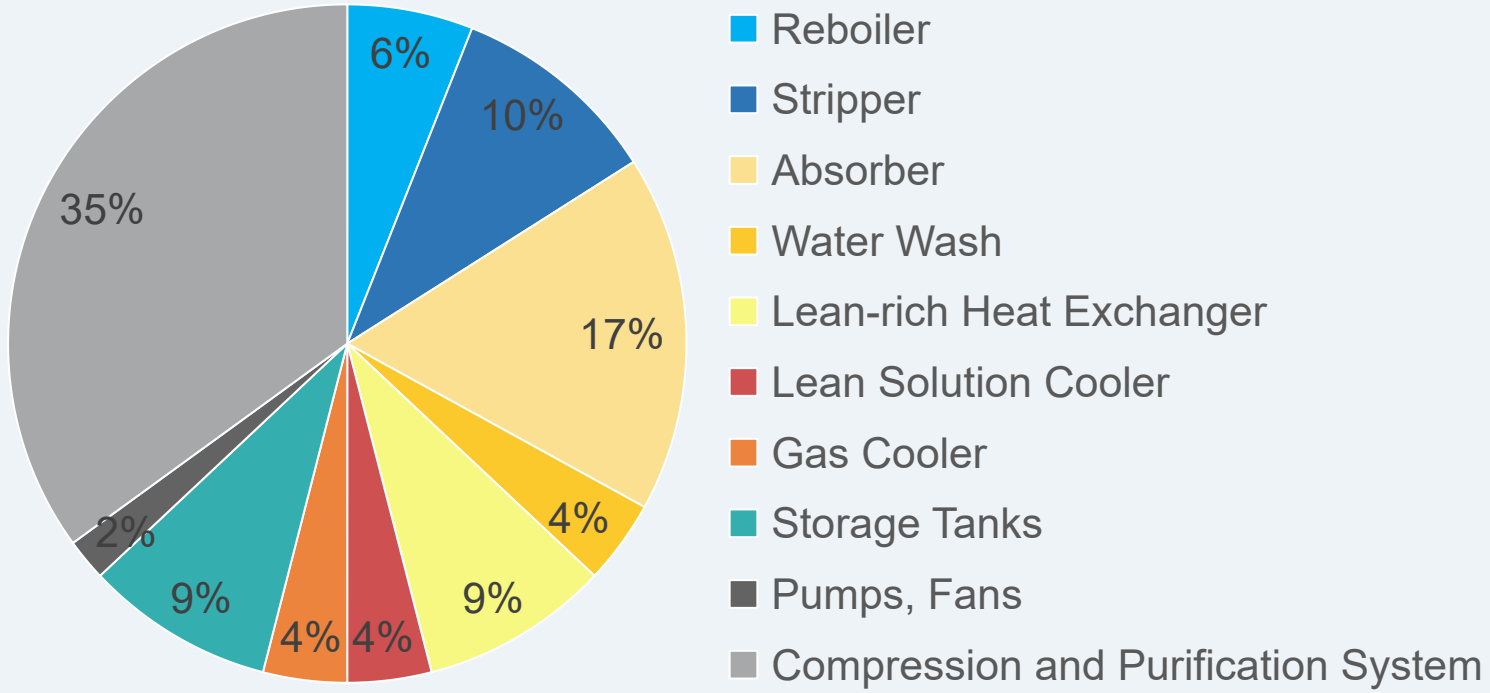
Main Bottlenecks

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✓ Traditional technology (based on 30% MEA solution), though mature, is hindered from wide application mainly by its high operating and capital costs.



Operating Expenditure OPEX Analysis



Capital Expenditure CPEX Analysis

✓ **CPEX**: ~150 RMB/t CO_2 (low solvent uptake ⇒ oversized equipment)

✓ **OPEX**: ~480 RMB/t CO_2 (high regeneration energy: 3–4 GJ/t CO_2 , 60–70 % of total OPEX)

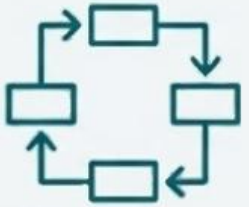
Solutions to the Key Bottlenecks

TewinCryo®



Advanced Absorbents & Absorbents Degradation Inhibitor

Novel “biphasic solvent” cuts regeneration energy at the source.
New absorbents degradation inhibitor slow solvent breakdown.



Innovative Processes

System-level redesigns— ”Amine Slip Control System”, “Amine solvent circulation regeneration system”—push energy and amine recovery to the limit.

Integrated Solutions



High-Efficiency Equipment

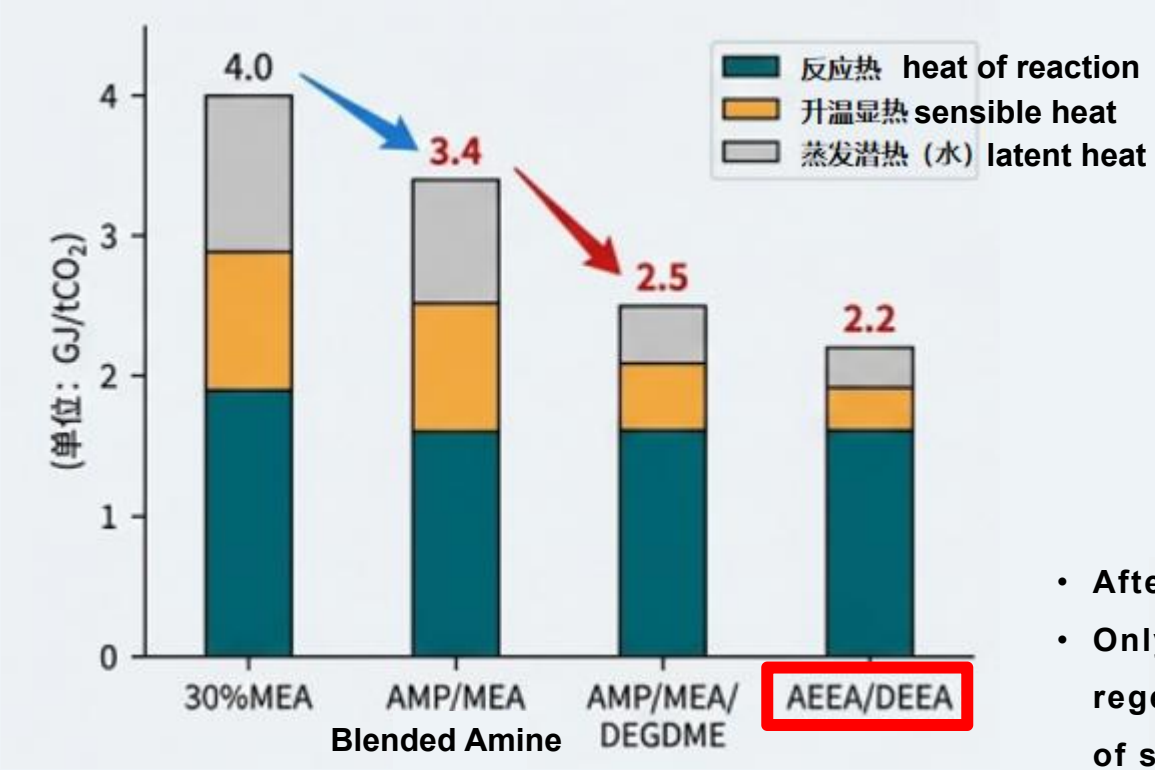
Intensified Equipment—high-efficiency heat exchangers and structured composite packing—shrinks equipment size and CAPEX.

Novel “Biphasic Solvent”

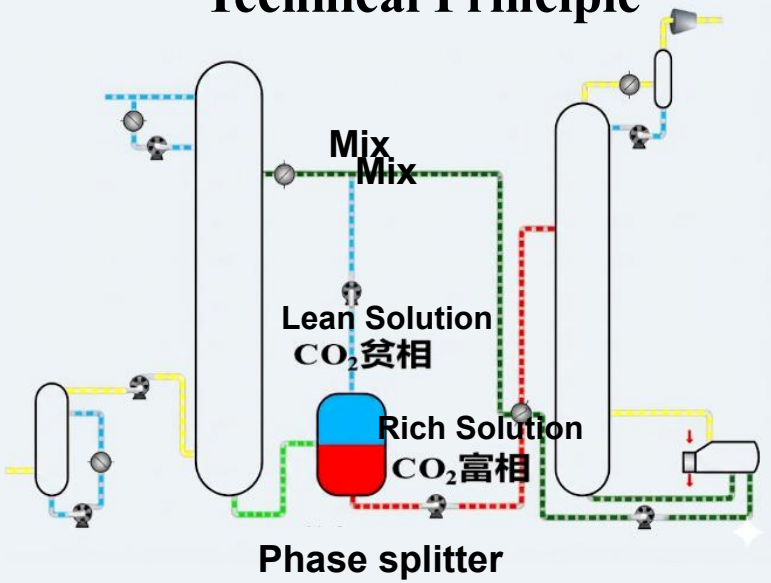
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Legacy absorbents contain a large amount of water; while water acts as a solvent to reduce viscosity and enhance mass transfer and reaction rates, it significantly increases regeneration energy consumption.

Regeneration Energy Consumption Comparison



Technical Principle



- After absorption the solution splits into a rich phase and a lean phase.
- Only the much smaller CO_2 -rich phase is sent to the high-temperature regenerator, drastically cutting both the circulation flow and the volume of solution that must be heated, thereby lowering energy consumption.

Compared with the conventional 30 % MEA absorbent, the new biphasic alkanol-amine blend AEEA/DEEA cuts regeneration energy from 4.0 GJ/t CO_2 to 2.2 GJ/t CO_2—an overall reduction of 45 %.

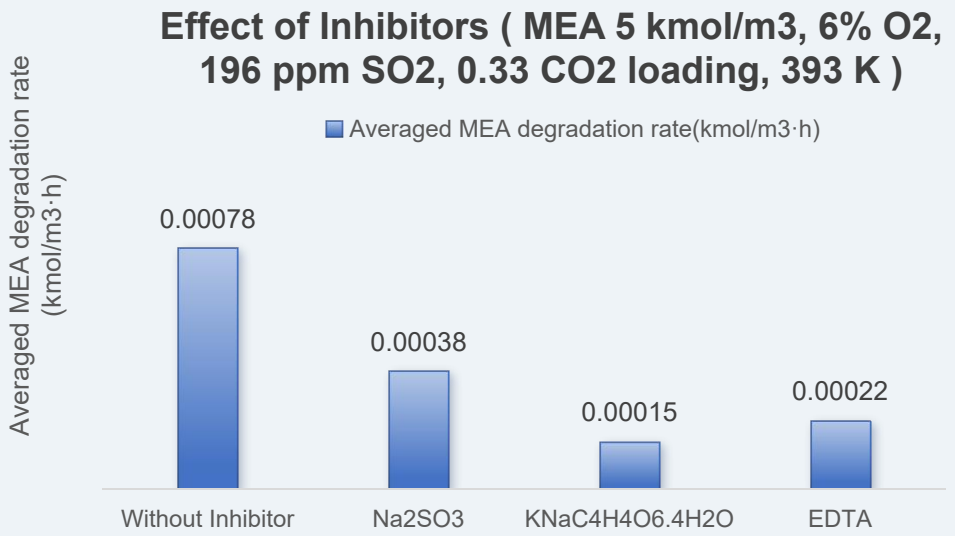
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Absorbent Degradation Countermeasures

Absorbents Degradation Inhibitor

- **Oxidation Film Type Corrosion Inhibitor**
  - Sodium Metavanadate, $KNaC_4H_4O_6.4H_2O$ etc.
- **Corrosion Inhibitors**
  - EDTA、DTPMP etc.
- **Oxidation Inhibitors**
  - Na_2SO_3, Formaldehyde, Formic Acid, etc.



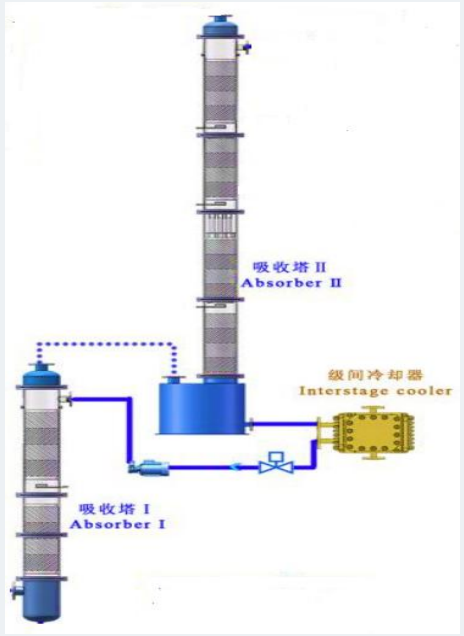


Process Flow Optimization

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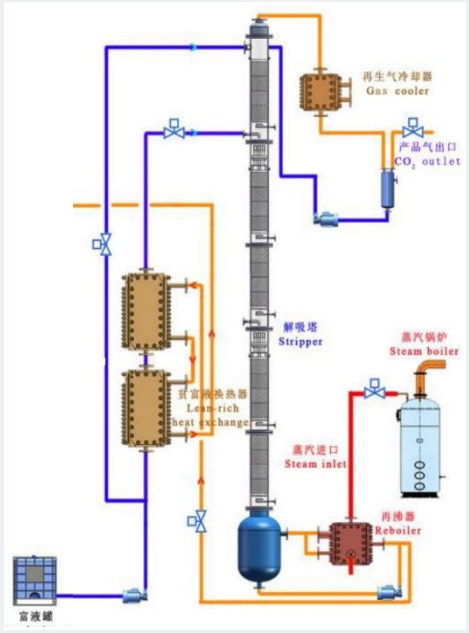
Through integrated process innovations, further energy-saving potential is unlocked.

Inter-stage Cooling Process



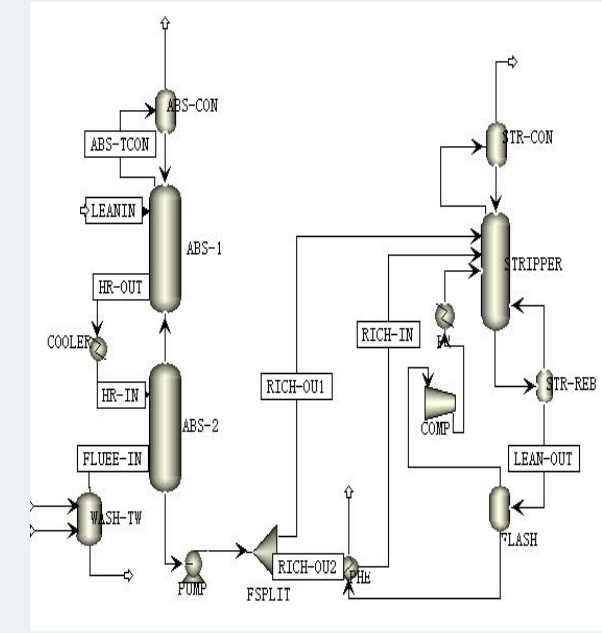
Inter-stage cooling lowers the absorber temperature, boosting CO_2 absorption capacity and cutting regeneration energy by 3 %.

Rich-solution Split-flow Process



The rich-solution split-flow process raises the mid-column temperature in the regenerator, enhancing solvent regeneration and further reducing regeneration duty.

MVR Flash Process



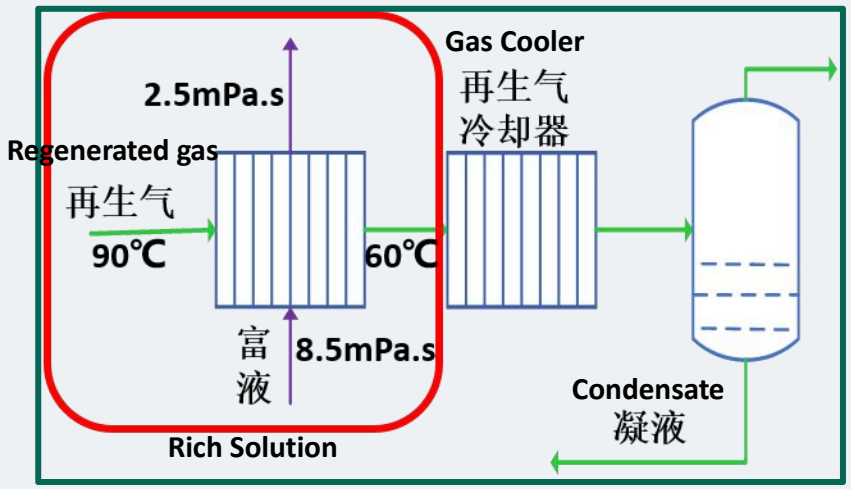
Regenerating the hot lean solvent via MVR flash drops the regeneration energy by 16.9 % relative to the baseline process.

Process Flow Optimization

TewinCryo®

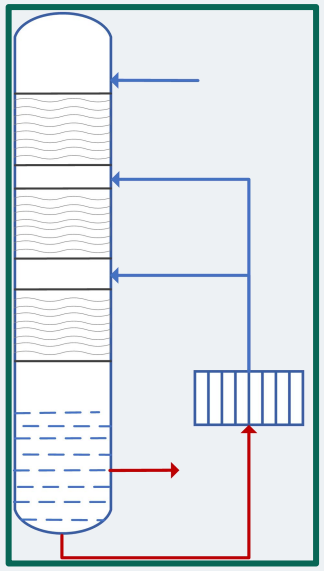
Through integrated process innovations, further energy-saving potential is unlocked.

Product-gas Heat Recovery Process



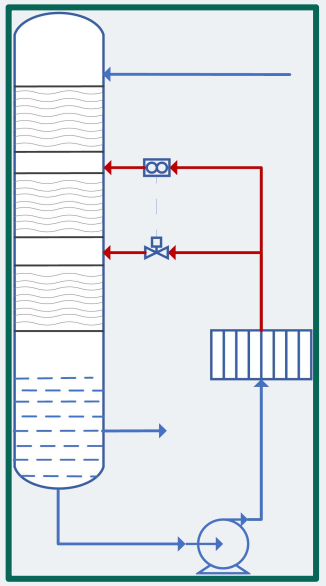
- Recover both sensible and latent heat from the product stream—≈0.38 GJ/t CO_2 heat recovered.
- Reduce the viscosity of the cold rich solution, raise the heat-transfer coefficient of the lean/rich exchanger, cut required surface area, and lower capital cost.

Bottom-recycle Process



- Higher absorption capacity → smaller solvent flow rate → lower regeneration energy
- Low-concentration flue gas allows a shorter absorber, cutting equipment CAPEX.

Multi-stage Temperature-control Process



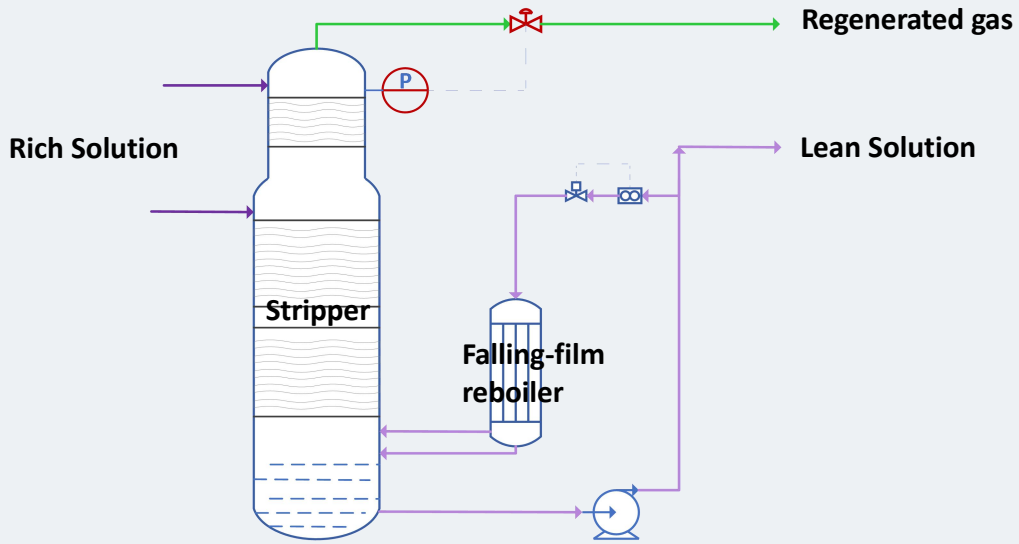
- Precise temperature control inside the absorber enlarges the mass-transfer driving force, significantly boosting CO_2 absorption capacity, reducing solvent circulation, and lowering energy consumption.

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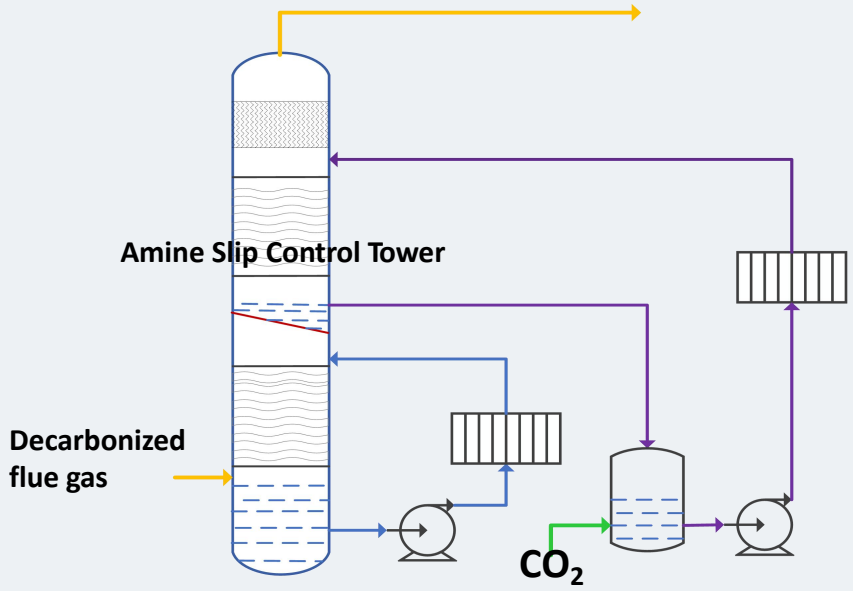
Through integrated process innovations, further energy-saving potential is unlocked.

Regenerator Pressure Control



- Raising the regenerator pressure lowers the partial pressure of water vapor at the column top, cutting energy demand; it simultaneously increases the overhead temperature, enlarging the mass-transfer driving force and accelerating CO_2 desorption throughout the regenerator.
- The optimum operating pressure is 2 bar, where both regeneration duty and total cooling-water requirement reach their minima.

Amine Slip Control System

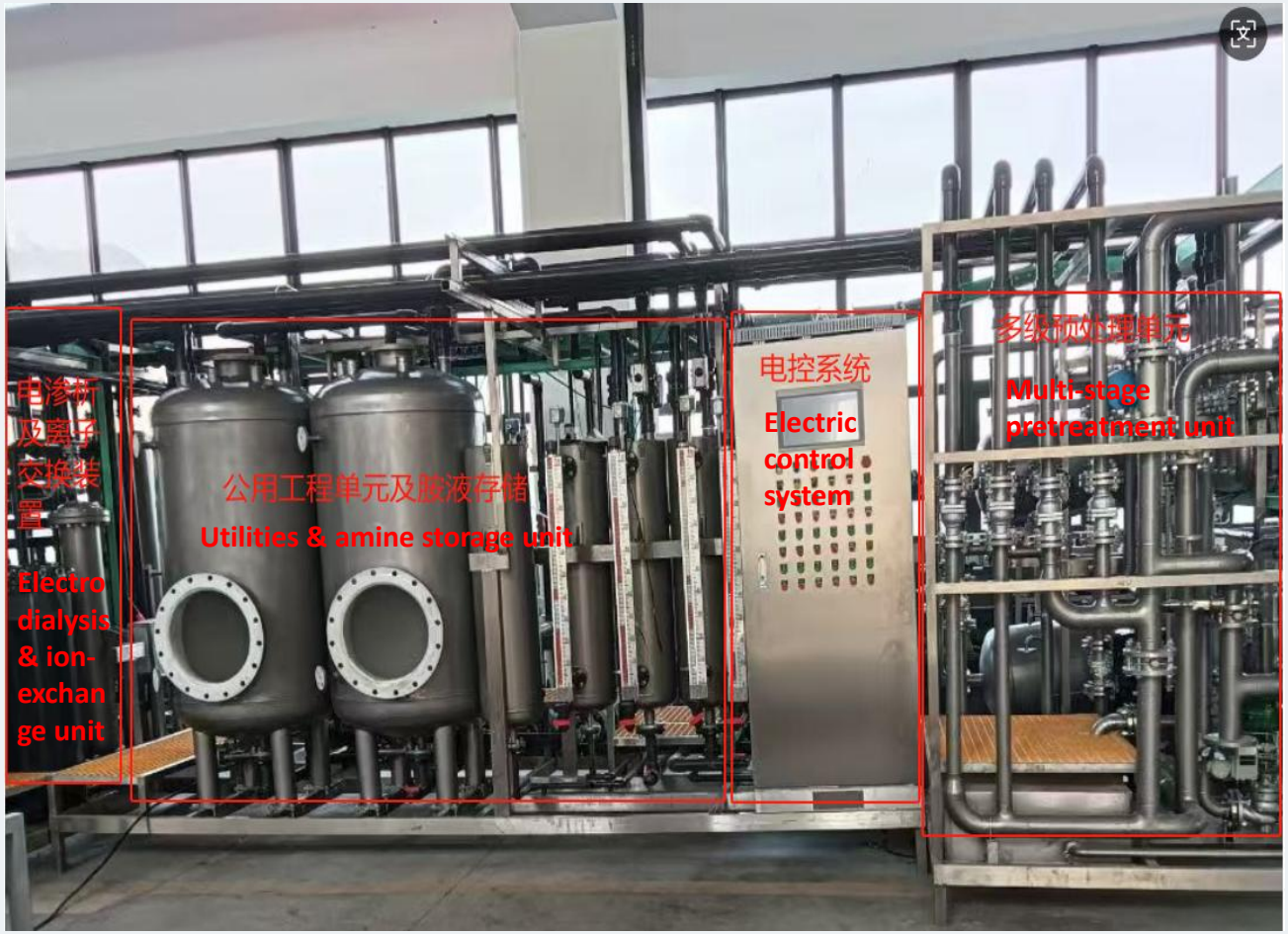


- Both domestic and international CO_2 capture plants in operation predominantly apply a water-wash process to curb organic-amine slip, limiting amine loss to 1.5–2 kg per ton of CO_2 captured and reducing organic emissions in the treated flue gas to >100 mg/Nm³.
- By installing an additional amine-slip control unit—comprising a two-stage water wash followed by a dry-bed polisher—amine loss can be driven < 0.5 kg/t CO_2, while the total organic-amine concentration in the stack gas is lowered to 9–9.5 mg/m³.

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Ion-exchange electrodialysis absorbent-regeneration system



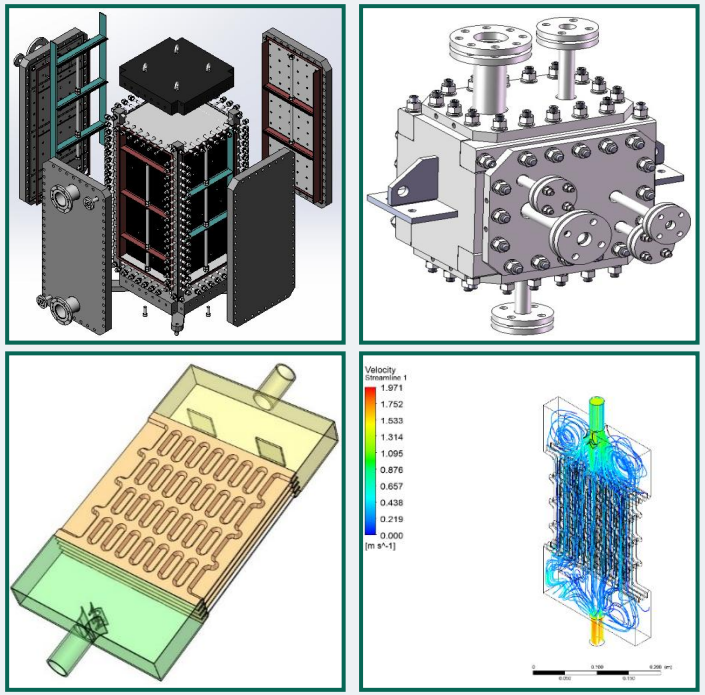




High-Efficiency Equipment

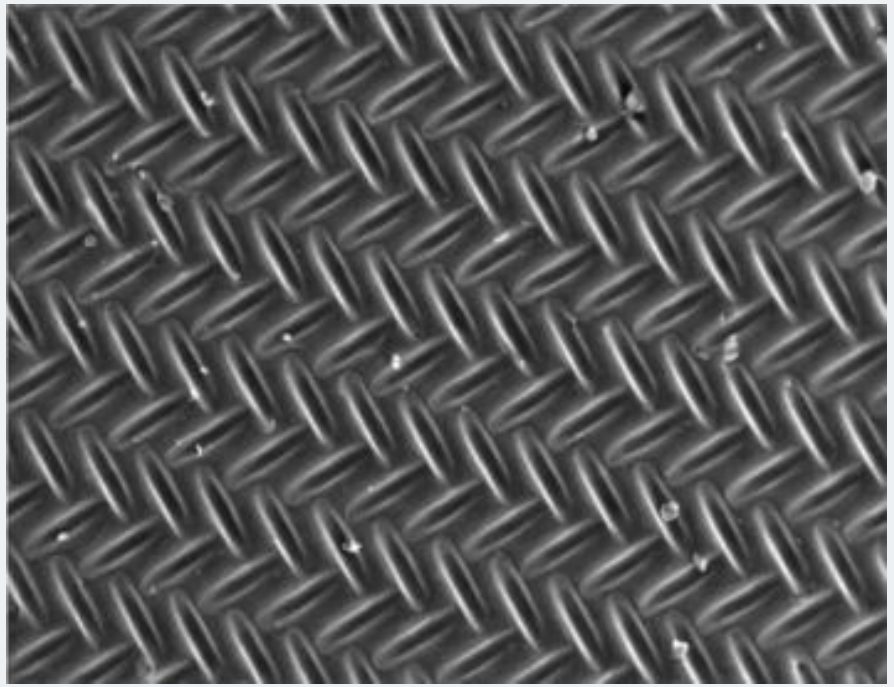
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High-efficiency Heat Exchanger



- The all-welded plate heat exchanger was experimentally retrofitted with redesigned plates that intensify fluid turbulence and incorporate inlet distributors to boost area utilization, achieving tested heat-transfer coefficients of 1000–3000W/(m²·K).
- By adopting a 5°C approach all-welded plate exchanger, the lean solution leaves the lean/rich exchanger at ~50 °C, cutting overall circulating cooling-water demand by 20–30%.

Noval Composite Structured Packing



- A hydrophilic polypropylene structured packing has been developed, featuring a multi-scale porous surface texture.
- Compared with stainless-steel packing, its production cost drops by 70%, and the installed absorber CAPEX is reduced by more than 30%.

Jobsites

TewinCryo®



150 kt/a Shaanxi Guohua Jinjie
CO_2 Capture Unit



1500kt Zhengning
CO_2 Capture Unit (In construction)



Hangzhou Waste-to-Energy Plant
Decarbonization and CNG Production System



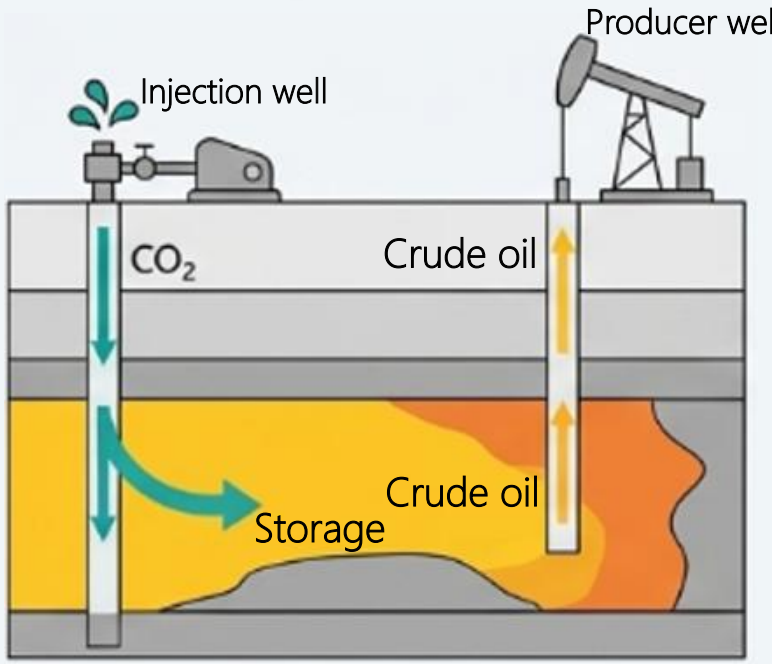
500kt/a Taizhou Power Plant
CO_2 Capture Unit



15 kt/a Zheneng Lanxi Power Plant
CO_2 Capture Unit

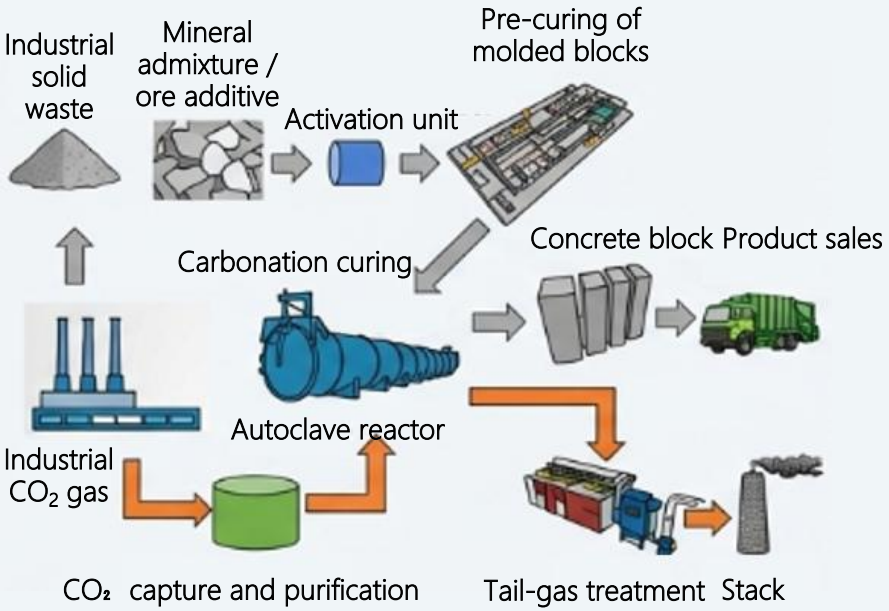
CO_2 Utilization Pathways

CO_2-EOR



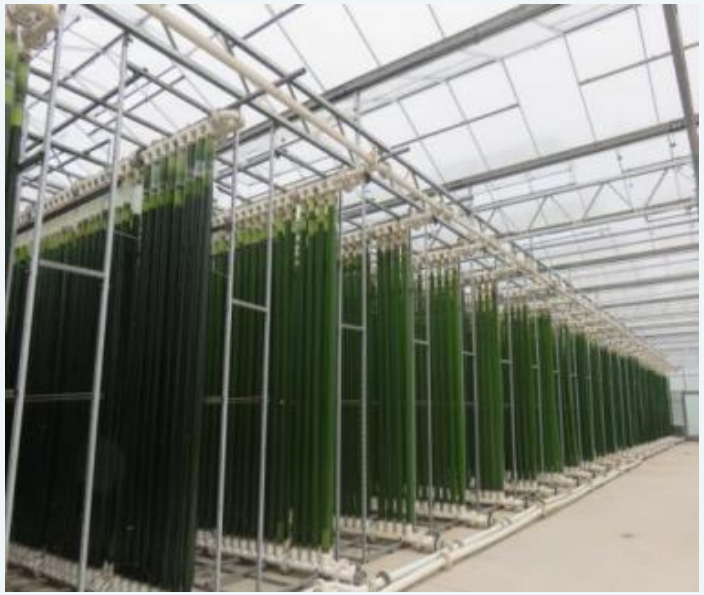
Enhanced oil recovery:
Boosts crude output by 10–20 % while permanently sequestering 50–60 % of the injected CO_2 underground.

Mineralization



Concrete curing:
replaces steam with CO_2 cutting energy demand and simultaneously improving compressive strength, impermeability and freeze–thaw resistance.

Bio-Conversion



Micro-algae cultivation:
converts CO_2 into biodiesel, health products (spirulina), pharmaceuticals and premium feed with high efficiency.

CO_2 Utilization Pathways

CO_2 as Fertilizer

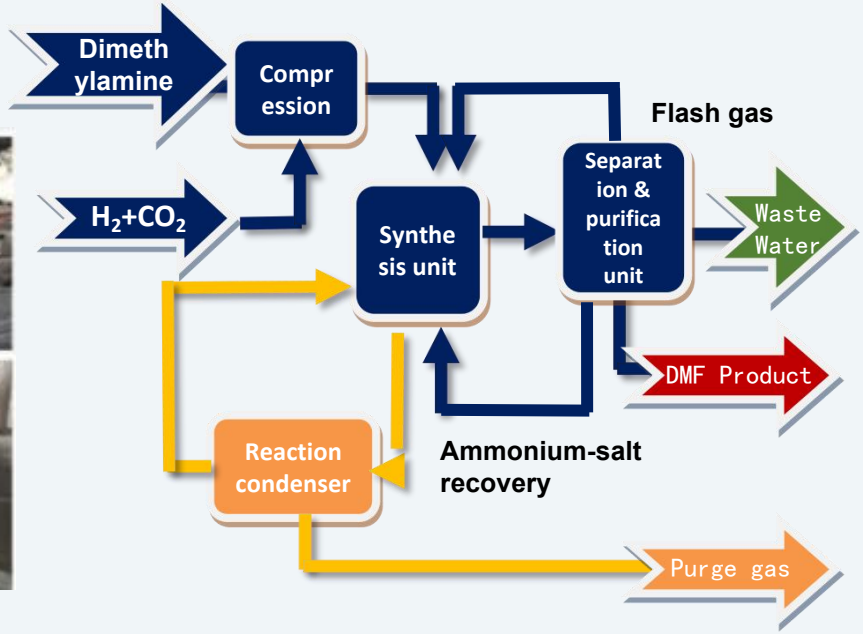
Not Use **After Use**



Dry Ice



Chemical Synthesis



Gaseous fertilizer:
In greenhouse tunnels, CO_2 increases cucumber yields by over 100 % and strawberry yields by 200–400 %.

Dry Ice:
Cold-chain logistics, industrial non-abrasive cleaning, food preservation, and stage effects, with a continuously expanding market.

As feedstock of basic chemicals:
such as formic acid, methanol, ethanol, olefins, and aromatics.



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Thank you