

Cryocap™

Carbon Capture technologies

碳捕捉技术



Cryocap™

针对工业气体的 全系CO₂捕捉与液化产品

A complete product range
to capture and/or liquefy CO₂

全球首发 A world premiere

Cryocap™是全球独一无二的采用低温工艺(包括低温气体分离)实现CO₂捕捉的创新技术。
Cryocap™可以与液化空气多种技术相结合以适应特定的应用场景。

Cryocap™ is a technological innovation for CO₂ capture that is unique in the world,
using a cryogenic process (involving low temperatures to separate gases).
Cryocap™ can be adapted to specific applications combining a variety of
Air Liquide technologies.



CRYOCAP™ H₂

氢气生产
Hydrogen production

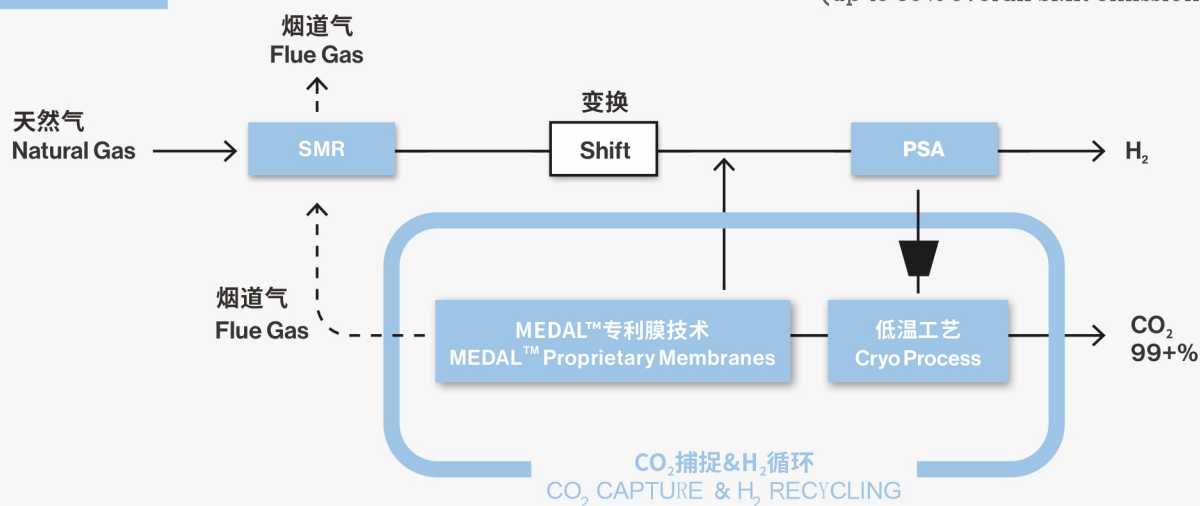


Cryocap™ H₂

捕捉CO₂的同时提升H₂产量
Capturing CO₂ while boosting H₂

- 低温技术与膜技术相结合
- H₂产量提高10~20%
- 和MDEA比, CO₂捕捉的费用减少可达40%
- 气体或液体CO₂产品
- 回收率>95% 合成气
(相对于SMR整体排放, 回收率可达60%)

- Combination of Membrane and Cryogenics technologies
- Extra H₂ production by 10 to 20%
- Avoided CO₂ cost reduction: up to 40% compared to MDEA
- Gaseous or liquid CO₂
- >95% capture from syngas
(up to 60% overall SMR emissions)



CRYOCAP™ FG

- > 15% 烟道气
(水泥厂、炼油厂、制氢厂)
- > 15% flue gas
(Cement, Refineries, H₂)

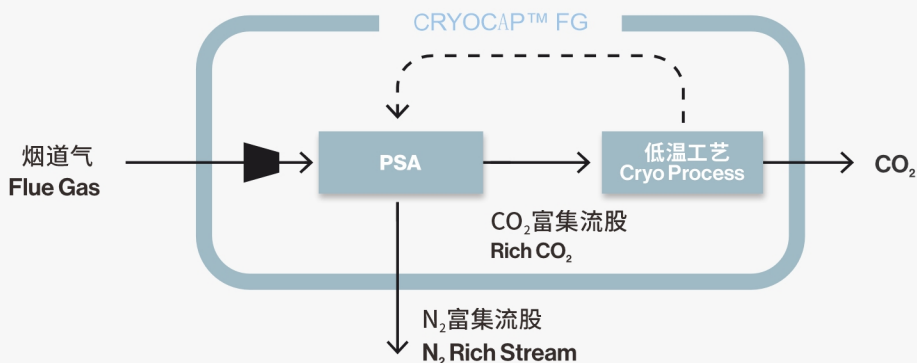


Cryocap™ FG

从烟道气中捕捉CO₂ Capturing CO₂ from flue gases

- 适用于SMR (烟道气), 流化催化裂化(FCC), 水泥厂
CO₂含量 ≥ 15%
- PSA辅助CO₂浓缩
- 占地紧凑且灵活: 压缩机, PSA和低温工艺
可以布置在2个不同的位置
- 智能杂质管理 (高氮化合物NO_x)
- 气体或液体CO₂产品
- CO₂捕捉率 85%~95%

- Suitable for SMR (flue gas), FCC, cement...:
off gas with CO₂ content ≥ 15%
- PSA-assisted CO₂ condensation
- Compact & flexible footprint:
Compressors, PSA and cryo process
can be located in 2 different plots
- Smart impurities management
(high NO_x)
- Gaseous or liquid CO₂
- CO₂ capture rate: 85 to 95%



CRYOCAP™ Oxy

富氧燃烧 Oxycombustion

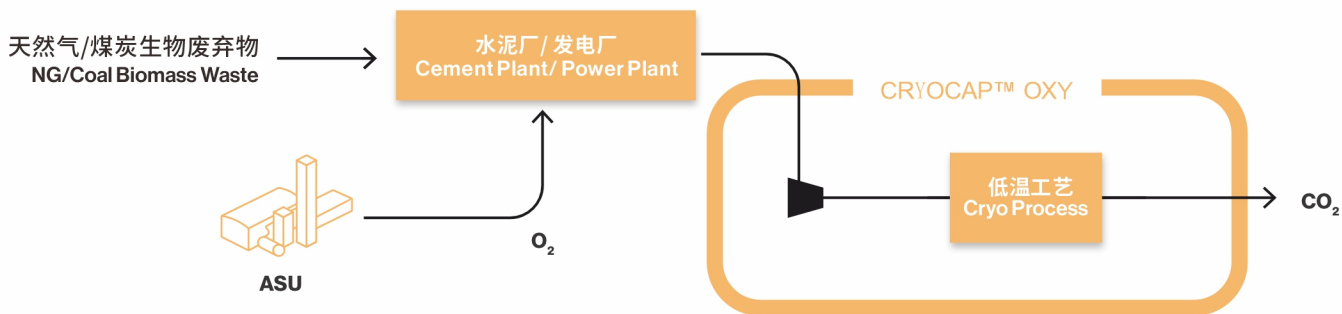


Cryocap™ Oxy

针对富氧燃烧的捕捉和纯化 Capture and Purification for Oxycombustion

- 烟道气中的CO₂可浓缩到> 60%
- 智能杂质管理 (高氮化合物NO_x)
- 与各种富氧燃烧炉进行整合得到验证
- 已在3个工厂得到验证
(Calide, Ciuden, Total Lacq)
- 气体或液体CO₂产品
- CO₂捕捉率: 90%~98%
- 独一无二的技术模块
 - 烟道气干燥
 - 除尘
 - 低温纯化

- Enriches Flue Gas above 60% CO₂
- Smart impurities management
(high NO_x)
- Integration validated
on different Oxy boilers
- Demonstrated on 3 plants
(Callide, Ciuden, Total Lacq)
- Gaseous or Liquid CO₂
- CO₂ Capture rate: 90-98%
- Unique Technological bricks
 - Flue Gas Drying
 - Dust Filtration
 - Cryogenic Purification



CRYOCAP™ Steel

钢铁生产
Steel production

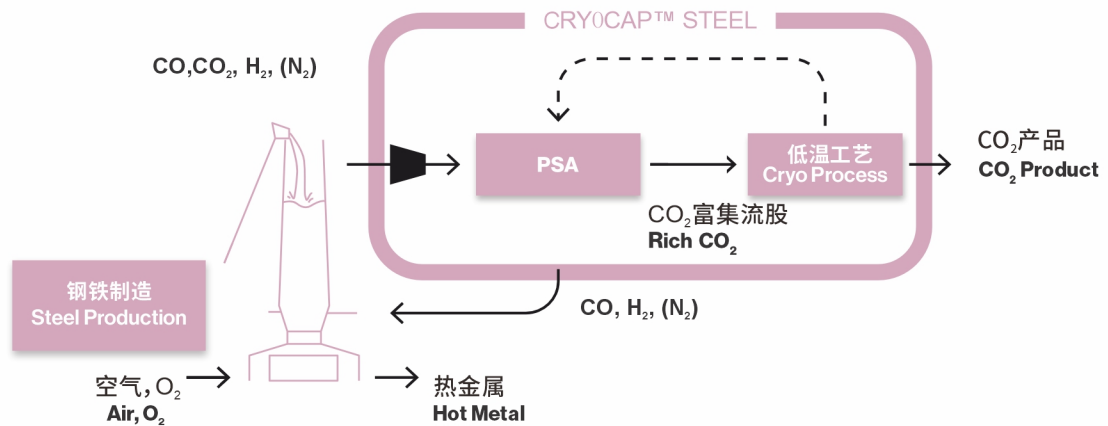


Cryocap™ STEEL

捕捉CO₂的同时提升效率

Capturing CO₂ while bootsting efficiency

- 钢厂改造或同钢厂一起建造
- CO₂原料气: 20%~50% CO₂含量
- 焦炭消耗量减少可达20%
热金属产量提高可达5%
- CO回收率 80%~90%
- 占地紧凑且灵活: 压缩机, PSA和冷箱
可以布置在3个不同的位置
- 气体或液体CO₂产品
- CO₂捕捉率 80%~95%
- Retrofit and greenfield for ironmaking
- CO₂ source: 20-50% CO₂
- Up to -20% Coke consumption
and up to +5% Hot Metal Produced
- 80 to 90% CO recovery
- Compact & Flexible footprint:
Compressors, PSA and Coldbox
can belocated in 3 different plots
- Gaseous or liquid CO₂
- CO₂ capture rate: 80 to 95%



CRYOCAP™ XLL

CO₂液化
CO₂ liquefaction



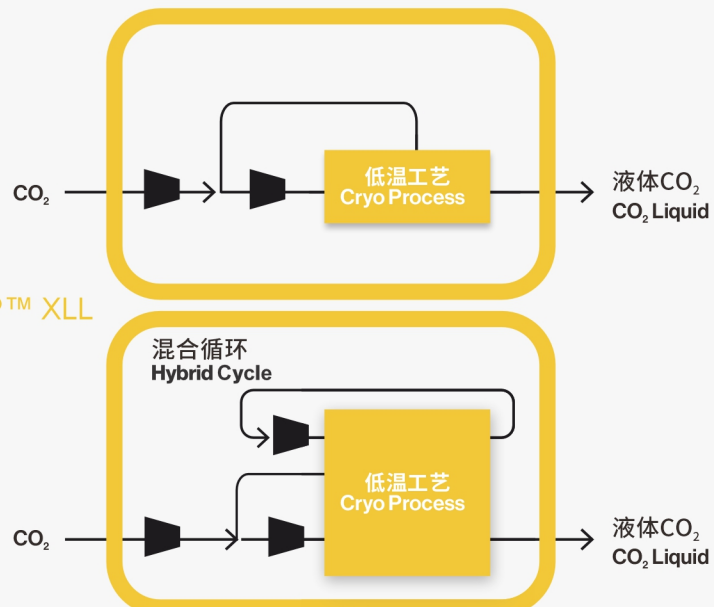
Cryocap™ XLL

大型CO₂液化

Large scale CO₂ liquefaction

- 700~7000+ 吨/天
- 定制化工厂: 设计灵活
- 运行能耗极低, CO₂回收率极高
- 高度紧凑
- 700 - 7000+ tpd
- Custom plant: flexible design
Very low OPEX
and very high CO₂ recovery
- Impurities final removal
(e.g. O₂, ...)
- High compactness
or very compact unit

CRYOCAP™ XLL



Cryocap™

总有一款Cryocap碳捕捉产品适合您 Which Cryocap technology fits your needs

	CRYOCAP™ H2	CRYOCAP™ FG	CRYOCAP™ OXY	CRYOCAP™ Steel	CRYOCAP™ XLL	物理吸附 Physical Absorption Rectisol™ Recticap™	化学吸收 Chemical Absorption (amines)
制氢产业, SMR H ₂ production, SMR	✓	✓					✓
制氢产业, ATR H ₂ production, ATR	✓					✓	✓
水泥/石灰 Cement / lime		✓	✓				✓
钢厂 Steel		✓		✓			✓
炼油厂 (FCC) Refineries (FCC)		✓					✓
炼油厂 (乙烯石脑油裂解) Refineries (Ethylene Naphta Cracker)							✓
煤炭/生物质发电厂 Coal / biomass power plant		✓	✓				✓
纸浆&造纸 Pulp & paper		✓					✓
任何CO ₂ 浓度>95%的应用 (来自碳捕捉单元) Any application with CO ₂ concentration > 95% (from carbon capture units)					✓		
任何CO ₂ 浓度>40%的应用 (富氧燃烧或其它浓缩工艺) Any application with CO ₂ concentration > 40% Oxycombustion or alternate concentration process)			✓				
任何燃烧废气, 垃圾焚烧气体<10% Any combustion gas, waste incineration < 10%							✓



技术整合带来低投资低能耗 Combining technologies

Cryocap™可以针对不同的应用场景进行定制。通过对液化空气核心技术（低温、吸附、膜分离）的整合，适应不同CO₂含量原料气，满足不同CO₂产品技术规格要求。同时，Cryocap™可以促进原料气中其它气体分子（CO，H₂等）的生产。

Cryocap™ can be tailored to specific applications, combining Air Liquide core technologies (Cryogenics, Adsorption, Membranes), adapting to CO₂ content in the feed gas, CO₂ product specification and offering the possibility to valorize other molecules contained in the feed gas (eg. CO, H₂...).

