

HONEYWELL CARBON CAPTURE

A PATH TO CARBON NEUTRALITY ACCELERATES TODAY

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Honeywell



ENERGY & SUSTAINABILITY SOLUTIONS

OVERVIEW

Sustainable Technology Solutions



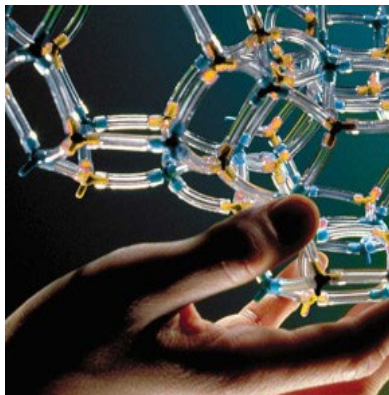
Develops, commercializes, and services highly differentiated technology to enable and accelerate a material reduction in global energy carbon intensity.

Honeywell UOP



Over a century of experience shaping the refining, petrochemical and gas processing industries through invention and innovation.

Honeywell Separation & Purification Solutions



Broad portfolio of adsorbents serving multiple end segments through contaminant removal, catalyst production, and polishing application solutions.

Honeywell LNG



Process technology and equipment to enable the optimization of LNG production facilities.

Sundyne



The world leader in pumps and compressors for the energy, chemical, petrochemical and industrial markets.

Johnson Matthey Catalyst Technologies



Licenses and manufactures specialty catalysts, additives and materials.

Expected Close:
1H 2026

Committed to innovation and investment in solutions that address global energy needs and sustainability

HONEYWELL UOP AT A GLANCE

100+ Years of Global Expertise and Leading Technology Development



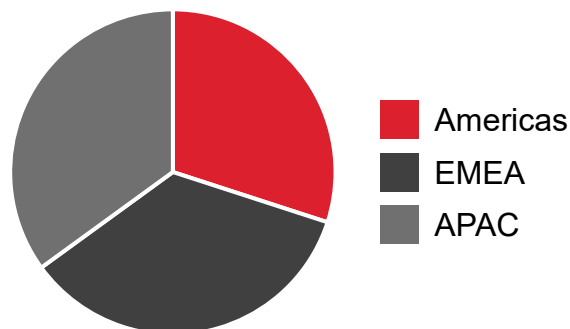
UOP TECHNOLOGY POWERS

- 90% of biodegradable detergents
- 70% of the world's polyester
- 60% of the world's gasoline
- 60% of the world's on-purpose propylene
- 60% of the world's paraxylene
- 50% of the world's renewable fuels
- 40% of LNG processed
- 15M tons of captured CO₂



GLOBAL REACH

Diversified regional presence that can effectively react to changes in demand



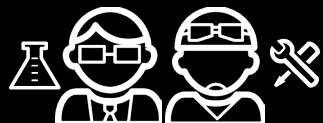
NEW TECHNOLOGIES

Honeywell UOP creates new technologies that convert oil and natural gas into transportation fuels, energy, and petrochemicals



EXPERTISE

Broadest range of downstream refining and petrochemical technologies; leading process technology licensor



2,000

Engineers and scientists



4,900

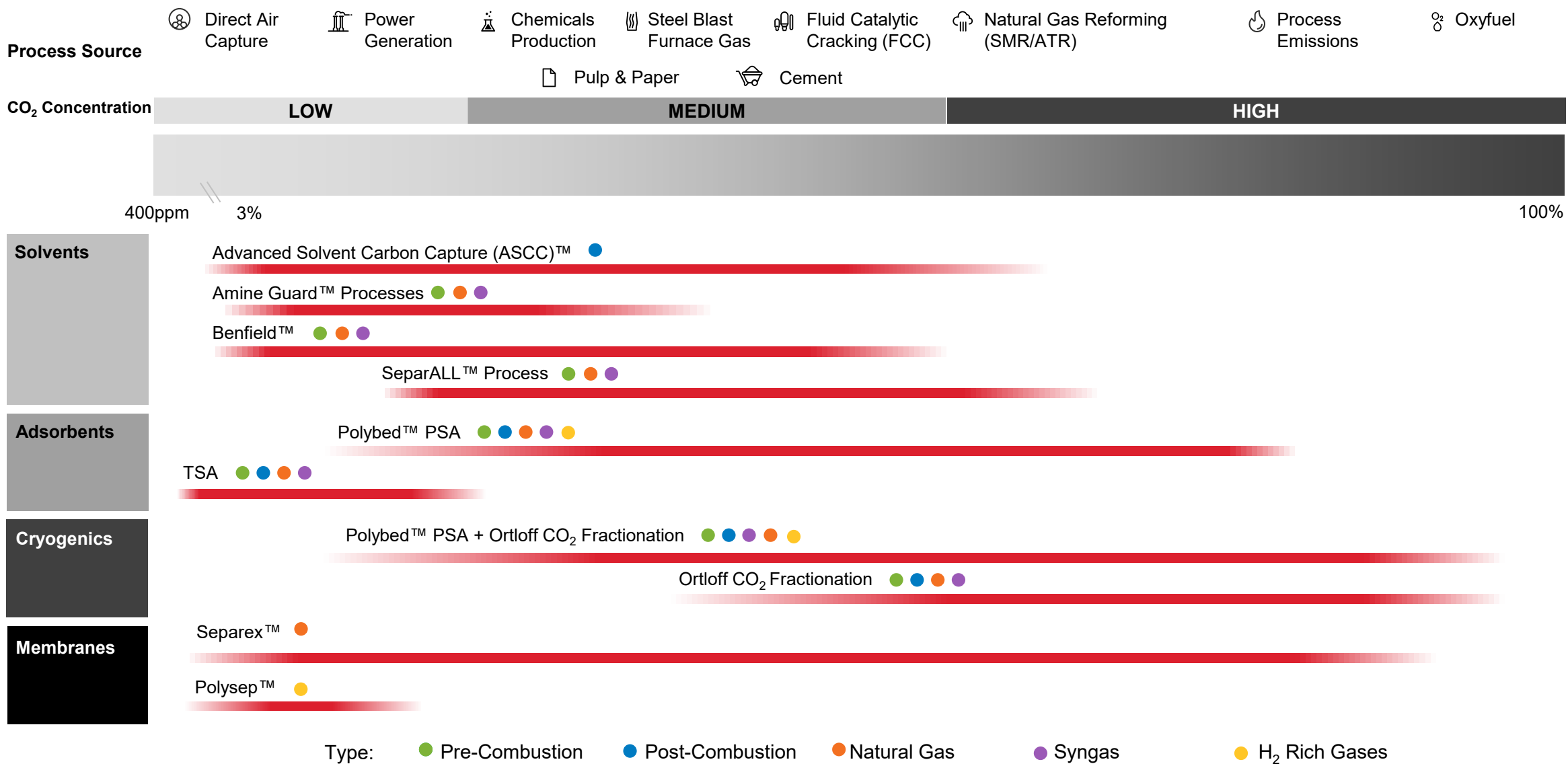
Active patents and applications



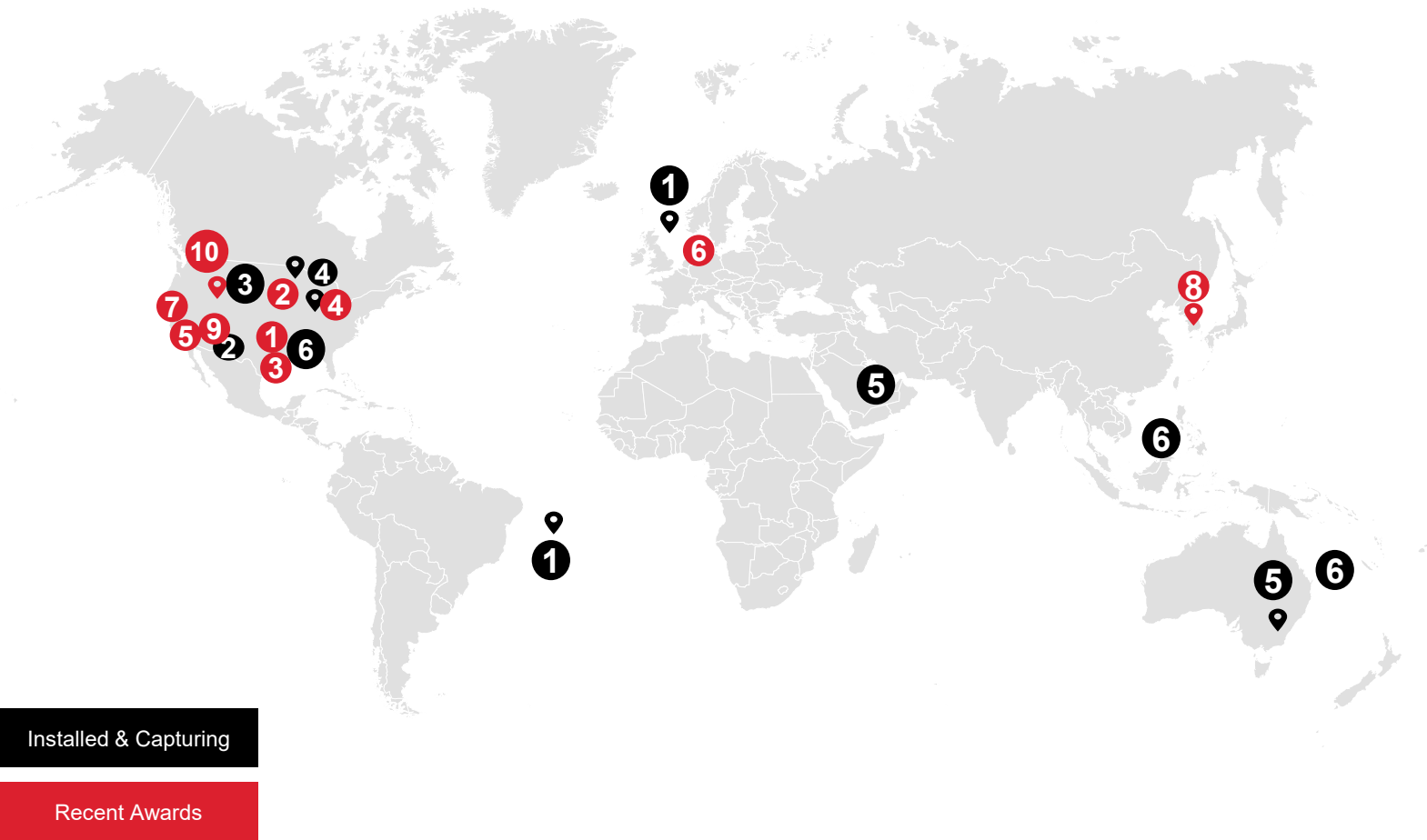
LARGEST
process licensing
organization
in the world

31 out of **36**
refining technologies in use
today were developed by
UOP

HONEYWELL CO₂ SOLUTIONS



CARBON CAPTURE REFERENCES



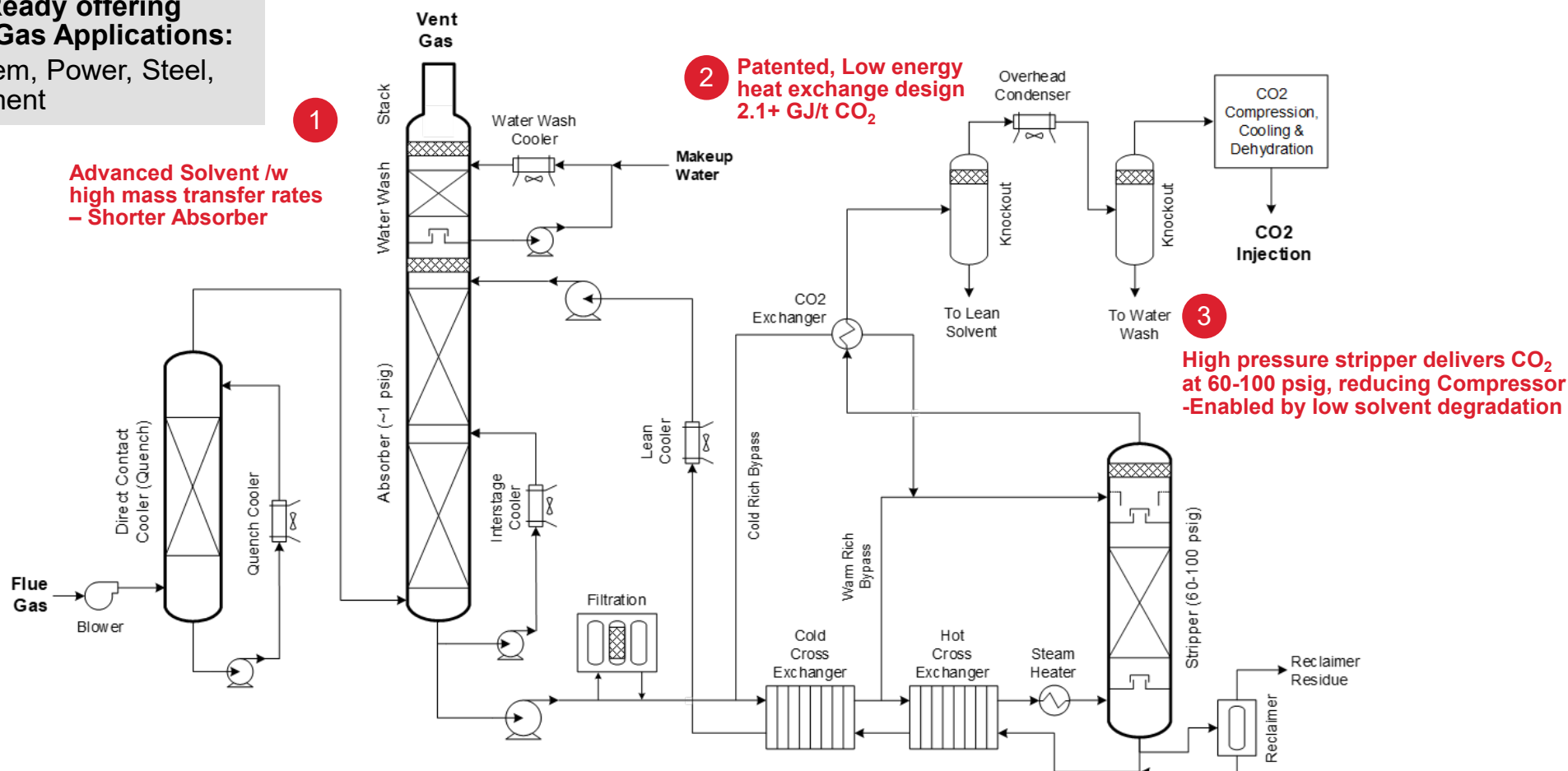
Existing Units Capture Ready & Capturing			
#	Customer	Technology	CO2 Capture Capacity (kMTA)
1	FPSO	Membranes	26,000
2	Gas Processing Plant	Cryo-Selexol	8,400
3	Fertilizer Plant	Selexol	1,000
4	Power Plant Indiana	Selexol	1,500
5	Gas processing plants	AGFS, Selexol, Benfield	>6Bscfd of installed capacity transitioning to CO ₂ Capture plants
6	Bulk CO ₂ Removal Plants	Separex	>3Bscfd of Bulk CO ₂ removal capturing & capture ready
Recent Awards			
1	Exxon Mobil Baytown	Cryo-PSA	7,000
2	Wabash Valley Resources	Cryo-PSA	1,650
3	Crescent Midstream	ASCC	3,000
4	Duke DOE Selection	ASCC	3,600
5	Calpine DOE Selection	ASCC	Confidential
6	Cement Kiln	Cryo-PSA (FastFEED)	700
7	SMR Flue Gas	ASCC	245
8	CCGT Demo	ASCC	10
9	Confidential	Cryo-PSA	6,700
10	Blue Spruce Operating	Cryo-PSA	4,500

Capturing >15 Mt per year with Capacity to Capture More

Sources: ExxonMobil to Deploy Honeywell Carbon Capture Technology, Honeywell Technology Enables Large U.S. Carbon Capture And Storage Project, OCED_CCFEEDs_AwardeeFactSheet_Duke_1.5.2024.pdf (energy.gov), Ecopetrol selects Honeywell technology for advanced solvent carbon capture study (digitalrefining.com), <https://www.energy.gov/fecm/project-selections-foa-2614-carbon-management-round-3>, Crescent Midstream Selected to Develop an Integrated Carbon Capture Solution for Entergy Natural Gas Power Plant

ADVANCED SOLVENT CO₂ CAPTURE (ASCC) PROCESS

**Commercial Ready offering
targeted for Flue Gas Applications:**
Refining & Petchem, Power, Steel,
Cement



Advanced solvent offering reduces overall CAPEX and OPEX

HONEYWELL ASCC – SECOND GENERATION AMINE TECHNOLOGY SCALE UP

Bench Scale



- Considered 100+ solvents
- Fast mass transfer rate
- Robust against oxidation

SRP Pilot



- >17+ years of Pilot Plant Operation
- CO₂ concentrations 3-20%
- Flue Gas flow rates of 350-600 CFM

National Carbon Capture Center



- 0.5 MW coal-fired flue gas, with 8 TPD CO₂
- CO₂ concentrations tested 4% & 12%
- Total of over 8500 hours to date
- Oxygen content tested up to 15%
- Emissions measurements for permitting
- Successful solvent reclaiming campaign

Technology Center Mongstad (TCM)



- 12 MWe RFCC flue gas, with average of 100 TPD CO₂ up to max of 200 TPD CO₂
- Further Advancing Oxidation Mitigation
- Emissions measurements for permitting
- Secondary Emissions Control Testing
- Successful Solvent Reclaiming campaign

UOP SOLVENT SYSTEM EXPERIENCE

LOCATION	Application	Capture Technology	Inlet CO ₂ %	Start Up Date	Total Feed Flow MMSCFD	CO ₂ Captured MMtpa
Middle East	LNG	Solvent	6.3	2015	979	1.02
Middle East	LNG	Solvent	6.3	2015	979	1.02
Middle East	LNG	Solvent	6.3	2015	942	0.98
Middle East	Sales Gas	Solvent	2.3	2007	2500	0.95
N America	LNG	Solvent	2	2024 - 2025	2583	0.86
N America	LNG	Solvent	2	2019 - 2020	2010	0.67
N. America	LNG	Solvent	2	2019	2000	0.66
Middle East	LNG	Solvent	2.5	2009	1563	0.65
Middle East	LNG	Solvent	2.5	2008	1560	0.65
Middle East	LNG	Solvent	2.5	2008	1560	0.65
Middle East	Sales Gas	Solvent	4.6	2007	794	0.61
SE Asia	LNG	Solvent	3.1	2014	980	0.50

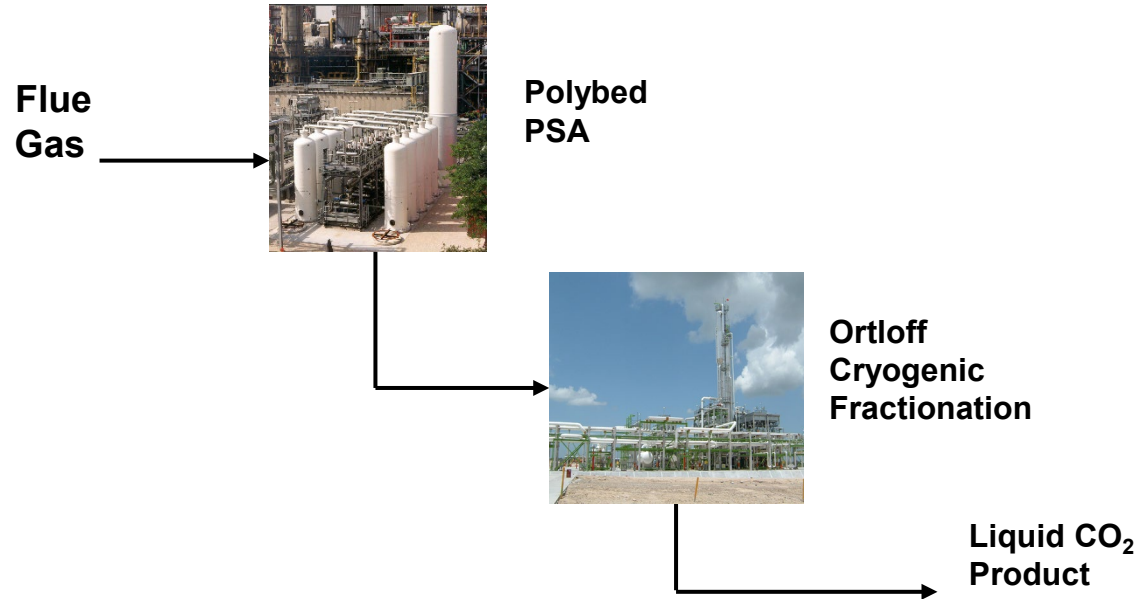
**70+ years experience
in gas processing**

**1200+ solvent
systems designed**



Long and diverse experience in Amine-based CO₂ removal

CRYOGENIC CO₂ CAPTURE



Experience

- 1150+ PSAs in 9 different applications
- 418 cryogenic references in 5 different applications

- Carbon capture for higher CO₂ concentrations – 15% +
- Pressure Swing Adsorption (PSA) used for flue gas enrichment
- Proprietary CO₂ fractionation process integrated to deliver it in **transportable form** (liquid)
- High purity CO₂ specification (>99.9%)¹ achievable along with high recovery (>95%)²
- All electrically powered

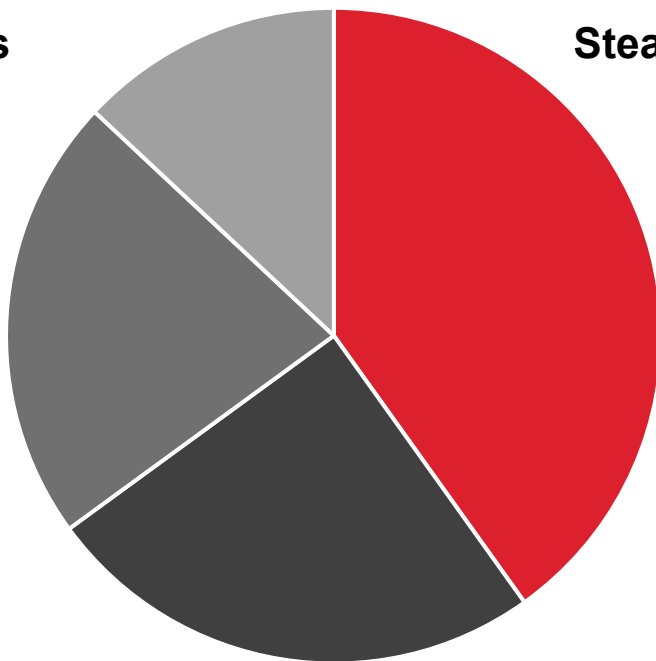
Energy Requirements Cryogenic Lower as CO₂ Concentration Goes Up

PSA APPLICATIONS & EXPERIENCE

13% ■
Ethylene Off-Gas
No. of Units: 151

22% ■
Specialty Applications
No. of Units: 255

- Ammonia Plants
- Coke Oven Gas
- Gasification
- Methanol Off-Gas
- Misc. Off-Gas
- Partial Oxidation / Syngas



40% ■
Steam Reformers
No. of Units: 465

25% ■
Refinery Streams
No. of Units: 255



>1,150 Polybed PSA units supplied by Honeywell UOP worldwide

CO₂ FRACTIONATION UNIT | SANDRIDGE, TX USA

Natural Gas Processing Plant with CO₂ for Enhanced Oil Recovery

Capacity: 675 MMSCFD with 65% CO₂

Annual CO₂ Capture – 8.4 MTPA





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