

HONEYWELL H₂ SOLUTIONS

Meet tighter emissions goals with low-cost CO₂ capture

As the world strives to reduce greenhouse gases, Honeywell H₂ Solutions are a viable way for you to decarbonize your plant today to meet your emissions goals.

Honeywell H₂ Solutions work by efficiently capturing and sequestering carbon dioxide to create hydrogen as a low-carbon energy source. These solutions are based on proven Honeywell UOP technologies widely known for reliability, high purity and low cost. Honeywell experts can tailor a solution to help meet the needs of your operation.

EXISTING STEAM METHANE REFORMER (SMR) RETROFIT

Retrofitting existing SMR assets with carbon capture technology is a ready-now, commercially proven and significant step on the journey to net zero. Most existing hydrogen production plants for refining, chemical, and agricultural use employ an SMR to convert hydrocarbon feeds such as natural gas or naphtha and steam into synthesis gas which comprises H₂, CO, CO₂, unconverted methane, and a small amount of inerts. To maximize H₂, the synthesis gas is cooled and shifted in a water gas shift reactor to convert CO and water to H₂ and CO₂ and then sent to a pressure swing adsorption (PSA) system for high purity hydrogen production.

To reduce the carbon emissions of an existing hydrogen asset, CO₂ can be captured from the shifted syngas, the PSA tail gas or the flue gas. The most cost-effective location to remove CO₂ is from pre-combustion streams, which are the shifted syngas and PSA tail gas. The CO₂ can be removed by a variety of means including cryogenic fractionation, PSA or solvent-based absorption.

UOP Ortloff® CO₂ Fractionation System

Cryogenic fractionation provides the lowest overall cost of CO₂ captured, driven by significant additional high purity H₂ yield. In this option, the H₂ PSA tail gas is compressed, dried, condensed, and fractionated, resulting in a high purity liquid CO₂ stream. Combining separation and liquefaction in a single unit operation saves utilities when a liquid product is required. UOP's Ortloff CO₂ Fractionation process was commercialized in liquefied natural gas (LNG) applications in 2011.

This retrofit does not require any revamp to the existing H₂ PSA, can be operated 'on' or 'off' without impacting the SMR operation, is solvent free, has a smaller footprint than an amine unit, requires no steam usage in the CO₂ recovery steps, and is guaranteed to meet high purity CO₂ product specifications with 99+% CO₂ recovery. In addition, 10-20% additional high-purity hydrogen can be directly recovered from within the fractionation system in order to increase SMR production capacity and improve process economics.

UOP CO₂ Polybed® PSA System

An alternative option for CO₂ capture from the PSA tail gas is a CO₂ PSA unit. A CO₂ PSA unit can be installed on the shifted syngas or the H₂ PSA tail gas, though the latter is preferred primarily due to a simpler revamp and ease of operation in the event the CO₂ capture unit is bypassed. The CO₂ PSA is the lowest CapEx and OpEx carbon capture



FEATURES AND BENEFITS

- Ready-now, commercially proven technology
- Low-cost options to significantly reduce CO₂ emissions
- 99%+ CO₂ recovery
- Tailored to meet required H₂ and CO₂ purity requirements
- Single unit separation and liquefaction available
- Solvent-free options with a smaller footprint

option and can remove 99% of the CO₂ in the pre-combustion stream. For transport, the low-pressure CO₂ requires drying and liquefaction, or contaminant polishing via catalytic oxidation, followed by drying and multi-stage compression.

UOP Amine Guard™ FS Process

Amine-based solvent technology can also achieve 99% CO₂ removal from the shifted syngas stream, using steam for solvent regeneration. The low-pressure CO₂ product requires drying and multi-stage compression or liquefaction to be transport-ready. For end-users that want gas-phase CO₂ and are long on steam, an amine unit is a reliable, proven choice for CO₂ recovery, albeit at a higher cost of capture than tail gas recovery.

UOP Callidus® Burners

CO₂ removal from the fuel gas requires advanced burner technology for stability and to achieve low NO_x emissions. UOP Callidus burners are widely used in SMR furnaces today. These burners are customized to the furnace licensor's specifications and can be revamped to enable low carbon intensity hydrogen production.

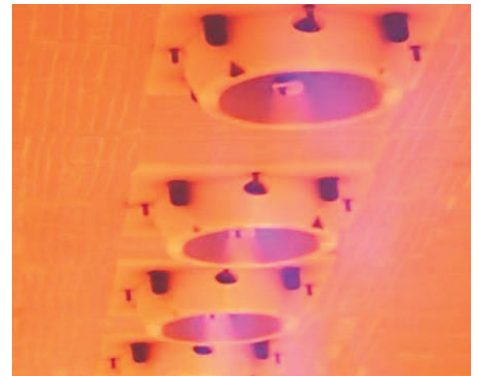
EXPERIENCE

With 19 engineering and R&D centers and 14 manufacturing facilities in 19 countries, UOP is close to its customers wherever they are. Since 1914, UOP has developed more than 70 licensed processes and 5,000 active patents and applications for the industries served.

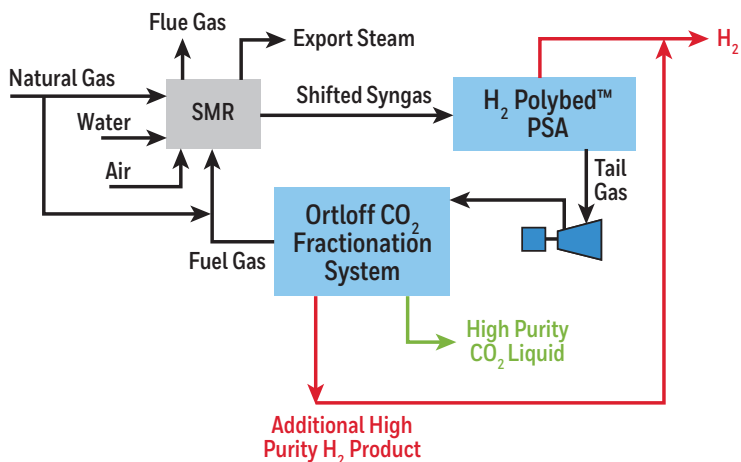
Honeywell UOP invented and developed Polybed PSA technology more than 50 years ago and has delivered more than 1,100 PSA systems worldwide. Field performance tests prove the performance of PSA systems with an on-stream factor of 99.8+% and specified adsorbent life of more than 20 years.

UOP also offers a wide portfolio of process technologies, engineering know-how and patents for the recovery of natural gas liquids and/or liquefied petroleum gas (NGL/LPG), LNG, and CO₂ fractionation. Orloff cryogenic technologies have been applied worldwide in over 200 operating gas processing plants.

Amine Guard FS process technology was introduced more than 20 years ago. To date, UOP has licensed more than 400 Amine Guard units for commercial service.



Cryogenic Fractionation Flow Scheme



For more information

www.uop.com

UOP LLC, A Honeywell Company

25 East Algonquin Road
Des Plaines, IL 60017-5017, U.S.A.
www.uop.com

UOP4810-12 | 04/2021
© 2021 UOP LLC. All rights reserved.
The information in this Honeywell Company document should not be construed as a representation for which UOP assumes legal responsibility, or an authorization or recommendation to practice a patented invention without a license.

