

UOP Polysep™ Membrane Systems for Hydrogen Recovery and Purification

Introduction

Polysep systems combine state-of-the-art composite membrane technology with advances in polymer science. The Polysep membranes offer separation characteristics (permeability, selectivity, and contaminant resistance) that allow the design of an optimum system to fit a given process need.

Polysep membrane systems are modular units containing hollow fiber membrane cartridges. Hollow fiber cartridges consist of fibers wound helically around a perforated hollow tube, called a mandrel, through which the non-permeate gas is removed. The desirable, or permeate, gas will collect inside the fiber and exit as product.

The membranes are supported by the cartridge structure, resulting in excellent mechanical integrity and flow distribution. The cartridges are housed in modules, which are in turn mounted on a skid in series or parallel configurations depending upon feed gas volume and product requirements. High membrane packing density (high surface area per volume) minimizes system size and cost.

UOP Polysep Membrane Systems offer:

- **Ease of installation and maintenance**

Modular design and shop fabrication permit compact design, and the membrane cartridges are oriented horizontally for easy installation and maintenance. Testing of components before delivery allows for faster start-ups.

- **Minimal manpower requirements**

Automatic operation features, which can include automatic start-up, capacity control, product purity control, and auto depressurization, require minimal operator attention. The system design automatically adjusts for changes in the feed rate without any additional operator intervention.

- **High reliability**

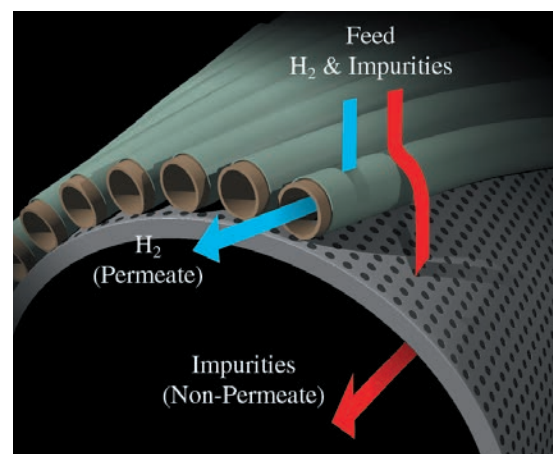
Historical operating data indicates minimum unscheduled shutdowns for these systems. This record of maximum on-stream time is due to reliability features that include:

- Minimal feed pretreatment and utility requirements
- Proven valve and instrument designs
- Patented turn-down control system, which limits the risk of condensation in the membrane system during reduced feed rate operation
- High resistance to contaminants

- **Future expandability by adding modules or skids**



Polysep Membrane Systems are economical and reliable for producing high purity hydrogen from off-gases of refinery, ammonia, methanol, gasifier and partial oxidation units.



Hollow Fiber Membrane

Process Description

The separation of a gas mixture by membranes is effected by the differences in permeation rates of various gases through the polymeric membrane. The more permeable gas (hydrogen) is enriched on the permeate side of the membrane, while the less permeable gas enriches on the feed side of the membrane. The membrane separation of these gases is a pressure driven process. Polysep Membranes have been used to produce hydrogen from feed streams with pressures ranging from 200 to 2,500 psig (14 to 175 kg/cm²(g)). The product stream (permeate) is produced at a lower pressure by taking a pressure drop across the membrane. The non-permeate stream is available at a pressure that is slightly below the feed pressure. The membrane process is continuous, and produces permeate and non-permeate streams at constant flow, pressure, and purity.

Experience

In their primary application, Polysep systems produce high-purity hydrogen from a variety of feed sources, such as off-gas streams from refining, ammonia, methanol, gasifier and partial oxidation plants. Depending on the application, hydrogen purity can be >98% and hydrogen recovery can exceed 95%. Other proven applications are H₂/CO syngas ratio adjustment, CO purification, and enrichment of methane-containing streams in olefin complexes.

UOP has also supplied integrated Polysep Membrane and Polybed PSA systems for optimized recovery and purification of hydrogen and syngas production. Polysep Membranes have also been installed in combination with UOP's Amine Guard, Benfield and Selexol technologies to meet unique

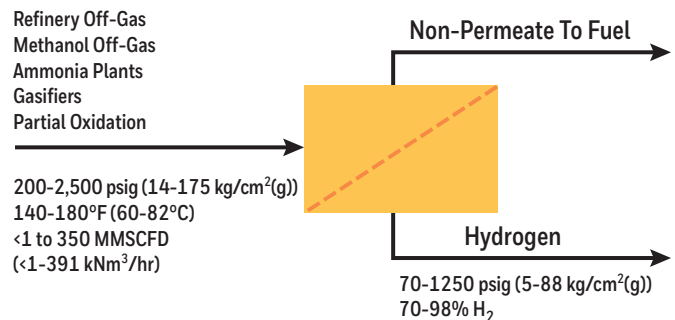


plant or project needs. More than 70 Polysep Membrane systems have been supplied, including installations processing feed rates of more than 350 MMSCFD (391 kNm³/hr).

UOP Provides:

- Polysep Membranes for the production of high purity hydrogen from a wide variety of gas streams.
- Polysep Membranes to recover hydrogen from gas streams that might otherwise be lost as fuel.
- Reduced operating requirements from control systems that automatically adjust for changes in the feed flow rate.
- Optimized integration of Polysep Membrane technology within your plant
- Improvements to existing technology to meet your changing process needs
- New applications to meet your new challenges
- Integration of Polysep Membranes with other UOP processes, for optimized processing solutions
- Unparalleled international experience in project development, engineering, fabrication, and technical support
- Flexibility in project execution
- Membrane systems optimized to customer requirements
- Worldwide sourcing to meet local requirements
- Shop fabricated skid-mounted systems for fast on-site installation and short start-ups.
- Superior quality control resulting in long-term safe, reliable operation
- Revamp services to enable existing equipment to meet your future needs
- Products and services within ISO-9001 certification
- On-going technical support after plant start-up

Hydrogen Applications



For more information

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