



UOP Polysep™ Membrane Systems for Gas Extraction and Purification

Hydrogen

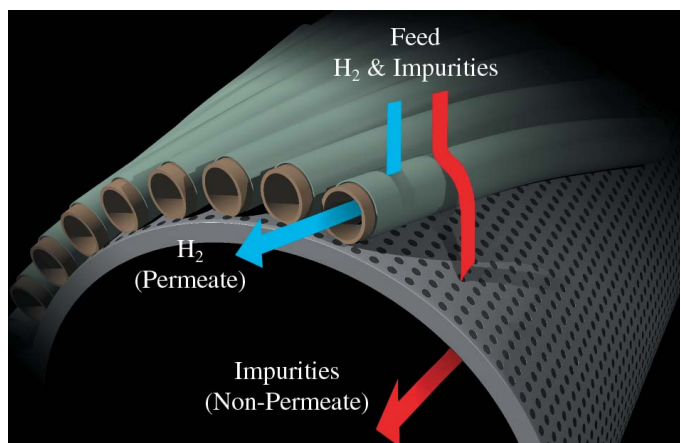
Polysep systems combine state-of-the-art composite membrane technology with advances in polymer science, a combination that results in membranes that are fundamentally different from others. The Polysep family of separation polymers offers a range of separation characteristics (permeability, selectivity, and contaminant resistance) that allow the design of an optimum system to fit a given process need.

Polysep membrane systems are modular units containing either hollow fiber or spiral wound membrane elements.

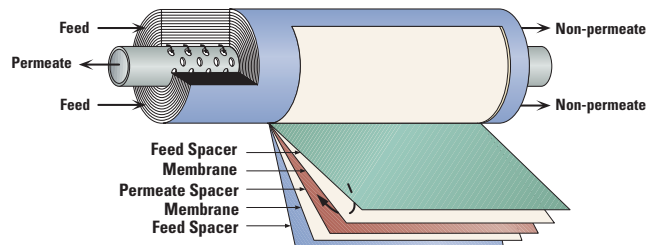
- Hollow fiber elements consist of fibers wound helically around a perforated hollow tube through which the non-permeate gas is removed. The desirable, or permeate, gas will collect inside the fiber and exit as product.
- Spiral wound elements consist of several leaves. Each leaf contains two membrane sheets that are separated by a permeate channel spacer of rigid and porous material. The membrane leaves are wound around a perforated hollow tube through which the permeate gas is removed as product.

The membranes are well supported by the element structure, resulting in excellent mechanical integrity and flow distribution. The elements are housed in pressure tubes, 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.

Hollow Fiber Membrane



Spiral Wound Membrane



UOP Polysep membrane systems offer:

- **Ease of installation and maintenance**
Modular design and shop fabrication permit compact design, yet membrane elements are oriented for ease of 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 no special operator consideration. The system design permits easy turn-up and turn-down without ongoing operator attention to capacity.
- **High reliability**
Historical operating data indicates minimum unscheduled shutdowns for these systems. This record of more than 99.8% on-stream time is due to reliability features that include:
 - Minimal feed pretreatment and utility requirements
 - Proven valve and instrument designs
 - Unique turn-down capability, 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.

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 (for example, 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

Hydrogen

is a pressure driven process and requires a high feed pressure. 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 essentially 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 high-pressure vents and purge streams from hydroprocessing, methanol, and ammonia plants. Other proven applications are H₂/CO syngas ratio adjustment, CO purification, and CO₂ removal from natural gas. In addition to stand-alone systems, Polysep membranes have been installed in combination with UOP's Polybed™ PSA and Isosiv™ adsorption technologies, and UOP's Amine Guard™, Benfield™, and Selexol™ absorption technologies to meet unique plant or project needs. More than 500 units have been supplied, including installations providing more than 55,000 Nm³/h (50 mm SCFD) of enriched hydrogen.



UOP provides:

- Unparalleled international experience in project development, engineering, fabrication, and technical support
- Flexibility in project execution
- Membrane systems optimized within customer requirements
- Worldwide sourcing to meet local requirements
- Shop fabricated skid-mounted systems for fast on-site installation and short start-ups.
- Products and services within ISO-9001 certification
- On-going technical support after plant start-up

For more information

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UOP 4810-3 0907

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