Linde

HISELECT® powered by Evonik for ultra-efficient gas processing.

Leading technologies for benchmark selectivity and stability.

Bringing new levels of efficiency to gas treatment.

Highly selective, robust membrane technology

Membrane technology has proven its advantages in the field of gas separation, ideal for recovering helium, process and natural gases, for instance. Rising global demand for natural gas is prompting energy companies to increasingly develop reserves with a higher carbon dioxide (CO_2) contents. However, the conventional technologies used to treat natural gas from CO_2-rich reserves require multiple, energy-intensive process steps.

Linde Engineering and specialty chemicals company Evonik Industries have joined forces to address this challenge, developing an innovative membrane technology that enables even CO_2-rich natural gas to be processed in an energy-efficient way without the need for solvents, power, instrument air or other utilities. "HISELECT® powered by Evonik" rounds out Linde Engineering's gas separation portfolio, giving customers a one-stop service for all of their gas processing needs.

Building on Linde Engineering's leading, field-proven pressure swing adsorption (PSA) and membrane technologies, HISELECT takes cost-efficiency and reliability to the next level – offering greater purification performance and selectivity over a broader application spectrum. This selectivity means that these high-performance membranes are also ideal for separating heavy hydrocarbons and trace components.

A closer look

HISELECT bundles Linde's world-class membrane and PSA technologies with Evonik's expertise in innovative polymer materials. The polymer is designed as hollow fiber, which maximizes the membrane surface area per module and thus the purity of the resulting gases. The hollow fibers are highly robust and resistant to pressure and temperature, supporting a broad application spectrum. Superior selectivity provides high recovery rates and significantly helps to optimize the design of the membrane unit (1 vs. 2 stages) while simultaneously achieving a high capacity.

Membrane operation

→ Hollow fiber for a compact solution
→ Different flows and arrangements possible
   (4 or 8 inch modules available)
→ High selectivity allows for superior efficiency
→ Pressures up to 200 bar and temperatures up to 80°C possible
→ Suited to plants of all sizes
→ Multiple cartridges can be connected in series in one housing

Pretreatment

Linde offers multiple pretreatment options for the removal of liquid aerosols, particulate matter, heavy hydrocarbons (HHC), and certain vapor-phase hydrocarbon contaminants, adapting its offering to each customer's process to ensure the pefect fit.

→ High-efficiency coalescing filter
→ Polishing filter
→ Guard bed (activated carbon adsorbent)
→ Mechanical refrigeration unit for hydrocarbon dewpoint control
→ PSA unit to capture water and HHC
→ HISORP™ temperature swing adsorption (TSA) for HHC removal
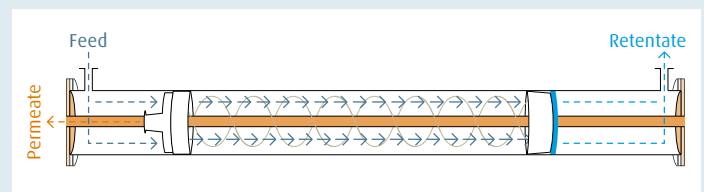
General flow inside the membrane.

Gases flow through the hollow fiber membrane, where high-performance fibers – specially adapted for the natural gas industry – provide excellent selectivity.

Robust performance across broad scope of applications and process gases with our HISELECT® family

The HISELECT family consists of different cartridges, combined to ensure the best solution for each application.

Natural gas
HISELECT® F membranes were custom-developed for the efficient removal of CO_2 from natural gas, scaling easily from small to large capacities, and from low to high concentrations. Strong resistance to hydrocarbons ensures a high level of stability. HISELECT can also be used to remove hydrogen sulfide (H_2S) from natural gas.

Process gases (syngas)
HISELECT® S membranes are suited to the removal of CO_2 and adjustment of the ratio of hydrogen (H_2) and carbon monoxide (CO) for process gases. It can further be used for debottlenecking existing amine units and removing hydrogen from process gases.

Helium
HISELECT membranes are specially designed for helium recovery. The high-performance polymer in the membranes separates this noble gas from a natural gas mix or other helium-rich gases. Since 2016, a HISELECT plant in Mankota, Canada, has been using a hybrid process combining membrane separation with PSA to recover high-purity helium (He) from a natural gas mixture.
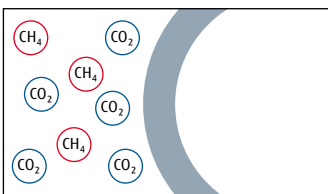
CO_2 and CH_4 mixture downstream of the membrane barrier.
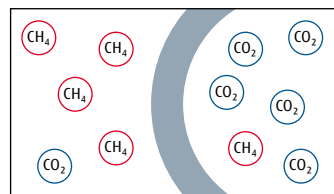
CO_2 passes through – CH_4 preferably remains outside.

Main advantages of HISELECT

→ High selectivity (higher recovery, single-stage instead of two-stage design frequently feasible)
→ Good resistance to heavy hydrocarbons
→ Long operating lifetime
→ Highly robust and resistant to pressure and temperature
→ Tolerant towards high CO_2 partial pressure
→ Low operational costs
→ No moving parts, corrosion or foaming
→ Small footprint
→ Easy to operate
→ No solvents required

Stable performance over time

—— HISELECT®
—— Conventional cellulose acetate membrane
----- Partial exchange of cellulose acetate membrane
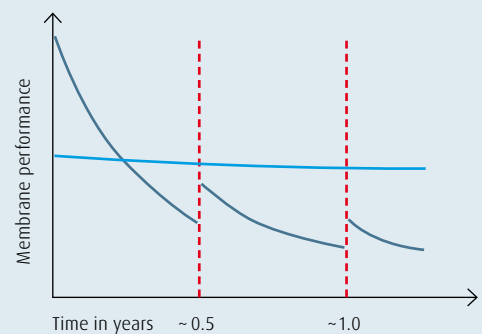
HISELECT hollow fibers.

Your partner for the production and processing of gases.

Delivering reliable process plants for maximum capital efficiency
Linde has been optimizing gas processing technologies for 140 years, successfully delivering more than 4,000 plant engineering projects around the globe. Favoring trusted, lasting business relationships, the company collaborates closely with customers to enhance plant lifecycle productivity and innovate process flows. The company's proven gas processing expertise plays an indispensable role in the success of customers across multiple industries – from natural gas and oil refining through petrochemicals and fertilizers to electronics and metal processing.

Operational excellence along the entire plant lifecycle
We work closely with our customers to gain an in-depth understanding of individual needs. Building on the unique synergies of Linde as an integrated plant operator and engineering company, Linde offers innovative process technologies and services to exceed our customers' reliability and profitability expectations. This commitment to innovation extends along the entire plant lifecycle. The LINDE PLANTSERV™ service team supports customers every step of the way – from maintenance and repairs to full revamps. Leveraging the latest digital technologies to offer on-site and remote operational and support services, we consistently take asset performance to the next level.

Making the impossible possible
From the desert to the Arctic, from small- to world-scale, from standardized to customized designs, Linde's engineering specialists develop solutions that operate under all conditions. The company covers every step in the design, project management and construction of gas processing plants and components. Customers can always rely on Linde to deliver the plants, components and services that fit their needs best – anywhere in the world.

Discover how we can contribute to your success at www.linde-engineering.com

Get in touch with our adsorption and membrane plants team:
Inquiry: www.linde-engineering.com/contact

Core competencies at a glance

Plant engineering	Component manufacturing	Services
→ Air separation plants	→ Coldboxes and modules	→ Revamps and plant modifications
→ LNG and natural gas processing plants	→ Coil-wound heat exchangers	→ Plant relocations
→ Petrochemical plants	→ Plate-fin heat exchangers	→ Spare parts
→ Hydrogen and synthesis gas plants	→ Cryogenic columns	→ Operational support, troubleshooting and immediate repairs
→ Adsorption plants	→ Cryogenic storage tanks	→ Long-term service contracts
→ Cryogenic plants	→ Liquefied helium tanks and containers	→ Expert reviews for plants, operations and spare part inventory
→ Carbon capture and utilization plants	→ Air-heated vaporizers	→ Operator training
→ Furnaces, fired heaters, incinerators	→ Water bath vaporizers	
	→ Spiral-welded aluminum pipes	

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