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Gas Separation Membrane Market Forecasts to 2030 – Global Analysis By Membrane Type (Polymeric Membranes, Inorganic Membranes, Composite Membranes, Mixed Matrix Membranes (MMMs), Carbon Molecular Sieve Membranes (CMSM) and Other Membrane Types), Material Type, Membrane Configuration, Process, Application, End User and By Geography

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Abstracts

According to Stratistics MRC, the Global Gas Separation Membrane Market is accounted for $1.9 billion in 2024 and is expected to reach $2.8 billion by 2030 growing at a CAGR of 7.0% during the forecast period. A gas separation membrane is a semi-permeable barrier designed to selectively separate different gases from a mixture based on their size, solubility, or diffusivity. These membranes are used in various industrial processes, including natural gas purification, carbon capture, and oxygen enrichment. The materials used for these membranes can range from polymers to inorganic substances, each offering specific advantages in terms of efficiency, selectivity, and durability. Gas separation membranes are essential for improving energy efficiency and reducing environmental impacts in various applications.

According to the World Steel Organization, in December 2023, China produced 67.4 metric tons of steel. Meanwhile, India has risen to become the second-largest producer of crude steel globally. The country exported 6.72 million metric tons of finished steel while only importing 6.02 million metric tons in the fiscal year 2022-23.

Market Dynamics:

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Driver:

Rising demand for natural gas

The rising demand for natural gas is significantly driving the growth of the market. As natural gas production increases globally, efficient separation technologies are essential for purifying and processing the gas. Gas separation membranes offer an energy-efficient solution, reducing costs and improving productivity in industries such as energy, petrochemicals, and environmental applications. This trend is expected to continue as the need for cleaner energy solutions and enhanced separation efficiency intensifies.

Restraint:

Membrane fouling and degradation

Membrane fouling and degradation have significant negative effects on the market. Fouling, caused by contaminants like dust, oils, or biological matter, reduces membrane efficiency, leading to higher operational costs and frequent maintenance. Degradation, due to chemical exposure or physical wear, shortens membrane lifespan, affecting performance and increasing replacement costs. These issues hinder long-term operational stability, reduce system efficiency, and limit the widespread adoption of membrane technologies in various industries.

Opportunity:

Advancements in membrane technology

Advancements in membrane technology are transforming the market by enhancing efficiency and selectivity. Innovations in materials are improving gas permeability and separation performance. New techniques like nano-engineering and hybrid membrane systems are increasing the lifespan and reducing energy consumption. These advancements are crucial in meeting the growing demand for cleaner, more efficient gas separation in industries like natural gas processing, petrochemicals, and CO2 capture.

Threat:

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Sensitivity to operating conditions

Sensitivity to operating conditions negatively impacts the market by limiting the membranes' performance under varying environmental factors. Variations in temperature, pressure, and feed composition can significantly reduce separation efficiency, leading to inconsistent results. This sensitivity increases operational costs as systems require frequent adjustments or maintenance to optimize performance. As a result, the reliance on specific conditions can hinder the versatility and widespread use of membrane technologies in diverse applications.

Covid-19 Impact:

The COVID-19 pandemic negatively impacted the market by disrupting global supply chains, delaying manufacturing processes, and causing a decline in demand from key industries like oil, gas, and petrochemicals. Additionally, reduced industrial activities and investments during lockdowns slowed the adoption of advanced gas separation technologies. However, as industries recover, the market is expected to rebound, driven by increasing demand for energy-efficient and sustainable separation solutions.

The polymeric membranes segment is expected to be the largest during the forecast period

The polymeric membranes segment is expected to account for the largest market share during the projection period. These membranes are widely used for natural gas purification, CO2 capture, and nitrogen separation, offering efficient performance with lower energy consumption. Advances in polymer material formulations enhance their selectivity and durability, making them increasingly popular for various industrial applications. Their versatility positions polymeric membranes as a leading choice in gas separation technologies.

The oil & gas segment is expected to have the highest CAGR during the forecast period

The oil & gas segment is expected to have the highest CAGR during the extrapolated period as these membranes are vital for processes such as natural gas purification, carbon dioxide removal, and hydrogen separation. Membranes provide efficient, cost-effective solutions for removing impurities, improving gas quality, and optimizing resource extraction. With increasing global demand for cleaner energy, gas separation membranes offer a sustainable and energy-efficient alternative to traditional separation technologies in the oil and gas sector.

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Region with largest share:

North America region is projected to account for the largest market share during the forecast period due to increasing demand for natural gas, stricter environmental regulations. Key industries such as oil and gas, petrochemicals, and energy are driving the adoption of gas separation membranes for applications like CO2 removal and natural gas purification. Innovations in membrane technology, along with substantial investments in sustainable energy, are further boosting market expansion in the region.

Region with highest CAGR:

Asia Pacific is expected to register the highest growth rate over the forecast period due to the growing focus on environmental sustainability and the push for cleaner energy solutions. The market is benefitting from advancements in membrane materials, such as polymeric and composite membranes, which offer improved performance, durability, and cost-effectiveness. As the demand for natural gas continues to rise and environmental regulations tighten, the gas separation membrane market in the region is poised for continued growth.

Key players in the market

Some of the key players in Gas Separation Membrane market include Air Products and Chemicals, Inc., Membrane Technology and Research, Inc., Honeywell UOP, BASF SE, LG Chem, MTR Inc., Fluor Corporation, Dow Chemical Company, Membrane System Solutions (MSS), Linde AG, Air Liquide, Toray Industries, Inc., Baker Hughes, Pall Corporation, Koch Membrane Systems, Inc., Saint-Gobain and Hankook & Company.

Key Developments:

In October 2024, Air Products announced the launch of the new PRISM® GreenSep liquefied natural gas (LNG) membrane separator for bio-LNG production. PRISM® GreenSep LNG membrane separators eliminate the need for intermediate purification technologies such as amine scrubbing or thermal swing adsorption during bio-LNG production, allowing for a higher yield of bio-LNG while also reducing operational expenses and energy consumption.

In October 2024, Honeywell and Air Products jointly announced that Honeywell has agreed to acquire Air Products' liquefied natural gas (LNG) process technology and

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equipment business for $1.81 billion in an all-cash transaction. This represents approximately 13x estimated 2024 EBITDA.

Membrane Types Covered:

- Polymeric Membranes
- Inorganic Membranes
- Composite Membranes
- Mixed Matrix Membranes (MMMs)
- Carbon Molecular Sieve Membranes (CMSM)
- Other Membrane Types

Material Types Covered:

- Polysulfone (PSF)
- Polyimide (PI)
- Polyvinylidene Fluoride (PVDF)
- Cellulose Acetate (CA)
- Zeolites
- Other Material Types

Membrane Configurations Covered:

- Flat Sheet
- Hollow Fiber

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Spiral Wound

Tubular

Process Covered:

Permeation-Based Separation

Absorption-Based Separation

Adsorption-Based Separation

Applications Covered:

Natural Gas Processing

Biogas Purification

Oxygen Enrichment

Carbon Capture and Storage (CCS)

Hydrogen Recovery and Separation

Air Separation

Other Applications

End Users Covered:

Oil & Gas

Chemicals & Petrochemicals

Healthcare & Medical

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- Food & Beverage
- Automotive
- Other End Users

Regions Covered:

- North America
  - US
  - Canada
  - Mexico
- Europe
  - Germany
  - UK
  - Italy
  - France
  - Spain
  - Rest of Europe
- Asia Pacific
  - Japan
  - China
  - India

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- Australia
- New Zealand
- South Korea
- Rest of Asia Pacific

South America

- Argentina
- Brazil
- Chile
- Rest of South America

Middle East & Africa

- Saudi Arabia
- UAE
- Qatar
- South Africa
- Rest of Middle East & Africa

What our report offers:
- Market share assessments for the regional and country-level segments
- Strategic recommendations for the new entrants
- Covers Market data for the years 2022, 2023, 2024, 2026, and 2030
- Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)
- Strategic recommendations in key business segments based on the market estimations

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- Competitive landscaping mapping the key common trends
- Company profiling with detailed strategies, financials, and recent developments
- Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

Regional Segmentation

Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

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Note: Tables for North America, Europe, APAC, South America, and Middle East & Africa Regions are also represented in the same manner as above.

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