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Membrane Bioreactor Market Forecasts to 2030 – Global Analysis By Type (Submerged Membrane Bioreactor (SMBR), External Membrane Bioreactor (EMBR), Hollow Fiber Membrane Bioreactor, Flat Sheet Membrane Bioreactor, Hybrid Membrane Bioreactor, Rotating Disk Membrane Bioreactor and Other Types), Membrane Material, Technology, Application, End User and By Geography

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Abstracts

According to Stratistics MRC, the Global Membrane Bioreactor Market is accounted for $4.59 billion in 2024 and is expected to reach $7.25 billion by 2030 growing at a CAGR of 10.2% during the forecast period. A membrane bioreactor is an advanced wastewater treatment technology combining a biological treatment process with membrane filtration. The membrane, often made of microfiltration or ultrafiltration, separates solid particles, microorganisms, and contaminants from the treated water. This process enhances filtration efficiency, allowing for higher quality effluent and compact system design. It reduces footprint, improves effluent quality, and has the ability to handle high contaminant loads with minimal sludge production.

According to the Organization for Economic Co-operation and Development (OECD), in 2015, around 1,700 biopharmaceutical companies, which utilize bioreactors, are from Europe.

Market Dynamics:

Driver:

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Urbanization and population growth

With the rising population and cities expansion, the pressure on existing water resources and sewage systems intensifies. MBR systems, offering high-quality effluent and compact design, become essential for managing large volumes of wastewater, particularly in densely populated urban areas. MBR systems, with their compact design and high-efficiency filtration, are ideal for urban areas where space is limited. They effectively treat large volumes of wastewater, facilitating water reuse, reducing pollution, and helping meet the growing needs of urban populations for clean and safe water.

Restraint:

Membrane fouling

Membrane fouling in (MBRs occurs when contaminants like microorganisms, organic matter, and inorganic particles accumulate on the membrane surface, reducing its permeability. This leads to decreased filtration efficiency and higher energy consumption for maintaining flow rates. Fouling also increases maintenance costs and shortens membrane lifespan, requiring frequent cleaning or replacement. As a result, membrane fouling hampers the market growth of MBRs by increasing operational costs and complexity.

Opportunity:

Rising industrial wastewater treatment

Industries such as pharmaceuticals, textiles, food processing, and chemicals produce large volumes of wastewater with varying contaminants, requiring advanced treatment solutions. MBRs offer superior filtration, effectively removing suspended solids, pathogens, and organic contaminants, ensuring compliance with stringent discharge regulations. As industries face increasing pressure to minimize environmental impact, MBRs provide a sustainable, cost-effective solution for treating and recycling wastewater, driving the demand for this technology across industrial sectors globally.

Threat:

High capital and operational costs

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The high capital and operational costs of membrane bioreactors stem from the expensive membrane materials, complex system setup, and the need for skilled labor for maintenance and operation. Membrane replacement, energy consumption for filtration, and regular cleaning add to the operational costs. These high expenses make MBR technology less accessible, especially for smaller municipalities. As a result, the cost barrier hampers widespread adoption, limiting market growth.

Covid-19 Impact

The covid-19 pandemic had a mixed impact on the membrane bioreactor market. On one hand, disruptions in supply chains and delayed construction projects slowed market growth. On the other hand, the heightened focus on public health and wastewater management, particularly for tracking and treating viruses, spurred interest in advanced water treatment technologies. The pandemic also highlighted the need for more resilient infrastructure, driving long-term demand for MBR systems in wastewater and water recycling applications.

The flat sheet membrane bioreactor segment is expected to be the largest during the forecast period

The flat sheet membrane bioreactor segment is predicted to secure the largest market share throughout the forecast period. FS-MBR is a type of MBR technology that utilizes flat, stacked membrane sheets for filtration. This configuration enhances the separation of solids and contaminants from wastewater, providing high-quality effluent. They offer advantages such as reduced fouling, higher permeability, and improved energy efficiency compared to traditional tubular membrane systems, making them ideal for water reuse and resource recovery applications.

The water reuse segment is expected to have the highest CAGR during the forecast period

The water reuse segment is anticipated to witness the highest CAGR during the forecast period due to their ability to produce high-quality effluent suitable for various purposes, including irrigation, industrial processes, and even potable water. MBR systems efficiently treat wastewater by combining biological treatment with membrane filtration, removing contaminants and pathogens. This technology is essential for addressing water scarcity issues and promoting sustainable water use, making it a key solution in regions with limited freshwater resources or high water demand.

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Region with largest share:

Asia Pacific is expected to register the largest market share during the forecast period due to increasing water scarcity, rapid urbanization, and stringent environmental regulations. Major players in the region include Mitsubishi Chemical, Toray Industries, GE Water & Process Technologies, and Hyflux. The market is primarily driven by municipal wastewater treatment and industrial applications such as textiles and food processing. The Asia Pacific MBR market is expected to experience significant growth, driven by technological advancements and growing environmental awareness.

Region with highest CAGR:

North America is expected to witness the highest CAGR over the forecast period driven by stringent environmental regulations, increasing water scarcity, and a focus on sustainable water treatment solutions. The region sees high demand for MBR technology in municipal and industrial wastewater treatment applications. With growing investments in water infrastructure and rising awareness of efficient wastewater treatment, the North American MBR market is poised for steady growth, particularly in urban areas and industrial sectors.

Key players in the market

Some of the key players profiled in the Membrane Bioreactor Market include Suez SA, Mitsubishi Chemical Corporation, Pall Corporation, Kubota Corporation, Dow Inc., Siemens, Toray Industries Inc., Danaher Corporation, Nitto Denko Corporation, Hitachi Zosen Corporation, Xylem Inc., Veolia, IDE Technologies, Pentair Plc, Degremont Technologies (SUEZ), Evac Oy, A3 Water Solutions, Inge GmbH, Hyflux Limited and Aquatech International.

Key Developments:

In September 2022, Evac introduced a new mid-size version of their Membrane Bioreactor (MBR) wastewater treatment plant. This system was specifically developed to provide efficient, advanced wastewater treatment solutions for a variety of vessels, including ships and offshore platforms.

In July 2020, SUEZ has signed an agreement to purchase the Reverse Osmosis (RO) membrane portfolio from specialty chemical company LANXESS. SUEZ’s focus on sustainable solutions aligns with its broader corporate mission to promote

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environmental conservation. The purchase enabled SUEZ to expand its market share in the reverse osmosis market, which is essential in regions facing freshwater scarcity.

Types Covered:

- Submerged Membrane Bioreactor (SMBR)
- External Membrane Bioreactor (EMBR)
- Hollow Fiber Membrane Bioreactor
- Flat Sheet Membrane Bioreactor
- Hybrid Membrane Bioreactor
- Rotating Disk Membrane Bioreactor
- Other Types

Membrane Materials Covered:

- Polymeric Membranes
- Ceramic Membranes
- Composite Membranes
- Other Membrane Materials

Technologies Covered:

- Microfiltration (MF) MBR
- Ultrafiltration (UF) MBR
- Reverse Osmosis (RO) MBR

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Nanofiltration (NF) MBR

Other Technologies

Applications Covered:

Mining

Aquaculture

Water Reuse

Desalination

Food & Beverages

Pharmaceuticals

Chemicals

Other Applications

End Users Covered:

Municipal

Industrial

Commercial

Regions Covered:

North America

US

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- Canada
- Mexico

Europe

- Germany
- UK
- Italy
- France
- Spain
- Rest of Europe

Asia Pacific

- Japan
- China
- India
- Australia
- New Zealand
- South Korea
- Rest of Asia Pacific

South America

- Argentina
- Brazil

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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
- 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)

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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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