

Biopharmaceutical Fermentation System Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, 2018-2028 Segmented By Product Type (Upstream Products (Bioreactors/Fermentors, Bioprocess Analyzers, Process Monitoring System, Others), Downstream Products (Filtration & Separation, Chromatography, Consumables and Accessories, Others)), By Application (Antibiotics, Recombinant Proteins, Others), By End User (Biopharmaceutical Industries, Contract Research Organization, Academic Research Institutes, Others), By Region, and By Competition

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Abstracts

Global Biopharmaceutical Fermentation System Market has valued at USD 24.94 billion in 2022 and is anticipated to project impressive growth in the forecast period with a CAGR of 8.30% through 2028. The global biopharmaceutical fermentation system market is a critical segment of the biotechnology and pharmaceutical industries. Biopharmaceuticals, which include therapeutic proteins, antibodies, vaccines, and other biologically derived drugs, have gained prominence in recent years due to their effectiveness in treating various diseases.

Key Market Drivers

Rising Demand for Biopharmaceuticals

The global biopharmaceutical fermentation system market is on an upward trajectory, and one of the key drivers behind this growth is the rising demand for biopharmaceuticals. Biopharmaceuticals, including monoclonal antibodies, vaccines, gene therapies, and other biologically derived drugs, have been at the forefront of medical innovation.

Biopharmaceuticals represent a revolution in healthcare. Unlike traditional chemical drugs, biologics are derived from living organisms and are highly targeted and effective. They have demonstrated remarkable success in treating a wide range of diseases, including cancer, autoimmune disorders, and rare genetic conditions. As a result, the demand for biopharmaceuticals has soared.

Biopharmaceuticals are now used to treat a broader spectrum of diseases. New indications are continually being explored, leading to a growing list of therapeutic applications. For example, monoclonal antibodies are being developed for various cancers, autoimmune diseases, and infectious diseases. As these indications expand, so does the need for biopharmaceutical production capacity.

The global population is aging, and with age comes an increased susceptibility to chronic diseases. Biopharmaceuticals offer hope for patients suffering from conditions like diabetes, rheumatoid arthritis, and Alzheimer's disease. The prevalence of these diseases is driving up the demand for biopharmaceuticals, which, in turn, boosts the need for efficient fermentation systems.

The COVID-19 pandemic underscored the importance of vaccines and rapid vaccine development. Biopharmaceutical fermentation systems play a crucial role in vaccine production. Governments and organizations worldwide are investing in pandemic preparedness and vaccine manufacturing capacity, further stimulating the growth of the fermentation system market.

Emerging markets, particularly in Asia-Pacific and Latin America, are witnessing a surge in demand for biopharmaceuticals. These regions are experiencing economic growth, improved healthcare infrastructure, and an increasing middle-class population. As healthcare access improves, so does the demand for advanced biologics, thus driving the demand for fermentation systems.

Many pharmaceutical companies are outsourcing biopharmaceutical production to contract manufacturing organizations (CMOs) to streamline costs and access

specialized expertise. CMOs rely heavily on fermentation systems, and as their services become more sought after, the market for these systems expands.

Advancements in Biotechnology

The global biopharmaceutical fermentation system market has been experiencing remarkable growth, thanks in large part to the continuous advancements in biotechnology. Biopharmaceuticals, including monoclonal antibodies, gene therapies, vaccines, and other biologically derived drugs, have revolutionized healthcare.

Advancements in biotechnology have led to precision in bioprocessing techniques. Genetic engineering, synthetic biology, and molecular biology innovations have allowed scientists to modify microorganisms and mammalian cells to produce biopharmaceuticals with higher specificity and efficiency. The need for precise control over these processes has fueled the demand for advanced fermentation systems.

Biotechnology has opened the door to customized therapies and personalized medicine. Researchers can now develop biopharmaceuticals tailored to individual patient profiles and genetic makeup. This requires highly specialized fermentation systems capable of handling diverse production processes, including gene editing and cell-based therapies.

Cell culture is a cornerstone of biopharmaceutical production. Innovations in cell culture techniques, such as the development of high-yield cell lines and optimized media formulations, have significantly increased the productivity of bioreactors. As a result, biopharmaceutical companies require more advanced fermentation systems to harness these improvements.

The scalability of biopharmaceutical production has been a historical challenge. However, biotechnology has introduced scalable bioreactor designs and single-use technologies that enable manufacturers to scale up production more rapidly and cost-effectively. This scalability factor drives the need for versatile fermentation systems.

Continuous bioprocessing is emerging as a game-changer in biopharmaceutical manufacturing. This approach offers increased productivity and efficiency compared to traditional batch processing. Advancements in continuous bioprocessing technologies are driving the adoption of fermentation systems capable of supporting these novel processes.

While fermentation focuses on upstream processes, advancements in biotechnology have also influenced downstream processing. Improved purification methods and chromatography techniques have increased product yield and reduced production costs. Fermentation systems must now integrate seamlessly with these downstream advancements.

Technological Innovation

The global biopharmaceutical fermentation system market is experiencing unprecedented growth, largely driven by continuous technological innovation. Biopharmaceuticals, including monoclonal antibodies, vaccines, gene therapies, and other biologically derived drugs, have transformed the healthcare landscape.

Technological innovations have led to more efficient biopharmaceutical manufacturing processes. Automation, data analytics, and machine learning have allowed for real-time monitoring and optimization of fermentation processes. This leads to increased yields, reduced production costs, and improved overall efficiency.

Single-use bioreactors represent a significant technological advancement. These disposable systems reduce the risk of contamination, minimize downtime between batches, and streamline cleaning and validation processes. The adoption of single-use bioreactors is on the rise, driving market growth.

Modern fermentation systems are equipped with advanced control systems that provide precise control over critical parameters such as temperature, pH, dissolved oxygen, and agitation speed. These systems ensure product consistency and quality, meeting the stringent requirements of regulatory agencies.

High-throughput screening techniques have revolutionized the development of cell lines and culture media. Automated platforms enable the rapid screening of thousands of conditions to identify optimal production conditions. This accelerates biopharmaceutical process development and boosts the demand for fermentation systems.

Continuous bioprocessing technologies are gaining traction in biopharmaceutical manufacturing. These systems allow for uninterrupted production and can significantly increase productivity. As the industry embraces continuous bioprocessing, the demand for fermentation systems supporting this approach grows.

The cultivation of mammalian cells is central to biopharmaceutical production.

Technological advances in cell culture, including the development of high-yield cell lines and improved media formulations, have led to higher productivity in bioreactors. This necessitates the use of advanced fermentation systems to harness these improvements fully.

Biopharmaceutical Outsourcing

The global biopharmaceutical fermentation system market is poised for remarkable growth, thanks in no small part to the increasing trend of biopharmaceutical outsourcing. Biopharmaceuticals, including monoclonal antibodies, gene therapies, vaccines, and more, have become pivotal in modern healthcare.

Biopharmaceutical outsourcing, often in the form of contract manufacturing organizations (CMOs), is a pivotal development in the industry. Many pharmaceutical companies are choosing to outsource their biopharmaceutical production to CMOs to improve efficiency, reduce costs, and access specialized expertise. This shift has generated a substantial demand for advanced fermentation systems.

CMOs are dedicated experts in biopharmaceutical production. They offer specialized skills and knowledge that allow pharmaceutical companies to tap into a wealth of experience. As CMOs expand their services, they invest heavily in fermentation systems to meet the growing needs of their clients.

The scalability of biopharmaceutical production has been a historical challenge. Outsourcing to CMOs allows pharmaceutical companies to quickly scale up production to meet surges in demand or to accommodate the production of new drugs. As a result, CMOs are continuously investing in versatile fermentation systems.

By outsourcing biopharmaceutical production, pharmaceutical companies can concentrate on their core competencies, such as drug discovery and marketing. This strategic approach has driven the demand for outsourcing services, further boosting the market for fermentation systems.

Many CMOs operate globally, allowing pharmaceutical companies to access a broader market and navigate complex regulatory landscapes more effectively. This global reach has accelerated the globalization of the biopharmaceutical fermentation system market.

CMOs are well-versed in navigating the stringent regulatory environment governing biopharmaceuticals. They have established quality control systems and expertise in

regulatory compliance. Advanced fermentation systems play a crucial role in ensuring compliance with Good Manufacturing Practices (GMP) and other regulatory standards.

CMOs are often more cost-effective than in-house production, as they can take advantage of economies of scale and operational efficiency. To maintain this cost advantage, CMOs invest in modern fermentation systems that improve productivity and reduce production costs.

Key Market Challenges

High Initial Capital Investment

Setting up a biopharmaceutical fermentation facility requires substantial capital investment. Bioreactors, fermentation tanks, and associated equipment are expensive. Smaller companies and startups may find it challenging to make these initial investments, limiting their ability to enter the market.

Contamination Risk

Biopharmaceutical fermentation processes are highly susceptible to contamination. Even minor contaminations can lead to the loss of entire production batches. Maintaining sterile conditions throughout the process is crucial but challenging and costly.

Scalability Issues

Scaling up biopharmaceutical production is not always straightforward. Many biopharmaceutical fermentation systems face challenges in maintaining consistent product quality and yields when transitioning from small-scale research and development to large-scale production.

Raw Material Supply Chain

The availability and quality of raw materials, such as cell culture media and reagents, can impact biopharmaceutical production. Supply chain disruptions, variations in raw material quality, and dependence on a limited number of suppliers can create vulnerabilities.

Key Market Trends

Single-Use Bioreactors Revolution

Single-use bioreactors have gained immense popularity in recent years due to their flexibility, reduced risk of contamination, and cost-effectiveness. The trend towards single-use technology is expected to continue, with more biopharmaceutical manufacturers adopting these systems for their scalability and efficiency.

Continuous Bioprocessing Adoption

Continuous bioprocessing is gaining traction in biopharmaceutical manufacturing due to its potential to reduce production costs, increase productivity, and improve product quality. The adoption of continuous processing technologies is expected to rise, leading to the development of fermentation systems designed to support this approach.

Advanced Control Systems and Automation

Automation and advanced control systems are becoming integral to biopharmaceutical fermentation. These technologies enable real-time monitoring and control of critical parameters, leading to improved product consistency and reduced human error. The integration of artificial intelligence (AI) and machine learning will further enhance process optimization.

Sustainability and Green Bioprocessing

Sustainability is a growing concern in biopharmaceutical manufacturing. Companies are exploring ways to reduce the environmental impact of bioprocessing. This includes developing greener production processes and minimizing waste. Fermentation systems that align with sustainability goals, such as those designed for recycling and reduced resource consumption, will gain prominence.

Segmental Insights

Product Type Insights

Based on the category of Product Type, the downstream products are expected to dominate the overall market revenue in 2022. In the downstream products, the chromatography segment anticipates a substantial CAGR during the projected period. This growth is driven by factors such as the increasing demand for innovative

biopharmaceutical drugs and the introduction of new product offerings.

Chromatography is utilized to separate molecules based on their size, charge, hydrophobicity, and specific ligand binding properties. The selection of chromatography type is determined by the physical and chemical characteristics of the fermentation products. For instance, reversed-phase high-performance liquid chromatography (HPLC) is employed for purifying recombinant human insulin and separating insulin variants from various species.

The launch of new devices enhances product availability in the market, which is poised to stimulate segment growth. An example of this is Thermo Fisher Scientific's introduction of the Thermo Scientific HyPeak Chromatography System in October 2021. This system is among the pioneering single-use chromatography systems for bioprocessing, offering a broad operational flow range from 1LPH to 1,980LPH, achieved through a combination of pumps and fluid transfer assemblies (FTA) that enable scalability from process development to cGMP manufacturing. Another noteworthy release in October 2021 was Novasep's Hipersep Process M, an HPLC chromatography system tailored for the purification of pharmaceutical molecules like peptides, oligonucleotides, insulin, and other synthetic compounds.

Moreover, the continuous technological advancements in chromatography techniques are expected to drive higher adoption rates within the biopharmaceutical industry, further propelling the growth of this segment. As an illustration, in January 2021, Cytiva enhanced fiber chromatography technology with the launch of HiScreen Fibro Prisma, a product designed for early monoclonal antibody (mAb) purification process development.

Application Insights

The Recombinant Proteins segment is poised to claim a substantial market share in the Global Biopharmaceutical Fermentation System Market during the forecast period for several compelling reasons. First and foremost, there is a growing demand for recombinant proteins in various therapeutic applications, driven by their efficacy and potential in treating a wide range of medical conditions. Moreover, advancements in biotechnology and genetic engineering have significantly enhanced the production of recombinant proteins through biopharmaceutical fermentation systems, making them more accessible and cost-effective. Additionally, the expansion of the biopharmaceutical industry and the increasing investments in research and development activities have accelerated the development of novel recombinant protein-based drugs, further

boosting the demand for biopharmaceutical fermentation systems. These factors collectively position the Recombinant Proteins segment as a prominent player in the biopharmaceutical fermentation market.

Regional Insights

In the Global Biopharmaceutical Fermentation Market, North America is anticipated to assert its dominance throughout the forecast period. This expected leadership position can be attributed to several pivotal factors, including the rising demand for biotechnology-based pharmaceuticals, an upsurge in research and development endeavors, and substantial investments in the advancement of biopharmaceutical fermentation technologies. Furthermore, the increasing prevalence of chronic illnesses has driven the consumption of medicines, consequently propelling the growth of the biopharmaceutical industry. This, in turn, generates substantial opportunities for market players, as the demand for biologics and biotech drugs continues to rise, further underscoring the significance of biopharmaceutical fermentation.

The mounting demand for biopharmaceutical fermentation in the biopharmaceutical sector, driven by its potential to reduce drug toxicity and bacterial resistance while enhancing drug efficacy, has attracted numerous companies to engage in research and development initiatives centered around biopharmaceutical fermentation. For example, in August 2022, the United States' National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) allocated funding amounting to USD 15.8 million for 14 new projects encompassing technology innovation and workforce development. These projects aim to address crucial opportunities for innovation within the biopharmaceutical sector.

Additionally, the increasing prevalence of diseases such as diabetes, rheumatoid arthritis, and cancer in the region contributes significantly to the market's growth. Biopharmaceutical fermentation plays a pivotal role in manufacturing biotech and biological drugs to combat these conditions. As an illustration, as of 2021, approximately 32 million people in the United States and 14 million in Mexico were grappling with diabetes, and these numbers are projected to rise to 36.2 million and 21.8 million by 2045, respectively. Moreover, in 2022, about 1.9 million individuals in the United States were diagnosed with cancer, as per statistics from the American Cancer Society. This heightened disease burden underscores the need for effective biological drugs, thereby fueling market growth.

Furthermore, the increasing focus of companies on deploying diverse business

strategies such as product launches, approvals, fundraising, and partnerships to expand their presence in the biopharmaceutical industry is expected to be a driving force behind market growth. For instance, in February 2022, Kerry Group plc completed the acquisition of Enmex S.A., a Mexican-based enzyme manufacturer, for EUR 62 million. This strategic move enhances Kerry's capabilities in enzyme engineering, fermentation, and bioprocess development. Additionally, in September 2021, Thermo Fisher Scientific announced its plans to expand its Nashville, Tenn. site by establishing a dedicated single-use technology manufacturing facility, effectively doubling its capacity. This expansion is expected to incorporate large-scale bioreactors for the production of biological drugs.

Key Market Players

Agilent Technologies, Inc.

Thermo Fisher Scientific Inc

Lonza Group AG

Sartorius Stedim Biotech GmbH

Eppendorf SE

Danaher Corp

F Hoffmann-La Roche AG

Nova Biomedical Corp

Merck KGaA

Becton Dickinson & Co

Report Scope:

In this report, the Global Biopharmaceutical Fermentation System Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

Biopharmaceutical Fermentation System Market, By Product Type:

Upstream Products

Bioreactors/Fermentors

Bioprocess Analyzers

Process Monitoring System

Others

Downstream Products

Filtration & Separation

Chromatography

Consumables and Accessories

Others

Biopharmaceutical Fermentation System Market, By Application:

Antibiotics

Recombinant Proteins

Others

Biopharmaceutical Fermentation System Market, By End User:

Biopharmaceutical Industries

Contract Research Organization

Academic Research Institutes

Others

Biopharmaceutical Fermentation System Market, By Region:

North America

United States

Canada

Mexico

Europe

Germany

United Kingdom

France

Italy

Spain

Asia-Pacific

China

Japan

India

Australia

South Korea

South America

Brazil

Argentina

Colombia

Middle East & Africa

South Africa

Saudi Arabia

UAE

Kuwait

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Biopharmaceutical Fermentation System Market.

Available Customizations:

Global Biopharmaceutical Fermentation System market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

Detailed analysis and profiling of additional market players (up to five).

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