

# **Bioreactors Market Size and Forecasts (2020 - 2030), Global and Regional Share, Trends, and Growth Opportunity Analysis Report Coverage: By Scale (Lab-Scale Production, Pilot-Scale Production, and Full-Scale Production), Application (Microbial Application, Cell Culture Application, and Others), Technology (Fed-Batch Bioreactors and Perfusion Bioreactors), End User (Biopharma Manufacturers, Research and Development Organizations, and Contract Manufacturing Organization), and Geography (North America, Europe, Asia Pacific, Middle East & Africa, and South & Central America)**

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## **Abstracts**

The bioreactors market is expected to grow from US\$ 3.643 billion in 2022 to US\$ 6.570 billion by 2030; it is estimated to register a CAGR of 7.65% from 2022 to 2030. The increasing adoption of single-use bioreactors and rapid growth of the pharmaceutical and biotechnology industry are the noteworthy factors driving the bioreactors market growth.

A bioreactor is an instrument used to cultivate organisms (such as yeast, bacteria, or animal cells) under regulated circumstances used in the manufacturing of medicines, vaccines, and antibodies. In bioreactors, whole cells or cell-free enzymes metabolize the input components into biochemical products and/or less undesired byproducts.

## Rapid Growth of Pharmaceutical and Biotechnology Industry Drives the Bioreactors Market

In recent years, the pharmaceutical industry has been growing at an unprecedented pace. Big pharmaceutical companies and contract research organizations (CROs) are coming up with new medicines and therapy forms to treat a wide range of indications. The biopharmaceuticals market is increasing. The strong demand for biologics and biosimilars has driven the growth of the industry. As per the Pharmaceutical Research and Manufacturers Association (PhRMA), the US firms conduct over half the world's R&D in pharmaceuticals (US\$ 75 billion) and hold the highest number of patents in new medicines. Besides growing economies, rapid growth is witnessed in the research environment in emerging economies such as Brazil, China, and India. Factors such as increasing biologics approval, growing biosimilar pipeline, and rising investment in research activities are facilitating the growth of the industry. The biopharmaceutical industry is one of the most significant contributors to the economy. Biopharmaceutical research activities are gaining pace in emerging economies such as Brazil, China, and India and offering lucrative opportunities to the market. Apart from this, increasing approvals in gene and cell therapies are favoring market growth. The approved gene therapies are Glybera, used to treat lipoprotein lipase deficiency, and Strimvelis, which treats ADA-severe combined immunodeficiency. Thus, the factors mentioned above are increasing the demand for the large-scale production of various therapeutics, thereby facilitating the growth of the bioreactors market globally.

### Market Opportunity

#### Rising Demand for Personalized Medicine

The transformation of the healthcare industry from one-size-fits-all to a targeted approach is expanding the demand for personalized medicine. Precision medicine is being considered as one of the most promising approaches to tackle diseases such as cancer, neurodegenerative diseases, and rare genetic conditions. Innovations in the production of personalized medicines are likely to impact the entire sector, and single-use technologies aimed at smaller-volume production have potential applications in protein bioproduction, particularly in downstream processes. Personalized and differentiated approaches to medicine are leading to a need for a wider range of products, many of them for a relatively small number of patients. A fundamentally different approach to the production and delivery of biological products may be required.

Precision medicine utilizes the genomic information of an individual to offer targeted

treatment for a particular indication. The rising prevalence of a number of chronic diseases has increased the demand for biologics, drugs for orphan diseases, and personalized medicines. For instance, in 2019, the FDA approved 12 personalized medications to address the root causes of disease and further integrate precision medicine with clinical care. Also, increasing government efforts are strengthening personalized medicine research activities. For instance, in February 2020, the National Human Genome Research Institute (NHGRI) announced to establish a new precision medicine and genomics program. This program will focus on the innovation of genomics and informatics tools for better diagnosis and treatment of disease. The rising demand for personalized medicine is anticipated to offer significant growth opportunities to the players operating in the bioreactors market during the forecast period.

The “Global Bioreactors Market” is segmented on the basis of scale, technology, application, end-user, and geography. Based on technology, the market is segmented into fed-batch bioreactors and perfusion bioreactors. The fed-batch bioreactors segment held a larger market share in 2022. In fed-batch systems, fresh medium or medium components are continuously, intermittently, or singularly added while the batch volume increases over time. During fed-batch fermentation, the nutritional environment can be maintained at a consistent level. This can prevent the production of byproducts that are typically caused by high concentrations of substrate. By using this method, it is possible to extend the operating time and achieve high cell concentrations, which can lead to improved productivity (measured as mass of product per volume and time). This method is particularly useful in the production of growth-associated products. Due to the advantages mentioned above, the demand for fed-batch bioreactors used for the production of cell cultures is growing.

### Application-Based Insights

Based on application, the global bioreactors market is segmented into microbial applications, cell culture applications, and others. The cell culture application segment held the largest market share in 2022. However, the microbial application segment is anticipated to register the highest CAGR during the forecast period. Microbial cultivation includes the cultivation of bacterial and viral cell cultures for various purposes, such as for basic research and development and the manufacturing of biopharmaceuticals, chemicals, and other products. The bacterial culture of *E. coli* is the preferred microorganism for the production of recombinant proteins. It is widely used for cloning, genetic modification, and small-scale production for research purposes.

Additionally, bioreactors are crucial for the production of large-scale viral vaccines in cell

culture. According to an article published by Frontiers in February 2020, bioreactors have evolved into a platform for producing various viral vectors, live viruses, and virus-based vaccines using cells. The development of fed-batch culture, perfusion culture, and genetic engineering has contributed to this advancement. In addition, the application of smart sensors and actuators to bioreactor control systems holds great promise for improving bioprocess control in the near future. As vaccine production processes have advanced, more scalable bioreactors and cell lines with high virus affinity have been utilized to produce several vaccines.

The bioreactors market, by scale, is segmented into lab-scale production, pilot-scale production, and full-scale production. The pilot-scale production segment held a larger market share in 2022. However, the full-scale production segment is anticipated to register a higher CAGR during the forecast period. Benchtop bioreactors are used widely for laboratory purposes. They are used for cultures up to 15L. Benchtop bioreactors are used for growth studies of microbial, mammalian, insect, and plant cells, culture media optimization, multivariate process optimization studies, and small-scale protein and mAB expression. These bioreactors have been used extensively for processes such as process development and optimization, scale-up and scale-down studies, seed expansion, cell bank production, and protein supply. Infors AG, Sartorius AG, and Eppendorf are among the companies offering benchtop bioreactors. Sartorius offers a wide range of benchtop bioreactors. These benchtop bioreactors are used for cell cultivation as well as for microbial fermentation. These are autoclavable culture vessels and are available from 1–10L and single-use vessels of 250ml and 2L. Benefits offered by benchtop reactors are saving valuable bench space in the development lab, easy cleaning, additional storage space for a tidy workplace, and increased measurement safety and control of the process according to the latest standards.

The bioreactors market, by the end user, is bifurcated into biopharma manufacturers, research and development organizations, and contract manufacturing organizations (CMOs). The research and development organizations segment held the largest share of the market in 2022 and is anticipated to register the highest CAGR in the market during the forecast period. In industries such as biotechnology, healthcare, and pharmaceuticals, research and development play a crucial role. Research and development organizations are engaged in the processes and activities to innovate and introduce new products, technologies, and services in the bioreactor market. Research and development is also important to accelerate product introductions. The growth of research and development organizations is majorly attributed to the increasing adoption of bioreactors for research and innovation processes. Additionally, the research institutes are investing heavily to boost the bioprocesses, leading to market growth.

Food and Drug Administration, International Trade Administration, Pharmaceutical Research and Manufacturers Association, Japan External Trade Organization, and Japan Bioindustry Association are some of the relevant sources referred to while preparing the bioreactors market research report.

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