

## **Cryocooler - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2025 - 2030)**

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### **Report description:**

The Cryocooler Market size is estimated at USD 3.47 billion in 2025, and is expected to reach USD 4.73 billion by 2030, at a CAGR of 6.4% during the forecast period (2025-2030).

#### Key Highlights

- A cryocooler is a device that provides active cooling to reach cryogenic temperatures. According to the Cryogenic Society of America Inc., a cryogenic cooler or a cryocooler is designed to allow active cooling at about -150 C. It uses the flow of gas inside closed tubes, which absorbs the temperature and radiates it outside. The device generally uses helium or a mixture of gases. These devices produce refrigeration at a specific low temperature that can replace normal cryogenic fluids. There are many types of cryocoolers, including Stirling, pulse tube, Gifford-McMahon (GM), and Joule-Thomson.
- One of the major factors driving the adoption of cryocoolers is its growing adoption across the military and defense industries to maintain cryogenic temperatures for IR sensors installed in night-vision-based systems. The use of night vision devices has significantly increased in the last few years as countries advance their defense capabilities. Moreover, countries are increasing their military spending to adopt new technologies. According to SIPRI, military spending worldwide amounted to USD 2.44 trillion in 2023, the highest amount in several decades.
- Furthermore, the cooling of infrared and visible cameras continues to provide opportunities for small cryocoolers. While recent years have witnessed a shift from cooled to uncooled IR cameras, there is still significance for high-performance infrared imagers cooled by small Stirling cycle cryocoolers. For instance, in February 2024, Prama India partnered with the Indian government's Centre for Development of Advanced Computing (C-DAC) to bolster local production and innovation. This partnership, facilitated by a transfer of technology (TOT) agreement, centers on advancing thermal camera manufacturing, marketing, and support. It signifies Prama India's stride in leveraging technology for advanced thermal camera R&D. Such government initiatives in advanced technology may further propel the market's growth.

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- The need for cryocoolers in industrial processes, such as liquefaction of gases and cryogenic preservation, as well as in energy applications like superconducting magnetic energy storage (SMES) systems, is expanding, further propelling the market's growth. Also, the expanding activities in space exploration and the deployment of satellites, which rely on cryocoolers for cooling infrared sensors and other components, are significant drivers. For instance, Creare, a significant developer of cryogenic components and systems, received a new contract from NASA. The SBIR Phase II award from NASA Shared Services Center is expected to fund further expansion of a 10 K multi-stage cryocooler with very low vibration.
- Moreover, technical problems with traditional cryocoolers present several challenges to the market's growth. Traditional cryocoolers often have moving parts, such as pistons and compressors, which can wear out over time, leading to frequent maintenance and reduced reliability. This can deter potential users who require highly reliable cooling solutions for critical applications. Also, some traditional cryocoolers have relatively low thermodynamic efficiency, resulting in higher power consumption. This inefficiency can be a significant drawback in applications where energy efficiency is essential, such as in space missions or portable medical devices.
- Additionally, high inflation and rising costs of raw materials and manufacturing can impact the production costs of cryocoolers. This may affect pricing and profit margins, potentially influencing the market's growth. Furthermore, increasing focus on environmental sustainability and regulations related to energy efficiency can drive demand for more efficient cryocoolers that consume less power and have a lower environmental impact.

## Cryocooler Market Trends

### Healthcare to be the Largest End-user Vertical

- Cryocoolers are in significant demand in healthcare due to their widespread application in MRI systems, cryosurgery, and proton therapy. They are used to keep the superconducting magnets in this medical equipment cool. The studies and developments on cryocoolers have enhanced their acceptance in the healthcare industry for various applications.
- The high input power consumption of cryocoolers is claimed to be a limitation. However, the benefits of using cryocoolers in healthcare exceed the drawbacks. The use of cryocoolers in magnetic resonance image (MRI) and nuclear magnetic resonance (NMR) equipment is increasing in the medical field. For instance, in December 2023, Bruker Corporation, a significant provider of nuclear magnetic resonance (NMR) spectroscopy solutions for life and materials research, announced the installation of a 1.2 gigahertz (GHz) NMR system at the National Gateway Ultrahigh Field NMR Center at the Ohio State University. Such initiatives may further create demand for cryocoolers in the healthcare segment.
- In addition, the rise in medical machines would create an opportunity for the market's growth. The Indian Council of Medical Research (ICMR) and Indian Institutes of Technology (IITs) cooperated in establishing 'ICMR at IITs' by establishing centers of excellence (CoE) for Make in India product development and commercialization in the medical devices space. According to IBEF, FDI inflows into the medical and surgical appliances industry stood at USD 3.26 billion between April 2000 and December 2023. Furthermore, in the Interim Budget 2024-25, INR 98,461 crore (USD 11.85 billion) was allocated for the pharmaceutical and healthcare industry.
- Furthermore, the country is scaling up the Ayushman Bharat initiative, aiming to expand the Jan Aushadhi program and anti-TB campaign by 2025. This is also aiding in the growth of the cryocooler market. Such increased budget allocations may help in the growth of the healthcare industry and, thereby, the market. Robust infrastructure, access to diagnostics, comprehensive healthcare policy, and tax incentives are some expectations of the healthcare industry from this budget.
- In addition, cryocoolers play a crucial role in cryopreservation, a method that conserves biological entities, ranging from cells to tissues, by chilling them at extremely low temperatures. The field of cryobiology, especially in cell and tissue preservation, has seen significant advancements. This progress has led to cryobiology's extensive adoption, spanning diverse fields like reproductive medicine, hematopoietic stem cell treatments for cancer, cutting-edge immune cell therapies like CAR T-cells, and the establishment of gene banks for both animals and plants.

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- According to the IARC's World Cancer Report, despite constant progress in cancer prevention and treatment, the global cancer burden kept growing, as the number of new cases is anticipated to increase by 50% between 2018 and 2040. Furthermore, according to the WHO, new global cases of cancer are anticipated to be recorded at 29.88 million by 2040 and 35.28 million by 2050. Such factors are expected to drive the demand for cryocoolers.

#### North America is Expected to Hold the Largest Share

- North America is significantly driving the adoption of cryocoolers in the market due to rising investment in the military and healthcare industries. According to SIPRI, the United States led the ranking of the countries with the highest military spending in 2023, with USD 916 billion dedicated to the military.
- Furthermore, government space organizations in the United States invested significant research and development funds in introducing innovative cryogenic cooling technology. This will help the country's space industry grow in the coming years. According to the US Congressional Budget Office, the plans for US nuclear forces, as outlined in the FY 2023 budget and supporting documents, are projected to cost USD 756 billion over the 2023-2032 period, which is USD 122 billion more than the 2021-2030 period.
- In the healthcare industry, the rising need for cryocoolers in the region is attributed to their extensive utilization in proton therapy, cryosurgery, MRI systems, and the liquefaction of oxygen in hospitals. The area is a significant developer of new cancer drugs and rapidly evolving technologies, such as cryocooler devices, with the most prominent groups aimed at treating solid tumors, lung cancer, and leukemia.
- Additionally, the cryocooler market in the region has been escalating as cryocoolers are primarily used for proton therapy in cancer treatment. Proton therapy for lung and brain cancers has proven to be a suitable treatment for patients whose cancer is limited to the local area. Brain tumors are the significant cause of cancer-related death among children aged 0-14. The upsurge in the cases of the cancers noted above in the region may drive the demand for proton therapy, thereby driving the market's growth. According to the National Association of Proton Therapy, 42 proton therapy centers treat patients in the United States.
- Cancer is the second leading cause of death in the United States. According to the American Cancer Society, in 2024, it was estimated that there would be over 972 thousand new cancer cases among women in the United States. The source also estimated that there will be around 125,070 deaths from lung and bronchus cancers in the same year.
- Cryocoolers maintain cryogenic temperatures for IRIR sensors installed in night vision-based systems, satellite-based surveillance, and missile guidance. The growing demand for cryocoolers across North America's military and surveillance industries has been boosting the cryocooler market in the region.
- NASA has started working on studying the cosmos using a stadium-sized balloon. The mission, ASTHROS, was launched in December 2023 from Antarctica. The balloon carrying ASTHROS will carry the instrument and a lightweight telescope. ASTHROS will observe wavelengths of light invisible from Earth. NASA will use a cryocooler supplied with electricity to cool the tools and keep superconducting detectors near -268.5 C.

#### Cryocooler Market Overview

The cryocooler market is home to multiple key players, including Sumitomo and Barry Automation Inc., alongside other contenders, all striving for prominence within this moderately fragmented market space. These companies have embraced potent competitive strategies, such as product innovations, investments, acquisitions, and strategic partnerships, to maintain their relevance and competitive edge in the market. During the study period, the competitive rivalry within the market exhibited a moderately high level of intensity.

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