

Fiber Bragg Grating Sensor - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts 2019 - 2029

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Report description:

The Fiber Bragg Grating Sensor Market size is estimated at USD 0.76 billion in 2024, and is expected to reach USD 1.16 billion by 2029, growing at a CAGR of 8.83% during the forecast period (2024-2029).

Key Highlights

- Fiber Bragg grating (FBG) technology is becoming a popular choice for optical fiber sensors for temperature or strain measurements because of their simple manufacture, relatively strong reflected signal strength, and operational flexibilities.
- A periodic modulation of the refractive index of the fiber core along the longitudinal direction forms fiber Bragg grating sensors. Various sensing functionalities can be added to the optical fiber by carefully determining the structure. The wavelength-encoded nature of the output allows the use of the wavelength division multiplexing (WDM) technique by assigning each sensor to a different wavelength range of the available light source spectrum. As calibration is used to determine the mapping relationship between the physical quantity and wavelength and is one of the critical factors affecting the sensor's performance, such a feature favors the market's growth.
- Furthermore, a longer lifetime than other sensors is another major factor supporting the market's growth. According to Hindawi, a publisher of peer-reviewed, open-access scientific journals, the life-prediction model indicates that the estimated monitoring life of an FBG sensor in an unstressed condition is about 56 and 27 years under the stressful situations that fiber Bragg grating (FBG)-based steel strands are subjected to in their working environment.
- Owing to their intrinsic capability to measure a variety of parameters, such as strain, pressure, temperature, and many others, along a single fiber, their demand has been increasing across various end-user industries. Additionally, these multi-point sensing arrays of many relatively low-cost FBGs also provide great flexibility of design, making them ideal devices to be adopted for a multitude of different sensing applications.
- Fiber Bragg grating sensors have many advantages over traditional and structural monitoring devices in the building and aviation

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sectors. However, cost and technological limitations in some use cases are among the significant factors challenging their widespread adoption and growth.

-A notable impact of the COVID-19 pandemic was observed in the market studied. During the initial phase, the manufacturers faced difficulties in securing the supply of raw materials/components due to stringent lockdown measures, which disrupted the supply chain globally. However, with the condition normalizing and major end-user industries expanding their operations further, the demand for these sensors is expected to grow during the post-COVID period.

Fiber Bragg Grating Sensor Market Trends

Aerospace to be Among the Fastest Growing End User for FBG Sensors

- Fiber Bragg grating sensors have proven ideal options in aerospace engineering-related applications requiring high precision, remote sensing, and lightweight sensors. This technology is used in a variety of applications, including high-pressure sensing, ground-based aerodynamic test facilities, shock pressure sensing, spacecraft monitoring, and structural health monitoring of aircraft composites.
- It also has significant uses in the aerospace industry, mainly for airplane wing monitoring, fuselage fatigue, and many others. Also, they have been used in smart composite manufacturing for aircraft and space structures. Furthermore, a harsh and complex operating environment characterizes the aerospace industry, and choosing a suitable sensor to withstand such external environment extremities and perform at the desired accuracy, reliability, precision, and repeatability is of prime importance for the players in the industry.
- Several aircraft-making companies are successfully using this technology. For instance, SAAB, a Swedish aerospace company, uses a Fiber Optic Sensor System Overheat Detection System (OHDS) for real-time monitoring of bleed air piping to detect hot air leakage. According to the company, FBG sensor technology provides actual temperature measurements with the ability to set alarm thresholds, trace trends, and introduce smart alarm functions.
- Furthermore, a rise in aircraft construction is expected to bolster the market's growth during the forecast period. For instance, according to Japan Aircraft Development Corporation (JADC), Airbus is one of the largest commercial aircraft manufacturers, delivering 611 jets last year. It is expected to maintain its growth trajectory during the forecast period. Boeing's main competitor added 340 jets to the global aircraft fleet last year. Such massive aircraft manufacturing will drive the demand for the Fiber Bragg Grating sensor market.
- The growing aircraft fleet size across various regions is also anticipated to drive the demand for the fiber Bragg grating sensors market in the aerospace industry. For instance, according to Boeing, the North American region is anticipated to lead the charts of the largest aircraft fleets in the world, with about 10,810 aircraft in its fleet by 2041.

Asia Pacific is Expected to Register Fastest Growth

- The demand for fiber Bragg grating sensors in Asia will increase over the forecast period due to rapid industrialization in emerging countries, such as China, India, Japan, and South Korea. Fiber Bragg grating-based sensors, such as temperature, pressure, strain, and others, are widely used in process control industries such as water treatment and services, oil and gas, mining, and power generation.
- The governments in countries such as China, India, and Indonesia, among others, are taking the initiative to support the manufacturing industry's growth, further creating growth opportunities for the market. For instance, in October 2022, China announced several measures to enable foreign investment in the manufacturing industry. The Chinese government stated that it would facilitate imports and exports of foreign-invested manufacturing firms and provide assistance regarding trade and customs

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clearance. According to the National Bureau of Statistics, China's industrial output increased by 6.3% year-on-year in September 2022.

- The region is also home to some of the largest power-generating countries in the world, like Japan, India, and China. For instance, India emerged as the third-largest electricity-generating country in the world in 2022. (Source: World Population Review). As per IBEF, in the financial year 2022, India's power generation capacity rose to nearly 400 gigawatts.
- Furthermore, the growing civil aviation industry in India will also fuel the market growth as fiber Bragg grating sensors are widely used in aircraft. According to the India Brand Equity Foundation (IBEF), domestic traffic contributes around 69% of the total airline traffic in South Asia. India's airport capacity is expected to handle 1 billion trips annually in 2023. India is currently the 7th largest civil aviation market in the world and is expected to become the third-largest civil aviation market within the next 10 years.

Fiber Bragg Grating Sensor Industry Overview

The Fiber Bragg grating sensor market is characterized by a diverse landscape, featuring prominent players such as FBGS International NV, Smart Fibres Ltd, Micron Optics (Luna Innovations), Timbercon Inc., and National Instruments Corporation. Market participants are strategically employing tactics like partnerships and acquisitions to bolster their product portfolios and establish a sustainable competitive edge.

In January 2023, Technica Optical Components marked a significant achievement by successfully manufacturing their one millionth FBG sensor. The company offers an extensive range of FBG products, encompassing FBG sensors, FBG arrays and cables, as well as FBG packaged sensors, positioning the company as a leading provider of fiber Bragg grating sensors.

In December 2022, Technica Optical Components introduced a new line of Fiber Bragg Grating-based Temperature Sensors engineered for operation in cryogenic environments. These sensors feature an advanced unibody micro-structured design, specifically optimized for precise temperature measurements in ultra-low temperature settings. The technology leverages high-precision, advanced cryogenic-rated materials and incorporates Technica-manufactured FBGs within the fiber cores to deliver a transducer configuration characterized by exceptional precision, resolution, and repeatability.

Additional Benefits:

- The market estimate (ME) sheet in Excel format
- 3 months of analyst support

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