Structural Health Monitoring Market In-Depth Profiling With Key Players and Recent Developments, Forecast Period 2021-31

Structural Health Monitoring Market Size, Share, Competitive Landscape and Trend Analysis Report

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The global structural health monitoring (SHM) market was valued at $1,674.0 million in 2019 and is projected to reach $3,815.1 million by 2027, growing at a CAGR of 14.5% from 2020 to 2027. SHM is a non-destructive method of collecting and analyzing data through connected sensors to monitor the condition of structures and equipment, predict deterioration, and optimize maintenance.

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Market Dynamics
Drivers
Aging Infrastructure in Developed Regions:
Europe and North America face challenges with aging infrastructure, increasing the need for SHM solutions to maintain structural integrity.

Government Initiatives and Investments:
Governments globally are investing heavily in infrastructure projects. For instance, the U.S. government approved a $1.2 trillion infrastructure bill in November 2021, allocating funds for roads, bridges, and utilities. Similarly, India and Dubai collaborated on projects like industrial parks and medical facilities in Jammu & Kashmir.

Advancements in Wireless Sensor Networks:
Innovations in wireless technologies enhance real-time monitoring capabilities, reducing operational costs and improving structural safety.

Rising Demand from the Aviation Industry:
Rapid growth in aviation, fueled by economic development and increased purchasing power in emerging markets, drives demand for SHM systems in aircraft. For example, Airbus SE delivered 661 aircraft in 2022 and received orders for 1,078 more. SHM systems help monitor aircraft

health in real time, ensuring safety and cost-efficiency.

Restraints
High Implementation Costs:
The upfront cost of installing SHM systems can be a barrier, especially for small-scale projects.
Data Normalization Challenges:
Processing and interpreting vast amounts of data from SHM systems can complicate their implementation.
Opportunities
Green and Smart Infrastructure:
Growing adoption of sustainable building practices and smart city initiatives presents new opportunities for SHM solutions.
Disaster Mitigation:
SHM systems can enhance structural resilience and aid post-disaster management, particularly in earthquake-prone regions.
Market Segmentation
By Component
The market is segmented into hardware, software, and services. The services segment is expected to grow at a significant CAGR, driven by increased demand for maintenance and real-time monitoring solutions.

By Connectivity
SHM systems are classified into wired and wireless. Wireless systems are projected to witness substantial growth due to their flexibility, ease of installation, and cost-effectiveness in monitoring complex structures.

By End User
Key end-user segments include civil, aerospace, defense, mining, energy, and others. The civil sector dominated the market in 2019, driven by growing infrastructure development and urbanization.

By Region
Asia-Pacific: Held a dominant position in 2019 and is expected to maintain significant growth due to rapid urbanization and infrastructure development in countries like China, India, and Japan.
North America and Europe: Mature markets with increasing demand for SHM in aging infrastructure.
LAMEA (Latin America, Middle East, and Africa): Anticipated to grow at the highest rate, driven by investments in modern infrastructure.

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Key Market Players
Leading companies in the SHM market include:

National Instruments Corporation
Advitam Inc.
Acellent Technologies, Inc.
Nova Metrix LLC
COWI A/S
Hottinger Baldwin Messtechnik GmbH
Strainstall UK Limited
Kinemetrics Inc.
These companies leverage strategies like product launches, partnerships, and expansions to meet evolving consumer needs. For instance, Strainstall UK Limited developed new load shackles for Marine Energy's PLAT_I tidal energy project in the U.S., showcasing SHM applications in extreme conditions.

Government Support and Research Initiatives
Governments are actively promoting SHM adoption through research and funding. The European Union's TRIMIS program demonstrated the value of SHM in reducing operational costs by up to 90% and enhancing safety and reliability.

Emerging Trends
Integration with IoT and AI:
SHM systems increasingly leverage IoT and artificial intelligence for predictive maintenance and automated data analysis.
Focus on Dam Monitoring:
Monitoring static and dynamic stress in dams is gaining attention, addressing structural variations caused by environmental and load conditions

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David Correa
Allied Market Research
+ 1 800-792-5285
email us here
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