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4D Printing Market Analysis By Material (Programmable Carbon Fiber, Programmable Wood, Programmable Textiles), By End-use (Defense, Aerospace, Automotive, Textile, Healthcare), By Region, And Segment Forecasts, 2019 - 2025

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Abstracts

The global 4D printing market is expected to reach USD 313.1 million by 2025, according to a new report by Grand View Research, Inc. 4D printing is an advanced process for printing customizable smart materials where an object is 3D printed using a programmable material. It enables the material objects to adjust their appearance or shape over time by using internal or external stimuli, such as change in temperature or water immersion subjected to pressure, electric current, UV light, or other form energies. 4D printing, with its form changing tools, is estimated to revolutionize every industry on a global scale as the technology offers advantages of reduced resource consumption and energy wastage.

Researchers are increasingly emphasizing on 4D printing materials, primarily focusing at the microscopic level. Technologies incorporating shape memory alloys are developed wherein a temperature change results in the change of an object’s shape. Additionally, newer technologies are also utilizing electroactive polymers, pressurized fluids, smart materials, and chemicals.

Technology needs are ever increasing in today’s rapidly changing environment. The market is anticipated to witness a robust growth over the forecast period, which is ascribed to the increased demand for technological innovation in the fields of military & defense, automotive, aerospace, and healthcare, resulting in the rising adoption of 4D printing. Additionally, the latent scope for innovations and product development is likely to supplement the market demand over the coming years.

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The increasing demand for reduction in the cost of manufacturing and processing is another major factor anticipated to accelerate the 4D printing market growth by 2025. Moreover, there is a growing demand for efficient material and resource management. The self-transforming property of the technology would lead to the use of limited materials for several purposes, which in turn would lead to reduced wastage of natural resources, thereby maintaining a sustainable environment. Thus, the increasing focus on ensuring a sustainable environment is likely to accelerate the demand in the near future.

The high development cost, growing insecurity of policy makers as the technology is yet to be commercialized, and rising issues related to intellectual property rights and potential safety hazards are some of the factors estimated to restrain the development of the 4D printing market. However, the increasing opportunities for key players are expected to overpower the aforementioned restraints, thereby driving the growth over the next few years.

Further key findings from the report suggest

> The global 4D printing market is estimated to reach USD 64.5 million by 2019 and grow at a CAGR exceeding 33.2% from 2020 to 2025, which is primarily attributed to its rising demand in the military & defense, aerospace, automotive, and healthcare industries.
>
> Programmable carbon fiber is anticipated to emerge as the largest product segment over the forecast period as it is extremely light and strong, like traditional carbon fiber; requires no complex electronics, actuators, or sensors; minimizes failure-prone mechanisms; and decreases the total weight of the product.
>
> The military & defense sector is expected to be the largest contributor to the overall 4D printing market, accounting for more than 25% of the share in 2019, which is followed by the aerospace segment.
>
> North America is anticipated to emerge as a dominant region for 4D printing market by 2025 owing to high investments in R&D in the region, which is boosting the 4D printing technology.
>
> Key players such as Stratasys Ltd., Autodesk Inc., and Hewlett-Packard Inc. are

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estimated to dominate the market over the forecast period with their emphasis on expanding the market presence through a series of new product launches, announcements, and partnerships.

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