

ADDITIVE MANUFACTURING



Context

The Additive Manufacturing Market 2023 Report makes available the current and forthcoming technical and financial details of the industry.

About

Additive manufacturing or additive layer manufacturing is the industrial production name for 3D Printing used to create 3D objects by depositing materials, usually in layers. Additive manufacturing adds material to create an object.

The oldest fully realised additive manufacturing technique is stereolithography, which was developed in 1987 by 3D Systems.



Advantages of Additive Manufacturing

- › Complex manufacturing with little wastage.
- › Design alterations can be done quickly and efficiently during the manufacturing process.
- › Multiple pieces can be fabricated as a single object which can provide improved strength and durability.
- › AM can also be used to fabricate unique objects or replacement pieces where the original parts are no longer produced.
- › AM can bring digital flexibility and efficiency to manufacturing operations.
- › It delivers a perfect combination of improved performance, complex geometries and simplified fabrication.



Way Forward

- › Its development can help in the design and manufacture of functional parts for the aircrafts in India especially when India is putting thrust on defence manufacturing.
- › By leveraging topology optimisation and additive manufacturing, companies can focus on harmonising and improving the use of materials in India.
- › There are also ongoing efforts to establish additive manufacturing in series production in India.
- › Biomedical engineering companies can map the patient data from scans and other medical technology, to create artificial limbs that are specific to the patient geometry.
- › It can help the Indian health sector to a large extent.
- › It can enable a company to realize competitive advantages through disruptive business models, more agile operation, through innovative product design, flexible manufacturing, and sustained reduction of costs.



Material



Subtractive Manufacturing



3D object



Waste

How does Additive Manufacturing work?

- › **Binder Jetting-** This technique uses a 3d printing style head moving on x, y and z axes to deposit alternating layers of powdered material and a liquid binder as an adhesive.
- › **Directed Energy Deposition-** A laser, electric or an electron beam gun mounted is used.
- › **Material Extrusion-** spooled polymers which are either extruded or drawn through a heated nozzle are used.
- › Powder bed fusion.
- › Sheet lamination.
- › Vat polymerisation.

Where Additive Manufacturing is used?

- › **Aerospace:** Due to its weight saving capability and ability to produce complex geometric parts such as blisks.
- › **Automotive:** It speeds up the production rate in the automotive sector.
- › **Medical:** Applications for additively manufactured parts, especially for bespoke custom-fitted implants and devices.
- › **Consumer products:** AM has proven beneficial to the product development of many consumer goods such as sporting goods and consumer electronics.
- › **Energy:** AM innovation in producing efficient, on-demand, lightweight components has driven success in the energy sector.

Limitations of Additive Manufacturing

- › Cost of entry is high.
- › Production costs are also high.
- › Deposited layers can create weakened parts if not calibrated perfectly.
- › Much too slow for mass manufacturing.
- › Special materials are required for application in corrosive environments, or where food-grade materials are required.
- › The machines require very highly trained maintenance teams.

