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3D Printing: Flex Manufacturing With New Possibilities

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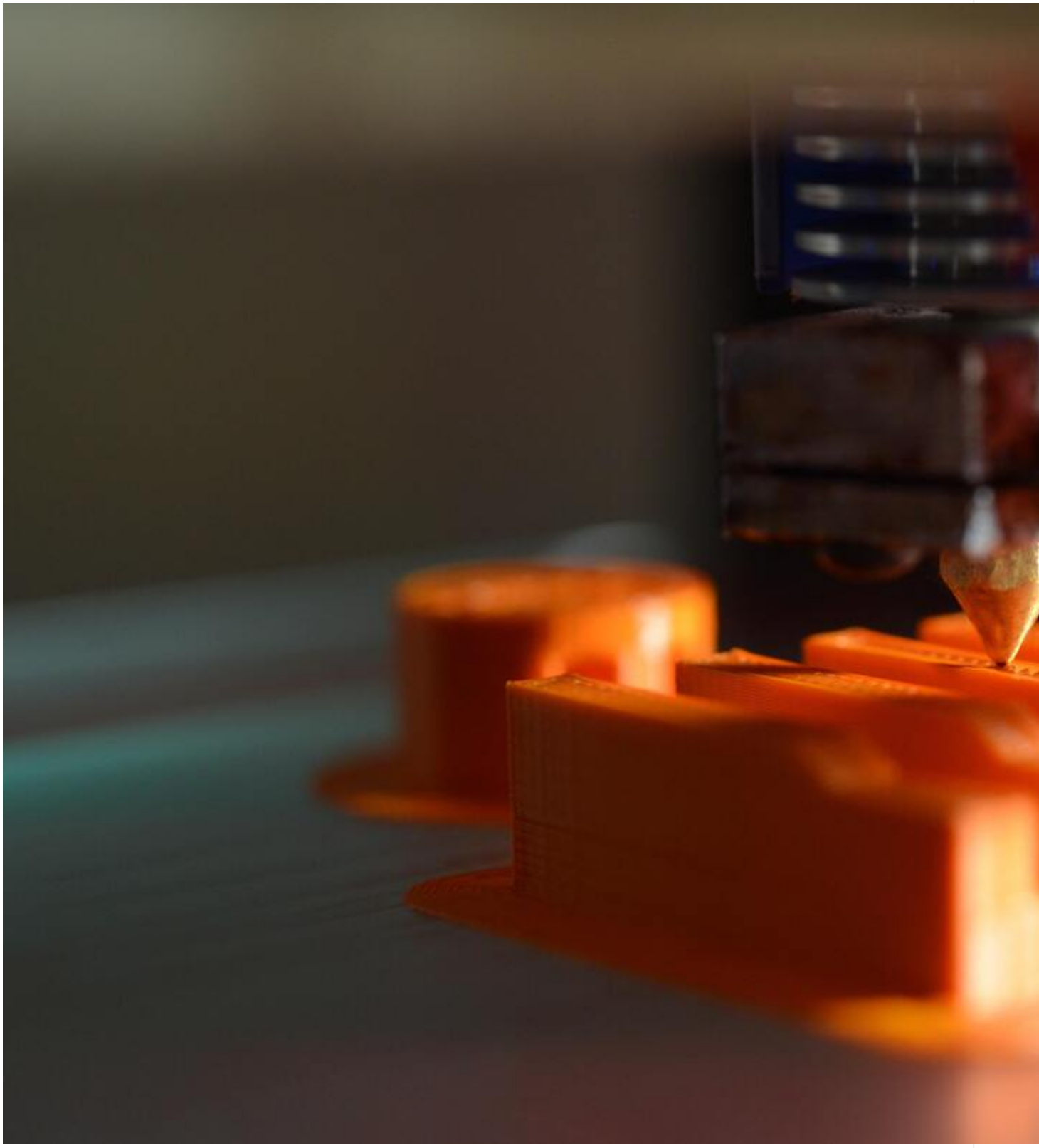
Who could have foreseen that 3D printing, which took baby steps in the early 80s, could come to the rescue of Ukrainian troops in the ongoing tussle with Russia? More than 100 makers from Ukraine manufactured and supplied a horde of 3D printed products to the forces engaged in combat operations with a belligerent opponent. 3D printers also rescued lives during the peak of the virulent Covid pandemic by producing emergency supplies of face shields and ventilator parts. Even as research on this super niche technology gains momentum, 3D printing or additive manufacturing is beginning to deliver industrial-grade product quality and printing in volume. In a testimony to the strides in its innovation, researchers at the Indian Institute of Technology (IIT), Jodhpur, have indigenously developed a metal 3D printer for aerospace, defence and general engineering applications. 3D printing is poised to gain ground with incontestable advantages over conventional manufacturing like greater flexibility, fewer assembly steps and other cost savings, and enhanced product-design possibilities.



It's Working, And The Market Potential

3-D printing refers to building something from the ground up, layer by layer. Computer-guided laser beams melt powders of metal, plastic, or composite materials to create the layers. As 3D printing has evolved beyond rapid prototyping, engineers are using it for larger production runs. Hubs, a marketplace for manufacturing services, predicts that the 3-D printing market will triple to nearly $45 billion by 2026. Sixty-eight percent of businesses used this cutting-

edge technology more in 2021 than in 2020.

Adoption In Government And Corporate Circles

In the US, the Biden administration is banking on 3D printing to lead the resurgence of American manufacturing. US President Joe Biden has announced Additive Manufacturing Forward, an initiative coordinated by the White House in collaboration with major manufacturers. One key takeaway of additive manufacturing (AM) is that it accelerates the pace of experimentation and innovation. General Electric uses 3-D printing for jet fuel nozzles, Stryker uses it for spinal implants, and Adidas uses it for the lattice soles of high-end running shoes. Carmaker Mercedes-Benz uses AM to produce spare parts for its classic vehicles. Dental implants and teeth-straightening devices are 3-D printed. There are also environmental benefits to additive manufacturing. The process is far less wasteful than traditional manufacturing methods like casting, forging, and cutting. Also, 3-D printing can reduce materials costs by 90 per cent and energy use by 50 per cent for some metal parts.

Getting Over Barriers In Large-Scale Adoption

1.Hardware:

Most AM machines have a slow build speed and limited build volume, limiting their potential applications. The integration of such devices into production workflows has also proven challenging.

2.Software:

Most AM equipment relies on vendor-specific control software, with limited integration with the broader plant's equipment and production control systems.

3.Materials:

In today's market, even common engineering materials are more expensive when supplied as AM-ready materials. It is complex and time-consuming to develop polymers specifically for AM machines.

4.Services:

There is a complaint among industrial users that equipment vendors do not provide high-quality technical support beyond installation and commissioning.

How Fast Will Be The Switch?

Businesses need to invest their resources in strategic thinking on the scale and pace of AM or 3D printing adoption. For example, the US hearing aid industry transitioned from traditional manufacturing to AM in less than 500 days. Additive manufacturing doesn't offer economies of scale. However, it avoids the downside of standard manufacturing- lack of flexibility. Each unit can be built independently and can easily be modified to suit unique needs. Some of the big players active in AM are vying to build platforms on which other companies will connect and build. Platforms will disrupt the AM systems by helping to deliver highly customized orders as efficiently as they are produced. The next few years will see 3D printing climbing up the maturity curve with fully automated, high-speed, large-quantity AM systems that are economical even for standardized parts. The flexibility of such systems would open up customization or fragmentation in many product categories, stealing the market of traditional mass manufacturing. Additive manufacturing will turn addictive.

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