Forbes Middle East

How 3D Printing Is Shaping The Future Of Manufacturing

Ask a random selection of the general public about where 3D printing or additive manufacturing is making its biggest impact and the answers will likely be varied. Opinions might range from chocolate printing to the building of entire houses, to the unchartered territory of human organ printing. Even a good number of those who have some understanding of the technology will still cite prototyping as the mainstay of its capabilities.

The truth is that, having been around for 30 years, the technology has evolved incredibly, no longer confining itself to solely offering a faster, more cost-effective method of prototyping. Although still a significant area of use, 3D printing has developed to offer a much wider proposition to the industrial manufacturing world – particularly with design and manufacturing engineers in sectors such as automotive and aerospace.

The factory of the future – right here and right now

From a commercial standpoint, 3D printing is truly disrupting things, encapsulating the *factory of the future* concept. This doesn't just apply to individual businesses, but for the manufacturing industry itself, which in turn creates a positive knock-on effect with the potential to affect economies.

For manufacturing applications, we're seeing a tremendous uptake of 3D printing in two areas. Looking at these in turn, the first is where 3D printing makes the tools which range from simple assembly fixtures or jigs to complex forming tools for composite, metal, and plastic parts. The second, is where 3D printing is used to make the final production part.

Disrupting manufacturing processes

Used to form, position, hold, protect and organize components and sub-assemblies during the manufacturing process, tools like jigs, fixtures, guides, and forming tools are virtually invisible when production is running smoothly, but their importance becomes evident when problems arise.

As a result, to avoid production halts or product defects, new tools must be rapidly designed, manufactured and deployed to maintain workflow. The downside is that they are typically made from metal, wood or plastic in small quantities using a manual or semi-automated process, with the result that each tool takes between one and four weeks to design and build. Furthermore, with elaborate or intricate tools sometimes requiring several cycles of design, prototyping and evaluation to attain the required performance, it's easy to see that this area of manufacturing can invariably be costly from both a monetary and time perspective.

The use of 3D printing for such applications relieves companies of the strain that would otherwise rack up costs and manufacturing lead-times and provides a fast and accurate

method of producing these manufacturing tools. Using Fused Deposition Modelling (FDM) 3D printing technology, the traditional fabrication process is substantially simplified, such that tool-making becomes less expensive and time consuming.

Immediate and real benefits for industry

The immediate and real benefits for manufacturers are instant improvements in productivity, efficiency and quality. Indeed, those companies deploying it within their operations aren't simply replacing machinery, they are redesigning their entire production lines to make the work more efficient, accurate, fast, simple and profitable.

In certain cases, some of our own customers have reported lead time reductions and cost savings of 90% or more. A good example is Volvo Trucks' engine production facility in Lyon, France. Here, Stratasys additive manufacturing technology is employed to produce different durable yet lightweight clamps, jigs, supports and even ergonomically-designed tool holders that ensure a more organized working environment for operators. Crucially, by incorporating our FDM technology within its operations, Volvo Trucks has reduced the time taken to design and manufacture certain tools traditionally produced in metal, from 36 days to just *two* days in thermoplastic ABSplus – a decrease of more than 94%.

From a financial perspective, Volvo Trucks estimates that, where customized or small quantities of tools are required, the all-in cost of 3D printing ABS thermoplastic items is – in some cases – as little as 1€/cm^3, compared to up to 100€/cm^3 if making the same item from metal*.

Production of previously unmanufacturable parts

The growth of 3D printing will continue to come from applications where it offers a more efficient process to traditional manufacturing. For example, for the production of low volume quantities or on-demand parts that improve supply chain workflows, 3D printing's evolution from the prototyping lab to the factory floor has significant benefits. The acknowledged nirvana of 3D printing, has established itself as a viable option to challenge traditional methods of production in some applications and enable the production of the previously unmanufacturable parts for others – something we continue to see demonstrated by our customers.

This is underscored by global engineering and technology leader, Siemens AG. Faced with the challenge of meeting increased customer demand for rapid production of one-off spare or customized parts, the company's Mobility Division has adopted 3D printing technology to overcome the time and cost barriers associated with traditional low volume production.

This is exemplified in a project for one of the company's customers, German transport services provider, SWU Verkehr GmbH. By incorporating 3D printing into its production process, the SIEMENS Mobility team produces customized low-volume production parts such as armrests for the driver seat of SWU Verkehr GmbH trams. SIEMENS Mobility does this rapidly and cost-effectively with 3D printing, representing genuine on-demand production that has seen turnaround times decrease from weeks to days.

To boldly go where no 3D printed parts have gone before…

Meanwhile, our partnership with rocket manufacturer, United Launch Alliance (ULA), has

seen our FDM 3D printing technology used to produce 3D printed parts in place of metal parts on the company's Atlas V rocket. Since early 2016, every Atlas V rocket launched flies with a number of 3D printed parts.

Using industrial-grade thermoplastic material to produce durable, high-performance yet lightweight printed parts, not only demonstrates 3D printing's capabilities from a material properties perspective, but also the incredible time and cost-efficiencies obtainable. In one ducting application, ULA consolidated the part count from 140 procured to 16 printed parts for a single assembly, significantly reducing installation time and resulting in a 57 percent part-cost reduction. According to ULA, switching to manufacture components using 3D printing has contributed to annual savings of up to $1m.

Similarly, over the past several years, Airbus has steadily progressed in their adoption of FDM for aircraft parts. Starting with a single replacement part in 2012, to printing over a thousand parts for early A350 XWB aircraft in order to meet the delivery schedule, to the recent announcement of serial part production for the A350 XWB, the steady adoption of the technology continues with Airbus and other major OEMs. That, now, drives further adoption with their suppliers as well as unlocking the extreme benefits of digital inventory in the aftermarket.

Looking ahead, it is clear to me that the positive impact of 3D printing within the manufacturing world and the way in which an increasing number of companies are adopting this efficiency-driving, cost-reducing technology will be instrumental to the future of the factory floor.

**1€/cm^3 equivalent to $1.13 per 0.06 cubic inches; 100€/cm^3 equivalent to $113 per 0.06 cubic inches.*

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