ADDING ON

IT IS BETTER FOR MANUFACTURING COMPANIES TO MOVE TO ADDITIVE MANUFACTURING AS IT SAVES IMMENSE COSTS ON DESIGNING AND CREATING PRODUCTS.

BY **BINDU GOPAL RAO**

IN INDIA, THE ADOPTION OF ADDITIVE manufacturing or 3D printing (or AM as it is popularly known) is increasing. The proof is in the figures — nearly 30 machines were sold last year. In 2015 and 2016 it was just four or five machines. But the need is growing. Small as well as large enterprises are taking advantage of additive manufacturing technology and even public sector companies are using additive manufacturing. Globally companies are using AM for production. But in India, it is largely used for prototyping. Incidentally additive manufacturing (AM) has been around for close to three decades and there has been a significant technology upgradation last few years.

LOOKING BACK

The AM technology has evolved from prototyping development. It has shifted to manufacturing. The machines themselves, the processing technologies and the materials have also evolved. Some of the areas are aerospace, dental and medical. "A lot of software is being developed in parallel. A robust ecosystem has come up. It is not a standalone mechanism but can be included in the production chain. That has been the leap forward. The one big advantage of AM is that irrespective of industries, it can cater to many industry verticals. What was earlier done with 100 or 200 people, additive manufacturing can help achieve the same with four to five people," says

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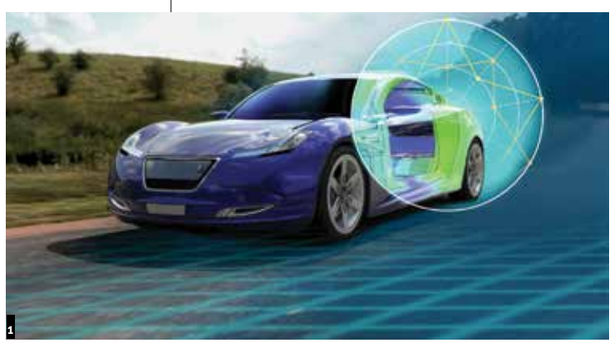

"We are looking at In Process Monitoring where the machine provides real time in-process monitoring and is Industry 4.0 compliant and we have system called InfiniAM for this."
– Nayan Patel

1 & 2. Automatic three dimensional performs plastic modeling.

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Anand Prakasam, country manager - India, EOS GmbH India Branch Office.

DOING IT RIGHT

Additive Manufacturing (AM) refers to a set of technologies that build 3D objects by adding materials layer-upon-layer of different kinds whether metal, concrete or plastic. Using 3D modeling software and machine equipment and layering material, the AM equipment reads in data from the CAD file and adds successive layers to fabricate a 3D object. AM hence includes a combination of Direct Digital Manufacturing (DDM), 3D Printing, Rapid Prototyping (RP), layered manufacturing and additive fabrication.

Designers and analysts must have good understanding of manufacturing in AM space. More than any other manufacturing process, here, you are adding material – as you are adding material, there is sintering going on, there is cooling going on – all of this has an impact on the part you are printing. "So, in AM, the actual work has to begin at the design stage itself. One example could be, in metal printing. You may be looking at a few percentage points of distortion and you know there is likely to be some level of distortion while printing that needs to be factored into the design phase itself. You have to account for thermal behaviour and you come up with revised parts where the distortion effects are minimal. Because you can print complex shapes and parts, such as a part with a void inside, that gives an immense advantage over the traditional methods. You can have a single tightly sintered part as against a loosely joined assembly of multiple parts. This not only improves the look and feel of the product but also the sturdiness and the life of the parts you make. This is possible with AM," explains **Renuka Srinivasan, director, SIMULIA WW Services, Dassault Systèmes.**

Sridhar Balaram, founder and MD, Intech DMLS, adds, "With respect to hardware, machines are becoming faster, smarter and bigger. As more lasers are being added to the system, the size of the platform has increased from 100mm to one-meter. Whereas for production, machines are settling at 400mm or 500mm. Coming to software, we can see advancements in increased reliability to ensure consistent part quality, likewise, with AM Simulation technology we will be able to reduce and eventually eliminate build failures and part distortions altogether."

Simultaneous printing of multiple parts is another application area for large format machines. The fundamental premise of AM is that as an effective solution that is also easy. "For example, in the aerospace sector, if they have to manufacture a part today based on a design, they have to follow a multi-step process such as tooling, fixtures, etc. It costs a lot and requires time. But with AM, if you have a design in hand, you can directly print the part you want. This reduces time, costs as well as number of operations. The customer can simply focus on the design itself than the manufacturing. AM is just a tool that prints as per your design," says Prakasam.

TECH TALK

Newer technologies that are trending include DMLS, Direct Metal Deposition, Binder Jet, and Embedded technology. There is a three-fold innovation that can be observed in AM that includes hardware 3D printers, software that is enabling 3D printing as well as materials for 3D printing. Srinivasan adds, "We have created a marketplace where an Indian company can sign up, pay charge, and connect with service providers who can help them with on-demand manufacturing of components. Now customers have access to over 600 machines and suppliers. They can get a quote online. They will 3D geometry and can scan these suppliers based on the kind of process and machines they have. They can send a request for a quote and based on the geometry, they can get the part they want to manufacture." Adoption for production is happening in the medical sector especially customised medical implants. Likewise aerospace is another industry adopting this technology for production. "We are looking at In Process Monitoring where the machine provides real time in-process monitoring and is Industry 4.0 compliant and we have system called InfiniAM for this," adds **Nayan Patel, operations & technical manager, Renishaw.**

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INNOVATION MATTERS

Apart from laser sintering improvements, miniature desktop machines are coming in. Another hardware advancement is being seen in high temperature builds. "You build a platform of 1500 Celsius and we are now looking at building a platform for 4900 Celsius which addresses a lot of problems when you are using high strength materials like titanium. You will need this only for metal and metal parts are going to be put under stress to test the integrity of the part," says Patel. New materials coming up include bio-compatible titanium for AM, aerospace approved aluminum as well as high nickel alloys.

Guruprasad Rao, director & mentor, Imaginarium India, explains, "The software is getting geared for 3D printing. New file formats are coming in. 3MF and AMS are coming up as portable file formats and the future is going to be loaded with colour, encryption and expiry date properties. Material was a neglected area traditionally but in the last five years, there has been a lot of funding in research and material is going to lead to innovation. CNC and 3D printing are being combined as they can deliver many things not only faster but also cheaper. Digital manufacturing is the future and with CNC + Robots + 3D printing it will be a formidable force."

> APART FROM LASER SINTERING IMPROVEMENTS, MINIATURE DESKTOP MACHINES ARE COMING IN.

Intech has developed a software called AMOptoMet that allows customers to optimise the parameters of the machine for powder bed technology. It can print parts faster with an effective control over the density, have the flexibility to tweak parameters and optimise Micro alloys for enhanced properties. The software is equipped with machine learning for prediction accuracy, product traceability, and effective management. It increases productivity and optimises heat treatment cycles. The software is made available for the purchase either through the original manufacturer or from us directly" adds Balaram. In the recent past there is an increased interest in 3D printing. But as technology becomes patent-expired, costs comes down and material supply improves as generic materials become available, it will increase adoption of metals. MT

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3. Object printed on metal 3D printer. A model created in a laser sintering machine close-up.

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