Mitsubishi's '5D printed' parts 3-5x stronger than 3D printed counterparts

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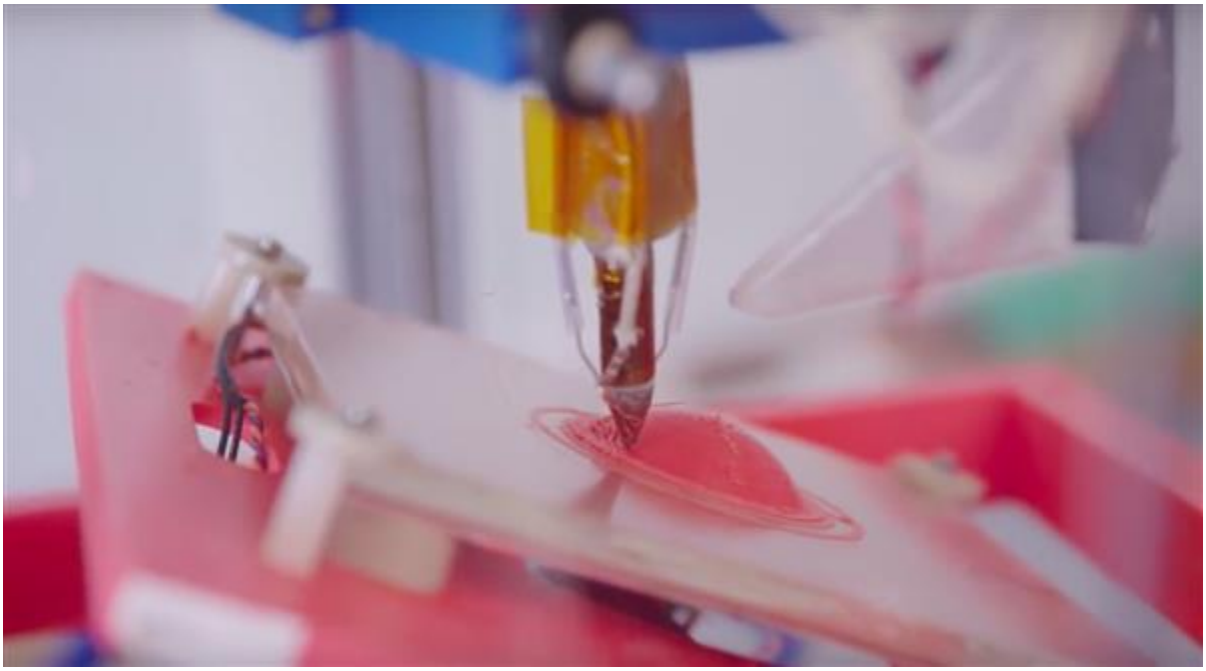
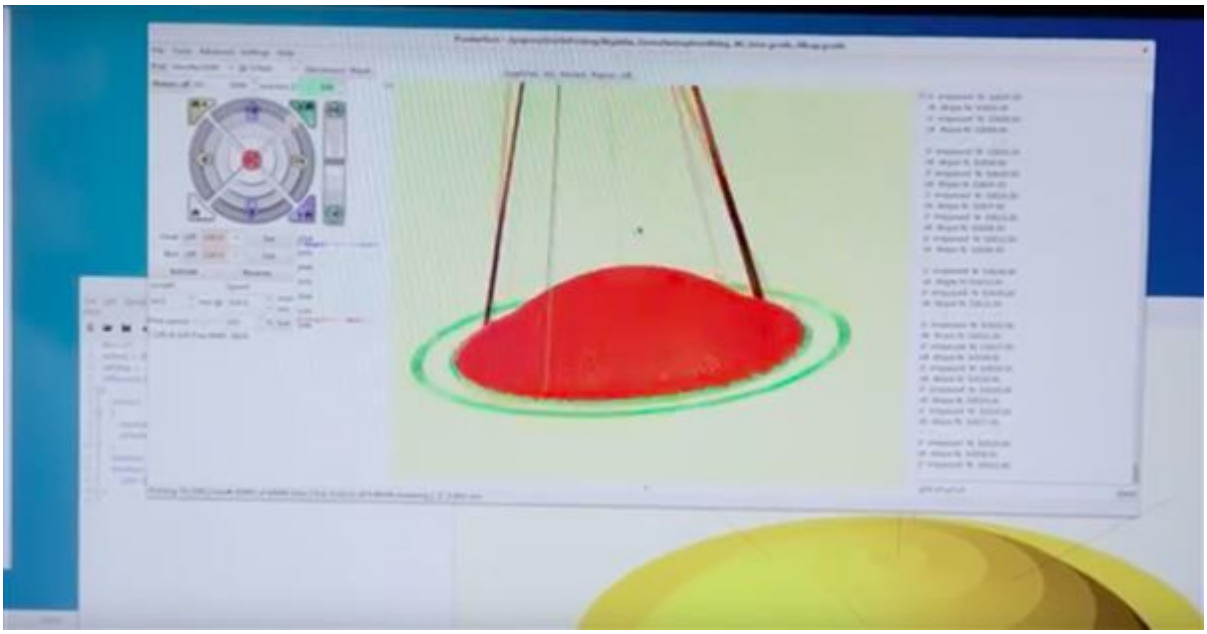
Mitsubishi Electric Research Laboratories (MERL) is using five-axis additive manufacturing—what some call ‘5D printing’—to make components that are three to five times stronger than their regular 3D printed counterparts.



From fighter planes to LCD TVs, Japanese multinational electronics company Mitsubishi has dabbled in virtually every field of electronics and electrical equipment. And while the company operates all over the world, some of its most exciting behind-the-scenes developments are actually taking place in the US, where Mitsubishi Electric Research Laboratories (MERL) supplies parent company Mitsubishi Electric United States with innovative new products and ideas.

Since it manufactures such a diverse range of products, Mitsubishi has, of course, dabbled in 3D printing—and not just for minor electronics, either: two years ago, the company’s Heavy Industries arm announced that it would consider using additive manufacturing to build rocket parts. Right now, however, MERL is focusing on a

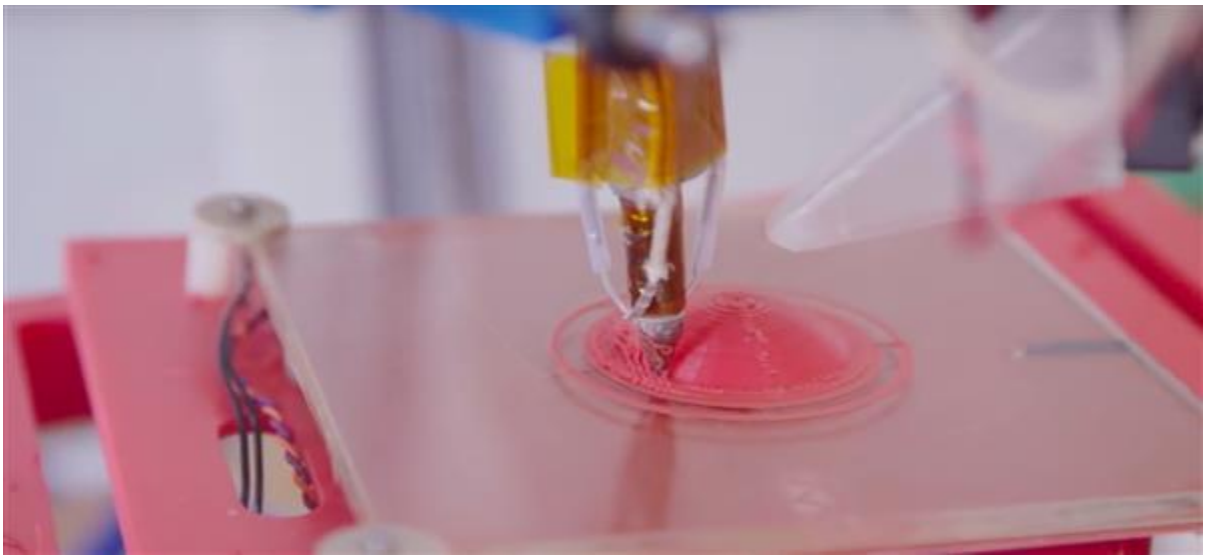
particular method of 3D printing which, if perfected, could help the company to produce much stronger printed parts suitable for critical applications.



The 3D printing process in question is known as five-axis additive manufacturing, and involves 3D printing an object upon a print bed capable of rocking back and forth upon two axes, which brings the total number of axes up to five. These additional axes enable a 3D printer to create objects with entirely different internal structures, disrupting the usual neat stack of flat layer upon flat layer. The term “5D printing” is sometimes used to describe five-axis additive manufacturing, although that term has also been used to describe other processes.

William Yerazunis, Senior Principal Research Scientist at MERL, recently conducted an experiment to demonstrate just how advantageous five-axis additive manufacturing can be. The Mitsubishi expert first 3D printed a small plastic pressure cap, using a standard print bed and the usual three axes. The 3D printed cap was evidently weaker than, say, an injection molded part, because of its uniformly layered structure: “With conventional 3D printing technology, the cap’s layers all lie flat, and the force of the pressure will easily rip the tank cap apart along the line of adhesion between the layers,” Yerazunis explained.

There is, however, a way to improve the strength of the 3D printed part, while still using the same printer and materials. The secret is to alter the way in which each layer is deposited, using five-axis additive manufacturing. To demonstrate this, Yerazunis and his research team next used their “5D printing” process to make the same pressure cap, from the same CAD model, but which has a stronger structure: “If we take into account that the force will be coming from within, and change the layers from flat to curved along the lines of maximum stress in the pressure cap, we can make that part three to five times stronger, and use twenty five percent less material to do it,” Yerazunis said.



As expected, the 5D printed pressure cap fared much better than its 3D printed cousin. While the 3D printed cap was able to resist around 0.1MPa (megapascals) of pressure, the cap produced with the five-axis additive manufacturing technique was able to withstand 3.7MPa. This significant increase in strength, as well as the reduction in material usage, shows that five-axis additive manufacturing represents a serious option for Mitsubishi and any other company willing to invest the time and effort into perfecting the procedure.

“5D printing does require a lot of analysis and it does require knowing how the part will be used,” Yerazunis said. “But when you can make a part that’s five times stronger, that really changes how you think about 3D printed parts.”

http://www.3ders.org/articles/20160623-mitsubishis-5d-printed-parts-3-5x-stronger-than-3d-printed-counterparts.html

Chi tiết ô tô

* FDM: Fused Deposition Modeling 熔融擠製成型
(Công nghệ tạo hình bởi từng lớp nhựa nóng chảy)

Sản phẩm gia dụng

Thiết bị dạy học trực quan

Tạo khuôn mẫu

Mô hình kiến trúc

Dụng cụ y tế