

GIVING METAL PRINTING A HOME

Opened in May, the Additive Manufacturing Centre is testament to 3D MetalForge's move to capture the market for 3D printed metal parts

At the new Additive Manufacturing Centre (AMC), 10 3D printers are working with different materials, from sandstone to carbon fibre and the predominant medium – metal.

It belongs to 3D MetalForge, which was established last year as the sister company of additive manufacturing company 3D Matters. The latter was founded in 2012 to specialise in 3D printing for models and prototypes.

After Mr Matthew Waterhouse (*photo, right*), Chief Executive Officer, acquired 3D Matters in 2015, he decided to diversify the business and build capabilities for metal printing.

“The demand for metal parts is rising both locally and internationally. Clients who took our prototypes asked if we could produce the end-use parts for their operations,” he explains.

As a result, 3D MetalForge started to accept client orders for metal parts. It began printing small metal parts using AM400, a laser-melting machine by British engineering company Renishaw.

These machines are used by companies and research institutions for 3D metal printing.

Last May, 3D MetalForge took its foray into metal a step further. It opened its AMC, which focuses on metal printing, with the help of SPRING Singapore's Capability Development Grant.

The centre was set up to enable the company to provide an end-to-end service for 3D metal printing, allowing clients to be involved in the overall process and ensuring that requirements such as an ideal weight are met.

New technologies

and Research's Singapore Institute of Manufacturing Technology (SIMTech) and is now being commercially developed by 3D Matters. This will be the first such printer in Singapore for large end-use metal parts, measuring up to 1.5 metres wide, which will start taking orders from July.

and Research's Singapore Institute of Manufacturing Technology (SIMTech) and is now being commercially developed by 3D Matters. This will be the first such printer in Singapore for large end-use metal parts, measuring up to 1.5 metres wide, which will start taking orders from July.

There is a strong demand for larger mechanical parts from heavy industries – companies in the marine, oil and gas, engineering, manufacturing and transportation sectors, Mr Waterhouse says. Unlike current 3D metal printers, the LAAM-enabled printer does not have an internal chamber, which puts a limit on size.

The new printer features a free-range robot arm that sprays metal powder, and a laser to melt the metal powder into shape. It can print large parts of up to 1.5 metres wide.

While the printed parts will be of mid-complexity level, they are suitable for a variety of uses, including industrial equipment and engines, Mr Waterhouse says. “Heavy industries will want to 3D print mid-complex parts faster and at a cheaper rate,” he explains. “A typical 3D printer can take 40 to 50 hours to print a metal part but we are able to do it up to 10 times faster than that.”

This project is partially funded by the National Additive Manufacturing Innovation Cluster, which is part of the Innovation Cluster Programme led by

NTUitive and supported by the National Research Foundation, in partnership with SPRING and the Economic Development Board.

Tangible benefits

A range of businesses worldwide, from large brands to smaller outfits, have benefitted from 3D metal printing.

One example is multinational conglomerate General Electric, which used to manufacture multiple parts of its engines separately, before welding them together. However, with the help of 3D printing, it now produces entire engine parts in one piece.

“There are benefits to this, in the sense that the parts are now stronger. The 3D-printed parts last longer, perform better and weigh less,” Mr Waterhouse explains. This is also due to a design optimisation process, where digital images of a part or parts are run through a 3D printing software.

The design optimisation process gives insight on key areas of the product that need to be strengthened. Areas that are less crucial can take the form of a

production cost of hundreds of dollars.

This is comparative to the alternative solution which would require the company to replace the entire braking system that would have cost the company tens of thousands.

This is largely due to how 3D printed parts can be produced in low quantities, with a flat unit rate. “Complexity is free. A machine doesn't mind if it is creating a simple or complicated product,” quips Mr Waterhouse. The process is faster, too; while traditional manufacturing of a part can take four to six weeks, 3D printing does the job in as little as 10 days.

Looking into the future

To date, a healthy demand for 3D printing has been streaming in from companies in the region and beyond. To date, more than 500 client projects have been serviced between 3D Metalforge and 3D Matters, including for MNCs like Unilever, GE Healthcare, Samsung, TetraPark and SingPost.

The company is also in the early stages of embarking on a research collaboration with the Singapore University of Technology and Design to bring another 3D metal printing technology option to the market.

With support from SPRING's Capability Development Grant, 3D MetalForge will send staff for training programmes by SIMTech, to upgrade their knowledge in additive manufacturing processes, from design to material, using additive manufacturing machines and post-production workflow for 3D printed parts, which includes testing.

3D MetalForge has also acquired more software for design optimisation, and hired a lead engineer familiar with the regulatory and design framework for heavy industries.

“To be a partner for companies in heavy industries, we felt that we needed to understand their constraints to serve them better,” Mr Waterhouse says. “Additive manufacturing is not just manufacturing for the next generation. Traditional heavy industries will always be in need of large metal parts, and the 3D printing technology is a good fit.” ■

“Additive manufacturing is not just manufacturing for the next generation. Traditional heavy industries will always be in need of large metal parts, and the 3D printing technology is a good fit.”

Mr Matthew Waterhouse
Chief Executive Officer,
3D MetalForge

honeycomb structure, instead of solid metal, giving companies the option to lighten the weight of the overall structure.

Businesses today are also using 3D metal printing to replace parts that are no longer available in the market. For instance, one of 3D MetalForge's clients, in the transportation industry here, needed to replace a no-longer-in-production braking valve for its fleet.

3D MetalForge was able to produce the valve through 3D printing at a



keytakeaways

■ 3D printing metal printing provides flexibility to customers from both traditional and up-and-coming industries

■ To find out more about strengthening 3D printing capabilities for the future, visit www.spring.gov.sg/cdg