

## 3-D printing goes high speed and high volume

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The world's first additive manufacturing (3-D printing) machine that can make plastic parts as fast and as cheaply as traditional manufacturing is to be built by the University of Sheffield.

The machine will build parts up to three times larger and 100 times faster than current comparable additive manufacturing (AM) machines, making it capable of challenging conventional injection moulding for high volume production.

The £1million project - funded by the Engineering and Physical Sciences Research Council - has the potential to transform both manufacture and distribution. Low cost, high volume additive manufacturing would enable parts to be made where they are needed, rather than produced centrally.

Professor Neil Hopkinson from the University of Sheffield's Faculty of Engineering says: "Additive manufacturing is already being used to make tens of thousands of a product - such as iPhone covers - and ten years ago that volume was unthinkable. This machine will enable serious production of volumes over one million, which is currently inconceivable. I believe history will repeat itself and in ten years' time, producing volumes over a million using additive manufacturing will be commonplace."

The machine is based on a technology developed by Professor Hopkinson, who originally filed patents on the process as lead inventor at Loughborough University. The technology for HSS is being licensed to

industrial machine manufacturers on a non-exclusive basis, with new machines being expected on the market from 2017/18.

The process, called high speed sintering (HSS), selectively fuses polymer powder layer by layer, similar to other AM processes. However, instead of using lasers, HSS prints infra-red-absorbing ink onto a powder bed. Once a layer has been printed, it is exposed to infra-red light, which heats the powder covered by the ink, causing it to fuse, while the rest of the powder remains cool.

The new machine will be able to make parts up to 1m<sup>3</sup> - the size of a washing machine - which is three times bigger than existing machines. The speed will depend on the size of the product, but the team estimate that small components will be built at a rate of less than one second per part, allowing AM to compete with injection moulding for high volume manufacturing.

AM has advantages over injection moulding which makes the process more attractive, as Professor Hopkinson explains:

"With [additive manufacturing](#) you can make more complex parts and make each part unique," he says. "You can also make the parts where they are needed, which reduces transport costs. Additive manufacture also limits the risks involved. With injection moulding, you have to make tools, which is expensive and has to be done in advance. With AM, you miss out that stage, moving straight from design to manufacture."

The machine will initially be built in the University of Sheffield's Advanced Manufacturing Research Centre (AMRC) before installation in the University's Centre for Advanced Additive Manufacturing (AdAM), of which Professor Hopkinson is Director.

Dr Andy Bell, from the AMRC's Design Prototype and Test Centre

(DPTC), said: "This machine will be built completely from scratch, drawing on all the skills and expertise of our design engineers. We have been involved in developing machines with commercial partners in the past, but this will be the biggest machine we have ever created."

Provided by University of Sheffield

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