Rise of **additive manufacturing** machines and services

More and more engineers and designers are discovering the potential of 3D printing. Not only are growing numbers of affordable machines appearing on the market, but also increasing numbers of companies have bought 3D printing services in-house to deliver prototypes and short production runs more quickly and cost-effectively

The growing interest in 3D printing is demonstrated nowhere more clearly than in consumer electronics and hobby store Maplin, where a 3D printer can be purchased for home use for beer money. It is no surprise then to see increasing numbers of 3D printing machines for industrial use.

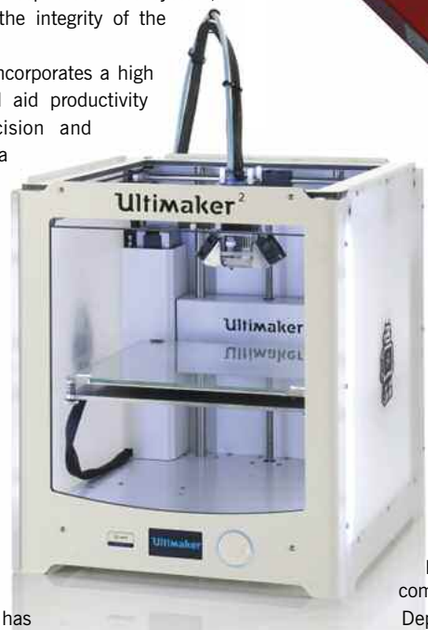
RS Components, for example, has added to its growing range of rapid-prototyping machines with the Ultimaker 2 3D printer, recently voted 'Best Consumer Product 2014' at the London 3D Print Show Global Awards. This new desktop 3D printer employs fused filament fabrication (FFF) technology and targets electronics and mechanical engineers involved in design, prototyping and research and development, as well as enthusiasts and students.

Manufactured from premium parts and materials the latest version of the Ultimaker 3D printer, compared to its previous incarnation, now adds a heated bed, which smoothens the print output, allows for ABS material printing and also prevents warping. Claiming the highest speed and accuracy possible on any desktop 3D printer available today, the printer offers a print speed of up to 300mm/s and a layer resolution of only 20 microns or 0.02mm.

The printer also comes with a standalone SD-card for 3D-model file upload and Ultimaker's Cura open-source software, which essentially slices a 3D-model into the requisite layers in preparation for printing. Cura was voted Best Consumer Software 2014 also at the London 3D Print Show Global Awards.

For its part, **Renishaw** has unveiled a machine that it is developing specifically for production manufacturing. Provisionally named EVO Project, it is the first additive manufacturing system designed and engineered in-house at Renishaw and reflects the company's 40 years of experience in supplying high quality equipment to demanding global manufacturing businesses. The new machine, which has a strong emphasis on automation, monitoring technologies and reduced operator interaction, is designed for single material industrial production. Powder handling is almost entirely hands off, whilst powder recirculation, recycling and recovery are all carried out within the inert atmosphere of the system, protecting both the user and the integrity of the material.

The EVO Project machine incorporates a high power 500W laser which will aid productivity whilst still maintaining precision and surface finish. It also boasts a class leading high capacity filtration system, a large 19" HMI user interface and intelligent workflow to further reduce the need for operator interaction.



The new machine, which is planned to be available in the second-half of 2015, is designed to complement and not replace the current Renishaw AM250 system which is better suited for flexible manufacturing and research applications where changes between materials are a requirement. The AM250 has an interchangeable hopper system which allows various materials to be used on the same machine.

3D printing services

While cost-effective 3D printing technologies are opening up possibilities for companies to bring additive manufacture in-house for their own prototyping facilities, what we are also starting to see is growing numbers of component suppliers offering 3D printing services.

One such company is bespoke fastener specialist **Jet Press**. Andrew Mitchell, sales and marketing director at Jet Press, comments: "3D printing or additive manufacturing is rapidly becoming the chosen method of producing first-off prototype parts of bespoke designs for evaluation. The cost and speed of producing parts is far less than traditional methods of machining from solid or laying down 'Soft Tooling', for plastic injection moulded components."

As the name suggests 3D printing involves printing a solid part in a similar way to an ink jet printer, but prints a three dimensional object. "Once the part has been designed in a 3D CAD environment, the file is exported in STL format to the 3D printer software," explains Mitchell. "This then breaks down the STL file into a series of layers, where the thickness and density can be adjusted to produce either a quick print to use for general aesthetic evaluation, or a more accurate, functional part for trial in an application. Overhanging structures are supported by a framework which can easily be peeled away after the print is complete."

Depending on the physical size of the part being printed, several parts can be produced in one print run, allowing several samples to be evaluated by different departments or customers. Print times are measured in hours, so evaluation of a design proposal can be carried out quickly.

Mitchell adds: "Any modifications to the design can simply be done within the 3D CAD system and exported for print and re-evaluated in a very short time scale. With traditional prototyping methods this would take weeks rather than hours and incur substantial additional costs."

Another company offering 3D printing services is **TR Fastenings**. The company's core business is aimed at being the principle provider of assembly components to a fast growing range of high volume multinational OEMs, whereby global consistency of price, quality and delivery is a minimum requirement for being nominated as a preferred strategic supplier. With more than 90% of TR Fastenings' revenue deriving from non-standard components to customer specification, engineering product development is a key group activity, often

demanding design and pre-production component prototyping.

Malcolm Diamond, chairman of TR Fastenings, comments: "In the past, not only did the manufacturing of component parts take an average of two weeks to complete but the costs exceeded thousands of dollars, thus prompting a reassessment of optimal prototyping for customer product development."

He continues: "Extensive research by my colleagues in our marketing and IT system teams into US and UK based 3D printing manufacturers has led to our first investment in a highly sophisticated industry standard printer and we are delighted by the response from our customers."

One of the big advantages of such 3D prototyping or low volume production services is the way they can be integrated with online design tools to further reduce timescales for delivery. **Schunk**, for example, has introduced eGrip, which it says is the world's first fully automatic 3D design tool for additively manufactured gripper fingers. Schunk general manager Martin Kent explains: "eGrip needs only minimal data for the fully automatic calculation of the optimal 3D contour, pricing and delivery schedule. The license-free, browser-based web tool reduces the design and ordering time for customised gripper fingers to only 15 minutes."

Using the intelligent software, the user uploads the workpiece or component as a STEP or STL file. The next process is to enter additional specific information such as the weight, installation position of the gripper and finger length. "In a few seconds, the user receives a detailed offer containing the 3D contour, the delivery time and the price," says Kent. "Schunk eGrip can quickly calculate even complex geometries. Users can either order the top jaws right away or save the offer and retrieve it later. In addition, the outer contour of the generated assemblies that consists of the gripper, top jaws and workpiece, can be downloaded in STL format for immediate use in the system design."

Bespoke parts production

Demonstrating that 3D printing isn't only good for prototyping but can also provide benefits in custom and low volume parts production, **Tapeswitch** reports that it has recently been able to offer an all-digital route to the design and production of a bespoke rubber bumper product. Tapeswitch engineers worked with the customer to design the product using Solidworks 3D CAD software, and then had the product 3D printed.

Tapeswitch manufactures pressure-sensitive products for safety, signalling, sensing and control applications, designed to serve a wide range of industries and markets. Marketing manager Karen Keighley comments: "A lot of our product enquiries are for one-offs and specials, and with 3D design software and then the capability for 3D printing the finished parts, we can achieve a much faster turnaround both for prototypes and short production runs."

3D printing has been described as a technology which is democratising design and encouraging innovation. Certainly it holds the potential to revolutionise numerous fields of engineering, providing not only faster turnaround on concept parts and prototypes, but also enabling whole new geometries which would be impossible to produce using any other method. While 3D printing itself might be more expensive per part over volume production runs that tooling up for a conventional process, these new geometries could be the key to making 3D printing cost-effective even for longer production runs by enabling greater application efficiencies.

www.gb.schunk.com
www.jetpress.com
www.renishaw.com
www.rswww.com
www.tapeswitch
www.trfastenings.com

SCHUNK TOP JAWS

Affordable additively manufactured Schunk top jaws can be quickly manufactured and are made of lightweight, wear-resistant polyamide 12, in either white or black. For use in pharmaceutical and medical applications, top jaws are also available in FDA-approved polyamide 12. Since polyamide is resistant to chemicals and suitable for use with foods, it can also be reliably used in connection with aggressive media. Due to their low weight, the top jaws are ideal for minimising cycle times and power consumption of the corresponding systems.

Tel: 01908 611127
Email: info@gb.schunk.com
Web: www.gb.schunk.com

BESPOKE FASTENERS

Jet Press offers a full design service for bespoke fasteners with CAD data exchange in standard formats such as STP, IGES, DWG and DXF. In addition, they can produce samples from their in-house 3D printer, offering a full design and prototyping service for bespoke fastening solutions. Once the design is confirmed and approved, they produce cost-effective injection moulding tooling for ongoing production requirements.

Tel: 01623 551800
Email: sales@jetpress.com
Web: www.jetpress.com

AUTOMOTIVE COMPONENTS

TR Fastenings has invested in a highly sophisticated 3D printer for the purpose of creating, testing and prototyping parts, predominantly for the automotive industry. The 3D printer, which is based at the company's headquarters in East Sussex, will use molten plastic to produce the prototypes, enabling customers to see what a particular part might look like before they commit to ordering a large quantity. The investment underpins the company's commitment to the latest technology processes – particularly those that support continuous improvement and innovation in customer care.

Tel: 01825 764711
Email: sales@trfastenings.com
Web: www.trfastenings.com

PRESSURE-SENSITIVE PARTS

Tapeswitch manufactures pressure-sensitive products for safety, signalling, sensing and control applications, designed to serve a wide range of industries and markets. The company has developed a wide range of ribbon-switch systems suitable for use in numerous different applications. The versatility of the product, combined with the expertise of Tapeswitch's engineers, enables the company to provide innovative solutions for customers' requirements.

Tel: 01257 249777
Email: info@tapeswitch.co.uk
Web: www.tapeswitch.co.uk

BRING YOUR DESIGNS TO LIFE

RS Components gives you the widest range of additive manufacturing options, with a comprehensive range of 3D printing products and accessories. 3D printer brands include 3D Systems, Ultimaker, RepRapPro and Beeverycreative, as well RS' own brand IdeaWerk FDM 3D printer.

Tel: 01536 201234
Email: uk.marketing@rswww.com
Web: www.rswww.com

METAL 3D PRINTING

Renishaw's additive manufacturing technologies encompass laser melting, vacuum casting and injection moulding. Laser melting is a digitally driven additive manufacturing process that uses focused laser energy to fuse metallic powders in to 3D objects. Vacuum casting is primarily used to produce high quality prototypes in a range of polyurethane (PU) resins that mimic the performance of engineering polymers. Injection moulding machines from Renishaw are suited to either short series production using resin tooling, or volume production of small shot components under 12 grams.

Tel: 01453 524524
Email: uk@renishaw.com
Web: www.renishaw.com