

Empowering Innovation

THE WORLD OF ADDITIVE MANUFACTURING APPLICATIONS







Stratasys 3D printing technology is now very much at the heart of our design and manufacturing process and allows us to produce race-ready parts significantly faster and cheaper than the traditional manufacturing methods that we had been accustomed to.

DAN WALMSLEY, STRAKKA RACING TEAM PRINCIPAL



 PROTOTYPING

 JIGS & FIXTURES

 COMPOSITE LAY-UPS

 PRODUCTION PARTS



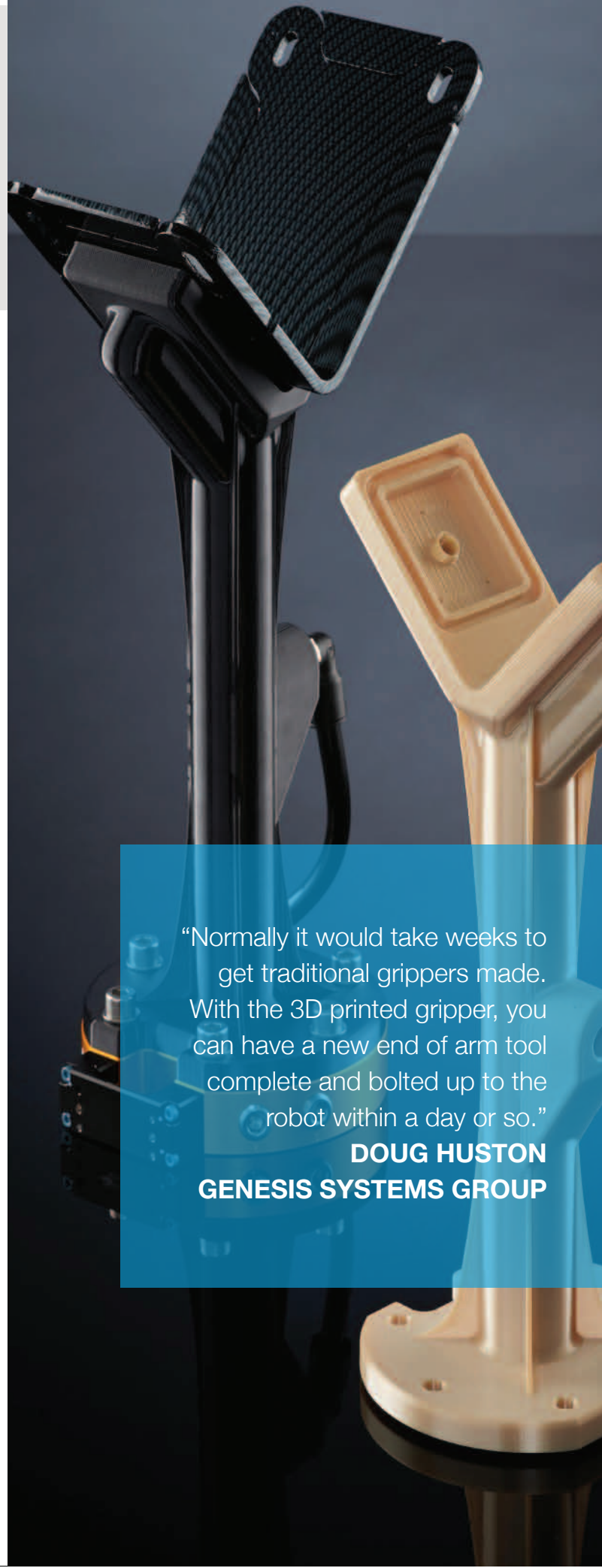
Additive Manufacturing Unleashed

Additive Manufacturing saves time and money for manufacturers of all sizes, in all industries, worldwide. Furthermore, it allows the creation of prototypes, tooling and production parts with superior performance.

3D printers were formerly the preserve of product designers. Nowadays they can be found in factories creating jigs & fixtures, mould tools, composite lay-ups and even carrying out short-run production. Advances in 3D printing materials, allied with incredible innovation by users, has meant that additive manufacturing is providing some incredible benefits.

However, the story has only just begun. In this guide, you will see some examples, with tangible results and ROI, of how additive manufacturing is being used for:

- ◆ Advanced Prototyping
- ◆ Mould Tools
- ◆ Jigs & Fixtures
- ◆ Manufacturing Tools & Aids
- ◆ Production Parts



“Normally it would take weeks to get traditional grippers made. With the 3D printed gripper, you can have a new end of arm tool complete and bolted up to the robot within a day or so.”

DOUG HUSTON
GENESIS SYSTEMS GROUP

Truly Lifelike Prototypes



GET AS CLOSE TO THE PRODUCTION PART AS POSSIBLE WITH MULTI-COLOUR AND MULTI-MATERIAL RAPID PROTOTYPING. LIFELIKE FORM, FIT AND FUNCTIONAL TESTING.

Rapid Prototyping was the original use for 3D printing. However, models represented no more than basic concepts. Today, however, Stratasys' advanced prototyping capabilities mean that printed models are as close to the production part as possible. As a result, you can test form, fit and function with complete confidence.

By getting so close to life, you can be certain that the product is right before you go to manufacturing. Costly errors in tooling set-up are avoided and the design can be tweaked in advance. Therefore your end products are perfect for purpose.

The world's biggest and best manufacturers use Stratasys technology, as do the stars of tomorrow.



Material Selection: for true realism, choose from production-grade thermoplastics and advanced photopolymers, such as rubber-like and transparent.



Material Combinations: want to combine materials in a single build? Require accurate colour representation? Then you need the most advanced systems - provided by Stratasys.



Accuracy: low-end desktop systems are great for concept models, but higher-end systems are needed for accurate form, fit and function testing.




MODELLING LUXURY - PRECISELY

From wheel rims and tyres, to full-size tail pipe trims, multi-material 3D printing enables **Bentley** engineers to produce models across several engineering functions with a diverse range of material properties. "Stratasys' systems have allowed us to develop things in a totally new way. With this technology, we can simulate exactly how the car will look."



ENHANCED PROTOTYPING SPEEDS DEVELOPMENT CYCLES

Engineers at **Trek** embraced the capability to integrate soft rubber-like components into models. This is crucial because so many bike parts and accessories contain rigid and soft components. "For Trek, something that would take a week to make now takes hours, significantly accelerating our product development."



Design Reality can produce all of the parts on the mask for testing, so that they can reliably confirm form, fit and function.

ADVANCED PROTOTYPING SYSTEMS PROVIDE PRODUCT DESIGNERS WITH:

- Confidence that their prototype is as close as possible to the end product.
- Considerable time savings against traditional methods of prototyping.
- Reduced risk of costly changes to tooling once production begins.
- The ability to produce more design iterations and therefore improve the end product.
- Security at design stage by keeping intellectual property in-house.



Our prototyping experts are always happy to benchmark Stratasys capabilities - why not test us out?

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Printing for Moulding

REMOVING THE NEED FOR EXPENSIVE TOOLING IN MOULDING APPLICATIONS

Additive manufacturing can provide staggering results when short runs of moulded items are required. 3D printed mould tools can be created in a matter of hours, far faster than traditional mould manufacturing methods. In addition, costs are usually lower by double-digit percentages.

3D printed moulds have been successfully used in low-volume:

- ◆ Injection moulding
- ◆ Blow moulding
- ◆ Liquid silicone rubber moulding
- ◆ Polystyrene moulding
- ◆ Room-temperature vulcanising moulding

Whether you need short runs for prototyping or for low-volume production, additive manufacturing is the answer.



Whale cuts lead time by 97% with 3D printed injection moulds on their Stratasys 3D printer.



INJECTION AND BLOW MOULDING FOR CONSUMER GOODS

Unilever uses a Stratasys 3D printer to produce injection and blow mould tools for part development across its divisions for regional and global markets. The 3D printed moulds not only meet these requirements, but can also be produced in significantly reduced times and at 20 percent the cost.



SILICONE MOULDING AND RTV MOULDING FOR MEDICAL

ScanMed produces its MRI coil covers utilising silicone moulding or room temperature vulcanisation (RTV) moulding. Today, ScanMed prints its smaller part mould masters in-house on their Stratasys 3D printers in one to two days — a time saving of 71% and cost saving of 60% as compared to CNC machining.



TESTING DETAILED PARTS IN THE PRODUCTION MATERIAL

With the help of 3D printed moulds, electronics manufacturer **Seuffer** can create prototypes from final production material with complex geometries, thin walls, and fine details. With this they can gather true-to-life performance data much earlier in the process than previously possible.

3D PRINTING FOR MOULDING IS PERFECT WHEN:

- Complex geometry would make traditional tooling difficult.
- Low quantities are needed - traditionally, tooling costs can make unit values very high.
- Design changes are likely - 3D printing avoids the need to scrap expensive tools.
- Rapid prototyping from the final production plastic is important.



Why not speak to our experts to see if you can cut costs and time in moulding?

Tools Without Tooling



RELEASE MACHINE TOOL CAPACITY WITH 3D PRINTED JIGS AND FIXTURES

3D printing provides a fast and accurate method of producing jigs and fixtures. By using 3D printing, the traditional fabrication process is substantially simplified; toolmaking becomes less expensive and time consuming. As a result, manufacturers realise immediate improvements in productivity, efficiency and quality.

Additionally, these tools can be designed for optimal performance and ergonomics because 3D printing places few constraints on tool configuration.

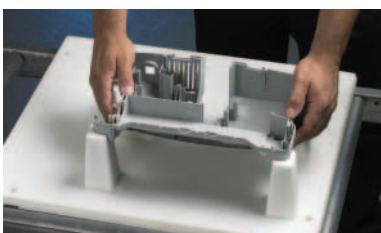
What's more, adding complexity does not increase build time and cost.

Engineers can easily evaluate the performance tools and make quick, cost-efficient adjustments to the design as needed. 3D printing also makes it practical to produce jigs and fixtures for operations where they have not been previously cost or design feasible when produced with traditional manufacturing methods.



DRIVING DOWN TIME AND COST FOR TOOLS

Opel is slashing manufacturing tool production costs by up to 90% using its Stratasys 3D printers. Opel also creates 3D printing assembly tools in less than 24 hours. Any design changes to the manufacturing tools are easily accommodated in a matter of hours, eliminating costly iterations further along the production process.



A NEW WAY OF PRODUCING ASSEMBLY FIXTURES

In the past, **Oreck** used only traditional methods to produce assembly fixtures. These included silicone or epoxy moulds and urethane castings with inserts. Now, using Stratasys 3D printers, they can reduce fixture production costs by up to 65 percent. With some traditional fixture projects costing over \$100,000, the savings can be substantial.



Rutland Plastics now produces 90% of their jigs & fixtures on 3D printers, saving around 60% on time and 40% on cost.

TYPICAL BENEFITS OF 3D PRINTED JIGS AND FIXTURES:

- Average lead time savings: 40% - 90%
- Average cost savings: 70% - 95%
- Greater efficiency: streamline and improve process
- Greater design freedom: integrate / consolidate / improve
- Improve performance, accuracy and ergonomics



Why not invite one of our experts to evaluate how much time and cost you could save on your jigs and fixtures?

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Imagination is the Only Limit



3D printing is being used for an ever-growing number of manufacturing applications every day. Wherever there is a need to reduce time and costs, to improve performance or to solve a previously unsolvable requirement, manufacturers are turning to Stratasys technology to find a solution. Here is just a small number of examples:



SACRIFICIAL TOOLING

Achieving a smooth interior and exterior surface finish with tubular composite components is almost impossible using conventional tooling methods. Using 3D printed soluble cores, **Champion Motorsports** not only improved the performance of their carbon fibre parts, but also improved the consistency and production yield.



INVESTMENT CASTING

3D printed patterns are direct replacements for traditional patterns that are injection moulded with foundry wax. Using Stratasys technology, **RLM Industries** built patterns in less than a day. In just seven days they produced perfectly matching gear set castings that met drawing requirements and were functional as part of an assembly.



HYDROFORMING

Piper Aircraft is using hydroforming to produce hundreds of aluminium structural components of the aircraft such as the inner frame, gussets, brackets and skins. They determined that 3D printed hydroforming tools could withstand pressures of up to 10,000 psi. As a result, they have significantly cut costs and lead times for their tools.



SAND CASTING

With systems available from Stratasys, foundries can fabricate patterns using 3D printing. This results in substantial savings in cost, labour and time, ultimately speeding new product development. For **Melron Corporation**, the cost of producing new matchplates was reduced 60% compared to CNC machining, with a time reduction of 50% or more.



3D printing allows Robai to produce plastic End Of Arm Tools in a fraction of the time and cost required for conventional metal tooling. The lighter weight of 3D printed tooling also makes it possible to use smaller, less expensive robots.

HOW DOES 3D PRINTING COMPARE TO TRADITIONAL METHODS FOR ROBAI?



| METHOD | TIME | COST |
|----------|----------------|---------------|
| CNC | 70 hours | \$7,000 |
| 3D PRINT | 4 hours | \$400 |
| SAVINGS | 66 hours (94%) | \$6,600 (94%) |

New capabilities of 3D printing are being unleashed every day. Why not discover some for yourself?

The Future of Production

HIGHER PERFORMANCE AT REDUCED COSTS FOR LOW-VOLUME PRODUCTION

One of the rewards of the 3D printing revolution is the ability to begin production without the delay and expense of tooling, and to produce customised, geometrically complex products free from traditional manufacturing constraints.

Now you can realise revenue without time-consuming inventory management. With in-house, on-demand production, inventory becomes a digital file at your fingertips.

Stratasys 3D printers build the most durable, stable, repeatable parts in the industry. With an array of real thermoplastic materials, Stratasys helps manufacturers say yes to more opportunities in low-volume, customised production parts and factory automation.

Engineers are free to optimise parts with organic shapes and complex geometries, including hollow interiors and negative draft. Traditional tooling constraints don't apply in the world of additive manufacturing. Now you make the rules.



ULA is saving over 50%, and in some cases 95%, by 3D printing rocket components over traditional methods.



REDUCED PRODUCTION TIME AND COSTS

Airbus has produced more than 1,000 flight components on Stratasys 3D printers for use on A350 XWB aircraft. The items were used in place of traditionally manufactured parts, enabling Airbus to meet its delivery commitment on time. This enabled strong, light-weight parts while substantially reducing production time and manufacturing costs.



CUSTOMISED PRODUCTION FOR THE MASSES

Additive Manufacturing enables **Normal** to deliver premium, custom earphones in a way — and at a price — that traditional manufacturing methods are unlikely to achieve. The earphones are manufactured to exactly fit the wearer's ears on Stratasys 3D printers.



PEAK PERFORMANCE IN EXTREME CONDITIONS

Prodrive uses Additive Manufacturing for hood vents on MINIs. The design is optimised for aerodynamics. The shape makes moulding or carbon fibre lay-up very difficult, but with AM, production is simple. The vent is stiff, light, and heat resistant; it extracts air passing over the turbo and exhaust, which can run as high as 980 °C.



WHAT CAN YOU GAIN WITH 3D PRINTED PRODUCTION?

- Significantly reduced costs in production, as tooling is not required.
- Improved performance, as designers are not constrained by manufacturing limits.
- Faster production times, as the part can be sent to production straight from CAD.
- The ability to customise production for every item to the end user's exact requirements.

Get in touch now for an ROI assessment of your low-volume manufacturing...

Stratasys is Shaping Our World

Every day, our customers find simpler, smarter approaches to stubborn design problems. Less hindered by the usual constraints, they can imagine, design, iterate and replicate more freely than ever before. By providing the shortest possible path from idea to solid object, Stratasys empowers them to untangle complexity, tackle tough problems, uncover new solutions – and to do it all with the urgency our accelerating world demands.

Stratasys has been at the forefront of 3D printing innovation for more than 25 years. Stratasys is shaping lives by helping researchers and health experts expand human knowledge and advance health care delivery. Stratasys is fueling the next generation of innovation through its work in aerospace, automotive and education. Stratasys is trusted worldwide by leading manufacturers and groundbreaking designers, makers, thinkers and doers. As a proud innovation partner, Stratasys offers the best mix of technologies, deep industry expertise – and the most flexible implementation options to meet customers' needs – whatever shape they may take.





AEROSPACE

3D printing means innovating fast and flying with confidence to get your ideas off the ground quickly. Stratasys technology helps aerospace manufacturers innovate faster, test more thoroughly and maximise resources.



ARCHITECTURE

Build detailed, durable models with 3D printing. Stratasys 3D printing helps architectural firms seize more opportunities by creating complex, durable models in-house, directly from CAD data.



AUTOMOTIVE

By building durable concept models, prototypes, tooling and low-volume production parts in-house, engineers and designers can work more iteratively, test more thoroughly and move confidently into production.



COMMERCIAL PRODUCTS

When clients make tough demands, commercial manufacturers with 3D printing capabilities have the power to say yes. Designers and engineers can skip expensive, time-intensive machining and gain the agility to make changes any time.



CONSUMER PRODUCTS

Get the next big thing to market faster with 3D printing, because timing can be as important as the idea itself. In the competitive consumer products field, in-house 3D printing enhances collaboration, shrinks time to market, and helps keep new devices under wraps until launch.



DEFENCE

When customised equipment is vital and deadlines are non-negotiable, 3D printing gives manufacturers the freedom to design a single production part, quickly create low-volume tooling, or build complex, precise prototypes.



DENTAL

3D printing makes digital dentistry happen. By combining oral scanning, CAD/CAM design and 3D printing, dental labs can accurately and rapidly produce crowns, bridges, stone models and a range of orthodontic appliances.



EDUCATION

Tomorrow's engineers, designers and problem solvers deserve every tool available to build a brilliant future. 3D printing fuels limitless creativity when students get to see, hold and test their ideas in real space.



ENTERTAINMENT

3D printing brings fantasy worlds to life. Like a magic portal between imagination and reality, 3D printing makes characters and props from ideas every day. You've probably seen 3D printed characters onscreen — without even realising it.



MEDICAL

3D printing empowers health care heroes. In a field where innovation saves lives, Stratasys 3D printing solutions empower doctors, researchers and medical device manufacturers to work faster, test more thoroughly and personalise care like never before.



STANFORD MARSH HAVE BEEN SUPPLYING DESIGN PROFESSIONALS WITH INNOVATIVE TECHNOLOGIES SINCE 1965.

Stanford Marsh have been supplying design offices since 1965. As design trends have changed and as industry has innovated, we have been at the forefront of bringing new technologies to the market. In 1989 when Computer Aided Design became both useable and affordable we quickly introduced Autodesk products to our portfolio and employed from industry specialist staff to fulfil this essential element of our services.

Since then we have grown in all areas of our business and we are proud to be the largest and most progressive independent provider of design solutions in the UK and Europe with annual turnover now exceeding £15.3 million GBP.

Today we have 3D print systems implemented in a wide spectrum of industries and public sector organisations from architectural environments through to both aerospace and automotive organisations including Formula 1. Our comprehensive range of industry sectors encompasses in-office rapid prototyping solutions & short-run manufacturing products for a wide variety of applications. So regardless of your application being a Maya led software for animation or a Solidworks solution for manufacturing, we can supply a 3D printer to meet your needs. If you don't already have a 3D design software then we can consult with you and provide a solution which can also include software training at one of our accredited training centres.

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