

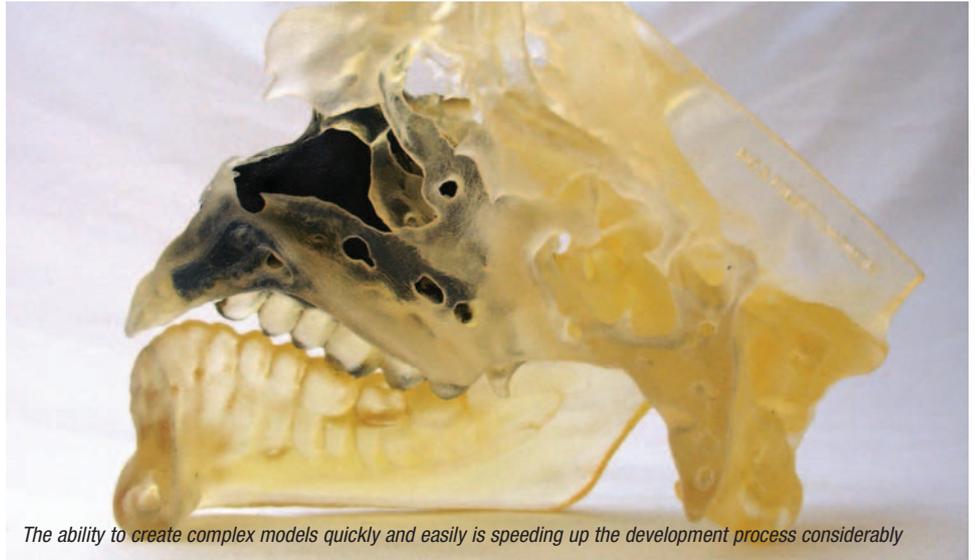
# Designing in 3D

**3D printing is changing the way product design and development are taking place. Paul Fanning finds out how.**

The availability and variety of additive manufacturing technologies has fundamentally altered the time and approaches taken in product development and seems likely to continue to do so.

This is certainly the view of Peter Pendergast of IDC Models, the prototyping arm of leading design consultancy IDC. Today, the company operates a Viper stereolithography machine alongside various other technologies. Having been with the company from the beginning in 1987, Pendergast can remember the days before this technology. He says: "One of the first jobs we did was the Vax upright cleaner, which had 'saddlebag' water tanks and back then we probably had 10 modelmakers and everyone was handmaking a component for this, so you used to have huge numbers of staff that were involved in the process."

While the speed and efficiency with which it allows models to be created is a desirable end in itself, perhaps even more interesting is the way in which the availability of 3D printing has changed the way in which product design and development takes place. Says Pendergast: "We operate as bureau to some extent, but the machine is also used as a design tool because the designers can work during the day and get things 'grown' overnight, which means that the next day they can see what they've been working on. This means they very quickly get an idea of whether they've been going down the wrong



*The ability to create complex models quickly and easily is speeding up the development process considerably*

route in the creative process."

Nick Broadbent of Cambridge Design Partnership agrees that the 'proof of principle' phase is where rapid prototyping has the most immediate benefits. He says: "If you put garbage in, you'll get garbage out. RP allows you to produce multiple designs for a part overnight and thereby trying new design after new design and fine-tune the results empirically."

However, this flexibility brings with it certain demands. Designers, given the freedom to experiment, will do so, printing as many variations of a design as they can – something that obviously puts pressure on IDC Models.

Pendergast says: "Before 3D printing, they had to be a lot more certain they were right. There was no building on an experimental basis because it was so costly and time-consuming to produce working models. However, with the advent of overnight printing of models, that has changed."

3D printing technologies have also allowed the development process to include factors such as consumer research to play a much larger part in the design process, with end user feedback to lifelike models being available at much earlier stages of the development process.

Of course, this level of work for 3D printing facilities inevitably puts pressure on in-house



*IDC Models created a full-size model of a Red Bull Racing car, assembling it "like an Airfix kit" according to Peter Pendergast*



*IDC Models uses a range of technologies to create models*

facilities, hence the requirement for external bureaux such as Industrial Plastic Fabrications, which performs much of the beta testing for 3D Printer and materials manufacturer Objet Geometries. With projects ranging from Formula One to Olympic mascots, the company's portfolio is wide and its expertise extensive.

According to IPF's head of rapid prototyping Gary Miller, there is no inherent conflict between companies having in-house 3D printing machines and using bureaux such as his. Indeed, he feels that, as people become more familiar with the technology, it can only work to his advantage. He says: "We did the models for the Lewis Hamilton/Santander ad last year and the client then went on to buy their own entry-level Objet machine. That doesn't worry me because they still come back when they need something that's too big for their machine or if they need

something flexible on it or whatever. If anything, it's advantageous for us, if anything."

Miller believes that, as awareness of 3D printing technology increases, so does the extent to which companies realise how it can be of value to them. He says: "Once people get a taste of the technology and see what it can do, they start realising all the things they could do with it. Not everyone wants to buy one, of course, but they start to realise the possibilities offered by the different technologies."

In this regard, Miller believes that the purchase of entry-level machines by designers can only be a good thing from his perspective. He says: "There are at least two dozen product development companies that have used us and then gone on to buy their own Objet machines. They all still come back because they're buying the entry level machines, so some stuff is too big

for it and they don't do what the Connex does, but they are investing in order to proof their designs."

As an example, Miller offers his work with Bentley, for whom he had produced a number of models for free, including a model of a Bentley wheel that took 14 hours to print. On the basis of these models, Bentley purchased two Objet machines – an entry level machine and a Connex. However, rather than damaging IPF's business, this has only enhanced it. Says Miller: "They've got so much overflow because everyone is using it that they are having to come to me to do it. So before he bought a machine, I got nothing and I was giving him models, but now he's got two Objet machines and I'm doing work for him."

Peter Pendergast of IDC Models concurs that there is clearly a value in entry level – even tabletop – machines as far as design offices are concerned. He says: "It depends on which way the design office goes. There are lots of tabletop FDM machines that are very good for having a look, but in terms of surface finish and accuracy it's not great and has limited uses..."

"There will be a time in the future when we're using these machines. Just as we started with drawing boards and gone to 2D files and then to 3D CAD, it won't be long before FDM machines will accompany every seat of CAD as an essential



*These 'Angry Birds' iPod docking stations are one of IPF's high-profile examples of 3D printing*





designer's tool – allowing people to get a feel for their designs. You see this sort of thing developing and, from a designer's point of view – if you're working on screen, it can be difficult to get a sense of scale sometimes with CAD – being able to produce to scale would help you get a sense of proportion."

Of course, there are still gaps in the understanding of customers and potential customers. One of these, of course, is the importance for designers of understanding the current limitations of the technology as well as its benefits. One of these limitations lies in the gap between being able to 3D print a part and being able to manufacture it. Says Pendergast: "People don't always realise that there are things you can 3D print that you simply can't manufacture. That relies on the designer's knowledge of the manufacturing process because the fact is that you can design and 3D print things that are totally unmanufacturable."

Neil Brotherton of Cambridge Design

Partnership points out the risk that the ability to print such 'unmanufacturable' items poses, saying: "It's so easy and quick to print a part that looks like it's ready that you can raise the client's hopes unrealistically. You then have to explain to them that the part cannot actually be manufactured in this form."

Miller, too, encounters this gap in understanding among his customers and potential customers. However, he does not see it as being entirely negative. He says: "You do get a decent percentage of people asking whether you can do metal and flexible. You have to be honest and say that isn't where the technology is right now. But people are thinking about what they want and that is filtering back to the likes of Objet. Their ideas start the brainstorming process."

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