

Making the model project

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Edinburgh-based practice Gilberts invested in a Z Corp rapid prototyping machine to turn cad images into physical models. A year on, the architect and an engineer discuss the process and the dividends it has brought

Z Corp rapid prototyping printer

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Kelvin Donaldson, a director at Edinburgh practice Gilberts, writes:

The Z Corp Spectrum Z510 that we operate is a relatively low-tech device. It uses design-jet technology to print fixative into a bed of powder, in full colour, in layers about 0.1mm thick. We have refined our modelling technique to produce really quite fine detail and colour ranges — our models are robust, yet realistic. Depending on scale, the level of detail can vary, and we can now print thinly enough to represent translucent glazing.

We have also developed, and continue to expand, our model types. We initially foresaw building modelling as the printer's main task, but can now offer fully contoured, coloured site and masterplan plates at 1:500 to 1:10,000 as well.

We have also engaged in structural and services modelling with clients like Faber Maunsell, and are discussing possible display modelling with National Museums for Scotland. And we are examining a possible arrangement with archaeological surveyors, tying up their intensely accurate and detailed laser survey data with physical outputs.

The printer operates for the practice on a number of levels. Internally, it provides a means for designers to analyse the pros and cons of alternative solutions, which is improving design quality. It can also demonstrate designs to non-professional and conservative clients — as well as sceptical planning departments — in forms that are easy to follow. Externally, as described above, our Spectrum Z510 has the capacity to create further revenue streams from existing clients.

We have now had the Z510 in our office for just under a year. For the first six months or so we were definitely on a steep learning curve. We are still learning new tricks and techniques as is inevitable with such ground-breaking technology, but we believe we are now a leading authority in the field. We even envisage expanding our team of modellers from two to five or six, all feeding the one printer.

Tenae Francis and Steven Ferguson from consulting engineer Faber Maunsell write: “RP lets us take 3D animations to more tactile and realistic environments”

Having a close working relationship with Gilberts, we were aware of their 3D printing capabilities and were very impressed with their early efforts to model the built environment physically. We were already using 3D cad modelling for drawing and interactive computer animations, so we were intrigued about how we could use this new technology.

A demonstration of the rapid prototyping process revealed its potential for our practice, although further investigation was required to establish how the intelligent 3D parametric models we produce for drawing production could be exported into a readable format for 3D printing.

We established that through a little user interface we could export a 3D model into a format that allowed printing of our first prototype model. We model using 3D+ and ABS; the model is then saved in ADT format and exported to Rhino to be saved as an .iges file for printing. Clash detection, rendering and animation are done within Navisworks.

The result was an incredibly detailed physical model that impressed our department and enthused our clients. As a result we decided to commission a number of prototypes for Faber Maunsell offices throughout the UK.

It is unusual for an engineering practice to invest in physical models of building structures, but rapid prototyping is more effective than traditional model-making methods and has allowed us to take the 3D animations that we produce as a matter of course to more tactile and realistic environments. The prototype model allows easier visualisation of the structure and more flexibility in transferring ideas and concepts during design development. It also has the advantage of allowing us to show a finished project to a client before works begin.

3D goes beyond just drawing production and design analysis — it can achieve a fully integrated design. As a result the 3D cad role is becoming more influential and our strategic planning is embracing this technological potential.

How rapid prototyping works

Rapid prototyping is basically three-dimensional printing — models are created as a series of layers, laid down one-by-one.

There are a variety of techniques available, including using resin and sheets of specially treated paper, but the powder-based technique described here is probably the most popular.

The Spectrum Z510 machine launched in 2005 — the model purchased by Gilberts — is a 24-bit colour printer capable of building two layers a minute, culminating in a model of up to 254 x 356 x 203mm.

Purchase price of this machine is around £30,000, although accessories can push the price to nearer £50,000, but other machines cost far less such as the ZPrinter 310 Plus, which is about £12,000.

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