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3-D Generation

DIGITAL MODEL-MAKING IS ON ITS WAY TO BECOMING AN IN-OFFICE PRACTICE, THANKS TO ADVANCES IN 3-D PRINTING TECHNOLOGIES.

Source: ARCHITECT Magazine

Publication date: June 1, 2007

By Katie Gerfen

Almost every architect's office has at least one: a lovingly handcrafted scale model of a big project, usually under Plexiglas. These models represent hundreds of hours of labor by trained model-makers, working from sketches and conversations with the design team, and they may be going the way of the dodo. In this era of ever-changing technology, 3-D printers are on the way to becoming a cost-effective and accessible option for architects. With them, the ability to make fast and relatively inexpensive plastic models of everything from curtain wall details to entire buildings is available in the office and with one keystroke.

Until fairly recently, these complex printers were priced so exorbitantly that few except big-name manufacturing companies could even think of affording them. And while still not cheap by any means—the lowest-priced models range from \$18,000 to \$39,900, depending on the features and printing process—some firms have already jumped on-board: KPF has had two in the New York office since 2004, and one in London since 2006. “We use them constantly,” says James Brogan, KPF's senior associate principal and director of firmwide information technology. “We run them every night, with multiple schemes and projects in each build. They allow us to work on several iterations of building geometry and spatial studies very quickly.”

Kevin Lach, vice president of communications at Z Corp., and Jonathan Cobb, vice president and general manager for Dimension, a division of Stratasys, represent two leading companies with widely different approaches to 3-D printing (see pages 52 and 54). Lach and Cobb agree that the 3-D printing industry is gaining ground in the AEC market, and that two major concerns are changing the way the printer manufacturers do business. “These machines have to be affordable and easy to use,” says Lach. “Architects don't want to handle chemicals.” To that end, both manufacturers have made changing out printing materials as simple as possible, with snap-in cartridges of binder and powder on the ink-jet side and integral water baths to dissolve soluble supports on the FDM side. Everything that the end user touches is safe.

Also important to end users is reliability. “When the machines were \$500,000 or so, people were willing to tinker around with them for an inordinate amount of time if something wasn't working,” says Cobb. “But now the technology is not new, and people expect it to work 100 percent of the time.”

The industry is also continuing to work to make these printers more affordable. “It's got to be a lot more cost efficient, and it's got to be fast. People want to change the design, color it. We're not watching black-and-white TVs anymore,” says Lach. “Everyone in this space is working towards a \$10,000 machine in the next few years.”

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A completed model of a farmhouse (top) printed with the new ZPrinter 450 shows off the machine's ability to print in full color and print patterns imported from image files (note the “stone” chimney). The printing technology can build up thin walls and beams, allowing a true model of a space.

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3-D Ink-jet Printing

*Source: ARCHITECT Magazine**Publication date: June 1, 2007*

By Katie Gerfen

3-D ink-jet printers, like the new ZPrinter 450, from Burlington, Mass.-based Z Corp., use a high-performance composite powder alternated with a gluelike binder to slowly build up models layer by layer. The user has a proprietary print driver, called ZPrint, installed on their computer desktop. It parses a standard .stl file into a series of layers, or horizontal slices that can be built up by the plasterlike powder in the printer. Once inside the printing chamber, the layers of powder and binder build up, and two standard ink-jet printer heads apply ink to the perimeter of each layer, so that the model builds up in full color.

With another proprietary program called ZEdit, the user can import image files to provide simulated texture—such as images of paving tiles or roofing materials. The result is a faithful model of the original 3-D drawing, with a materials cost of between \$2 and \$3 per cubic inch.

“Cost has become big factor,” says Kevin Lach, vice president of marketing for Z Corp. “The cost of something is going to drive how you use it. If [a model] is going to cost several thousand dollars, you’re not going to try a lot of things. If it costs 50 to 100 dollars, and it’s already in your office, then it fosters creativity.” Another benefit to the powdered printing process is that in the ZPrinter 450, several items can be printed at once, stacked together so that they fill the print chamber. An extra layer of powder between each piece means they are completely separate once it comes time to remove them from the machine.

ZPrinter 450

Z Corp.

www.zcorporation.com

Maximum build size is 8 by 8 by 12 inches

No support structures on finished models

Automatically recycles excess powder

No-touch automatic binder and snap-in powder cartridge

Noise-suppression keeps printer quiet while in operation

Color applied with two standard ink-jet print heads

Environmentally safe build material

Two to four layers per minute

Layers range from 0.0035 to 0.004 inches thick, depending on user preference

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DesignMate Cx

Contex

www.contex.com

Maximum build size is 10 by 14 by 8 inches

Models are made from high-performance composite material, fused with a binder solution deposited via four ink-jet print heads (a total of 1,216 jets) in cyan, magenta, yellow, and clear

User-selected layer thicknesses range from .0035 to .008 inches

Build speed is two to four layers per minute

Accepts .stl, .vrm, and .ply file formats as input

Uses proprietary Contex print driver software

Compatible with Windows 2000 Professional and

Windows XP Professional

