

# THE RAMBOLL GROUP

## Full-color 3D printing helps Nordic civil engineering giant Ramboll extend leadership



Model of a water plant renovation project in Kaliningrad, Russia

- **The Ramboll Group** – A leading Nordic consulting group headquartered in Copenhagen
- **Challenge** – Finding the best way to convey civil engineering visions to prospective clients, established customers and engineers throughout the 4,000-person company
- **Solution** – Using the Spectrum Z™510 full-color 3D printer to produce 3D physical engineering models
- **Results** –
  - Model production at less than one-third the cost of handmade models
  - Dramatic time savings that increase with the complexity of the model
  - “Many examples” of new business acquisition
  - Increase in efficiency and accuracy

“There’s just something about a 3D model that stirs the passions in ways that a blueprint or computer file just can’t ... 3D printing has become a distinct competitive advantage for us, and ultimately, a tool that significantly benefits our customers.”

–GITA MONSHIZADEH  
CAD DEVELOPMENT MANAGER, RAMBOLL  
TRANSPORT AND INFRASTRUCTURE DIVISION

Landmark buildings, breathtaking bridges, efficient roadways and reliable public utilities serve as convincing testament to the Ramboll Group’s engineering vision. Communicating one’s vision prior to winning a job, however, is another matter. This is one reason that Ramboll, a \$577 million Nordic engineering consultancy, has adopted advanced 3D printing capabilities for all of its operations.

Ramboll operates an extensive international business offering full-service consultancy in infrastructure, telecommunications, building, health, industry, oil/gas, energy, environment, IT and management. The company earned record profits in 2005 and achieved a 98 percent customer satisfaction rating.

### Challenge

#### Competing for projects

Despite its successful track record, Ramboll faces aggressive competition for new business. From the start of a business relationship, the company must convincingly establish the advantages it can offer the client.

While Ramboll has always been proud of its engineers’ design concepts, it’s always been a separate task entirely to make the words, blueprints and pictures behind the designs vivid, memorable and compelling in the minds of prospective clients.

### Solution

#### Full-color 3D Printing

Seeking powerful new ways to improve its competitive capabilities, the company in late 2004 identified 3D printing as a potential solution. From the start, Ramboll saw full color as an indispensable capability. That requirement made the evaluation process straightforward. Early in 2005, Ramboll invested in a Z Corporation Spectrum Z™510 3D printer, the only high-definition, multi-color 3D printer on the market.

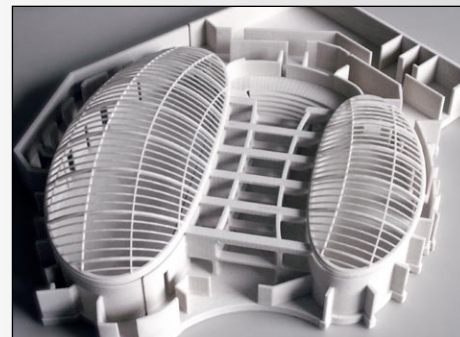
The Spectrum Z510 rapidly, colorfully and dynamically produces three-dimensional architectural and engineering models in shorter time and, in most cases, at far less cost than traditional handcrafting. Because of their fine, multi-colored detail, the models enable the company to vividly communicate its unique vision. The Spectrum Z510’s ability to print image-files on surfaces gives the models a realistic and picturesque touch and is an especially important factor when presenting infrastructure projects. For example, Ramboll engineers can map textures such as brickwork onto a wall, or they can map aerial photos onto terrain models.

### Results

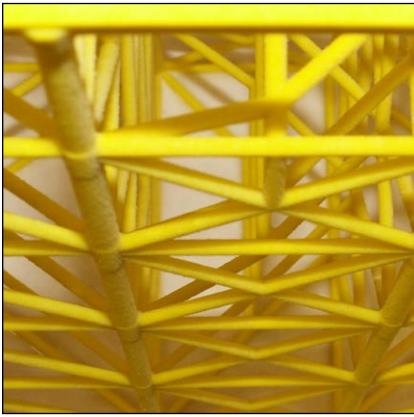
#### More new business

These new capabilities are improving Ramboll’s success at winning new projects. Shortly after purchasing the Spectrum Z510, Ramboll competed for a high-profile bridge project in its home country of Denmark. The company was able to faithfully depict special V-shaped abutments that consume less space and material than traditional vertical pillars. The model conveyed the concepts behind the innovation and helped Ramboll win the job.

“That’s one example of how full-color 3D printing helps us win new jobs,” says Gita Monshizadeh, CAD development manager



Model of a glass-domed elephant house at the Copenhagen Zoo



Model of an offshore oil rig project in the North Sea



Model of a motorway overpass near Vejle, Denmark

“Architectural designers think in spatial terms, and a 3D model helps bridge the gap between them and the engineers charged with bringing the design to reality. With a physical model, the engineers can see the concept in concrete terms and can easily imagine themselves in the 3D space.”

—GITA MONSHIZADEH  
CAD DEVELOPMENT MANAGER, RAMBOLL  
TRANSPORT AND INFRASTRUCTURE DIVISION

for Ramboll’s transport and infrastructure division. “We have more examples of similar success. 3D printing gives our prospective clients a good idea of our unique capabilities. We can create compelling presentations that give tangible substance to the superior Ramboll vision in full detail and vibrant color. The colors, the detail and the textures – down to the seams on a model of a masonry wall – establish our credibility immediately with the client and are quite convincing.”

In addition to securing new business, 3D printing saves Ramboll money. For example, Ramboll recently needed a model of a 12-story apartment building and discovered that it requires just one-third of the expense to print the model in full color than to commission a model by hand. Then there is the sheer simplicity of 3D printing with the Spectrum Z510. Engineers can produce the model by printing directly from a digital design file produced by applications like Bentley Systems MicroStation® or Autodesk 3ds Max® software.

“It takes little or no effort to turn a design into a full-color physical model if you have a proper print scale,” Monshizadeh says. “If your design is in 3D, you have what you need to make a 3D model. Sometimes you have to optimize the model so that the scaling factor allows printable elements, but in many instances that’s not a big effort. It’s quite the opposite case to fabricate a handmade model, where essential fine detail can consume great amounts of production time. In other words, 3D printing lets us think more creatively and spatially when we work on a project. We can easily print different technical phase-models for important comparison.”

On another occasion, Ramboll needed to introduce a New York architect to the landscape around the planned Orestad district of Copenhagen, for which Ramboll has a multifaceted engineering contract. Rather than fly the architect to Denmark, Ramboll printed a 3D model of the landscape and took it to a meeting with the architect in New York. The 3D model provided the architect with a clear and concise vision of the landscape that was almost as helpful as if he had visited the site. A site visit would have been far more time-consuming

for all parties involved, and the model will be handy for the architect’s reference throughout the project.

Ramboll engineering teams can now work from physical models in three dimensions instead of 2D images on a computer screen. This difference was particularly helpful for a 12-member Ramboll team recently charged with the engineering work for a \$25 million glass-domed elephant house at the Copenhagen Zoo designed by British architect Sir Norman Foster. The third dimension in the printed physical model promoted a gut-level understanding of what the engineering work would entail. “A full-color 3D model helps the team keenly understand the intent of the architect with every feature in context,” says Monshizadeh.

“Architectural designers think in spatial terms, and a 3D model helps bridge the gap between them and the engineers charged with bringing the design to reality. With a physical model, the engineers can see the concept in concrete terms and can easily imagine themselves in the 3D space. By improving our engineers’ understanding we are improving their accuracy, and we are avoiding the time, cost and embarrassment of errors that are ultimately unnecessary,” she says.

“Internally and externally, there’s just something about a 3D model that stirs the passions in ways that a blueprint or computer file just can’t,” she says. “For this reason, 3D printing has become a distinct competitive advantage for us and, ultimately, a tool that significantly benefits our customers.”

**RAMBOLL**

The Ramboll Group  
Virum, Denmark  
[www.ramboll.com](http://www.ramboll.com)



Z CORPORATION™

**WORLDWIDE HEADQUARTERS**

Z Corporation  
32 Second Avenue  
Burlington, MA 01803 USA  
718-852-5005  
[www.zcorp.com](http://www.zcorp.com)

ZPrinter is a registered trademark of Z Corporation. All other company and product names are trademarks or registered trademarks of their respective owners. ©2006 Z Corporation. All rights reserved.