3D Printing Cirque du Soleil's Fantasy World

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General Manager,
Guangzhou Deed 3D

On the shores of the beautiful West Lake in Hangzhou, China, a performance that promises fantasy is about to take place. In "X: The Land of Fantasy," an immersive show from Cirque du Soleil, audiences are treated to a feast of breathtaking acrobatic performances, stunning stage effects and sensuous storytelling.

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Case Study

New Vision, New Challenges

To make the immersive experience come alive, Cirque du Soleil needed to create a 100-meter wide moving stage with a "forest" as large as 420 square meters. This forest is the main prop, inside of which the fabulous story unfolds.

The props used in early shows were largely fixed, but this time the actors needed to perform a variety of acrobatics on the tree branches. However, creating custom trees that were durable, light and easy to assemble and disassemble was a huge challenge that intimidated the set design team.

That's because the splicing of the molding material had to be reduced and the molds needed to come in larger sizes.

Initially, Cirque du Soleil considered a variety of 3D printing solutions and examined some test samples. But the materials weren't tough enough and they needed to be spliced more than 10 times, resulting in insufficient strength that could not meet the safety requirements of the stage performance.

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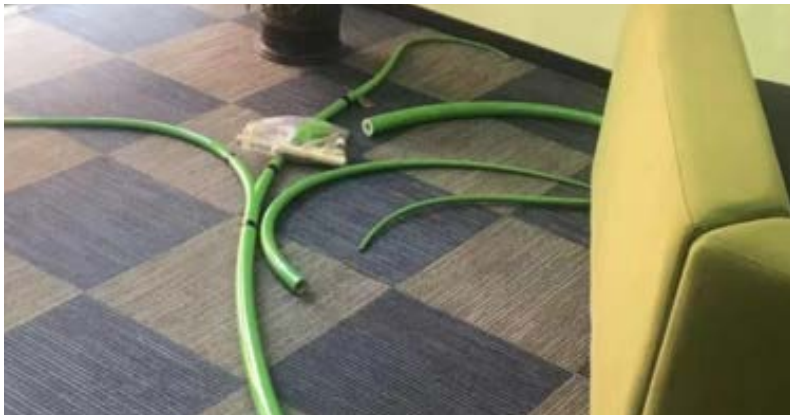
In a quest to find the right 3D printing solution that would meet its demanding requirements, the director of the Cirque du Soleil set design team toured the factory of Guangzhou Deed 3D, a 3D printing service provider based in Guangzhou, China. With 12 years of experience, Deed 3D has the largest Stratasys® 3D printing center in the Asia Pacific region and is able to meet a wide range of requests, from design verification to on-demand manufacturing. Hou Jie, General Manager of Guangzhou Deed 3D, believed that 3D printing was a suitable solution to solve the issues involved in this uniquely shaped stage. Teams from both sides examined a range of 3D printing solutions before agreeing that Stratasys FDM Technology™ — and its large variety of FDM® materials — would provide the best solution. At the same time, the Fortus 900mc™ 3D printer was chosen for its large-scale printing capabilities.

5 Years of Preparation, 30 Days of Printing



Wasting no time, Deed 3D began the process of creating the set's forest elements with a variety of FDM materials. The thick tree roots were printed using FDM Nylon 12CF™, a lightweight nylon material that contains 35% chopped carbon fiber and offers the highest stiffness and flexural strength of all Stratasys FDM thermoplastics.

The forest branches required strength and flexibility, so they were 3D printed with PC-ABS thermoplastic, which has excellent toughness and impact strength. PC-ABS is one of the most widely used engineering-grade thermoplastics and combines the excellent mechanical properties, impact strength and heat resistance of PC (polycarbonate), and the superior bending strength and beautiful appearance of ABS. The sparse printing mode also ensured that the top of the branches featured a sparse interior, reducing the weight. As a result, five or six actors, totaling 400 kilograms, could rotate, roll, jump and perform large movements on the slender branches — offering a realism that traditional sets could not provide.

Deed 3D directly imported the parts' design data into GrabCAD Print™ software to optimize their material properties and internal structures, greatly improving their strength. Additionally, Deed 3D used Stratasys systems and materials to 3D print special items for the show's costumes and add to the realism of the fantasy experience. A specially printed stage cable was also created to connect small pieces. This helped to reduce the weight of the connecting pieces and greatly improve safety during stage construction.

Deed 3D also provided set testing that met Cirque du Soleil's requirements. All aspects — such as drops, vibration and impacts — were fully considered. And a drop at three meters left the parts unscathed during testing.

Amazing Results

"As a 3D printing service center, we have deployed a lot of printers, but Stratasys devices are the only devices that can print different materials on the same printer by replacing the print cartridge. This is a unique advantage in the industry. For this project, several different materials could be printed continuously to realize the manufacture of the forest scenery," Hou emphasized. "Stratasys' technical support team is the largest of all foreign brands, there are no language barriers, and support for partners is very strong. Stratasys' entire training program, with new technologies and the application of new materials, is being introduced in the country for the first time, and it is difficult for other brands to compare."

With the help of Stratasys technology and support, Cirque du Soleil was able to bring its innovative forest scenery for "X: The Land of Fantasy" to life.

The Fortus 900mc is designed for large-scale, production-grade designs. It comes with exceptional accuracy, repeatability and predictability for optimum productivity and reliability.

According to Hou, with such a large and difficult set and prop design, the cost of using traditional methods may be seven times higher than 3D printing. "We spent less than a month from testing to completing the entire delivery — which was five times faster than traditional methods — guaranteeing the necessary training time for the actors. All the actors trained and rehearsed for three months. There were no problems."

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