

ILLUMINATING BONO

Design Studio Creates Unique Polyps and Microphone for U2's 360 Tour

"The Dimension 3D Printer is the best investment I've made in years."

— Tommy Voeten, President, 1212-Studio, Inc.



The Polyps

In April 2009, Tommy Voeten, President of 1212-Studio, was asked to help illuminate the fabric roof of the stages for rock band U2's upcoming international 360 Tour. The roof would become part of the famous LED video screen for the band. New York City-based 1212-Studio, Inc. is an award-winning product design company, specializing in custom design and innovation of LED illumination products for the architectural and entertainment markets. It was a perfect fit for the project.

The requirements were rigorous. The 360 Tour would contain three identical stages, each holding 36 orange pods, called polyps, on the roof. Each polyp would hold eight pieces of illuminating LED fixtures to light the roof fabric in millions of colors. A total of nearly one thousand custom fixtures had to be designed, manufactured and delivered within four weeks. To illuminate the double-curved fabric roof structure in full color, Voeten came up with an innovative optical, mechanical and thermal design solution which he called U2BE (pronounced you-tube).

Voeten, who had invested in a Dimension BST 1200es 3D Printer from Stratasys in 2007, knew he would use the printer to create the fixtures, and he had complete confidence that it would meet U2's design and time restrictions. "The Dimension is the best investment I've made in years," he said.

The most important test was the performance of the optical system as a completely assembled product, according to Voeten. "We needed to avoid unwanted shadows or an uneven light distribution," he said. "In addition, the fit and function of the units had to guarantee a fast, hassle-free assembly of nearly one thousand units in a matter of days, not weeks."

"The innovative LED illuminating fixture required proof of concept," said Voeten. "Optical and thermal simulation tools are fantastic for saving time and are incredibly accurate, but we still wanted to see the light distribution with our eyes. We wanted to hold a physical model in our hands before we started manufacturing."

The Dimension-produced functional prototype helped to demonstrate proof of concept to the other team members. Three days after the printer began creating the part, Voeten flew to the United Kingdom to meet the team for final approval. The next day, the design went into full production.

Dimension 3D Printers use Fused Deposition Modeling (FDM) technology, a method of additive technology that works by putting down layers of thermoplastic materials to create a prototype. “Tommy has said that investing in FDM technology was the best decision he has made for his company, as it enabled him to sell his ideas more efficiently, provide better proof of concepts, create functional prototypes and save money at the same time,” said Gary Shears, Vice President, Stratasys Product Manager, Cimquest Inc. “The Dimension 3D Printer required little explaining. It pretty much sold itself.”

Voeten was attracted to the clean and silent process of the printer, according to Shears, as well as to the ABSplus thermoplastic material used by the printer. This enabled him to cut, drill, file and finish the parts. “He never thought the material would be that important,” said Shears, “but it was the material that made the big difference.”

The production of nearly one thousand U2BEs became an international venture. The units were designed in New York City, the optics also came from New York, LED electronics and drivers were custom made in the United Kingdom, and the housing was manufactured and assembled in Belgium. “Without the Dimension 3D Printer, Tommy could not have completed the U2 project in the necessary timeframe,” said Shears. The entire design for a stage LED lighting fixture, U2BE, simulation and validation were completed in merely eight days.

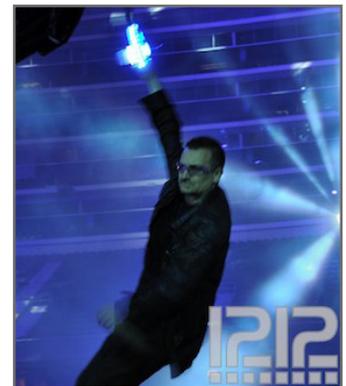
The Microphone

After successfully completing the LED polyp project, Voeten received a second request from U2. He was asked to build a custom LED-illuminated microphone for Bono that was to be suspended from a steel cable, enabling Bono to swing from the microphone, which was named the U2MIC.

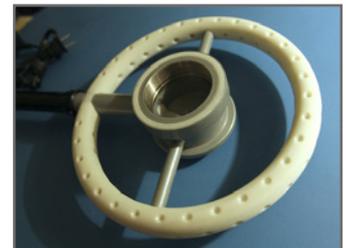
“Bono’s microphone was a much more complicated design and manufacturing challenge because of how it was going to be used on tour,” said Voeten. Again, the Dimension 3D Printer was instrumental in the development of the final product. Voeten’s team was able to print several design iterations and sections of the microphone in order to examine and optimize the pressure points and light distribution within the rings and between all the components. Voeten was so satisfied with the quality and strength of the printed FDM parts, he optimized the design so they could be used as final parts on the U2MICs.

The final illuminating ring is composed of two FDM shells that are assembled together. The simple and smooth exterior shape belies the complex interior shape, which consists of a support structure to divide pressure among the electronics and LED components without hindering the light transmission of the shell design itself. The ring design had to be strong enough to hold the pressure of a full body weight without deflecting and crushing the internal components. “The ABSplus material did a phenomenal job with strength and finish,” said Voeten. “It made all the difference. It was strong, and we could finish it to perfection.”

If the rings had been manufactured with traditional Computer Numerical Control (CNC) technology, it would have taken several hours per shell for the cutting, and additional work holding tools would have been necessary to fabricate the parts. This was eliminated by using the FDM process, resulting in lower part costs. “We saved thousands of dollars and weeks of tooling by eliminating CNC cutting of the parts, design time for work holding and additional tooling,” said Voeten.



A custom LED-illuminated microphone for Bono, created by the Dimension 3D Printer, needed to hold the singer’s weight without deflecting and crushing the internal components.



The un-lit ABSplus microphone.

Besides the illuminating ring, a separate compartment was printed by the Dimension printer to hold all of the electronic parts, batteries and other components included in the microphone. For the assembly of the U2MIC units, alignment and assembly tools were printed to simplify the assembly and to increase the consistency between the custom units. "Access to the Dimension 3D printer has been invaluable," said Voeten. "We can flip the switch and have simple models in hours or complex models overnight." Best of all, the Dimension is set to pay for itself in fewer than two years.

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