

Technology. Creativity. Fun.

Volume 8 Issue 8

# Entertainment Engineering

ELECTRIC MOTORCYCLE FEATURES  
RAPID MANUFACTURED  
COMPONENTS



## ALSO IN THIS ISSUE:

- AMUSEMENT PARK RIDES
- 3D MOVIE TECHNOLOGY
- WIRELESS CHARGING OPTIONS
- DRIVE AND CONTROL SYSTEMS
- & MORE...

## High-Performance Electric Motorcycle features Rapid Manufactured Components

Entertainment Engineering  
Volume 8, Issue 8 – August 2011

**As a high-performance electric powertrain manufacturer, time-to-market is critical. Mission Motors relies on Solid Concepts to create parts and accelerate design cycles for both prototype and rapid-manufactured components.**

Mission Motors was born when three engineers got together to create the world's highest performance electric motorcycles. Forrest North, Edward West, and Mason Cabot first built an electric motorcycle prototype from a converted Ducati motorcycle, which proved the team's claims that electric motorcycles were both viable and exciting. Every rider who got on the bike was enthusiastic, saying it was unlike anything they had ever ridden. Work toward the second prototype began soon after. In order to create a truly high-performance electric motorcycle, the growing team had to develop their own electric powertrain, as off-the-shelf offerings were not equal to the task.

According to Edward West, green is hot. "We recognized that electric motorcycle racing was at the intersection of motorsports and green technology, and we wanted to be there first." The second prototype evolved into the Mission One Premier Limited Edition, one of the highest performing electric vehicles in the world, with an AMA record-setting top speed of 150 mph and a range of 150 miles on a single charge.

### Rapid Manufacturing

"The ability to produce prototype parts through rapid manufacturing is a revelation to us. It enables us to create parts that we know will fit together, with extremely rapid design cycles. In this fast-paced industry, there is no substitute for rapid prototype iterations. Cutting out the long



lead times for production tooling for injection molding or CNC machining enables us to focus on core technology development," West said.

*"...within days of releasing the CAD file, we received the sub-frame in the mail, and it fit perfectly."*

When it comes to creating rapid manufactured components for their all-new racing motorcycle, Mission relies on Solid Concepts Inc. (Valencia, CA). The front sub-frame and dashboard was created as a single part made out of SLS (Selective Laser Sintering) glass-filled nylon. "The dash had several really complex design elements that would have been almost

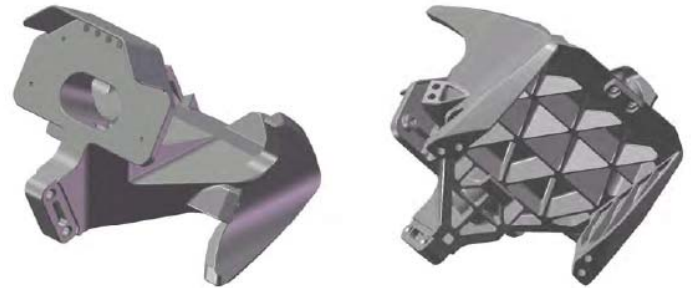
impossible to replicate through any other method of production, including machining the part out of metal or plastic,” West said. The component is used on the final bike, as a fully functional SLS component. It was delivered with all the attachment features from the original drawing and “within days of releasing the CAD file, we received the sub-frame in the mail, and it fit perfectly.”

The component was designed in solid modeling CAD software, and went through several iterations before the engineers at Mission Motors were satisfied with the design. The CAD data was then ported into an STL file for use with Solid Concepts’ SLS system. The final software design was the one that was produced. The part was put through Solid Concept’s ColorTek process to color the SLS part black. No additional finishing work was required when the part was delivered to the Mission Motors team. The part was also delivered with threaded brass inserts already in place so that it could be dropped right in. Edward responded by saying, “This is how far the available technology has come. We’re making high precision parts, one-off, for the final bike. In fact, what we designed was more than just the dash, it was the whole front sub-frame, which holds up the LCD dash display, the data acquisition unit, and is a mount for the front fairing used to reduce drag.”

Mission Motors has learned to rely on Solid Concepts for more than just production parts for their high-performance



*Mission Motors has been racing their bikes since they began producing them. Their goal has always been to produce the highest performance electric motorcycles in the world – and they’ve actually achieved that goal.*



*Every component used by Mission Motors that has to go through any type of rapid prototyping or rapid manufacturing process must first be designed into a standard CAD system and then saved as an STL file.*

motorcycles. The engineers also take advantage of other services the company offers, including creating prototypes for fit, form, and functional analysis as well as for creating one-off prototypes used for testing and trials. Solid Concepts has become an integral part of the Mission Motors supply chain.

### **Moving Forward from Here**

For 2011, The Mission One R race bike features an advanced electric powertrain, an integrated custom-built chassis with suspension elements and controls selected for race handling and performance, and a liquid cooled AC induction motor with 130 lb-ft of torque for speeds up to 160+ mile per hour. The motor runs at over 6500 rpm, and it takes eight revolutions of the motor for one of the rear wheel. The bike has a fixed ratio (no transmission), but there is a gear reduction as well as a chain drive employed in the system.

The advanced electric powertrain that lies at the core of the Mission One motorcycle pushes the boundaries of electric vehicle technology to achieve higher density, higher performance, and greater control. This technology has also found an OEM vehicle market eager to electrify their vehicle offerings. Because of this Mission began creating electric powertrain systems and components for OEM applications. The company launched the Mission Electric Performance Technology (MissionEVT), a division of the company dedicated to creating software, components, and integrated electric drive systems for OEM applications.