Plastics News

Plastic engine helps Solvay push new automotive technology

By: Don Loepp

February 8, 2016

Detroit — Building an all-plastic engine isn't an entirely practical project. Even the most hard-core plastics supporter would acknowledge that there are some applications where steel and aluminum still have the upper hand.

But pushing the limits for plastics in extremely difficult under-the-hood applications still plays an important role in moving polymer technology forward, and finding new commercial opportunities.

That's the message that Brian Stern, global ultra-polymers market manager at Solvay Advanced Polymers, brought to the Plastics in Automotive conference, held Jan. 12 in Detroit.

Stern has spent the last five years developing polymers for friction and wear applications in automotive systems. If that sounds a little dry, consider this: He's also playing a leading role in the development of Polimotor 2, an all-plastic (and composite) internal combustion engine.

First, some history: Polimotor 1, the first generation all-plastic engine, was created by Matti Holtzberg, a composites expert based in Florida, in 1980 after seven years of research and development.

Amoco Polymers Inc. was a major sponsor of the project at the time, and its Torlon polyamide-imide was used in the successful project. Holtzberg put the Polimotor in a LolaT616 race car in 1984, and the car actually raced a few times, finishing third in one contest.

Solvay's role

Now Solvay owns the Torlon business, and the company has a wide variety of other specialty and engineering plastics that are being used in the project.

"Solvay is trying to take the concept to the next level. This is really about innovation development. We're trying to move this technology forward and see if there are commercial opportunities for it," Stern said.

Stern said Solvay has three objectives as the lead sponsor of Polimotor 2:

• Introduce innovative new polymers and processing technologies.

• Demonstrate light weighting possibilities.

• Showcase opportunities to reduce carbon dioxide.

The technology base of the engine is a 2-liter, 4-cylinder Ford engine, but the target weight is just 138 pounds. Polymer components include — well, everything, from the cylinder block and cylinder head to the throttle body, fuel rail and oil pump.

The engine block, for example, is a glass-reinforced thermoset material, the same as on Polimotor 1. The team discussed whether to make it with a thermoplastic or thermoset, but in the end decided to use the same technology as in Polimotor 1.

"The tooling cost is what drove it," Stern said. "The reality is the temperatures within the engine are not that high."

The team expects its partners to use compression molding, injection molding, machining and 3-D printing to make the plastic parts.

Stern highlighted a few of the innovative plastic parts used on Polimotor 2. For example, the cam sprocket uses a Torlon material molded by Allegheny Performance Plastics LLC. The application required the part to be mechanically strong at high temperatures, to resist wear, and to offer low temperature generation and optimum torque transfer.

"This one here potentially has some commercial viability," Stern said.

Likewise, the fuel rail uses a Ryton polyphenylene sulfide resin capable of chemical and permeation resistance to ethanol-based fuels.

"This project is showing the innovation nature of the kind of company we are," Stern said. "It's a marketing endeavor. It's an innovation endeavor. It's a technology push."

In the end, he expects the project to achieve its goals of cost saving, weight saving, and carbon dioxide reduction. Plus, the engine will be used on the racing circuit, and will finish the race, just like Polimotor 1.

Sound like fun?

"We had a very successful and enjoyable 2015 and going into 2016," Stern said.
