Press Release

Polimotor 2 All-Polymer Race Engine Project Chooses Solvay's Ryton® PPS and Tecnoflon® FKM for Demanding Fuel Injection System

Alpharetta, Ga., May 19, 2016 – Solvay Specialty Polymers announced today that the Polimotor 2 all-plastic race engine project is incorporating two of the company's specialty polymer technologies in its fuel injection assembly to support engine weight-out goals, and deliver outstanding reliability and performance under demanding competitive racing conditions. Specifically, the assembly's 46-cm (18-in) fuel rail will be injection-molded from Solvay's Ryton® XK-2340 polyphenylene sulfide (PPS) reinforced resin, while seven O-rings fabricated from Tecnoflon® VPL 85540 fluoroelastomer (FKM) will seal parts throughout the assembly. Led by legendary automotive innovator Matti Holtzberg, the Polimotor 2 project aims to design and manufacture a next-generation, all-plastic engine for competitive racing later this year. Solvay is a leading materials sponsor for this highly anticipated technical endeavor.

"While the fuel rail and O-ring applications demanded materials with a higher degree of performance, Solvay's unmatched selection of specialty polymers offered us a versatile range of candidate solutions to work from," said Holtzberg, who is also president of Composite Castings, LLC, based in West Palm Beach, Fla. "While certain grades of Amodel® PPA would have made a suitable metal alternative for the fuel rail, we felt Ryton® XK-2340 PPS delivers a better balance of high-temperature chemical resistance and dimensional stability. The Tecnoflon® VPL O-ring, in turn, not only offers excellent sealing force at high temperatures, it maintains superior flexibility and fuel compatibility even in extreme cold."

When placed under high pressure, FKM materials experience an upward shift in their glass transition temperature (Tg). A standard fuel-resistant FKM with -10°C (14°F) Tg under normal atmospheric conditions, for example, would shift to +10°C (50°F) Tg in a high-pressure, 1,000 bar environment. In practical terms, this shift can compromise the material's flexibility and sealing function, resulting in performance problems for a race car engine, especially on a cold start condition. Solvay's Tecnoflon® VPL series are low-temperature peroxide curable FKM grades that offer the lowest cold temperature flexibility and best fuel compatibility among all fluoroelastomers. More specifically, Tecnoflon® VPL 85540's -40°C (40°F) Tg will help ensure the O-rings in the Polimotor 2 engine will perform reliably within design limits even under high pressure.

Molding Concepts in Sterling Heights, Mich., built the tooling and injection molded the fuel rail using Solvay's Ryton® XK-2340, a 40 percent glass-fiber reinforced PPS compound. As its name implies, the fuel rail channels fuel to the Polimotor 2 engine's four injector nozzles. In conventional race and production vehicles, this component would commonly be a six-part welded steel assembly. However, replacing steel with a high performance thermoplastic not only allowed the fuel rail to be injection molded as a single piece, it also enabled 25 to 30 percent reduction in part weight.

While standard polyamide and Solvay's Amodel® polyphthalamide (PPA) offer potential metal alternatives, Ryton® XK2340 PPS provided the Polimotor 2 team greater dimensional stability and stronger chemical resistance to alcohol-based fuel at high temperatures and pressures. The excellent flow of Solvay's PPS grade also made it easier to mold the fuel rail's thin-walled sections, and minimized both flash and cycle times.

"Solvay's high-performance Amodel® and Ryton® polymers both broaden options for consolidating parts into a single injection-molding process, while reducing vehicle weight through metal replacement opportunities. But we felt the Polimotor 2 engine needed Ryton® XK2340 PPS's extra degree of high-temperature chemical resistance and dimensional stability," said Brian Baleno, global automotive business development manager for Solvay Specialty Polymers. "In addition, the broad thermal stability of Tecnoflon® VPL 85540 FKM made it the optimal choice for ensuring the reliability of the Polimotor 2 engine's fuel injector O-rings."

Commercial automotive designers are showing increasing interest in Solvay's high-performance FKM, as engine down-sizing and transmission down-speeding continue to drive up temperatures and pressures within today's production engines and transmissions. Another factor is the need for materials that ensure automotive assemblies will perform consistently well in all environments and climates. Aside from O-rings used in gasoline direct injection, Solvay's Tecnoflon® VPL grades are also suitable for use in turbo, transmission, and engine systems.

The Polimotor 2 project aims to develop an all-plastic, four-cylinder, double-overhead CAM engine that weighs between 138 to 148 lbs (63-67 kg), or about 90 lbs (41 kg) less than today's standard production engine. Holtzberg's groundbreaking program will leverage Solvay's advanced polymer technology to develop up to ten engine parts. In addition to the fuel rail and O-Rings, these include a water pump, oil pump components, water inlet/outlet, throttle body, oil scavenger line and other high-performance components. Besides Ryton® PPS and Tecnoflon® VPL FKM, other Solvay materials targeted for use encompass Amodel® polyphthalamide (PPA), AvaSpire® polyaryletherketone (PAEK), KetaSpire® PEEK, Radel® polyphenylsulfone (PPSU) and Torlon® polyamide-imide (PAI).

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An international chemical and advanced materials company, Solvay assists its customers in innovating, developing and delivering high-value, sustainable products and solutions which consume less energy and reduce CO2 emissions, optimize the use of resources and improve the quality of life. Solvay serves diversified global end markets, including automotive and aerospace, consumer goods and healthcare, energy and environment, electricity and electronics, building and construction as well as industrial applications. Solvay is headquartered in Brussels with about 30,000 employees spread across 53 countries. It generated pro forma net sales of € 12.4 billion in 2015, with 90 percent made from activities where it ranks among the world's top 3 players. Solvay SA (SOLB.BE) is listed on Euronext in Brussels and Paris (Bloomberg: SOLB.BB - Reuters: SOLB.BR).

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Above: The Polimotor 2 all-plastic engine project selected Solvay's Ryton® XK2340 polyphenylene sulfide (PPS) reinforced resin to injection mold its engine's 46-cm (18-in) fuel rail component. Replacing the typically steel part with a high performance thermoplastic not only allowed the fuel rail to be injection molded as a single piece, it also enabled 25 to 30 percent reduction in part weight.

Below: The Polimotor 2 all-plastic engine project selected Solvay's Tecnoflon® VPL 85540 fluoroelastomer (FKM) to fabricate seven O-rings used to seal the fuel injection assembly. The material's singularly low temperature flexibility is helping to ensure the O-rings in the Polimotor 2 engine will perform reliably within design limits even under high pressure.

Photos courtesy of Solvay Specialty Polymers.