

Laser-welded oil pipe of DuPont™ Zytel® in VW's dual-clutch gearbox



Stevenage, July 2006. A tube of hot-oil-resistant DuPont™ Zytel® nylon carries oil from the filter to the six-speed direct-shift gearbox's control unit of Volkswagen's trend-setting dual-clutch gearbox. To produce the complex-shaped tube cost-effectively and at the same time avoid demoulding problems, German automotive supplier IBS Filtran combines injection-moulding with laser-transmission welding to join separately moulded parts without risk of producing loose particles that might contaminate the oil. A ring of heat- and oil-resistant DuPont™ Vamac® ethylene acrylic elastomer seals the oil tube from the gearbox.

Markus Beer, IBS Filtran's general manager, says: "The oil tube just fits into the tight space available, whether the oil is at minus 40 °C or +140 °C. The Zytel® 70G30 HSLR type we chose, reinforced with 30 percent glass fibre, makes weight-saving thin-wall mouldings possible, but still has very high strength. Even when the temperature and the vacuum in the system reach peak values, and vibration and impacts create high acceleration forces at the same time, deformation remains minimal. As a result, the upstream filter always works optimally and there is no risk of collision with gearbox parts which are very close."

IBS Filtran ruled out blow-moulding, which seemed the obvious way to produce this part. "This process would not have met requirements for a constant flow cross-section and even wall-thickness," Michael Jacob, the design manager, explains. "There was also a danger of glass-fibre particles coming loose from

the inner surface and damaging the delicate system of valves into which the tube carries the oil. So we decided on injection-moulding. For this we had to divide the tube into separate parts, to make demoulding easier. However, we could not make two equal halves joined by conventional welding techniques, because the necessary contact surface area would have been too broad and welding-waste particles could have come loose; this had to be avoided."

IBS Filtran's solution was a tube with offset open areas. "One part made of a laser-absorbent variant of Zytel® 70G30 HSLR can be moulded in a tool with a single parting line," Jacob continues. "Onto the open areas we then laser-weld two other injection-moulded tops of the same nylon but using a laser-transparent variant. The weld-seam is very precisely defined and reliably air- and oil-tight. As the welding process does not involve oil-contact surfaces, there is no danger that particles of the plastic material come loose and enter the oil-stream. All in all, laser-transmission welding provides an optimum combination of cost-effectiveness and reliability."

DuPont offers its customers comprehensive support in the development of laser-welded parts. This begins with the choice of suitable resins and extends to process optimization in co-operation with experienced laser-welding equipment makers. DuPont's portfolio of laser-weldable engineering plastics includes Zytel® PA6 and PA66 types, Crastin® PBT polybutylene terephthalate, Rynite® PET polyethylene terephthalate and Delrin® acetal, as well as high-temperature-resistant Zytel® HTN high-performance polyamide. For standard Zytel® types, both laser-transparent and laser-absorbent variants are available in a choice of colours.

IBS Filtran is a joint venture of SPX Filtran and the Fritz Brocke family. It is one of Europe's leading developers and producers of filter systems for automatic gearboxes and motors. The company's products include suction- and pressure-operated filters, all-plastic oil sumps, filter media, plastic parts and all-round service in design and development, testing and production.

The DuPont Engineering Polymers business manufactures and sells Crastin® PBT and Rynite® PET thermoplastic polyester resins, Delrin® acetal resins, Hytrel® thermoplastic polyester elastomers, DuPont™ ETPV engineering thermoplastic vulcanizates, Minlon® mineral-reinforced nylon resins, Thermx® PCT polycyclohexylene dimethylterephthalates, Tynex® nylon filaments, Vespel® parts and shapes, Zenite® liquid crystal polymers and Zytel® nylon resins and Zytel® HTN high-performance polyamides. These products serve global markets in the aerospace, appliance, automotive, consumer, electrical, electronic, industrial, sporting goods and many other diversified industries.

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