

Large truck air duct blow-molded in DuPont™ Zytel® nylon



The curved air duct, which is approximately 1 meter long and with a diameter of 13 centimeters, is one of the largest blow-molded parts that DuPont is aware of.

A three-dimensional blow-molded air duct, used on Volvo trucks with a 12-liter engine, is currently being produced by TI Automotive in Norway using an unreinforced, toughened and heat-stabilized grade of DuPont™ Zytel® nylon. The duct, which weighs just over two kilograms, is one of the largest blow-molded parts that DuPont is aware of.

By Murray Smith, DuPont Engineering Polymers, Sweden

The intermediate duct deployed on the 12-liter engines of Volvo trucks in the US is used to transport clean air from the air filter to the turbo-charger. It is thus exposed to temperatures of around 140°C (284°F) and needs to contend with pressure ranges of between 1.2 and 2 bar charge pressure, as well as exhibiting resistance to oil, blow-by gases and fuel. Moreover, parts for truck engines are required to achieve extended lifetime requirements of 10,000 hours.

Looking to replace metal for the duct's manufacture, thus reducing its overall weight by approximately 50 percent, TI Automotive, a global supplier of fully integrated fuel storage and delivery systems for cars and trucks, proposed that an unreinforced, toughened and heat-stabilized grade of Zytel® nylon be used to fulfill material requirements.

Demanding processing conditions were also a factor in material selection: the complex shape of the large, curved duct,

approximately 1 meter (just over 3 feet) long and with a diameter of 13 centimeters (5 inches) and varying wall thicknesses of between 4 and 2.55 millimeters (between 0.15 and 0.10 inches), requires the use of an engineering polymer with good flow characteristics and low shrinkage. The 'parison manipulation' process was used for its manufacture, a technique which is a development of conventional blow molding, whereby the extruded parison is 'manipulated' by a combination of robots and moving mold seg-

ments in order to make it conform to the 3-dimensional mold cavity. It was adopted by TI Automotive for this particular application in order to achieve the part's complex geometry and enhance mechanical performance. Parison manipulation produces scrapless parts, i.e. with no pinch weld on the finished part itself, to improve mechanical performance in critical stressed areas.

"The air duct was first supposed to be manufactured with a glass-reinforced polypropylene, but that material failed during processing," explains Kent Aurbakken, project engineer at TI Automotive in Norway. "Hence we suggested to Volvo that we use Zytel® nylon from DuPont, a material which we believed could cope with the issues associated with producing such large, curved pipes. During the entire process, DuPont has been very supportive with the provision of technical expertise both on site and from its technical center in Geneva."

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Publisher: Evelyne Schütz,
DuPont Engineering Polymers,
2, ch. du Pavillon
CH-1218 Le Grand-Saconnex
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Tel: +41 22 717 51 11
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Editor: Andrew Wilkins

Layout & production: Johan Hedqvist,
Geneva

Engineering Design is published in English,
French, German, Italian, Spanish and Russian by
Du Pont de Nemours International S.A., P.O.
Box 50, CH-1218 Le Grand-Saconnex, Geneva,
Switzerland.

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Printed in Switzerland

L-13906

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