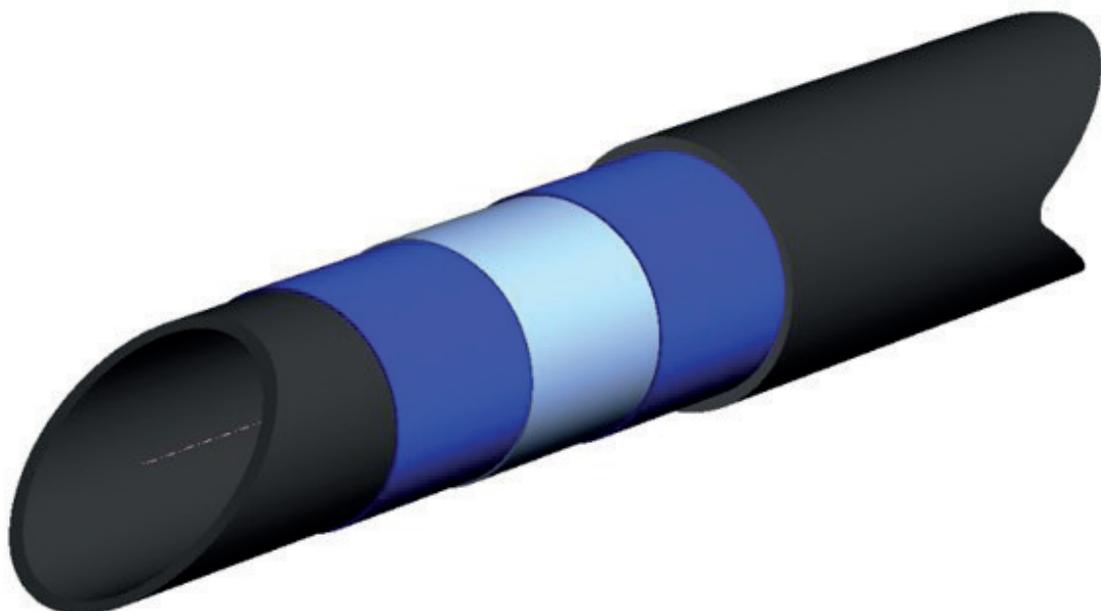


RILSAN®

PRODUCING LOW WASHOUT HIGH PERFORMANCE CONDUCTIVE FUEL LINES FOR HYBRID CARS AND BEYOND WITH RILSAN® PA11



SUMMARY

CASE STUDY

OBJECTIVES

Arkema's target is to provide the automotive industry a complete range of new high performance plastic extrusion grades for fluid transfer. This development supports the strategies of major global car makers in the launch of cost-effective, conductive fuel lines in hybrid vehicles. Proposed solutions are extremely competitive without technical compromise. And they are bio-based!

PARTNER

Leading global automotive car makers & fuel line producers

INDUSTRY

Automotive

APPLICATION

Liquid fuel & fuel vapor lines of plug-in hybrids.

PRODUCTION PROCESS

Tube extrusion, smooth or corrugated

MATERIAL

Rilsan® polyamide 11, Rilsan® Tieflex alloys & Rilperm® multilayer constructions

INTRODUCTION

The rapid electrification of the automotive industry comes with many technical challenges. One of them is, when Hybrid vehicles run on the Electric “zero emission” mode, fuel remains stagnant within fuel lines for several days or weeks. This increases the extraction of components from the plastic tube. “Low washout” solutions were developed, but these tend to swell more in contact with fuel than traditional fuel Lines. This constitutes a major challenge for conductive fuel lines as tube swelling has a detrimental effect on conductive performance. Carmakers are looking for competitive “low washout” conductive solutions for use in hybrid vehicles, to solve this issue and help accelerating the growth of environmentally virtuous vehicles.



RILSAN® PA11

CHALLENGE

DESIGNING GLOBAL SOLUTIONS

Plastic fuel lines are made conductive by the use of a thin layer of an electrostatic discharge (ESD) control material, the most competitive ones are using long chain polyamides as the base resin. These solutions are used mainly on vehicles sold in the USA. Indeed, local gasolines qualities have a variable ethanol content and, when this content is not high enough, the risk of electrical shortcut can cause severe safety issues for the driver. US-based OEMs, followed by others like ones based in South Korea, have enlarged the use of conductive liquid lines. More recently, some EU-based OEMs are also requesting conductive lines making the need of a globally available solution more urgent today than ever.

Designing a conductive solution with excellent and durable performances

The design of an electrostatic discharge (ESD) control material requires a low surface resistivity both at initial stage and after fuel soaking. Conductive performance is usually affected by swelling or thermochemical degradation mechanisms in the matrix. Using conductive fillers also usually tend to make polymers more fragile.

These challenges require strong formulation and compounding know how, as well as a strong partnership with Tiers to co-develop a new, innovative material with adapted design features.

SOLUTION

Arkema has developed a material platform allowing tier suppliers & car makers to build tailor-made conductive solutions (4 or 5 layers) with a limited number of grades. Rilperm® construction is a tubing solution for low permeation & low washout conductive fuel lines. The outer layer is made of a new Rilsan® PA11 grade (Rilsan® BESN Black P213 TL) with outstanding impact behavior, chemical resistance and ageing properties. Thanks to Arkemas' proprietary alloying technology, a Rilsan® Tieflex PA6-based material (Rilsan® Tieflex R073 Black T6L) is used as a structural tie layer with a unique combination of adhesion to

the EVOH barrier layer, outstanding high temperature strength, and great chemical resistance to biofuels and road salts. The inner layer is made of a specific low washout ESD high performance Rilsan® PA11 grade, Rilsan® BESN Black P002 CTL.

This solution is becoming the market standard in Europe and China. It is also now starting to penetrate the chemically demanding market of the United States.

“Arkemas’ low washout solution is being chosen by a growing number of customers versus several other possibilities because it offers the best compromise of performance, ease of processing and total cost of ownership” says Fidèle Nizeyimana, Arkema business development engineer for fuel system solutions in Europe.

For OEMs with specifications that prevent from using any PA6-based solution, Arkema has developed a portfolio of EVOH self-adhesive polyamide 11 grades with various flexibility & low washout performance. Rilsan® BESN Black P024 TL is one of these and can be used to design high performance 4-layer PA11/EVOH/PA11/PA11-ESD constructions.

OUTCOME

On-going and upcoming serial productions are global, mainly in Europe, China and North America. They already represent an annual output of several million meters of high-performance fuel lines on most recent hybrid vehicles.

Arkema is currently finalizing its new production plant in Singapore at a cost of over €400 million that will be dedicated to polyamide 11 production. This will represent the biggest integrated bio-factory in the world for advanced polymers, and will enable Arkema to satisfy its strategy of business continuity assurance. Rilsan® polyamide 11 is 100% sourced from renewable castor beans. There is no competition with food and there is no resultant deforestation. Arkema is highly involved in the driving of sustainable castor farming as well as open and closed loop recycling systems (via the Virtucycle® program). Arkema promotes this range under the ABC (Advanced Bio-Circular) offering, which demonstrates a strong proven legacy in the automotive and transportation segment.

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Headquarters: Arkema France

420 rue d'Estienne d'Orves
92705 Colombes Cedex
France
T +33 (0)1 49 00 80 80

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