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# Technical Textiles

with Benefits for Weight,  
Function and Design



**THE AUTHOR**

Dipl.-Kfm. Werner Borgers is the 5th generation of the family in the management of Johann Borgers GmbH & Co. KG.

Engineers are now focusing on technical textiles more and more because of the considerable increase in their use in vehicles. The following article by Johann Borgers GmbH & Co. KG demonstrates the benefits of textile parts in interior and exterior for weight, function and design thanks to the use of innovative materials and production processes and also shows potential fields of application.

**1 INTRODUCTION**

The use of textile materials in cars is on the advance – some are prominent and immediately visible to everyone, while others are inconspicuous and yet highly effective. They form an essential part of the various components and subassemblies and stand for

- low weight (compared with alternative materials such as plastics or wood)
- comfort (noise reduction through insulation, acoustically effective interior trim components, textile exterior wheel arch liners)
- attractive design (high-quality look of textile surfaces such as seats, trim components, parcel shelves, roof liners covered with furnishing fabric)
- functionality (storage spaces, shelves, reinforced covers; for example in the luggage compartment)
- safety (safety belt and airbag fabric)
- recyclability (little variety, good reusability).

The wealth of uses of technical textiles as a component part of materials such as the fabric used in fan-belts or hosepipes will not be dealt with in detail at this point.

The use of textiles on the exterior of the vehicle is particularly innovative. The term “change of paradigm” has rarely been ever used with any justification, but the exterior textile wheel arch liner was a first step which freed thinking from its previous limitations. “Textile on the outside” has been the aim ever since – with considerable benefits for acoustics, weight,  $c_w$  value and not least

for the price. Propylat material made by Borgers is used for the interior as well as the exterior.

**2 TEXTILES IN THE CAR**

Today technical textiles are an essential part of the car, and they are becoming more and more important. The value of technical textiles in the car more than doubled between 2000 and 2002 and is expected to increase fivefold by 2008. The background to this is that the increased weight of certain

parts of the vehicle due to rising demands on comfort, functionality and safety must be compensated for in other places. Textile car components made of non-wovens are of particular importance because of their high constructability (thickness, density, acoustic and functional characteristics, mouldability) and the resulting variability of use. Non-wovens are used for decorative surfaces as well as for substrates, where they usually provide support under furnishing fabrics and/or are acoustically effective as insulation.

**3 CONCEPT DESCRIPTION**

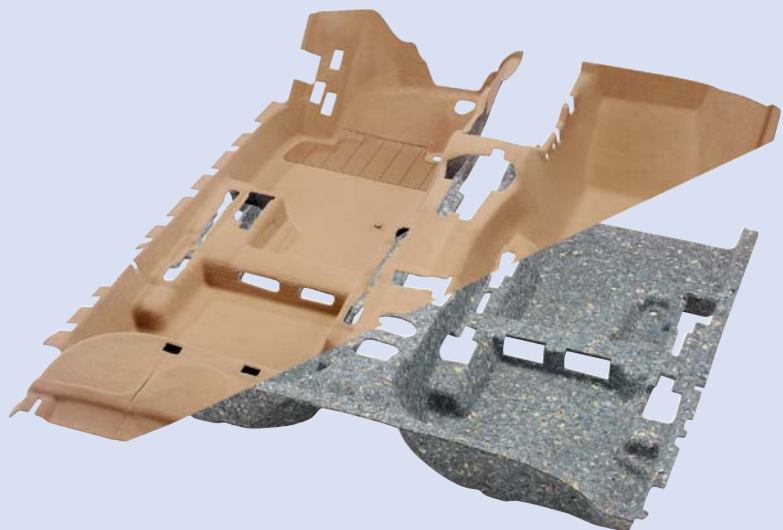


Figure 1: Interior floor assembly as a combination of Propylat NVH and Propylat Trim

### 3 PROPYLAT – A QUANTUM LEAP IN TEXTILE MATERIALS

Propylat, a brand name and registered trademark of Borgers, is an innovative textile material for use in components in the automotive industry. The manufacturing method used makes it a non-woven. Components made of Propylat can be used in many ways in the interior and exterior of the vehicle. They are designed for optimum weight and are acoustically effective and very efficient ecologically. The potential areas of application are expanding constantly. Unlike ordinary non-wovens, which are usually bonded by binders made of phenolic resin or latex, Propylat uses fibres, thus achieving considerable advantages for production with regard to both function and characteristics. Propylat consists of a mixture of synthetic fibres (polyester, polypropylene) and if necessary (depending on the intended use) additional natural fibres such as cotton or phloem fibre. With regard to structure and manufacturing process, there is a difference between

- supporting components (Propylat Trim), which are usually covered by furnishing materials (for example compartment trims), and
- insulation components (Propylat NVH), which are part of the floor assemblies.

Thus, an interior floor assembly consists of the softer insulation (Propylat NVH) and the supporting component above it (Propylat Trim) covered with a carpet, **Figure 1**.

#### 3.1 PROPYLAT TRIM AS SUPPORTING COMPONENT

Propylat Trim is mainly used as a supporting component in the interior of the vehicle or for exterior wheel arch liners. First a fleece is produced by carding, a textile technique whereby the fibres are transported between several quickly turning rollers equipped with hooks, thus aligning the fibres as if they had been combed. This fleece is then mechanically bonded by needling, whereby the individual fibres are locked together

via hundreds of needles fixed in an oscillating needle board. In the past, fleeces were almost exclusively bonded using phenolic resin or a dispersive adhesive (latex binder). In the case of the Propylat, on the other hand, the mechanically pre-bonded fleece is formed by means of thermal bonding. In the production of Propylat fleece, the natural and/or chemical fibres are bonded and moulded by a heating process which melts the proportionally added thermoplastic fibres (for example polypropylene). The fibres “stick together” and “set” when cold. Also, the shaped part is covered with a furnishing material (carpet, fabric or similar) which meets the individual design requirements with regard to colour, pattern, surface texture (for example smooth, with a pile or like velour). Propylat Trim is produced in weight layers between 600 and 2200 g/m<sup>2</sup>.

#### 4.4 ACOUSTICS

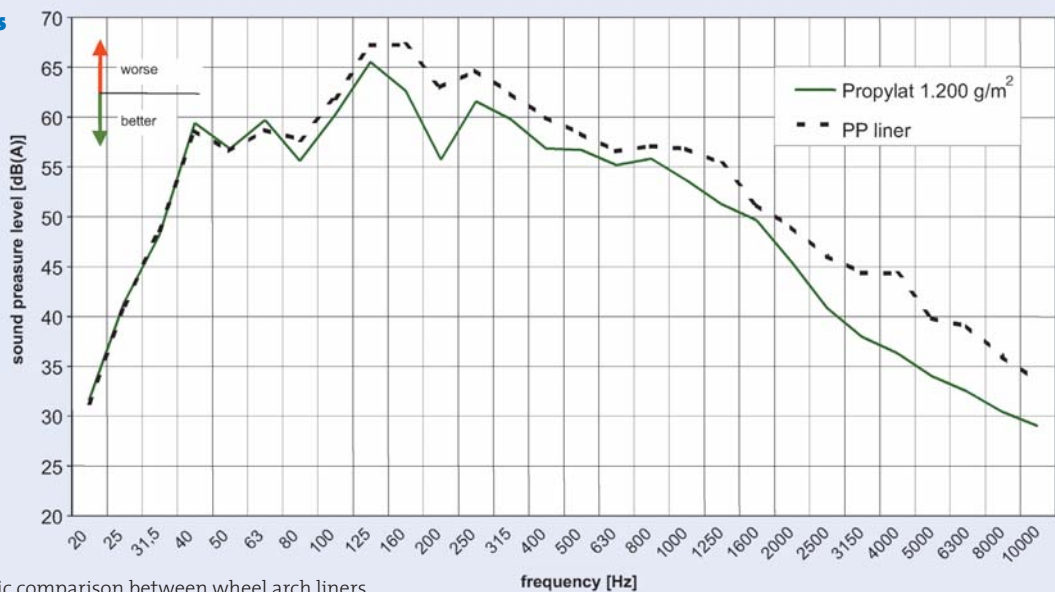


Figure 2: Acoustic comparison between wheel arch liners from Propylat and ordinary plastics

sound measurement in passenger compartment, gravel road at 60 km/h

#### Legend title:

Textile components in the car: ① outer dash insulator, ② hood liner, ③ inner dash insulator, ④ headliners, ⑤ seat back trims, ⑥ parcel shelves, ⑦ luggage compartment trim, ⑧ exterior wheel arch liner, ⑨ floor insulator, ⑩ floor covering, ⑪ decorative and surface materials

### 3.2 PROPYLAT NVH AS AN INSULATION COMPONENT

Propylat NVH (Noise Vibration Harshness) is produced for interior trim components with an insulating function. As with Propylat Trim, the fleece is fixed by means of binding fibres without the addition of a chemical binding agent. The main difference to Propylat Trim lies in the density. As far as insulation is concerned, NVH components have – at least in some areas – higher thicknesses and lower densities than Propylat Trim.

The manufacturing process is also different. There is no fleece to manufacture, and the fibre mixture is transferred directly to the moulding tool. Depending on the requirements, Propylat NVH is produced in densities between 100 and 800 kg/m<sup>3</sup>. One of its special features is that different densities can be produced in the same component, thus making it possible to combine characteristics such as soundproofing and rigidity.

### 4 USES AND CHARACTERISTICS OF PROPYLAT

The following advantages of Propylat for use in car manufacturing result from both material- and process-specific characteristics.

#### 4.1 USES

The different possibilities of composition, manufacturing technology and structure explain the special constructability of Propylat. It is thus possible to vary characteristics and values and therefore uses. Propylat can for example be used in floor insulations and/or as a support component for carpets in the passenger compartment, and as side wall,

tail gate and rear seat back trim in the luggage compartment. Since its introduction, the range of possible uses for Propylat has been expanded, and today it also includes components on the vehicle exterior. Propylat had originally been exclusively designed for use in the interior of the vehicle, but a paradigm change has since taken place. Despite of the effect of weather and driving on textile components, it is nevertheless possible and even beneficial to use them on the exterior of the vehicle in some cases. One prominent example is the textile wheel arch liner, which was first developed for series production by Borgers. The advantages of Propylat compared to conventional wheel arch liners made of plastics quickly convinced the customers in the automotive industry, as Propylat textile wheel arch liners are

- lighter than ordinary plastics components
- acoustically more effective more effective with regard to spray reduction
- more ecological, being a product made from recycled materials which is in itself 100 % recyclable.

These wheel arch liners are undergoing constant further development and are now used in many types of vehicle – from small cars up to Rolls-Royce, and from sports cars to SUVs.

#### 4.2 MOULDABILITY AND STABILITY

Propylat can be formed to fit various sub-frames with exceptional precision as it retains its shape and contains no (other) supports or materials. Propylat can be constructed with a combination of different strengths, for example rigid areas for ensur-

ing stability and soft areas for making use of the benefits of NVH. This is very useful and was not possible in the conventional fleece formation. Because of its adjustable rigidity (fibre mixture, moulding) Propylat can be used as a load-bearing support, for example in the luggage compartment, for trims etc.

#### 4.3 WEIGHT

Propylat is a product of Borgers lightweight activities "LowMass" aimed at developing innovative components which allow considerable weight reductions thanks to new materials or modified functions. All other factors (good price, recyclability, high functional value) are kept or even improved if possible. By using Propylat in a floor assembly, it was for example possible to achieve a weight reduction of almost 50 % as heavy layers were no longer needed. A similar weight reduction is achieved by using textile wheel arch liners made of Propylat, which has considerable additional acoustic benefits. There is further potential for saving weight by using lighter textile materials instead of synthetics for trim supports in the luggage compartment.

#### 4.4 ACOUSTICS

As vehicle acoustics always play a part in the development of fittings, the subject of weight is closely connected with the acoustic characteristics of Propylat. As a general rule, positive acoustic effects can be observed when textile materials replace synthetics, **Figure 2.**

Due to the construction of the component, its composition, the characteristics of the fibres and the finish, the required acoustic effect can be achieved individually – either

through absorption of sound waves by fleecy materials or insulation via the reflection of sound waves on surfaces impermeable to air. Various densities and thicknesses can be achieved in one component.

#### 4.5 Ecology

As a material, Propylat is particularly environmentally friendly through all aspects of its lifecycle, including the extraction of raw materials, production, use and final disposal. Propylat consists of recycled natural and/or chemical fibres: the natural fibres come from remnants from the clothing industry or from second-hand textiles, whereas the chemical fibres come from recycled drinks bottles and used packaging, **Figure 3**. Propylat is therefore already a recycled product which can in turn itself be recycled. In a waste-free manufacturing process (closed-loop system), the production residues are immediately fed back into the manufacturing process. They do not serve as ballast in the final product but have a decisive effect on its characteristics. Also, the production of Propylat does not include drying processes or chemical reactions (compare standard Öko-Tex 1000 [1] as an ecological testing and certification system for textile factories).

The low weight of the Propylat components compared to conventional materials also leads to a reduction in fuel consumption and thus to a reduction in carbon dioxide emissions. The 100 % recyclability of Propylat supports the automotive industry in its effort to realize a recycling quota of 85 % within the framework of its self-imposed target from 2006 onwards.

#### 5 Future Prospects

With the huge success of the wheel arch liner made from a technical textile as a starting point, further textile uses for the vehicle exterior are conceivable, for example as a textile underseal. Efficient products made of heavy masses like PVC or GMT do exist. However, their characteristics must be achieved or im-

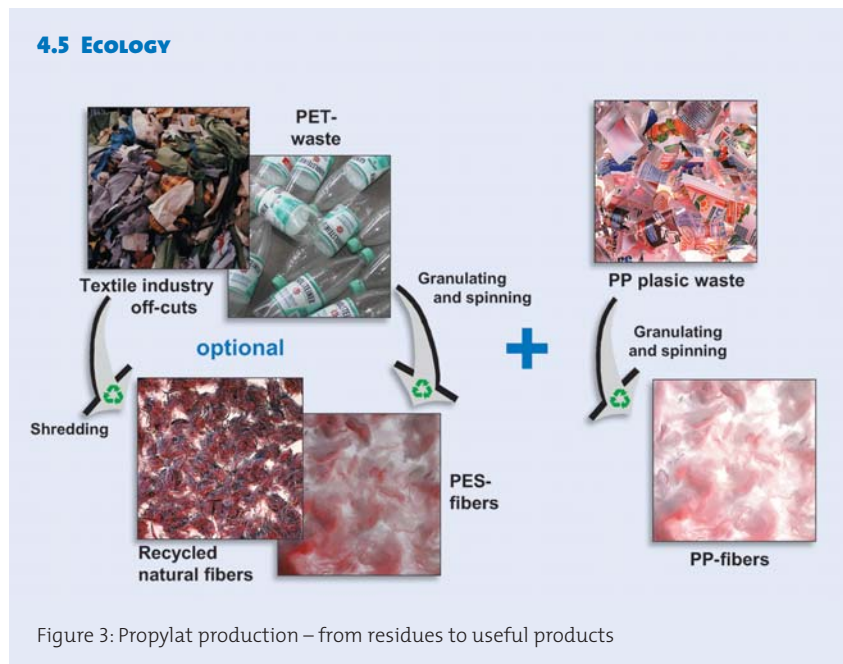


Figure 3: Propylat production – from residues to useful products

proved, and it is already becoming clear that components made of Propylat offer distinct advantages over these materials.

Propylat is a convincing concept for textile materials in all respects: it allows various uses, it is highly efficient acoustically and is light and ecologically advantageous. It is an example for the performance of textile materials in vehicles and its use is not limited to the interior. Textile wheel arch liners, which are in common use today, were the first step towards using textile materials on the vehicle exterior, and further uses will follow. It is apparent that the use and the technological development of textiles have not yet reached their limits.

Propylat, Propylat Trim, Propylat NVH and LowMass are registered trademarks of Johann Borgers GmbH & Co. KG.

#### LITERATURE REVIEW

[1] Öko-Tex Standard 1000. Directive for textile production sites. Research institute Hohenstein, Bönningheim, [www.oeko-tex.com](http://www.oeko-tex.com)

## Borgers: Innovation since 1866

Johann Borgers has been a supplier to the automotive industry since its foundation in 1866, although at that time it was only coaches being equipped with upholstery stuffing.

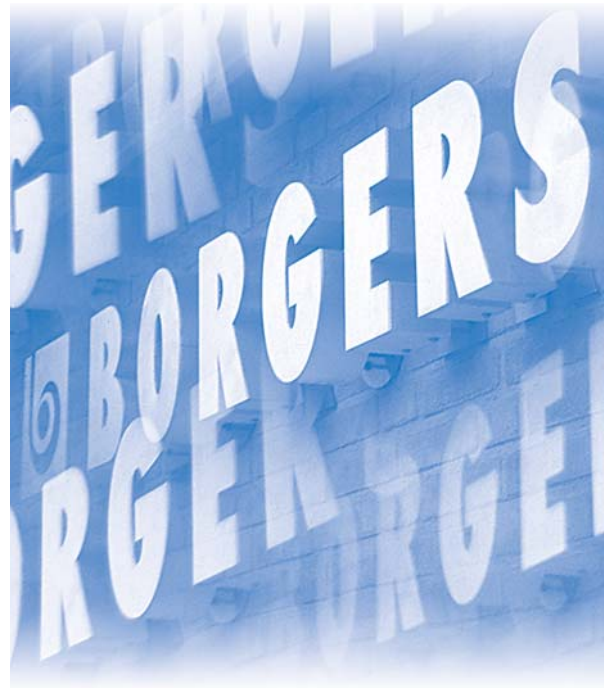
Borgers is actually one of the oldest recycling companies, as the company founder was already devoted to the recycling of used textiles and manufactured upholstery materials from shredded fibres.

Our customers from all over the world benefit from these almost 140 years of experience and are supplied by 22 plants throughout the world with acoustically efficient components for engine, passenger, and luggage compartments. As the inventor of the textile wheel arch liner (exterior) made from Propylat, Borgers set the standard for the innovative use of textile materials.

Because of our proven competence in acoustic development and lightweight construction, Borgers gets integrated by its automotive customers very early on into the development of their new models and thus can exert a decisive influence on acoustic optimizations. Our development and construction, as well as building our own forms, tools and machines, make it possible to achieve optimum control of the total value added chain from development to final product.

Today Borgers is the development and system supplier for:

- luggage compartment trims
- floor carpet systems
- outer wheel arch liners
- package trays
- insulation systems



“Centralised development and decentralised production” as well as “think globally and act locally” – with these principles Borgers is known by their customers as a flexible and reliable partner, which shows in a steady increase in turnover to currently almost € 500 million.

The company is still owned and run by the founder’s family.

### DO YOU WANT TO KNOW MORE?

Johann Borgers GmbH & Co. KG  
Borgersstraße | D-46397 Bocholt  
Phone: +49 2871 345-0 | Fax: +49 2871 345-291  
e-mail: [info@borgers-group.com](mailto:info@borgers-group.com)  
[www.borgers-group.com](http://www.borgers-group.com)