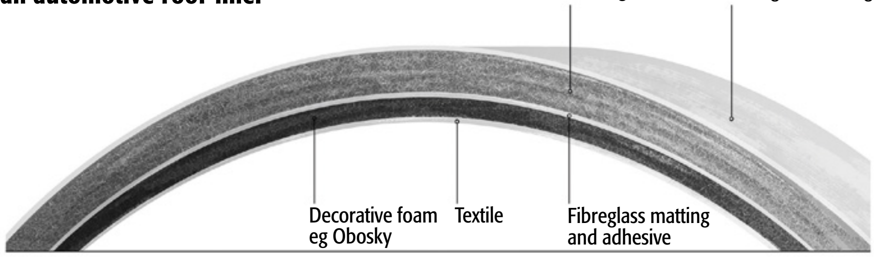
Lower emissions with new auto formulation

FoamPartner has developed a new range of low-emission flexible polyurethane foams for automotive interiors. **Heribert Perler** *and* **Henri Mispreuve** *explain what the foams can do*

Figure 1: typical set up for an automotive roof-liner



Flexible polyurethane foams are traditionally used for soft touch applications in passenger car interiors. They are commonly used behind the cover and aspect materials, because they can be made in big rolls and thin sheets that can be glued at the back of the fabrics, using various lamination processes. This enables fabricators to make components that are flexible and give a soft-touch-feeling.

Polyester foams are the material of choice in Europe, and are used by a large number of leading brands. This is because they can be made with a very regular cell structure that is free from faults such as pinholes. They are used successfully to make strong, durable roof-liners.

In recent years, customer requirements have changed. Standards, especially OEM emission standards, have become more stringent, as the industry moves towards global standards that meet changing customer requirements.

This pressure has forced technical developments in various directions. For example, polyester foams are constantly being improved, and this article will explain how a recent FoamPartner development can give the market more options to meet these challenges, both now and in the future.

From a technical standpoint, polyether and polyester polyols are very different materials, particularly in terms of viscosity. Polyether polyols are low-viscosity materials that are used in more than 90 % of all the polyurethane foams that produced around the world. They are easy to handle, which is one reason they are used to produce comfort foams. These foams are also chemically stable, and offer good ageing properties. Polyester foams, meanwhile, are specialty foams with good strength and flame lamination properties.

While the pressure from the automotive industry for lower emissions has been a driver, the sector is also demanding more sustainable and durable products. This has led to an increased number of raw materials and additives reaching the market that claim to be more environmentally benign than traditionally produced raw materials.

By using and combining these newly available building blocks, FoamPartner has developed the technology further. This family of materials, named Obosky, is designed to meet the most stringent standards in terms of odour and emissions. It also retains the benefits of controlled, fault-free cells and good lamination properties.

This was not straightforward to achieve. Each country and each customer has a different odour and VOC emission standard. Some have specific standards for specific families of chemicals such as aldehydes. The situation can be made more complex by regional requirements in the Americas, South East Asia and Europe.

Emissions are an important set of standards, but the materials had to meet the required physical standards as well. The formulations have to give foams that have the right properties using locally available raw materials. They also have to work on locally available equipment.

Suppliers have put a lot of effort into the reduction of odour and emissions from their raw materials. The challenge was particularly significant in polyols. Here, the development of DMC-catalysed polyols offered the advantage of cleaner materials, but this is sometimes at the expense of the processing.

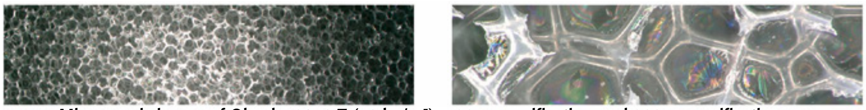
On a global scale, challenges remain, particularly regarding polyol stabilisation. This is because different applications require different levels of stabilisation, and there has to be a balance between safety, emissions and foam discoloration potential.

In the silicone surfactant field, a lot of effort has been put into making clean and reduced-odour materials. Abroad range of products is now available to optimise foam processing, and further help control cell structure and openness.

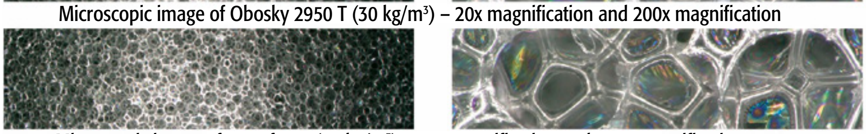
In the catalyst arena, a range of reactive materials is available. These make it possible to produce foams in good condition, independent of what equipment is available.

Low-emission, efficient and halogen-free flame retardants are still evolving, and work still needs to be done to reduce the impact on the foam's ageing properties. There are two competing approaches. Either reactive materials can be used, at the risk of having

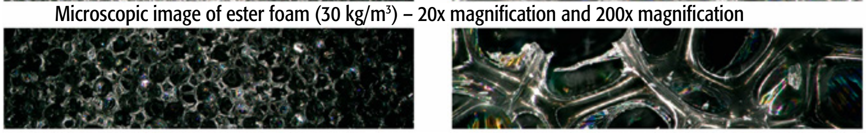
Figure 2: Comparison of cell structure of various types of foams



Microscopic image of Obosky 2950 T (30 kg/m³) – 20x magnification and 200x magnification

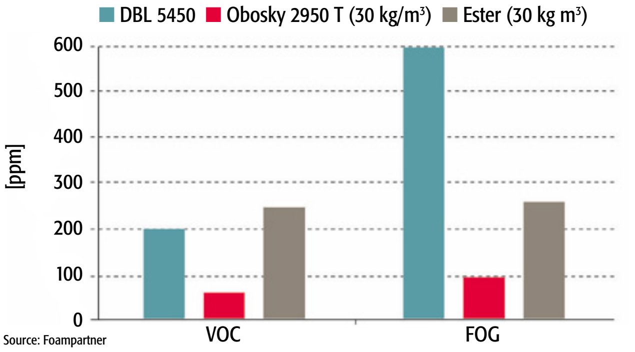


Microscopic image of ester foam (30 kg/m³) – 20x magnification and 200x magnification



Microscopic image of ether foam (30 kg/m³) – 20x magnification and 200x magnification

Figure 3. VOC emissions for Obosky 2950 T and polyesterpolyol foam



Source: Foampartner

a negative effect on foam processing, or higher molecular weight species that do not show up in VOC and FOG can be used. In the long run, however, these could migrate out of the material. FoamPartner is also active in this field, having developed new flame retardants in cooperation with the EMPA in Switzerland.

When developing the Obosky technology, FoamPartner first combined selected polyols with isocyanates. This gave a base formulation that has a stable and well-controlled cell structure. The results are shown in Figure 2.

State-of-the-art high-pressure machines were used to produce the foam.It is clear from Figure 2 that it is possible to match the cell structure of ester foams using polyether-based chemistry.

The new technology will allow a full range of materials to be developed. Their density ranges from 25 kg/m³ upwards, and air flow through the foam can be tuned from almost zero to virtually totally open. The foam family can be used in applications such as air-conditioned seats and airtight seal foams for *in situ* foaming.

Table 1 describes Obosky 2950 T in more detail. This is a general-purpose grade for roof-liner applications. It is a European grade material, but an identical product (Obosky 2950 C) is also produced in China.

Figure 3 shows a comparison between the European grade and ester foams in terms of VOC and FOG emissions according to the DBL 5450 test.

This new family of formulations has the potential to produce headliners faced with the thinnest of textiles. This can be achieved because of its good surface structure and cell properties.

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Table 1: Typical data for Obosky 2950 T (external / independent testing)

Obosky 2950 T	Typical data	Target Specification	Test
Key physical properties			
Density (kg/m³)	28.5	< 30	DIN EN ISO 845
40% CLD (kPa)	3.9	> 3.5	DIN EN ISO 3386
C.Set 50% (%)	3	<7	DIN EN ISO 1856
Tensile strength (kPa)	240	> 90	DIN EN ISO 1798
Elongation (%)	162	> 130	DIN EN ISO 1798
Hardness Loss			
After hydrolysis (%)	46	<50	DBL 5450
After heat ageing (%)	16.3	<20	DBL 5450
VOC/ FOG (ppm)	53/92	200/600	VDA 278
Odor	3	≤3	VDA 270
Acetaldehyde (µg/m³)	35	As low	10 litre Tedlar
Formaldehyde (µg/m³)	13	as possible	bag Test
Burning behavior			
(original/after hydrolysis/ after heat ageing)	0/0/0	< 100 mm/min	DBL 5307.5.1 / MVSS 302