Stiff textiles or felts glued on light impervious layers: a new "green" light septum fiber technology

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Sustainable lightweight and green technologies, meaning recycled and recyclable, are key for the automotive industry in order to reach the new CO2 emissions regulations in 2020. Absorbing systems based on cotton waste felts bonded by polyester bi-component fibers or resins (called shoddy sometimes) like the bi-permeable concept, have succeeded to remove heavy layers (EPDM-EVA-mineral charge), but at the cost of good insulation properties ([1],[2]). Even with significant improvements like the quadri-permeable concept [3], these absorbing technologies remain dedicated to bad pass-through situations, where the insulation properties are destroyed anyway.

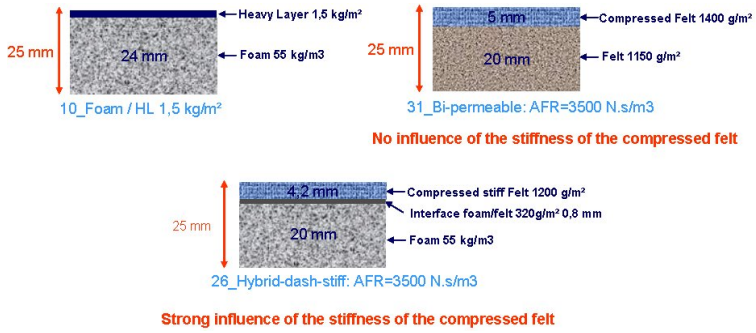

Figure 1: **Stiff compressed felt NVH concepts**

This paper presents a new way to overcome these difficulties, meaning maintaining the good insulation slopes (18 dB/oct in Transmission Loss for flat samples) with light solutions, while removing heavy layers, allowing up to 100% recycled and recyclable contents. This new "green" light septum is simply a stiff compressed textile or felt glued on a light impervious layer, generally backed by an open porous foam or felt. The light impervious layer captures the mass in Transmission Loss of the stiff compressed textile or felt as long as the bending stiffness is higher than $0.01\,N.m.$

The advantage is that you maintain the absorption properties of the compressed textile or felt, as if it were positioned on an heavy layer (cf. Figure 1). If the impervious layer is not glued or missing, you lose the effect and goes back to a classical compressed textile or felt acoustic property. This means that the bending stiffness, the mass per unit area are much more important here, than the airflow resistance (AFR) of the compressed felt or textile (cf. Figure 2 and 3).

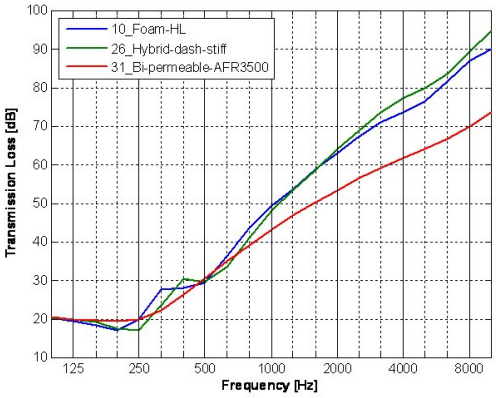

Figure 2: **Stiff NVH concepts Transmission Loss comparison**

Figure 2 illustrates that the stiffness of the compressed felt without the light impervious layer (bi-permeable case) does not allow to catch back the insulation properties of a mass-spring system (heavy layer and foam with the same mass per unit area). On the contrary, Figure 3 shows that the presence of a glued light impervious layer without the right bending stiffness for the compressed textile or felt leads to bad insulation properties like the bi-permeable concept.

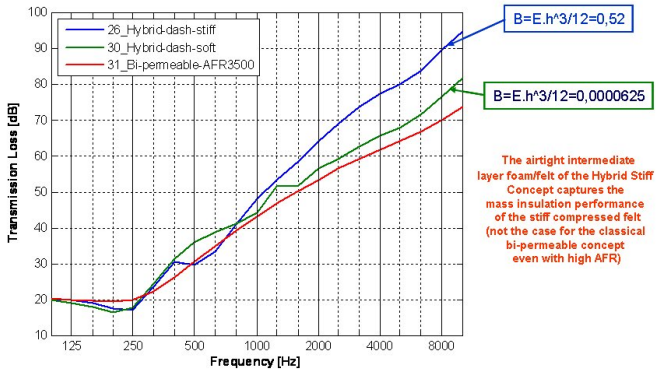

Figure 3: **Stiffness influence on Transmission Loss properties**

All these physical phenomena have been measured and easily reproduced using the classical Transfer Matrix Method. Other implementations and applications of this new "green" light septum fiber technology will be illustrated by carpet and dash insulators examples.

References

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3. A. Duval and al. Generalized light-weight concepts: improving the acoustic performance of less than 2500 g/m2 insulators - 2009-01-2136. In *SAE conference, St Charles (IL)*, 2009.