

Study of sound-absorbing properties of glass-fiber reinforced materials used in engineering

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Abstract. Modern engineering makes high demands to the noise level in the passenger compartment or cabin of KAMAZ. An effective means of dealing with noise is to use sound absorbing materials produced by the automotive industry. To increase sound-absorbing capacity of materials and structures using glass fibre reinforced polyurethane foams (PUF) obtained by the technology FiberCompositeSpraying.

One of the promising areas of development of mechanical engineering is the development and production of sound-absorbing materials and products. Modern production makes high demands to reduce background noise created by the nodes and aggregates: engine, transmission, suspension, steering, etc.

From the standpoint of human physiology and ecology noise is a sound irritant, which is generally characterized by a combination of different intensity and frequency components. Noise is a factor of the sensor, informative overload and is a typical stressor. Acoustic discomfort negatively affects the well-being and health of people [1]. Sound levels in the truck cab must not exceed 70 dBA, and in the cabin of cars and buses should not exceed 60 dBA [2]. Increased noise adversely affects human health, leading to an increase in occupational diseases (deafness, pneumatic hammer disease, etc.), increases the likelihood of cardiovascular disease. In this context, the struggle with the noise generated by the equipment is an urgent practical problem. Silencers, heat-proofing screens are most frequently used for struggle against noise in the vehicle cabin.

As a sound-absorbing engineering materials polyurethane composite materials (CM) which have high sound absorption, low specific gravity, strength and thermal conductivity are widespread but they were not tested of sound absorption.

In this regard, the study of sound-absorbing properties of the glass-filled polyurethane foam material is an actual material science problems.

Experimental study of sound absorption properties were performed on glass-filled polyurethane materials, consisting of polyurethane systems based on the polyol component A (SPECFLEX 753) and the isocyanate component B (SPECFLEX 138) in the ratio of components A: B - 1.8: 1, [3]. As the fillerglass fiber roving of brand EDR 24-2400-386 (2400 tex) [4] is used in an amount of 25 parts by weight 100 pbw matrix component. Products from a glass-filled polyurethane were produced by innovative «FiberCompositeSpraying» technology (FCS) [5]. The main process equipment for manufacture of products used: ABB robot 721 68; Zamboni KraussMaffei; Press SIEMAG.

We carry out the test of four pieces of glass foam:

- № 1, 2, 3 - 2 mm;



- № 4 - 5 mm;

Sound absorption coefficient was determined on acoustic tube Kundt type 4206 the firm "Brüel&Kjær" according to GOST 16297-80 "Sound insulation and sound absorbing materials. Test methods " [6]. We carried out three measurements of samples sound absorption coefficient (Ks) parts 1-4. The test results are shown in Fig. 1-4.

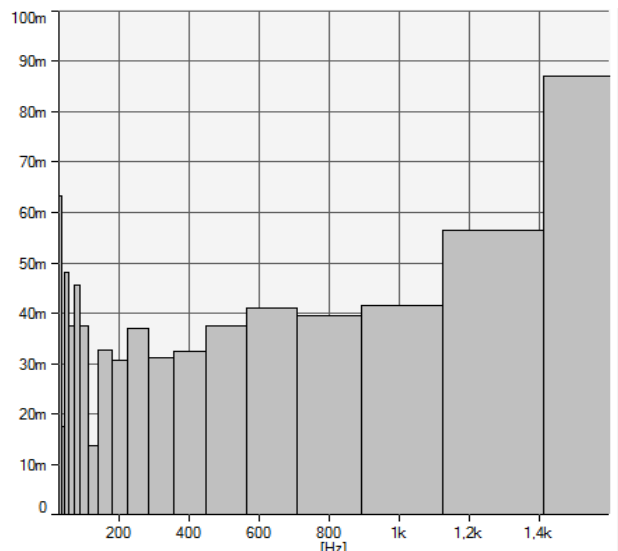


Figure 1 - Kspart №1

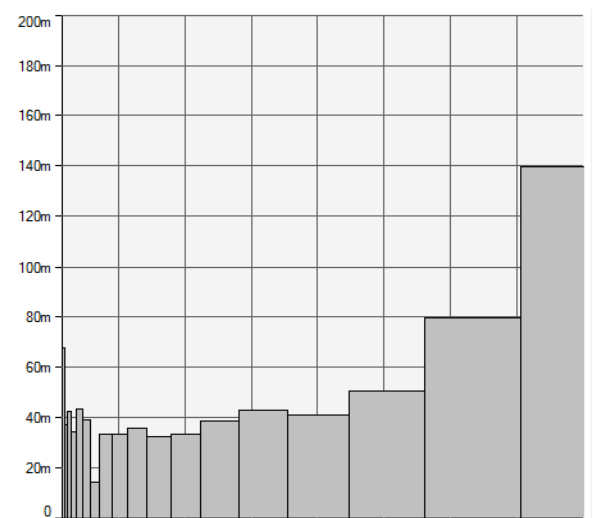


Figure 2 - Kspart №2

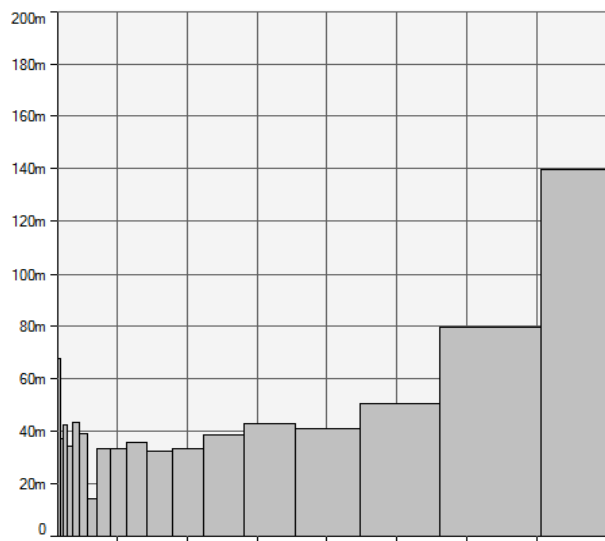


Figure 3 - Kspart №3

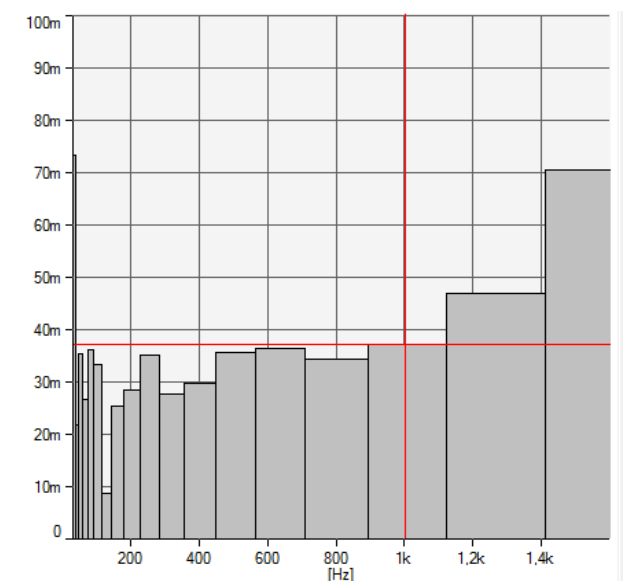


Figure 4 - Ks parts №4

The samples have low KZ in the test frequency range, KZ maximum are reached in the mid-range - 1600 Hz.

Analysis of the data showed a satisfactory sound-absorbing properties of the glass-filled polyurethane.

References

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