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CHAMBER INVESTIGATION AND EVALUATION OF ACOUSTIC PROPERTIES OF MATERIALS

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Abstract. Traffic-generated noise accounts for 60–80% of the noise prevailing in towns. With the aim of reducing the impact of noise on humans, measures and methods of fighting noise in towns and residential areas should be developed. In the majority of cases, noise suppression walls (barriers) are one of the most suitable means in tows to reduce the dispersion of noise to residential territories.

Acoustic properties of materials to be used for noise walls were investigated and, on the basis of the obtained findings, the most suitable materials with regard to noise reduction were proposed. A noise-suppression chamber was designed and installed for the experimental investigation into acoustic properties. Separate materials (fibreglass, wood chipboard, gypsum cardboard, foam polystyrene) were used for the experiment by composing various structures of different modifications. With the aim of evaluating the capacity of different materials to suppress noise, a coefficient was used to evaluate noise suppression in a material thickness measuring unit. Efficiency of the noise reduction structures used in the experiment is described by a separate index.

Different materials differently suppress the dispersion of noise of various frequencies, whereas the structures of wood chipboards (10 mm) filled with fibreglass or rock wool are the most efficient in all frequency ranges compared with acoustic properties of other structures used during the experiment.

Keywords: acoustic investigation of materials, noise suppression wall, noise suppression chamber.

1. Introduction

With increase of automation of the manufacturing industry and agriculture, traffic flows in towns and residential areas as well as with household appliances becoming more modern, the number of acoustical discomfort zones is rapidly growing. The level of noise in a workplace or home environment is one of the main factors predetermining the indicator of comfort, therefore, an increasing attention is devoted to the analysis of noise processes (Baltrėnas *et al.* 2007). Transport is one of the main sources of noise having a huge adverse effect on the environment. Up till now, the problem received very little attention (Gražulevičienė *et al.* 2003; Grubliauskas and Butkus 2007; Grubliauskas 2006).

Constant noise acts as a factor causing nervous strain and stress; therefore, the World Health Organisation (WHO) attributed noise to the physical factors that induce and spread professional diseases (Butkus and Grubliauskas 2008). All over the world, in order to humanise and ecologise the environment, shields and walls protecting from noise and pollution are built near streets with intensive traffic, highways and noisy factories (Bacevičius and Karalius 2002; Grubliauskas 2005). The dispersion of noise is expressed by complicated equations on the basis of a distance between the point being analysed and a source of noise, the type of paving of a territory, noise reflection from buildings and other obstacles occurring in the way of noise spread (buildings, plants, shields).

The level of vehicle-generated noise depends on a number of reasons: driving speed, technical condition of vehicles, traffic intensity, tyres, road paving, etc. With growing heavy-cargo vehicle transit flows on Lithuania's roads, permanent paving deformations emerge and develop (Sivilevičius and Šuškevičius 2007). Since 2000, axial loads of the Lithuanian vehicles on highways have increased 2 times, which is one of the reasons of paving degradation (Šiaudinis and Čygas 2007). A similar situation is in the railway transport – with the traction rolling-stocks improving, a driving speed and thus the noise aroused by them increase (Meidutė 2003).

A number of means are employed to reduce the acoustic noise of the environment: noise suppression walls, buildings-shields, green plantations (Transportinio ... 2004). However, the mentioned noise-reducing means may not be applied in any locality, in particular nowadays when dwelling buildings are constructed close to streets, highways, railroads, etc., where noise-proof shields, one of the most efficient noise reduction measures, are used (Ogata *et al.* 2003). They do not take much space and may be installed close to the sources of noise (Baltrėnas ir kt. 2004).

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When selecting the structure of a wall, it is necessary to consider its height so that it should reflect and absorb the waves of noise well and a field of reduced noise of sufficient height should form behind the shield (Stauskis 2007). Efficiency of the barrier decreases with a receiver's height and a distance from the barrier to the receiver increasing (Maekawa 2003). As a rule, the barrier cannot reduce noise by more than 25 dB. Tall buildings or high embankments can reduce noise by 20 dB or even more (Transportinio ... 2004).

Literature presents various classifications of barriers that the most commonly used distribution thereof is by acoustical properties (Triukšmo ... 2008):

- reflecting sound barriers (noise waves are reflected backward towards the source);
- noise-reflecting absorbing barriers (having a relied surface);
- noise-absorbing barriers (using various special materials capable of "absorbing" sound, which are often planted with climbers).

It is noteworthy that shields (walls, buildings, embankments, excavations) cannot fully attenuate spreading sound waves, since they only reduce the level of sound in a territory behind the shield (Triukšmo ... 2000).

Literature describes various laboratories that investigate the acoustic properties of building materials, structures, etc. Chambers of this type consist of two partition-separated rooms where the sample being analysed is mounted. These chambers are used to determine the capacity of building materials to absorb or reflect the waves of sound as well as to establish the suitability of building material composition for sound insulation (Ягнятинскис, Фикс 2002).

The aim of the work is to analyse and evaluate the acoustic properties of separate materials and structures composed of them to be used for noise-proof walls.

2. Object and methodology of investigation

Investigation into acoustic properties of materials is carried out in a noise-suppression chamber in Vilnius Gediminas Technical University (VGTU), Department of Environmental Protection. The entire surface area (walls, flooring, ceiling, partition) of the noise-suppression chamber interior totals 70 m^2 and is covered with 0.25 m layer boards of cut acoustic foam (0.15 m cutting step) of a conical form.

A general view of the laboratory and partition wall structure is presented in Fig. 1. The laboratory chamber consists of two rooms, separated by a double wall and a neighbouring room intended for measuring equipment. Room 1 is conditionally called a source (transmitting sound) room, room 2 – a target (receiving sound) room.

The noise-suppression chamber rooms are acoustically insulated from each other and from an external building (walls, flooring, ceiling) by rock wool boards, and the chamber frame is installed on a rubber base with the aim of preventing building vibrations from being transferred to the noise-suppression chamber. The rock wool boards limit indirect sound transmission between the chamber rooms and, apart from that, these rooms are insulated against outside noise, which minimises the background noise inside them. The measuring method of the partitions, blocking sound dispersion in the air under laboratory conditions, is presented according to the Standard LST EN ISO 140-3.

Acoustic properties of the structures in the noise chamber were analysed with the Danish Bruel&Kjaer measuring equipment consisting of:

a real time-sound spectral analyser Bruel&Kjaer mediator 2260;

a microphone 4189 – Bruel&Kjaer (2 pcs.);

a power amplifier – Bruel&Kjaer (300 W);

An omni-directional source with twelve speakers – Bruel&Kjaer (frequency characteristics: 100 Hz – 3150 Hz) with a tripod whose regulated height is from 1.3 to 2.0 m.

The levels of noise pressure were measured with a noise-and-vibration-recording device Bruel&Kjaer mediator 2260. A relative measuring error of this device is ±1.5%. The instrument records noise in the frequency range of 6.3 Hz to 20 kHz.

The instrument has two measuring channels, therefore, it can record noise at different points using two microphones at a time. One microphone is positioned in the source room, another one – in the target room.

As the device is pre-installed with a processor and specialised software, it statistically processes the measurement results.

To process the data obtained by acoustic investigation with Bruel&Kjaer 2260, BZ 7210 Qualifier, software is used for report generation. The software has the following options: real time of 1/1 or 1/3 octave bands analysis; graphic representation of noise characteristics using the set marks; sound recording; broad-band statistics; remote data transfer.

The reliability of acoustic values established in the noise-suppression chamber is verified by comparing the result obtained under laboratory conditions with the measurement result of the same sample obtained under natural conditions, i.e. in the object. A sample, a fragment of a partition, composed of clay blocks "FIBO", 100 mm thick, (3MPa), 75 mm rock-wool Paroc UNS 37z matting with a 50 mm air space and a 50 mm rock-wool layer was selected for the experiment.

The sound reduction index R_w under chamber conditions reached 53±1 dB, whereas under natural conditions – 51±1 dB.

Consequently, it can be stated that the results obtained during the investigation performed in the chamber are reliable.

The sample (1 m × 1 m) is mounted in the orifice in the dividing wall of the acoustics measurement chamber. Afterward, the following parameters of the mounted sample in 1/3 octave frequency bands (in the range from 50 Hz to 10.000 Hz) are measured:

- value of the medium equivalent sound pressure level in the source room;
- value of the medium equivalent sound pressure level in the target room.

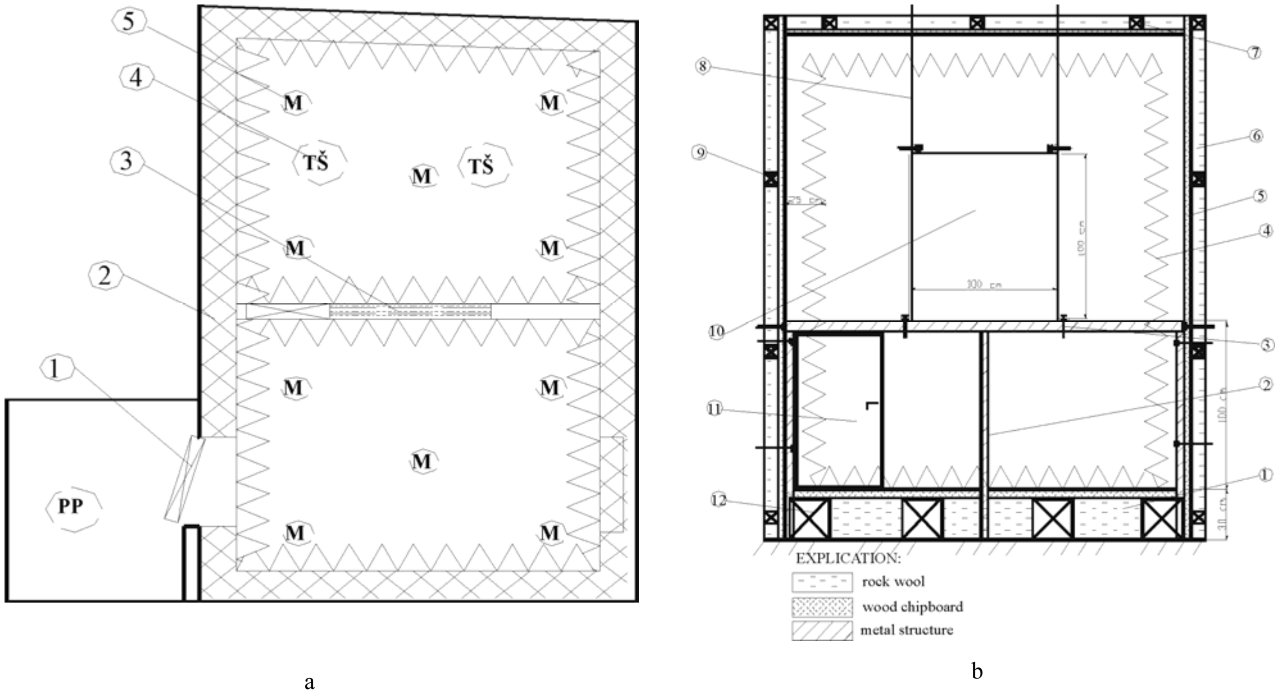

Fig. 1. Situation plan of the noise-suppression chamber: a) view from above the noise-suppression chamber: 1 – door; 2 – chamber partitions covered with foam; 3 – cage for mounting the study samples; 4 – positions of noise sources (TŠ); 5 – microphone positions (M); PP – data-recording-and-processing room; b) scheme of partition walls dividing the noise-suppression chamber and an orifice for mounting the samples: 1 – heat and noise insulation with rockwool, 0,3 m; 2 – steel structure holding the cage; 3 – steel band; 4 – acoustic foam; 5 – wood chipboard, 6 mm; 6 – rock wool, 5 mm; 7 – sealing frame beam; 8 – cage-bearing structure; 9 – wall frame beam; 10 – cage for investigating the rstudy samples; 11 – door of the partition wall separating chamber rooms; 12 – floor sleeper

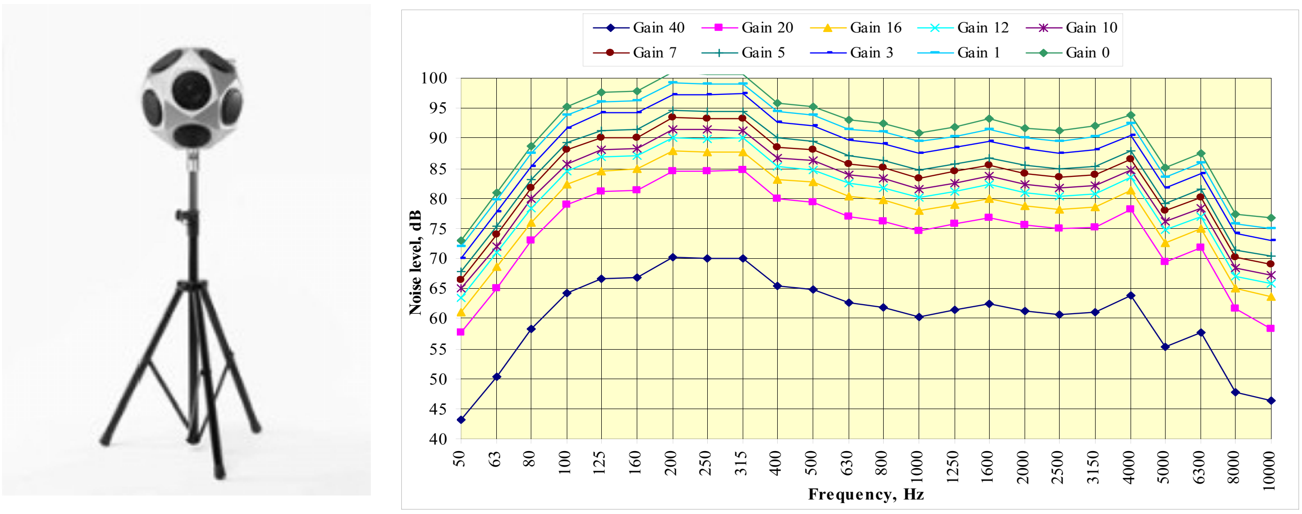

Fig. 2. Dodecahedral source of noise used for the experiment and the distribution of the levels of noise aroused by it in frequencies at different powers of the noise source (Omnipower Omnidirectional dodecahedral source of noise emits the level of noise when setting with the power amplifier Gain 40, Gain 20, Gain 16, Gain 12, Gain 10, Gain 7, Gain 5, Gain 3, Gain 1, Gain 0 values; where Gain – the power index of the noise source given in the device's technical specification

Omnidirectional 12-speaker stable source of noise Bruel&Kjaer is used to arouse noise during the experiments (Fig. 2).

The sound reduction index R_w (dB), describing the capacity of partitions to reduce airborne sound, is determined for separate structures in the noise-suppression chamber during the experiment. The airborne sound reduction index R_w of a structure is found from the formula:

$$R_w = L_1 - L_2 + 10\lg\frac{S}{A},\ dB, \tag{1}$$

where L_1 – medium sound noise level in the source room, dB; L_2 – medium sound noise level in the target room, dB; S – area of the structure, m^2;

$$A = \frac{0{,}163V}{T},\ \mathrm{m}^2, \tag{2}$$

where A – total sound absorption in the target room, m^2; V – volume of the target room, m^3; T – measured time of reverberation, s (Table 2).

Efficiency of the structures used for noise reduction during the experiment is described by the index DL_R (ISO 1793-2). Airborne sound attenuation index (DL_R), expressed in decibels, is calculated as follows:

$$DL_R = -10\lg\left[\frac{\sum_{i}^{18} 10^{0,1L_i} \cdot 10^{-0,1R_i}}{\sum_{i}^{18} 10^{0,1L_i}}\right], \; dB, \quad (3)$$

where R_i – sound insulation index in i- 1/3 octave band; L_i – standardized, A-assessed sound pressure level in decibels in i- 1/3 octave band (ISO 1793-3).

L_i values necessary for DL_R determination are given in Table 1.

Table 1. Standardized noise spectrum, L_i (ISO 1793-3)

Frequency, Hz	L_i, dB	Frequency, Hz	L_i, dB
100	–20	800	–9
125	–20	1000	–8
160	–18	1250	–9
200	–16	1600	–10
250	–15	2000	–11
315	–14	2500	–13
400	–13	3150	–15
500	–12	4000	–16
630	–11	5000	–18

Table 2. Measured values of reverberation time, s

Frequency, Hz	Reverberation time, s
100	0.26
125	0.2
160	0.14
200	0.12
250	0.14
315	0.1
400	0.09
500	0.08
630	0.08
800	0.07
1000	0.08
1250	0.07
1600	0.08
2000	0.07
2500	0.08
3150	0.09
4000	0.08
5000	0.08

With the aim of evaluating the capacity of a separate material to suppress noise, coefficient μ, showing longitudinal attenuation of a sound wave, is used. This coefficient is found from the formula:

$$I = I_0 \cdot \exp^{-\mu d}, \quad (4)$$

where I – sound intensity of the wave that passed through material , W/m^2; I_0 – sound intensity of the fallen wave, W/m^2; d – thickness of the tested material, mm.

The sound level (dB), but not the sound intensity, is measured in the sound reduction chamber and therefore if the relation between these values is known, i.e. $L = 10\lg(I / I_0^{/})$, where $I_0^{/} = 10^{-12} W/\mathrm{m}^2$, the value of the longitudinal sound wave attenuation coefficient is determined:

$$\mu = \frac{\ln \frac{10^{L_i/10}}{10^{L/10}}}{d}. \quad (5)$$

The experimentally determined time of reverberation for different sound wave frequencies is given in Table 2.

Comparison of the results obtained through chamber investigation of materials was analysed using different materials: wood chipboard, gypsum cardboard, foam polystyrene, fiberglass.

Fig. 3 presents experimental sample structures.

3. Investigation results

Fig. 4 presents the results of the performed investigation, evaluating noise level reduction for separate tested materials. Gypsum cardboards or wood cardboards are the most efficient in reducing low frequencies (first zone). Sound insulation of these materials reaches up to 37 dB. As the tests performed with fibreglass matting shows, this material is not efficient in reducing a low-frequency sound as it has the poorest low-frequency sound reduction capacity compared with the other tested materials.

It is common knowledge that the lower the frequency of sound, the bigger the length of sound waves, and the more difficult it is to absorb them, and material increase from 2 to 5 cm far more increases the coefficient of absorption at low frequencies. Therefore, the increase of foam polystyrene from 3 to 10 cm enables the reduction of a sound level within the frequency of 250 Hz by 8 dB more efficiently than using a 3 cm layer of foam polystyrene.

In a medium-frequency range, i.e. 400–1000 Hz (Fig. 4, the second zone), the most efficient materials determined in terms of noise reduction are gypsum cardboards and wood chipboards. When using these materials in a medium high-frequency range, the sound reduction of up to 35 dB was recorded. Foam polystyrene is another determined efficient means of reducing 800–2000 Hz sound. A 100 m layer of this material would achieve the sound reduction up to 30–35 dB. It is the frequency range of 800–2000 Hz where the highest efficiency of this material is achieved.

As the experimental data given in Fig. 4 show, higher-frequency sound waves are suppressed best. This is preconditioned by the fact that sound waves of a higher frequency are shorter compared to those of a low frequency. Another important determinant is the density of an insulating material. The higher the density and the bigger the structure's mass, the better the insulation of sound. Wood chipboards and gypsum cardboards have

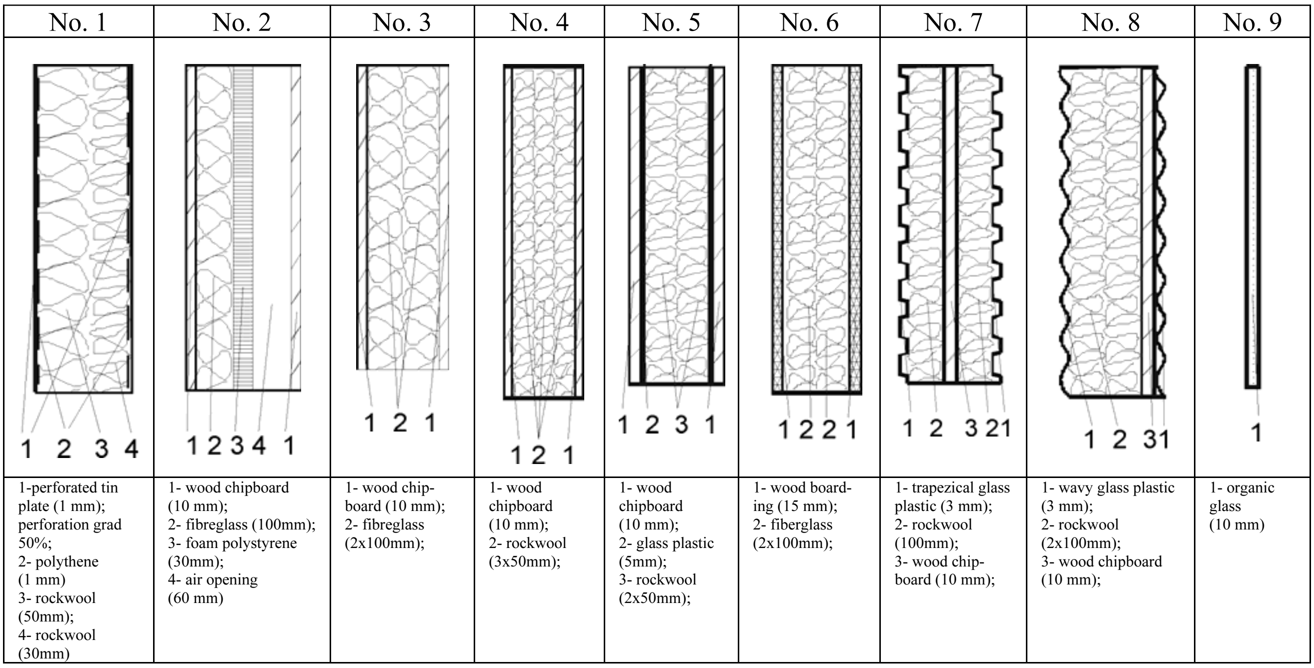

Fig. 3. Samples of experimental structures

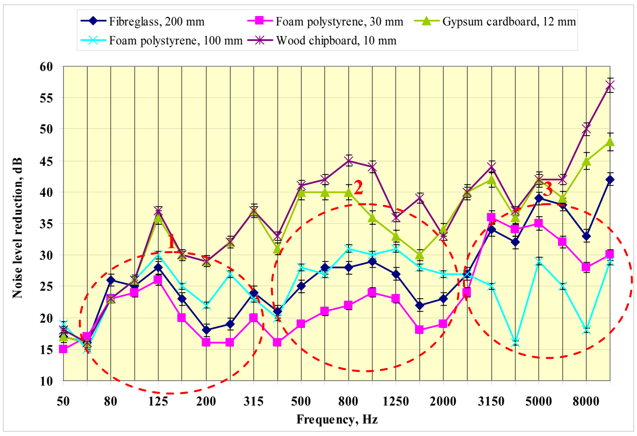

Fig. 4. Comparison of results obtained through chamber investigation of materials applied for reducing constant noise: 1 – conditional zone of low frequencies (50–315 Hz); 2 – conditional zone of medium frequencies (400–1000 Hz); 3 – conditional zone of high frequencies (1–10 kHz)

the highest volume mass of all the tested materials and therefore sound insulation using the samples of these materials is the highest. The result analysis of investigation into acoustic properties of individual materials shows that both structurally and acoustically it is purposeful to use various compositions of noise reduction walls made of these materials rather than of individual materials.

The results of attenuating the longitudinal wave coefficient are presented in Figs. 5 and 6.

The coefficient μ was investigated for different materials, which are attributed to the most widely used and available building materials:

- wood chipboard;
- gypsum cardboard;
- foam polystyrene;
- fibreglass.

Fig. 5 shows the values of the longitudinal sound wave attenuation coefficient after analysing acoustic properties of wood chipboard and gypsum cardboard. Higher values of this coefficient were measured in the sample of wood chipboard. Their medium values varied in the range of 630–720 m^{-1}. Gypsum cardboard also showed similar values of the coefficient (540 m^{-1} – 560 m^{-1}). Airborne sound insulation depends on a sample mass and sound frequency. Similar values obtained in this case can be substantiated by nearly equal volume mass of wood chipboard and gypsum cardboard, i.e. 735 and 720 kg/m^3, respectively. It is also obvious that with frequency increase, the values of the longitudinal sound wave attenuation coefficient also increase.

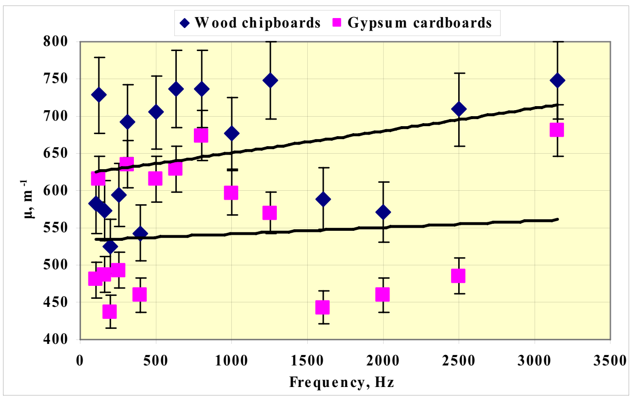

Fig. 5. Values of the longitudinal sound wave reduction coefficient μ for wood chipboards and gypsum cardboards

Fig. 6 presents the values of the longitudinal sound wave attenuation coefficient separately for fibreglass and foam polystyrene. Higher values of the coefficient were recorded for foam polystyrene (55 to 62 m^{-1}). As the experimental results of investigation into acoustic properties of fibreglass show, with the frequency increase, the values of the longitudinal sound wave attenuation coefficient also increase. The highest values were achieved at a frequency of 3150 Hz and reached around 38 m^{-1}. Values of the material's coefficient were lower compared with foam polystyrene as its volume mass hardly reaches 12 kg/m^3, whereas that of foam polystyrene – 20 kg/m^3.

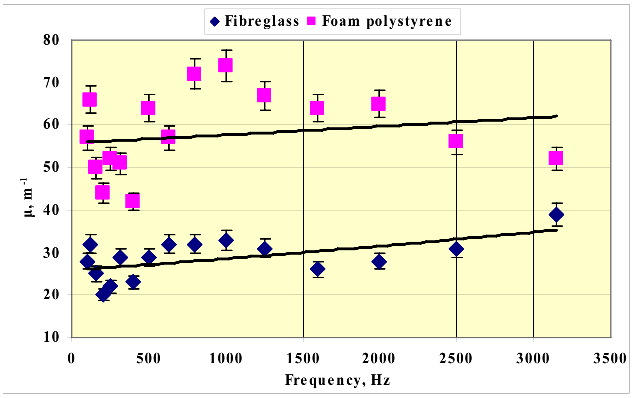

Fig. 6. Values of the longitudinal sound wave attenuation coefficient for fibreglass and foam polystyrene

Fig. 7 presents the results of low-frequency (50–315 Hz) sound reduction obtained by the chamber experiments when arousing noise with an omni-directional source of noise causing constant noise.

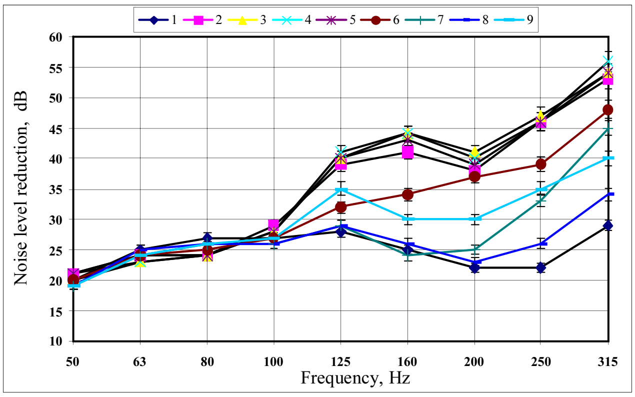

Fig. 7. Results of reducing a low-frequency sound in the frequency range of 50–315 Hz

As the results given in Fig. 7 show, none of the nine sample structures used for the experiment is distinguished by its acoustic properties in the frequency range of 50–100 Hz. Their sound-suppressing efficiency reaches around 20–25 dB. Out of all the elements used for the tests, structures No. 2 and 5 differ due to the fact that wood chipboards are applied on the outside. These structures have higher efficiency compared to the other ones in the frequency range of 125–315 Hz. In this range, the sound level generated in the source room is reduced during transmission to the target room by 40–55 dB, and the reduction of 55 dB is achieved at a frequency of 315 Hz.

The poorest results of reducing the sound level in the frequency range of 125–250 Hz were recorded when using structure No. 1, composed of two perforated tin layers (with the perforation degree of 50%), a space which was filled with an 80 mm rockwool layer. This structure reduces low-frequency sounds (125–250 Hz) by around 22–28 dB.

Analysis of the results presented in Fig. 8 shows that at medium frequencies structure No. 4 reduces an 800–1250 Hz sound best. In this frequency range, the noise that passes from the source room to the target room under chamber experimental conditions is reduced by 65 dB with the help of structure No. 4. Good noise reduction results (55–62 dB) were also obtained when using structures No 2, No. 3 and No. 5 for the experiments.

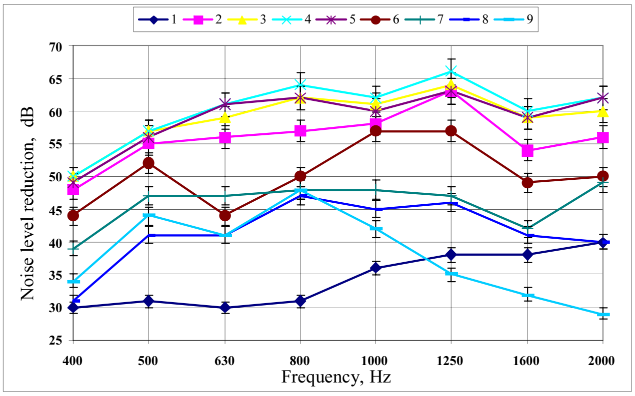

Fig. 8. Medium-frequency sound reduction results in the frequency range of 400–2000 Hz

The comparison of structure composition of No. 7 and No. 8, used in the experiment, shows that in the case of a medium high sound, the structure composed of dovetail glass plastic board, rockwool (100 mm) and wood chipboard (2×10 mm) has better acoustic properties. The structure's efficiency in reducing sound, transmitted by a constant source of sound from the source room to the target room at a frequency of 500–1000 Hz, reached up to 47 dB.

Areas out of town can be identified with a rural environment. Here, wooden noise reduction barriers would perfectly suit the case as it might be complicated to integrate a noise reduction barrier into an open rural landscape so that it does not disturb the visual environment. It is determined experimentally that upon using structure No. 6, composed of a 15 mm thick wooden plate case filled with a 200 mm fibreglass layer, at a frequency of 500–2000 Hz noise reduction reaches 45–56 dB.

As the data given in Fig. 9 shows, in the case of low frequencies, like under medium frequencies, the best noise reduction results were produced by those structural elements where the noise reduction wall is covered with wood chipboards on the outside. Such structures (No. 2–5) reduce the dispersion of high-frequency sound from the source room to the target rood around 70 dB.

As the investigation results presented in Fig. 9 show, the reduction of a high-frequency sound (5–10 kHz) under laboratory conditions when using structures No. 1 and No. 9 hardly reaches 50 dB.

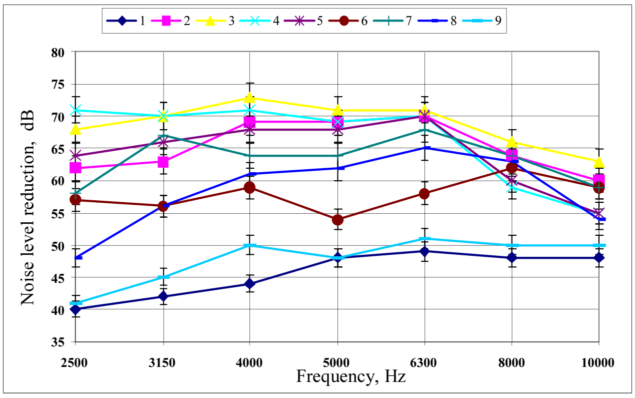

Fig. 9. High-requency sound reduction results in the frequency range of 2500–10 000 Hz

Table 3 presents the values of the airborne sound attenuation index DL_R in decibels, calculated from the experimental results.

Table 3. DL_R index values

Structure No.	1	2	3	4	5	6	7	8	9
DL_R index, dB	14	32	33	33	32	28	21	18	18
Stand. deviation, dB	±1	±1	±1	±1	±1	±1	±1	±1	±2

The highest DL_R index values (32–33 dB) were recorded when using a wood chipboard, 100 mm thick, as a component of the structure (structures No. 2–No. 5). When fibreglass mating (200 mm) was covered with a 10 mm thick wood chipboard (structure No. 3) or 15 mm thick wood plates (structure No. 6) the determined DL_R values reached 33 dB and 28 dB, respectively. As the results show the application of a thicker-layer material for the same structure does not produce a better value of the airborne sound reduction index DL_R.

The poorest result, DL_R equal to 14 dB, was obtained when using a perforated tin shield filled with rockwool matting. Another poor result (18–21 dB), compared with the other structures used in the experiment, was recorded when using glass plastic and Perspex for noise-proof shields.

According to LST EN ISO 1793-2:1997, in addition to DL_R value, a category of airborne sound reduction is ascribed to noise reduction shields (Table 4).

Table 4. Airborne sound attenuation groups (ISO 1793-2:1997)

Group	B0	B1	B2	B3
DL_R	–	<15	15–24	>24

On the basis of groups and their results presented in the Table, the highest rating is granted to structures No. 2–No. 5, i.e. B3. Costs of noise reduction barrier operation and technical maintenance greatly differ, depending on the type, material, location and the desired quality level of the barrier. Perspex or polycarbonate plates might be more expensive than the glass ones, but they are resistant and nearly unbreakable and therefore need not be often replaced. Therefore, both construction costs and technical maintenance should be considered in the designing stage.

4. Conclusions

1. The reliability of acoustic values established in the noise-suppression chamber is ±2 dB, equal by comparing the result obtained under laboratory conditions with the measurement result of the same sample obtained under natural conditions.
2. When studying the airborne attenuation index of individual materials, the best values were obtained using a wood chipboard.
3. The highest μ coefficient values (620–710 m^{-1}) were recorded in the sample of wood chipboard.
4. Out of the investigation materials, the best structure, according to the airborne sound attenuation index and the sound insulation index, was obtained upon composing a noise-reduction wall of a wood chipboard frame filled with fibreglass or rockwool (DL_R = 33±1 dB).
5. Medium- and high-frequency sounds are most efficiently reduced by a structure composed of wood chipboard with fibreglass or rockwool filling. Under laboratory conditions, the reduction of a medium-frequency sound reaches 45–60 dB, whereas that of a high-frequency sound – up to 70 dB (3150 Hz).

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KAMERINIAI MEDŽIAGŲ AKUSTINIŲ SAVYBIŲ TYRIMAI IR VERTINIMAS

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Santrauka

60–80 % miestuose vyraujančio triukšmo kelia transportas. Kad triukšmo poveikis žmogui būtų mažesnis, būtina ieškoti priemonių ir būdų triukšmui miestuose ir gyvenvietėse mažinti. Daugeliu atvejų miestuose vienas iš tinkamiausių metodų tam yra triukšmo slopinimo sienelės (barjerai).

Tiriant nustatyta triukšmo sienelėms naudotinų medžiagų akustinės savybės bei, atsižvelgiant į gautus rezultatus, siūlomos triukšmo slopinimo požiūriu tinkamiausios medžiagos. Akustinių savybių eksperimentiniams tyrimams buvo sukonstruota ir įrengta triukšmo slopinimo kamera. Tirta skirtingos medžiagos (stiklo vata, medžio drožlių plokštės, gipso kartono plokštės, putų polistirolas) bei iš jų sudarytos konstrukcijos, panaudojant įvairias modifikacijas. Skirtingų medžiagų geba slopinti triukšmą vertinta nustačius koeficientą. Jį taikant gaunamas garso slopinimas medžiagos storio mato vienete. Bandymuose naudojamų konstrukcijų, skirtų triukšmui mažinti, efektyvumas apibūdinamas tam tikru rodikliu. Įvairios medžiagos skirtingai slopina įvairių dažnių garso sklidimą, o medžio drožlių plokštės (10 mm) konstrukcijos su stiklo arba akmens vatos užpildu tam tinka geriausiai. Palyginti su kitomis bandymuose panaudotomis konstrukcijomis efektyviausiai slopinamas beveik visų dažnių diapazonų garsas.

Reikšminiai žodžiai: medžiagų akustiniai tyrimai, triukšmo slopinimo sienelė, triukšmo slopinimo kamera.

КАМЕРНЫЕ ИССЛЕДОВАНИЯ И ОЦЕНКА АКУСТИЧЕСКИХ СВОЙСТВ МАТЕРИАЛОВ

Р. Грубляускас, Д. Буткус

Резюме

Основным источником шума в городах, составляющим 60–80% общего шума, является транспорт. В целях снижения шумового воздействия на человека необходимо найти пути и средства уменьшения шума в городах и населенных пунктах. Во многих случаях одним из наиболее приемлемых методов уменьшения распространения шума в городах и жилых районах являются звукоизоляционные экраны. Объектом исследования настоящей статьи были акустические свойства материалов, из которых конструируются звукоизоляционные экраны. Полученные результаты показали, какие из проанализированных материалов наиболее применимы для поглощения шума. Для экспериментального исследования акустических свойств материалов была построена шумопоглощающая камера. Исследовались различные виды материалов (стекловата, прессованные древесные плиты, гипсокартон, пенополистирол), а также их конструкции разной модификации. Акустические свойства материалов эффективно поглощать шум характеризуются определенными индикаторами. Наиболее эффективно поглощающими шум всех диапазонов частот по сравнению с другими материалами оказались конструкции, в которых применялись прессованные древесные плиты.

Ключевые слова: исследование акустических материалов, шумопоглощающая стенка, шумопоглощающая камера.

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