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C H R O N I C L E

34rd Winter School on Vibroacoustical Hazards Suppression

Ustroń, 27th February – 3rd March, 2006

Dear Ladies and Gentlemen!

I invite you to acquaint with abstracts of selected lectures submitted to presentation in 34th Winter School on Vibroacoustical Hazards Suppressions. This national School, organized by Upper Silesian Division of the Polish Acoustical Society and Institute of Physics at Silesian University of Technology, is planned at February/March 2006 in Ustroń.

The conference is the forum for all environmental vibroacoustics fields. Particularly it concern to traffic noise, industry noise, vibroacoustics of machines, room acoustics, noise protection and similar problems. During the School the theoretical works, experimental, measuring, technical, applied and normative ones are presented.

The School lectures, and other conference materials, will be published in the "Materials of the XXXIV Winter School on Vibroacoustical Hazards Suppressions" edited by Dr. Mieczysław Roczniak (chairman of the conference). This publication is intend to participants of the School and for many libraries in Poland.

Other information about XXXIV WS on VHS you can find at address http://gnom.matfiz.polsl.gliwice.pl/zzw/zzw_06/.

In behalf of Organizers: *Roman Bukowski*, coordinator of the School

Abstracts

1. The conditions of the estimation process of the L_{den} level analysis

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The article describes the problem of evaluation of noise indicators L_{den}. Different methods of calculations and measurements of this process are described. The influence of day-evening-night period starting

time changes on the noise indicators L_{den} are presented. Statistical difference between [7:00–19:00, 19:00–23:00, 23:00–7:00] and [6:00–18:00, 18:00–22:00, 22:00–6:00] periods of traffic noise has been found. Changes of noise indicator level monitored during a year near one of the main road of Kraków were the base for analysis.

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2. Computer aided data management dedicated to outdoor measurement terminal

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Solution suggested in the article is a part of the elaborated monitoring system. Computer added obtained measurements data management, dedicated mostly to the outdoor measurement terminal, refers to data acquisition, their distribution through the net to the data server. It is also supposed to visualize the data and analyze information obtained from measurement systems. The suggested system will not only manage the measurements data but also describe them in the data base (among others all of non-acoustical data and some signal features), which is supposed to simplify their later analyze.

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3. Aid system for acoustical data acquisition, storage and distribution

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The article introduces the idea of universal multiple function system for acoustical data acquisition, storage and distribution. The data is obtained from noise measurement and noise monitoring. The system is capable of data analysis presentation and is able to support automatic data modeling with combination with most of popular calculation systems. Thanks to their virtues, the systems presented in this paper allow gathering of large number of information, which is useful for data analysis by any number of people in any place of the world, preserving the integrity of the data. The system will also allow the data distribution in accordance with the EU Directive 2002/49/WE.

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4. Digital filtering for virtual unidirectional source of sound

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One of the main differences between industrial automation plants and acoustic plants is presence of acoustic feedback between control value (“active” loudspeaker output) and measured disturbance value (reference microphone). This phenomenon can seriously reduce the effect of active noise control. The common approach to the problem is to use non-acoustic reference sensor or to process reference signal in order to subtract the influence of control value from it. The drawback of the former is that it does not allow for broadband noise cancellation. The latter requires very exact model of feedback path. The modern approach to the problem presented in this paper is called virtual unidirectional source of sound

(VUSS). The idea of VUSS in duct applications is to use digital signal processing algorithm to drive two loudspeakers in such way that the sound produced by them virtually propagates only downstream the duct. Virtually means that although the sound propagates in both directions the processing algorithm assures the sound waves propagating upstream the duct are actively cancelled by themselves while the waves propagation downstream the duct are amplified.

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5. Noises in open pit mines of mineral raw materials emitted by blasting works

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For production natural crushed stones in open pit mines of mineral raw materials, blasting work is basic method. Blasting works cause short-lived noises (impulse noises) and appear along with continuous noise emitted by machines and equipment. High sound pressure levels accompany blasting works. It causes large troublesome for surroundings occupants and also for natural environment. The assessment of impulse-noise hazard performed in one of open pit mines of mineral raw materials is done in article. These research are stage of experiment concern with reduction of such type of noise.

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6. Minimization of noise emission to the environment generated by the compressor unit in Chałupki Dębniańskie

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Authors of the publication present the complex design of acoustical enclosure of the compressor unit devices. The task of the acoustical enclosure is to reduce noise emission and to protect the compressor unit from the atmospheric impact. The acoustical enclosure is additionally equipped with a chamber for control–measurement system which bounds to the enclosure wall. The air intake muffler and exhaust silencer for gas engine were designed. To ensure the proper circulation, abstraction of heat and dangerous gas out of enclosure, the ventilation system was created.

The results and analysis of a sound pressure level measurement after application of the acoustical enclosure were also included. On a basis of the measurements the real transmission loss was defined which then was compared with theoretical results.

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7. Study of low frequency noise annoyance when performing mental work

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Low-frequency noise (including infrasound noise) is one of the most harmful and annoyance factors that occur at human work and living environments.

This paper presents the results of tests concerning the analysis of annoyance of low-frequency noise that occurs at the work stations located in offices. The tests covered measurements of acoustic parameters and survey at the work environment and in laboratory conditions on a model work station.

The study in laboratory included 60 pre-selected volunteers, aged 19–25, with normal hearing (< 25 dB HL). The selected persons had diversified properties of the nervous system (persons with low reaction level and high reaction level). Subjects took part in an experiment that consisted in completing psychological tests in three different acoustic conditions (the stationary noises with low frequencies and infrasound components). The experiment used a graphical rating scale and the survey of sensations and complaints related to the exposure to noise as a subjective method of evaluation of sensations related to the influence of low-frequency noise during the course of experiment.

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8. Examples of acoustic maps generated using various sets of data

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Recent methods of land development planning and preparing assessments of influence on the environment demand connecting the measurement data and computation methods used with maps of the investigated area. In this field, the GIS techniques are used, linking the cartographic maps with databases and visualization on them of the results of basic calculations related to the considered area. The most useful form of processing is that of creating layers. Creating layers is an effective method for grouping elements with similar properties. The GIS programs enable to make extensive processing of such a map.

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9. Noise at workplaces in office rooms – parameters for the assessment of the road traffic noise

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The noise at workplaces (in office rooms) comes from the following sources:

- in office rooms:
  - activities man
  - noise caused by technical equipment
- coming from other rooms in the some building and noise coming from outside of the building which connected with building
- sources of noise coming from outside of the building.

This paper presents parameters which determine traffic noise to reach workplaces rooms in the buildings.

First – equivalent A-weighted sound pressure level (during the stay of a worker at given workplaces in office room) and/or equivalent sound pressure level at bands frequency with wide third-octave in from the range 50–5000 Hz.

Second – a difference between two points: close to outside the building and at the workplaces in office room inside building for those parameters.

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10. Optimal active noise control for time-varying plants

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Optimal Internal Model Control system for active noise reduction is considered. The first part of the paper concerns the control problem defined by the H2 performance index without explicit constraints. This corresponds to minimisation of the mean-square value of the residual signal. For a random signal the solution depends on the plant variations with respect to the constant model. It is demonstrated that the modelling error may result in generation of the local zone of quiet at a position different than the assumed one. The error may also destabilize the system. To overcome this effect different optimisation problems can be formulated using the H_2 or H_{inf} norms. An overview of the formulations is presented in the second part of the paper. The basic requirements are high noise reduction and robust stability in case of plant variations. Other constraints concerning the control system behaviour are also considered.

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11. Experience by the sound fields selection machines in industry

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Many noise control problems require a practical knowledge of the relationship between the sound power level of source and sound pressure level around it. This relationship allows the calculation of the approximate sound pressure level that a particular machine produces in a specified environment at a specified location, based upon a known sound power level and directivity of the machine. Authors examined small machines that often are used in the industry: a pump, a compressor, a saw machine and a grinder. For each of those machines were measured the amplitudes of sound pressure level and the phase angles. Next were estimated 1/3 octave-band sound power levels of source. Applied the criteria ISO 11201-11204 authors calculate the sound pressure level at the operator's position.

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12. Experiences of distribution vibroacoustic energy in machines in industry

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Knowledge about quantity of energy radiated by a machine and dissipated by its construction makes it possible to obtain a vibroacoustical model. Often when we make acoustic models of a sound source, we use measurements of the sound pressure level around the machine only. For predicting the sound levels

produced by machine we try to use the energy balance equation in which we should estimate radiation power of each noise source. We try to work this problem out by making several measurements of the sound pressure level at a distance of machine and the velocity of radiating surface of machine. The radiated sound power we obtain from the spatial average of the mean-square sound pressure. All operations lead to estimation of sound power levels of partial sound sources and places of their localization for vibroacoustical modeling.

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13. Inversive method of industry sound sources modelling

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The issue of acoustics modeling in big industrial factories is usually a very complex problem. Especially it is complicated when there are lots of different sources that penetrate one another or if there occurs a complicated terrain configuration like many buildings. In such cases the results of acoustic measurements are not precise and so the obtained acoustic models. We can then better the accuracy by making extra calibration of the model using the inversion method. Setting extra algorithms is usually connected with bringing extra information, which calibration procedures should use in a rational way.

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14. Uncertainty analysis of the environmental noise research

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Accordingly to the regulations contained in the UE Directive, and the legal acts currently under legislative process in Poland, in the nearest future the LDEN and LN levels will become the basis for evaluation of the environmental noise. For calculation of these levels, and in particular the LDEN, it is necessary to know the long-term values of 24 h noise distribution. While for other sources of industrial noise such distributions can be determined from the daily working hours of the respective source, or as for the case of traffic noise from the measured average 24 h noise distributions for a given road category, in the case of transmission lines there are no recognizable regularities in the respective distributions. In practice for the UHV lines only a continuous noise monitoring procedure leads to reliable results.

In some instances it is necessary to determine the long-term noise level from short-term level measurements in random environmental conditions. The present paper describes the effect of the above-mentioned factors on the results of LDEN level of corona noise as well as a list of the uncertainty budget for the case of corona noise and traffic noise.

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15. Ultrasonic noise at the selected workplaces

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Ultrasonic noise is defined as the broadband noise containing high audible and low ultrasonic frequencies (from 10 kHz to 100 kHz).The main sources of ultrasonic noise in the working environment are

the so-called low frequency ultrasonic technological devices, including washers welders, ultrasonic drills, soldering tools and galvanizing pots. Ultrasonic noise is also generated by pneumatic tools and high-speed machinery such as planers, millers, grinders, circular saws and some textile machinery.

This article presets the assessment of occupational exposure to ultrasonic noise on the exemplified by selected workplaces.

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16. The estimation of twenty-four-hour trend of a traffic noise distribution

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The continuous twenty-four-hour noise measurements performed at the national roads' and highways' neighborhoods are conducted with accordance to the methodology applied by GDDKiA, that is based on reference methodologies adopted as executive acts to the Law on the Natural Environment Protection.

Circumstances in which the acoustic measurements are performed often effect in problems with the measurement continuity. The most typical difficulties include weather breakdowns, equipment failure or interference caused to by other acoustic sources.

Pauses appearing in such circumstances impair the accuracy of the equivalent level determination. Therefore drawing up a method for estimating the course of lacking fragments of distribution, becomes important aspect for the measurements quality.

Several methods of interpolation the lacking fragments of a traffic noise distribution in the context of the equivalent level determination accuracy at day and night time are presented and discussed in the present paper.

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