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**CONCEPTION FOR STANDARDIZATION IN THE FIELD
OF MACHINERY NOISE**

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The state of standardization in the field of machinery noise in Russia and on the international level is considered. The constructive principle is formulated for the standardization conception in the considered field, which was developed on the instruction Technical Committee for Standardization¹ 358 "Machinery Acoustics" of Gosstandard of Russian Federation. The schematic presentation of the system expressing the conception structurally is given, which includes directions for standardization activity, their subject filling and makes it possible to clarify the prospects of work. Correspondence between Russian Standards and International ones is illustrated.

To straighten out the work for standardization, to ensure unity of technical policy in the field of machinery noise and the most complete national and international cooperation for production of acoustically safety machinery and equipment Gosstandard of Russian Federation created in August 1993 the Technical Committee (TC) for Standardization N358 "Machinery Acoustics". The responsibility of TC is to conduct and to develop the normative document complex "Noise", to take part in international standardization activity in the field of machinery noise, to put in Russia the corresponding International Standards. It was decided at the first organizing meeting of TC 358 to develop the conception for standardization in the field of machinery noise to reflect the existing situation in Russia and on the international level and to direct the perspective and main trends of activity. Based on the study of the state of art the conception version was proposed by author for discussion and approval at the TC's meeting in 1994. Since then it is regularly used when being prepared the annual plans and programs of State and Interstate standardization activity in the field of machinery noise to be carried out by TC 358. The content of the conception and state of affairs on its realization is considered in the paper.

Conception constructive principle and its building structure

Constructive principle of the conception is to develop normative documents, which provide and stimulate the creation of machines of low noise and maintenance of the required acoustic characteristics over a whole period of machine service live, and also use of the acoustical parameters as information indicators of technical state of a product.

The schematic presentation of the system expressing the conception structurally is given in Fig. 1. It includes the list of organization dealing with this problem in Russia and on international level (International Organization for Standardization – ISO, European Committee for Standardization – CEN), directions for standardization activity and their subject filling.

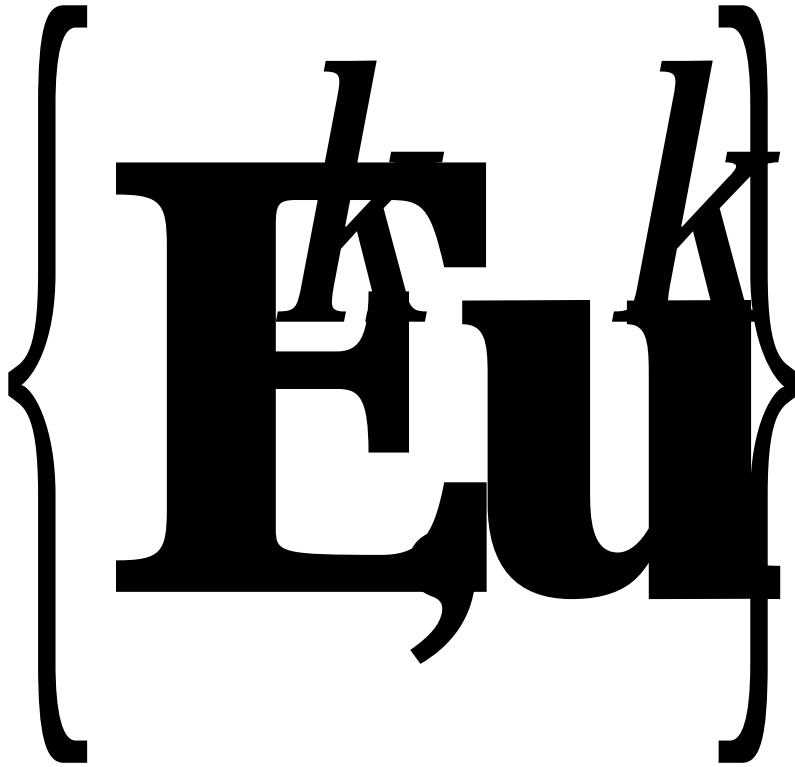


Fig. 1. The Schematic presentation of the standardization conception

The scheme illustrates also the correspondence between Russian Standards and International ones. It is made an afford to show tendencies for progress of the system, to introduce the missing elements and to trace necessary liaisons for integrity and unity of the system to attain the object putted by the conception.

In line with the general approach taken in noise control practice three directions of work are picked out which combine the normative documents setting:

1) principles, rules and methods for rating the noise emission values of machinery and equipment and procedures ensuring the normative values, when a machine is designed, produced and operated:

2) methods for qualification of machines as noise sources;

3) principles, methods and measures for machinery noise control.

The fourth direction has to include organization-methodical standards which form united language base for the first three directions and stimulate the work to solve the conception and the standards which envelope new field activity (there is not discussed here and is not given in the figure).

There are only base standards given in the scheme. Due to agreement between CEN and ISO the basic European Standards are the harmonized ISO Standards, so references will be made further to ISO Standards only with having in mind the corresponding European Standards too.

MACHINERY EMISSION NOISE VALUES RATING

This direction includes the group of standards which introduce the philosophy and practice for rating noise emitted by machinery and equipment. The standards have to realize the main principle of the conception: rating the noise emission characteristics of machines should be executed on the basis of sanitary normalizing the noise immission at operator's positions. This approach is stated in the main Russian noise Standard GOST 12.1.003 [1], is developed in GOST 12.1.023 [2], where the concept of a limit admissible noise emission values (LANEV) is introduced, and is fixed in GOST 27409 [3], which specifies this quantity as the normative noise emission value of a machine (NNEV at the scheme in Fig. 1). GOST 30530 [4] adopts the methods for calculation of normative noise emission values of stationary machines.

The indicated normative documents together with a planned standard on the order for ensuring the required noise emission limits will constitute the group of basic standards specifying the general principles, rules and procedures for machinery noise rating which should be guided under equipment designing, producing and purchasing. On their basis the normative documents for specific types of machinery must be developed.

ATTESTATION MACHINES AS NOISE SOURCES

This is to date the most elaborated standardization direction both on the international level and in Russia. There is practically the whole set of the basic methods for determining the sound power levels of noise sources (International Standards ISO 3740 series [5], GOSTs 12.1.024-12.1.028 [6] and GOST 27243 [7]) and statistical methods for determining and verifying stated noise emission values (NEV at the scheme in Fig. 1) of machinery and equipment (ISO 7574 series [8], GOST 27408 [9]). International Standards of ISO 3740 series are actively revised now in order to make them more accurate using the experience accumulated [10,11]. They are added by the new ISO 9614 series [10] being worked out on the basis of the sound intensity measuring procedures which were developed in the 80-th years and give the more wide possibilities to perform tests in situ without loss of the method accuracy. TC 358 worked out the Interstate Standard GOST 30457 [13], which introduced the engineering method from the first part of ISO 9614 [12].

The International Standards of ISO 3740 series is adopted in Russia and on interstate level by revision of the corresponding valid standards [6,7]. The drafts of GOST R and GOST were prepared in 1999 on the basis of practically whole series of international Standards (excluding ISO 3745). Notice, that it was provided thanks to financial support of British Standard Institution and Moscow firms "Octave +" and "S-Instruments" which are the representations of USA firms "Larson Davis" and "Hewlett Packard" providing acoustical instruments on Russian market. It is intended to continue this work in 2000 and in addition to the indicated firms it is understanding of support by Moscow firm "Algorithm-Acoustics" representing the Polish firm "SVANTEK" portable acoustic instruments of which are success on Russian market too.

LAST years this direction of standardization was enlarged by new group of standards to be prepared to meet the European machinery safety directive 89/392/EEC [14].

The International Standards of ISO 11200 series [15] specify the methods for determination of emission sound pressure levels at the operator's position and at other specified positions. These quantities are defined as the sound pressure levels at a specified position near a noise source, when the source is in operation under specified operating and mounting conditions on a reflecting plane surface, excluding the effects of background noise as well as reflection from room surfaces other than the plane on which the machine under test is placed. Draft Interstate Standard have been prepared last year and is a direct adoption of ISO 11204 in accordance of which the measurements may be done in situ taking into account the environmental correction.

ISO 4871 [16] set forth the requirements to the declaration of noise emission values by the machinery manufactures, which they guarantee under production. TC 358 prepared the harmonized Draft Interstate Standard. By contrast, due to requirements of noise control practice and noise emission values rating regulations the sound power levels in octave frequency bands are included in the list of noise emission values for obligatory declaration.

The International Standard ISO 12001 [17] specifies the technical requirements for the drafting and presentation of a noise test code. Such a code is a standard for a specific family of machinery or equipment which gives all information necessary to carry out as efficiently as possible the determination, declaration and verification of the noise emission values of the machine under test. Standard contains the outline of a typical noise test code summarizing the information that is required and the list of the basic standards, which should follow when the test is performed.

ISO 11689 [18] prescribes requirements for systematic collection and comparison of noise emission data, rules and methods for determination of the level of acoustical design for a family, type, group or sub-group of machinery or equipment on the basis of the regression analysis. The comparison of the collected data for a specific family of machines of different manufacturers with each other and with the normative values (LANEV) allow not only to evaluate the acoustical design of machines of a family but also to determine the necessity for noise reduction taking into account the state of art of world practice.

There are no Russian or Interstate Standards similar to the last forth type International Standards. The working program for improvement of the complex of standards of Occupational Safety Standards System stipulates their preparation (as adoption of corresponding International Standards).

MACHINERY NOISE CONTROL

The third direction includes standards specifying principles, methods and means for machinery noise control. They could be divided into three groups: standards giving methods for noise source revealing; standards stating requirements for noise control devices and methods for their efficiency assessment and documents containing recommendations for low-noise machinery design.

The various technical means available for reducing noise at a source, on a transmission path and at a work station itself are described in GOST 12.1.029 [19] and in International Standard ISO 11690, part 2 [20], which gives the information about the orders of magnitude of the noise reduction to be expected too.

The Technical Reports ISO 11688 [21] describe the recommended practice for the design of low-noise machinery and equipment. These means standards are intended to provide manufactures of machines with didactic documents to help them in noise reduction at the source.

R E F E R E N C E S

1. GOST 12.1.003-83. Occupational Safety Standard System. Noise. General safety requirements. (In Russian).
2. GOST 12.1.023-80. Occupational Safety Standard System. Noise. Determination methods of stationary machine noise characteristic values. (In Russian).
3. GOST 27409-97. Noise. Technical regulation of stationary equipment noise characteristics. General. (In Russian).
4. GOST 30530-97. Noise. Methods for calculation of limit admissible noise characteristics of stationary machines. (In Russian).
5. ISO 3740:1980. Acoustics - Determination of sound power levels of noise sources - Guidelines for the use of basic standards and for the preparation of noise test codes.
6. GOST 23941-79 (ST CMEA 541-77). Noise. Methods for determination of noise characteristics. General requirements. (In Russian).
7. GOST 27243-87 (ST CMEA 5621-86). Noise. Survey method for determination of sound power levels of machinery by standard noise source. (In Russian).
8. ISO 7574:1985. Acoustics - Statistical methods for determining and verifying stated noise emission values of machinery and equipment - Part 1: General considerations and definitions; Part 2: Methods for stated

values for individual machines; Part 3: Simple (transition) method for stated values for batches of machines; Part 4: Methods for stated values for batches of machines.

9. GOST 27408-87 (ST CMEA 5711-86). Noise. Methods for statistical processing of data in determination and control of machine emitted noise level. (In Russian).
10. Lang William W. Progress in the development of international standards for determining sound power levels and sound pressure levels of noise sources. – Proceedings Inter-noise 93. Leuven, 1993, p. 319 - 322.
11. ISO/DIS 3740. Acoustics - Determination of sound power levels of noise sources - Guidelines for the use of basic standards [Revision of first edition (ISO 3740:1980)].
12. ISO 9614:1993. Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points; Part 2: Measurement by scanning.
13. GOST 30457-97 (ISO 9614-1-93). Acoustics. Determination of sound power level of noise sources using sound intensity. Measurement at discrete points. Engineering method. (In Russian).
14. R. G. Higgins, J. Jacues, W. W. Lang. Directives, standards and European noise requirements. - Noise/News International, 1994, vol.2, ¹ 3, p.156-184.
15. ISO 11200:1996. Acoustics - Noise emitted by machinery and equipment - Guidelines for the use of basic standards for the determination of emission sound pressure levels at the work station and at other specified positions.
16. ISO 4871:1996. Acoustics - Declaration and verification of noise emission values of machinery and equipment.
17. ISO 12001:1996. Acoustics - Noise emitted by machinery and equipment - Rules for drafting and presentation of a noise test code.
18. ISO 11689:1996. Acoustics - Procedures for comparison of noise emission data for machinery and equipment.
19. GOST 12. 1. 029—80 (ST CMEA 1928—79). Occupational Safety Standard System. Means of methods for defense from noise. Classification. (In Russian).
20. ISO 11690-2:1996. Acoustics - Recommended practice for the design of low-noise workplaces containing machinery - Part 2: Noise control measures.
21. TR 11688:1995, 1998. Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning; Part 2: Introduction to the physics of low noise design.