NOISE CONTROL AND NOISE REDUCTION. SYSTEMATIC COLLECTION OF NOISE EMMISSION DATA

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1. INTRODUCTION

Many national standardization organizations and SubCommittee 1 (SC1) of ISO Technical Committee 43 (TC43) "Acoustics" have been active for many years preparing numerous noise-related standards. Until recently ISO standards have primarily given methods for determining quantities that describe the acoustical performance of products such as machinery and noise reduction materials/components. Such performance standards make comparison and ranking of products possible.

EEC-Directives 89/392 and 91/368 on machinery safety as well as 86/188 on the protection of workers specify two major requirements:

1) Noise emission data for machinery must be made available by the manufacturers.

2) New factories, plants and machinery must be so designed and constructed that risks resulting from airborne noise are reduced to the lowest level, taking account of technical progress and the availability of means of reducing noise, in particular at source.

To fulfil the first requirement there is a need for a number of performance standards (including specific noise test codes for each family of machinery) which enable determination and declaration of quantitative information on airborne noise emitted by machinery under well-defined operation conditions. Such noise measurement standards, called "test codes", are already available for a number of machines. For other machine types noise test codes are in preparation.

To fulfil the second requirement there is a need for a new type of standards that give guidelines on how to design silent machinery, how to reduce noise emission and/or noise immission and how to define the "state of the art" concerning low-noise design.

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2. NOISE CONTROL STANDARDS

The present paper describes standardization work in progress in relation to noise reduction - so called "noise control standards".

Two ISO-working groups are preparing "Know-how guideline-standards" telling how to reduce noise emission and noise immission to the lowest feasible level:

ISO/TC43/SC1/WG34 - Guidelines for the design of low-noise machinery (including systematic collection of noise emission data).
Convenor: E. Schaffert, Germany.

ISO/TC43/SC1/WG35 - Guidelines for the design of low-noise workplaces.
Convenor: J. Jacques, France.

In addition to this a third ISO-working group has the task of preparing a number of performance standards for noise attenuating devices (enclosures, cabins, silencers, screens). This work is done by:

ISO/TC43/SC1/WG36 - Methods for the determination of the acoustic performance of noise attenuating devices.
Convenor: K. Skovgaard, Denmark.

In accordance with the general principles of CEN/TC211 "Acoustics" CEN-standardization work is as far as possible transferred to ISO so that CEN-standards (ENs) have precisely the same content as ISO-standards. Therefore CEN/TC211 has initiated the work, but the tecnical work is carried out by working groups established by ISO TC43/SC1 "Noise".

3. DESIGN OF LOW-NOISE MACHINERY (KNOW-HOW STANDARDS)

It is important that non-acoustic engineers are engaged in noise control especially when designing new machines. As a tool to understand the basic concepts of noise control in machines WG34 has prepared the following standard:

ISO 11688: Recommended practice for the design of low-noise machinery and equipment.
Part 1: Planning
Part 2: Noise generation principles.

The objectives of the standard is noise control at the design stage as well as noise reduction in existing machinery. The standard is intended for use by designers of machinery and equipment as well as users and/or buyers of machines and authorities.

ISO 11688 describes design methods, which are generally applicable. Machine specific safety standards should include more specific design methods relevant to the family of machinery. ISO 11688 is expected to be used as a general basis when machine specific working groups are preparing machine specific safety standards.

4. SYSTEMATIC COLLECTION OF NOISE EMISSION DATA

The EEC directives 89/392 and 91/368 require that risks resulting from airborne noise are reduced to the lowest level, taking account of the technical progress and the availability of means of reducing noise, in particular at source.

To determine whether this requirement is fulfilled manufacturers and users of machinery as well as authorities need a method defining what is achievable concerning low-noise design for the relevant type of machinery. Based on reliable information on the actual noise emission data for "the whole" family of machinery a given product can be compared with the family it belongs to.

Methods for determining the achievable noise emission level (state of the art) for families, types, groups or sub-groups of machinery are given in:

ISO 11689 Systematic collection and comparison of noise emission data for machinery and equipment, which has been prepared by WG34.

Possible users of ISO 11689 are (among others):

- Working groups preparing machinery safety standards.
- Authorities
- Producers and potential users of noise emission data bases.

In order to determine "Achievable Noise Emission Levels" a systematic collection of noise emission data has to be organized. Until now no official body has been appointed to perform this task. The possibilities of establishing a European Noise Emission Data Base in collaboration with EEC-authorities is under consideration.

Another possible way of "publishing" Achievable Noise Emission Levels is to include such levels in machinery safety standards. This possibility will probably be accepted by CEN as a draft Memorandum on standardization concerning Health and Safety, prepared by CEN/BT/WG60, allows standards to set achievable values - determined by the state of the art - e.g. for emission values for noise. Whether such values should be included in safety standards for specific families of machinery is to be decided by the relevant CEN Technical Committee. The establishment of achievable noise levels should not prevent innovation, nor the achievement of better results. Consequently, such values have to be revised as the state of the art evolves.

5. DESIGN OF LOW-NOISE WORKPLACES (KNOW-HOW STANDARDS)

To assist e.g. machine users, health and safety officers and managers in industry in achieving the best possible results (the lowest possible noise immission) when designing new workplaces or when implementing noise control programmes WG35 has prepared the following standards:

ISO 11690: Recommended practice for the design of low-noise workplaces.

Part 1: Noise control strategies.
Part 2: Noise control measures.
Part 3: Noise propagation and prediction in workshops.

6. PERFORMANCE OF NOISE ATTENUATING DEVICES

There is a lack of "traditional" performance standards for assessing the acoustic performance of noise-attenuating devices. WG36 is filling up this gap by preparing the following standards:

ISO 11546: Sound insulation performance of enclosures.
Part 1: Laboratory.
Part 2: In-situ.
ISO 11957: Sound insulation performance of cabins.
ISO 11691: Silencers. Laboratory-survey method.
ISO 11820: Testing of silencers in-situ.
ISO 11821: Screens.

The performance data obtained by these methods will be useful when comparing products or may be used as input data for predictive calculations in the design of low-noise workshops or low-noise machinery.

Future work of WG36 might include performance standards for other types of noise-attenuating devices or methods for single-number rating.

7. WILL NOISE CONTROL STANDARDS IMPROVE THE EFFECTIVENESS OF NOISE CONTROL IN EUROPEAN INDUSTRY ?

It is hoped and expected, of course, that the answer is "yes". Whereas a number of noise measurement standards for specific machinery already exist, the subject of noise control is new in international standardization and there is not yet any experience with the effects of international standards in this area.

We are just at the stage where most of the basic standards on noise control described above have been approved by ISO/TC 43 and CEN/TC 211, and they are at present being processed for the final formal voting necessary for issue as international and european standards. Thus, practically most of this material is now available and it is up to the many CEN Technical Committees to make use of them in preparing the prescriptions concerning noise control in specific safety standards.

In particular it is noted that the establishment of achievable values require that a reliable and recognized noise emission database for the relevant family, type or group of machinery is available. For most machinery such a database does not exist, and it will take time to build it up.

Therefore, an important task for acousticians in the immediate future will be to make the new basic noise control standards known, understood and applied by those working with machinery safety. Any improvements in noise control as result of standards in this area is totally dependant on the success of this exercise.