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NEW STANDARDS FOR DETERMINATION OF SOUND POWER LEVELS

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1. INTRODUCTION

The methods available by which the sound power levels of noise sources can be determined fall into two groups, one using measurements of sound intensity and the other using measurements of sound pressure. It may be that at some time in the future, sound intensity methods will come to be used for all applications where the sound power level is required to be known, since they evaluate energy flow directly and they have certain practical advantages. However, at present, the great majority of sound power level determinations made for use in noise declaration and verification are obtained using sound pressure, and this appears likely to continue to be the case for some time yet.

The standard methods in use for sound power determination using sound pressure are the international standards ISO 3741 through ISO 3747. This series of standards has undergone major revision during the past ten years, and indeed this process is not yet quite completed. Even so, the basic structure of the standards remains unchanged from that originally laid down during the 1970s. The seven methods are identified with the different kinds of environment where they are applied, and they are also broken down by three grades of accuracy. Users of the standards find this variety confusing. Moreover, an aspect increasingly important to regulations on machinery noise emission, that of measurement uncertainty, is dealt with in a way that is unsatisfactory from several respects. This paper outlines proposals which have been made to ISO for a completely new series of standards with a simplified structure and addressing measurement uncertainties more adequately.

2 – THE PROPOSED STANDARDS

The titles proposed for the new series of standards are as follows:

ISO xxxx1 Noise emitted by machinery and equipment – Determination of sound power levels and sound energy levels using sound pressure – Laboratory methods for reverberation rooms.

ISO xxxx2 Noise emitted by machinery and equipment – Determination of sound power levels and sound energy levels using sound pressure – Laboratory methods for free-field and hemi-free-field rooms.

ISO xxxx3 Noise emitted by machinery and equipment – Determination of sound power levels and sound energy levels using sound pressure – Methods for a free space over a reflecting surface.

ISO xxxx4 Noise emitted by machinery and equipment – Determination of sound power levels and sound energy levels using sound pressure – Comparison methods using a reference sound source.

None of the titles include the accuracy grade of the method, but the first two will be laboratory methods of the highest precision. All of the standards will give data on measurement reproducibility and information on factors affecting it.

ISO xxxx1 will replace ISO 3741:1999. The overall approach retains both a direct method and a comparison method, but modifications include the addition of methods for determining the sound energy level for a source which emits impulsive noise or bursts of noise, and methods for normalising sound power levels and sound energy levels to reference barometric conditions.

ISO xxxx2 will replace ISO 3745:200x. Again, methods are added for determining the sound energy level, and for normalising all levels to reference barometric conditions.

ISO xxxx3 will replace ISO 3744:1994 and ISO 3746:1996. The procedures for obtaining sound power levels and sound energy levels in frequency bands will remain as they are already, but those for determining the A-weighted levels (most commonly used for noise declaration) will be radically different. Data will be given relating the number of microphone positions on the measurement surface to the overall measurement reproducibility, for noise sources having different directivity characteristics. The experimental basis for the approach adopted is described in Richard Payne's paper to this meeting. Normalisation to reference barometric conditions is not incorporated into the method, but the range of conditions under which the method may be applied is restricted.

ISO xxxx4 will replace ISO 3743-1:1994 and ISO 3747:2000.

3. DEVELOPMENT OF THE NEW STANDARDS

Fully drafted versions of ISO xxxx1 –xxxx3 have already been presented to working group 28 of ISO/TC 43 Sub-committee 1. A draft for ISO xxxx4 is expected to be prepared during 2001.