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NOISE DECLARATIONS - THE NEW ISO 4871

R F Higginson

Higginson Acoustics Ltd, Bracknell, Berkshire, UK

1. INTRODUCTION

Revision of International Standard ISO 4871 has been in progress for some time, and was first described in a previous Inter-Noise paper [1]. A completely new version of this standard is being prepared to satisfy, among other things, European requirements [2] for a method of presenting information on the noise emission from machinery. ISO 7574 [3] covers this topic, but in too much detail for many practical applications. ISO 9296 [4] is more "user friendly" in relation to business and computer equipment, and the more straightforward approach adopted there was needed in the new standard, but with wider application both to different machinery types and different means of expressing noise emission.

Two draft versions of the new standard have been circulated within ISO already. While in principle these received enough international support to be adopted, some strong negative opinions were expressed, and so a third draft has now been issued for final voting. The voting process is going on in parallel within ISO and the European standards organization CEN, and though the main text is identical in both cases, the European draft includes an informative annex which draws an important distinction to be made in the context of EU legislation.

This paper reviews the discussions which have lead to the preparation of the new draft and summarizes the important changes which have been made.

2. THE OLD DRAFT

DIS 4871.2 [5] said that any one or more of the A-weighted

sound power level, the A-weighted emission sound pressure level, and the C-weighted peak emission sound pressure level could be used as noise emission values of machinery. Declared noise emission values were said to represent statistical upper limits below which the corresponding measured values would lie when the machinery was new, and declaration of these values (in the instruction brochure and descriptive or sales literature) was the sole responsibility of the machinery manufacturer. Only guidelines were given for methods of noise emission declaration, in an informative annex. It was recommended that an amount K, in decibels, be added to the measured level to obtain the declared level, where K depended upon the uncertainty associated with the measurement method. Guidance was given on the determination of K, but its value was said to be usually between 2 dB and 4 dB when Precision or Engineering methods of measurement are used, and between 6 dB and 8 dB when a Survey method is used.

In national comments, objections were raised to this grossing-up of measurement results for noise declaration purposes. It was pointed out that in European legislation, "either the actual value *(of a sound pressure level or a sound power level)* or a value established on the basis of measurements made on actual machinery" has to be given in the technical documentation describing the machinery. The meaning of "actual level" was not entirely clear, but the implication was that it should be the value direct from a measurement and not a derived statistical upper limit. Behind these comments was the unvoiced fear of many machinery manufacturers that an addition of up to 8 dB to their measured noise levels would make the products appear to be much more noisy than they in fact are.

Objections were raised to the form of presentation of noise information, but not to the inclusion of information on measurement uncertainty as such. For most machinery types, the manufacturer or European agent is indeed responsible for the noise information (although objections were raised in the national comments to such a prescriptive statement in the standard). However, it remains open to a customer or even a competing manufacturer to make a complaint to an enforcing authority if they believe that the stated noise levels of a machine type are untrue. The authority can carry out verification measurements, and it has the ultimate sanction to require the removal of machines from the market if it finds that fraudulent claims have been made. In the event of such verification measurements, it is essential for account to be taken of the uncertainty attached to the original measurements.

In view of the fundamental criticisms made about the second draft of the new standard, major changes were incorporated into the third draft on which voting is now taking place.

3. THE NEW DRAFT

In DIS 4871.3 [6], the formal insistance in a mandatory clause that the declaration of noise emission values of machinery and equipment is the sole responsibility of the manufacturer has been removed. Instead, the "noise emission declaration" is simply defined as the information on noise emitted by a machine, given by the manufacturer or supplier in technical documents or other literature. The declaration may now take the form of either the declared single-number noise emission value or the declared dual-number noise emission value. The noise emission value itself may still be any one or more of the three quantities referred to in the previous draft standard. Now, however, the declared single-number noise emission value is the sum of a measured value and the associated uncertainty, rounded to the nearest decibel, and the declared dual-number value is the measured value and the uncertainty stated separately. There is no mention of a statistical upper limit. The alternative forms of declaration are simply given as such, with no advice in the main part of the standard as to which to choose in different circumstances. The informative annex giving guidance on noise declaration methods is retained, but in this version the uncertainty is said to be usually between 1.5 dB and 4 dB when Precision (Grade 1) or Engineering (Grade 2) measurements are used, and between 4 dB and 6 dB when Survey (Grade 3) measurements are used.

National voting is proceeding in parallel within both ISO and CEN. While the main draft is identical in both organizations, the draft of the EN version for adoption in Europe contains an additional informative Annex Z, about clauses addressing essential requirements of EU Directives. One paragraph of this annex contains a statement that the standard is intended to fulfil the requirements of Directive 89/392 [2], with the exception that for this purpose the possibility of using declared single-number noise emission values is excluded. In other words, information to be given in Europe about noise emission is to consist of measured noise levels and their associated measurement uncertainty.

Concerning verification of noise emission levels, DIS 4871.3 says that the quantity to be verified is either the declared single-number noise emission value, L_d, or the sum of the separately-stated measured noise emission value, L, and the uncertainty, K, depending on the form of the noise emission declaration. A number of alternative approaches to verification are then described. If a single machine is evaluated, yielding a measured noise emission value of the verification, L_1, the verification criterion to be satisfied is:

either $L_1 \leq L_d$

or $$L_1 \leq (L + K)$$

as appropriate.

However, if one machine is evaluated in order to verify the noise emission declaration for a batch of machines, yielding a measured noise emission value of the verification, L_1, the criterion to be satisfied in order that the declaration for the whole batch is verified is:

either $$(L_d - L_1) \geq 3{,}0 \text{ dB},$$

or $$[(L + K) - L_1] \geq 3{,}0 \text{ dB},$$

as appropriate.

The batch is rejected if the measured noise emission value of the verification, L_1, satisfies the criterion:

either $$(L_d - L_1) < -0{,}5 \text{ dB},$$

or $$[(L + K) - L_1] < -0{,}5 \text{ dB},$$

as appropriate.

If $$-0{,}5 \leq (L_d - L_1) < 3{,}0 \text{ dB},$$

or $$-0{,}5 \leq [(L + K) - L_1] < 3{,}0 \text{ dB},$$

the decision for the batch of machines cannot be made based on the verification measurement on one machine. In this case, an additional two machines from the batch must be evaluated. The noise emission declaration for the whole batch is then verified if the average noise emission value, $\bar{L}$, calculated from the three individual values, L_i, using the equation:

$$\bar{L} = \frac{1}{3} \sum_{i=1}^{3} L_i$$

satisfies the criterion:

either $$(L_d - \bar{L}) \geq 1{,}5 \text{ dB},$$

or $$[(L + K) - \bar{L}] \geq 1{,}5 \text{ dB},$$

as appropriate.

4. CONCLUDING REMARKS

The closing date for voting on the new draft is 1996, mid-July.

The form of words now used is rather tortuous in some places, having to allow for the alternative means of presenting noise emission levels, and it makes the drafting of the requirements rather clumsy. Nevertheless, it does make clear the important principle that the uncertainty is to be regarded as an integral feature of measurement results, and it should promote the collection of uncertainty data from different measurement methods, on a wide variety of machinery types.

5. REFERENCES

[1] R.F.Higginson, Proc. Inter-Noise 91, 127 (1991).
[2] Council Directive 89/392/EEC, Official Journal of the European Communities No. L 183, 9, (1989).
[3] 'Acoustics - Statistical methods for determining and verifying stated noise emission values of machinery and equipment', ISO 7574 (1985).
[4] 'Acoustics - Declared noise emission values of computer and business equipment', ISO 9296 (1988).
[5] 'Acoustics - Declaration and verification of noise emission values of machinery and equipment', ISO/DIS 4871.2 (1994).
[6] 'Acoustics - Declaration and verification of noise emission values of machinery and equipment', ISO/DIS 4871.3 (1996).