MEASUREMENT BY VENDORS FARRAGOES FALLACIES AND FACTS

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With the advent of noise control standards in countries throughout the world to control both noise exposure of employees and the neighbourhood there is a need to design industrial complexes to carefully chosen noise standards. The treatment normally required to meet these standards is not given free, neither does it improve production, nor ease maintenance of equipment. Inaccuracies in design are generally expensive. If the treatment specified is inadequate then additional treatment may need to be added after construction at considerable extra cost. If the treatment specified is excessive then money could have been saved by not carrying out some of the treatment.

One major source of inaccuracy is the basic machinery sound level data supplied by vendors. Such data is, hopefully, based on measurement of the particular vendor's equipment.

This paper describes the state of the art of acquisition of such data, and indicates ways of improving the general accuracy of data provided.

The standards for testing which are in use in the UK are:-

OCMA NWGI rev 1 or 2
BS 848 part 2
BS 4196
BS 4813
BS 4999 part 51
ISO 3740 to 3746

There are a similar number of standards in use in most European countries and in the United States.

The list of standards for the measurement of machinery noise is, therefore, quite formidable. The choice for the designer is confusing enough, the choice for a vendor who is selling to the world market is even more so.

The intent behind each standard is to describe a measuring system designed to provide the purchaser with sound emission data of reasonable accuracy. The accuracy of each individual standard is dependent on the measurement method adopted and varies from standard to standard. Any attempt by a vendor, therefore, to design a test facility to suit more than one method of test must inevitably result in unwarranted expense and confusion.

It is very simple to define what measurement should be carried out by vendors of equipment. The measurement required is a sound level measured at a given distance from the equipment (usually 1m) which is free from close field effects and which is measured under free field conditions, or corrected to free field conditions.

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There are several ways to achieve the required result, which are:-

1. Measure in an Anechoic chamber
2. Measure out of doors
3. Measure direct and reverberant sound level in a semi-reverberant room and correct for reverberation by:-
   - 3.1 Calculation
   - 3.2 Measurement of reverberant time
   - 3.3 Measurement of room constant
   - 3.4 Measurement of reverberant sound level
4. Measure in a room and correct for room effects by measuring at two different distances.
5. Measure in a reverberant room or a reverberation chamber and correct by room calibration
6. Measure in a room and ignore room effects
7. Measure equipment on site, taking account of background sound level

Vendors often do not understand what is required by measurements of sound level and therefore tend to report a "representative" sound level, in other words the sound level of a typical piece of equipment under "typical conditions", and expect designers to work with data which is just not suitable.

There is a tendency to assume that because noise data means nothing to the vendor it also means nothing to the recipient; that because noise, or the lack of it, does not affect the process performance then noise itself is not significant. This is not true. It is also very difficult to persuade a vendor to spend money on improvements to his acoustic testing facility. Consequently, there are pump vendors who confidently offer sound pressure level data which owes more to the works driver noise than to the noise from their pump. There are fan vendors who measure fan casing radiated noise with open inlet and discharge. There was also a report on a fired heater which stated that the weather at the time of the test was "Heavy rain gusting wind".

In one sense it is fortunate that any inaccuracy caused by incorrect measurement generally increases the vendor predicted sound level. Any improvements in measurement techniques must, therefore, tend to reduce the sound levels quoted by vendors. Any reduction in vendor estimated sound levels must inevitably lead to a cost saving in noise control treatment. This implies that inaccuracies in vendor measurements may cause money to be spent on noise control treatments which are unnecessary.

It is the authors' opinion that there are two keys to improving the quality of sound level data supplied by vendors. These are: to standardise on a method of test and apply it to all vendor measurements within any given industry; and to find a way of passing on, in cash terms, the benefit of more accurate (and therefore generally quieter) sound level measurements to the vendor.

By standardisation, we imply that there should be a standard method of use, for example by pump manufacturers in much the same way as BS4999 part 51 is

used by electric driver manufacturers.

The most effective way to pass on the benefit of accurate sound level measurements is to specify individual sound pressure levels for equipment items (different levels for different duties), and to make a notional cash adjustment for noise at bid analysis stage. This adjustment being based on the ability of the vendor to meet the sound level requirements of the specification. This notional adjustment is not passed on directly to the vendor, but expresses the benefit of the quieter machine in cost terms. Such treatment allows direct comparison of equipment with different noise emission data. It is, of course, desirable that the vendor sound level estimate from the successful tenderer replaces the original noise specification when the purchase order is given.

Acoustic test facilities should be as simple as possible within the requirements of accuracy of the test. As much, if not more, effort should be given to the selection of the test area as is given to the selection of the measuring equipment. The suitability of an area may be tested by means of a simple broad band random noise source. Such a noise source is described in BS 848 part 2: 1966 Appendix E. It is not necessary to calibrate the source in order to check the suitability of an area, although the calibration may be useful in providing definitive data.

Most test areas would benefit from the addition of areas of sound absorbant in order to control reverberation. In some cases proprietary acoustic enclosure panels may be used in order to define the test area and to control both reverberation and background sound levels within the test area. The advantage of using proprietary enclosure panels is that they are de-mountable, and thus the area used for the test is available for alternative uses if it is not being used for testing.

To sum up, accurate noise data is required by the designer in order to save costs. In order to achieve a satisfactory level of accuracy, the vendor should be given more guidelines on methods of test and such guidance ought to be related to equipment type.

The best way to pass on the benefit of lower vendor sound level data is to make a notional modification to the bid price to favour the quieter, and more accurately measured, machine.