The Use of Noise Dosimeters for Workplace Noise

THE USE OF NOISE DOSIMETERS WITHIN THE WORKPLACE

In recent decades, increased mechanisation has drastically changed the industrial work environment. This has led to many changes to an employee's work pattern. It used to be the case on the majority of production lines that an employee would stay in one place for their working shift. Therefore, monitoring their noise exposure with a sound level meter was very straightforward. However, with the increase in completely mechanised production lines, employees may now supervise several automated machines. This means that they now move around from area to area resulting in much more dramatic and varied exposure to noise.

Handheld or worn?

The only way to monitor precisely an individual's exposure to noise is by using either a sound-level meter or a dosimeter. A sound-level meter (pictured) is a hand-held device that allows a competent third party to take measurements at the operator's ear (or within 10-15 cm) with the instrument pointing at the noise source. By repeating this exercise for all the operations an employee performs during the day, you can calculate their daily exposure. Where it is difficult to get close to employees with a sound-level meter (as in the case of forklift truck drivers, for instance) or where workers are exposed to many different noise levels, they should wear noise dosimeters (see pic). This is the case more often in the modern workplace. Using a standard sound level meter, you would have to measure the noise levels at each location and find out how long the worker stays at each place, and then calculate the overall exposure.

The use of noise dosimeters

If these complex work patterns exist in your workplace and a noise dosimeter fits the bill, it is important to realise how they should be used, recognising the limitations and pitfalls in using them, and conducted at a time which represents a standard working environment. Given the logarithmic nature of the decibel scale, a variance of only 1 or 2dB can often mean serious misinterpretation of noise levels. This margin of error should be accounted for and the worst case scenario measurement taken as the reading, particularly when close to an action level.

A noise dosimeter consists of a microphone on a cable, which can be clipped to a lapel or collar. The microphone cable is then passed under the clothing to the unit itself, which is small enough to be located in a pocket or clipped to a belt. The dosimeter can then be started at the beginning of the shift. If it runs until the end of the working day, then the noise dose can be directly read from the instrument or downloaded without the need for calculations.

Another useful feature of noise dosimeters is that they will 'log' the noise data so that, when downloaded to a PC, the time history of the noise can be viewed, as illustrated below. This gives the ability to analyse when and where high noise exposures occur. This can be even more useful when the dosimeter can be placed on an employee who is prepared to make a diary of what times and jobs he or she was performing throughout the day. This will give an employer the ability to directly see which operations most need noise control in order to reduce noise exposure.

With a traditional noise dosimeter, it is fixed to the worker's belt, then a microphone on a cable is attached to the collar near to the ear. You should make allowances for human nature. Employees fitted with dosimeters and their colleagues will often shout into the microphones, distorting the readings so it's best to ignore the first few days' results, until the novelty wears off.

One advantage of dosimeters is that if employees wear them for complete work shifts the noise dose is measured in full, so you do not need to make any extra calculations to arrive at a full measure of exposure. However, if you need to make several measurements of different employees in the same day, a dosimeter can be moved to different employees, as long as the measurements taken for each employee are representative of their working day. Most modern dosimeters will also project the noise dose forward to the standard 8 hours, so no calculations are needed.

With innovations in digital technology, noise dosimeters are becoming smaller and smaller. The latest 'badge' dosimeters, like the *dB*adge2 (see pic), have certain advantages over traditional dosimeters. Essentially, because the whole dosimeter is in a package that is small and light enough to be worn on the shoulder, it means there are no microphone cables. If there are no cables to get in the way, not only is it safer to wear, but employees are less resistant to wearing it, and are therefore much more likely to forget it is there. This means the quality of the noise data collected will be much improved.

Due to the small size of badge type products, it is also possible to mount them in more innovative ways, such as on a hard hat (see pic). This allows the dosimeter to not be mounted on clothing at all, therefore completely removing it from the employees mind.

The badge dosimeters, like the *dB*adge can therefore be mounted close to the ear, without interfering with an employee's working process in any way.

Windshields also play a crucial role in any sound level measurements. Windshields should be used even when indoors. With reference to dosimeters they provide protection from dust settling on the microphone, as well as knocks.

Standards and accuracy

Noise dosimeters are manufactured to IEC 61252, the international standard for dosimeters. These are classed as 'Type 2', which is the required accuracy for workplace noise regulations. Noise Regulations stipulate, to check the accuracy of the dosimeter, that the dosimeter is checked with a field calibrator before use. Field calibrators produce a noise signal, normally a tone of 1 kHz at 114 dB. It is best practice to run the calibration test after any period of field measurement as well, to check that there has been no significant drift of the dosimeter during the measurement. To illustrate, see how the *dB*adge2 is fitted to an acoustic calibrator (see pic).

The Regulations say both the dosimeter and the acoustic calibrator must be returned to the manufacturer for a full calibration every two years. This is because an acoustic calibrator is used as a 'field' check to ensure that the dosimeter is working correctly by checking at one frequency and level. A true calibration, performed by a calibration laboratory, does multiple tests. These include testing the measurements across all frequencies and levels as well as numerous other tests, in essence to ensure that the dosimeter still meets the requirements of IEC 61652.

The post process

Modern dosimeters measure all of the essential parameters for workplace noise regulations including daily exposures and peak levels. However, it is important that the data can be easily accessed and the data presented in a format that is easy to understand to a layperson who may not be familiar with all the acoustic terminology. This is why software is important for modern dosimetry. The ability to store data in a format that is by person or place is important so that when you return the data it is easy to remember what it was about. Also, the ease with which the data can be placed into a report is paramount to avoid having to post process a lot of data. Software such as 'Insight' for the *dB*adge2 outputs data into reports automatically, including the average and peak time history, in a simple format with required data for workplace noise regulations.

Conclusion

Noise dosimeters prove crucial for noise monitoring in today's modern working environment, with highly mobile workers and varying noise exposure. They can give valuable information, using the logged time history data, on when and where the majority of noise exposure has taken place. This allows the implementation of noise control in the right place, which is of course the true end goal when performing any noise survey.