

# Noise and vibration training and its practical connection with real life practice in today's world

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## ABSTRACT

Presenting noise and vibration workshops, seminars and lectures over the last 20+ years to audiences ranging from people wanting only to gain awareness to university students and professional people who need to know, demonstrates the need for constantly updating the study material. Updating needs to include not only legislative changes such as the current 2011 Work Health and Safety legislation but also current subject knowledge and technology available to keep the presented material fresh, relevant and meaningful for audience expectations. Modern computer technology such as Excel and PowerPoint enhances capabilities of presenting case studies realistically by using audio and video of real life noise and vibration scenarios. Practical exercises in courses highlight the 'how to do it right' and the "how to avoid pitfalls" with measuring instruments and evaluations aiming to get accurate results and avoid basic mistakes. Such presentations enhance students' and other participants' involvement and problem solving skills.

## INTRODUCTION

Up until about the mid 1990s the use of overhead projectors and blackboards was the generally accepted means of projecting the study material into classrooms. Slide projectors and audio cassettes demonstrating for instance what noise induced hearing loss or tinnitus sounds like, often then supported the presented theory. With these limited materials the challenge was to make the material appeal to the audience so that they would appreciate perceived difficult subjects like noise and vibration management as serious issues and become inspired enough to apply them in their work environments. The challenge still exists today but is made easier because of the introduction of computers and PowerPoint in class contact and self-paced learning situations. PowerPoint for instance enables the use of video and audio segments in presentations whereas Excel enables the use of calculators and spreadsheets to be included in calculations and evaluations of case study material and is seen to be more user friendly than working through complicated formulae. Universities have embraced electronic learning systems which, in principle, no longer require a lecturer to be present in a classroom as the material is presented to students either via an internet based electronic "Blackboard" system or via "virtual classrooms" and "webinars", and can reach students anywhere in the world. These lectures may be followed up with a short but intensive residential period for University practicals and tutorials. Self-paced tutorials given throughout the semester are supervised by a lecturer via the electronic internet based "Blackboard" system. Another important component, essential to the success or failure of the training, consists of the reasons why participants attend, i.e. do they want to learn and work with noise and vibration or do they attend because for some reason they have to. This issue is particularly important for those using the self-paced learning system as their level of discipline and motivation has to be higher than for those attending classroom type situations.

## THE PROVISION OF TRAINING

### Types of training

The different types of training range from the traditional classroom situation to virtual training via webinars and on-

line tutorials to self-paced learning. The self-paced learning type training, whereby participants must pass a short test at the end of each module before they can progress to the next, is gaining in popularity with many institutions and even in work environments. In work environments this often takes the form of induction training but can be substantially more encompassing. One problem with this type of training is that participants can redo the tests as often as is necessary to pass a module. This does not necessarily equate to the participant knowing the material studied. On the other hand in the classroom type situations participants seem to be more motivated and stimulated as it offers greater possibilities for participation and exchanging experiences.



(Source: B. Groothoff, 2012)

**Figure 1.** A Classroom situation showing training in inserting earplugs

On-line tutorials in a university setting are periodically released during the semester period and require students to complete a tutorial within a set period of time. During this period they can try and submit the tutorial as often as they need to before final marks are allocated for each tutorial. They can also pose questions on the internet based "Blackboard" system's "Discussion board" which can then be answered among students themselves. This is a very popular and effective form of study as it stimulates thinking among fellow students to solve a problem and with the lecturer only needing to supervise in the background and only intervening when either asked or students go off in a different direction than required for solving the particular problem posed.

During the short “residential” practice period students get the opportunity to put the theory into practice with scenarios in which they actually use sound level meters and submit reports of simulated real life complaint situations. The photograph below shows such a situation where small groups of environmental health students are preparing to conduct a noise assessment using sound level meters. The results are shared among the members of the individual groups but individual reports are submitted.



(Source: B. Groothoff, 2012)

**Figure 2.** Students preparing to conduct a noise assessment

**Training material and its relevance to the real world**

The author has, over the last 25 years, written and presented training material for a wide variety of audiences in industry, government departments and universities. Because of the varied audiences the material had to cater for those wanting to gain only an awareness of the effects of environmental or occupational noise on people or the health effects of human vibration, to those needing in-depth knowledge of noise or vibration management. Awareness raising seminars and workshops are normally given over a day’s period and the more in-depth training over a two or more days’ period. A large percentage of audiences consisted of government inspectors in different states needing the knowledge and competencies to enforce noise regulations to courts’ standards, be they for occupational, environmental or for liquor licensing purposes. Because of the high standard of evidence gathering ability required it was necessary to include practical exercises on the correct use of measuring instruments and calibration, case studies and activities to enable inspectors to obtain evidence and carry out noise assessments to the required standard of the courts. To date, and even under the new 2011 Work Health and Safety Legislation, there are no regulations limiting human vibration exposure training material and the assessment and management of human vibration has predominantly been presented to occupational hygienists in the mining industry and to health and safety inspectorates dealing with hygiene or ergonomic issues. The other major audience for the human vibration subject was from Universities that have an occupational health and safety stream either at under graduate or post graduate level.

To optimise the relevance of the material to the participant and their work environment it is essential that a good brief is obtained as to the expectations the workplace has from the training outcome. It is anticipated that with a good understanding of the work environment’s needs and delivery of tailored training material a positive impact on the attitude towards the management of noise and vibration can be achieved. Where extensive material is provided this can then be used at any time afterwards by the participant as reference for future use and to refresh points missed during the original presentation.

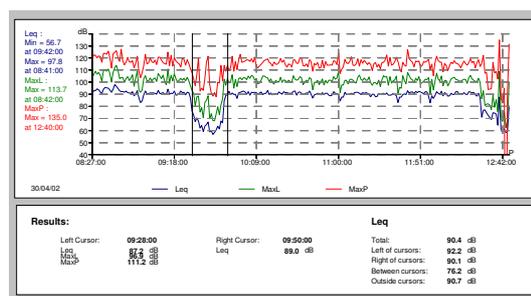
Extensive training material in text format, including diagrams and pictures, is preferred over the handout formats of Power-Point slides which are often provided with popular workshop type seminars. Considering that with an average concentration span of about 20 minutes it is virtually impossible for participants to maintain sufficient concentration over many hours to retain large amounts of information as typically presented in face-to-face forums.

**Feedback**

Feedback on the training material delivered and presented should be sought and invited, preferably shortly after the presentation. It is expected that this stimulates a greater level of positive engagement by all parties. Feedback also enhances opportunities for continual improvement of the training material and presenter.

**Some pitfalls observed**

Despite training in noise and vibration assessment normally including a practical component of using measuring instruments some pitfalls associated with their use are regularly observed. These include not reporting details of instrumentation used, incorrect calibration procedures and, with noise dose meters, the placing and removal of the instrument’s microphone on the wearer whilst the meter is still sampling. The extra noise created during these activities affects both the peak and the Leq results.



(Source: B. Groothoff, 2012)

**Figure 3.** Histogram of noise dose meter showing spurious peaks at the right hand side end

Other pitfalls which, despite having been extensively discussed and demonstrated during activity exercises, include the noise dose meter is recalibrated whilst it is still sampling, the microphone is incorrectly positioned on the worker, long hair or the worker’s collar is allowed to rub against the microphone.

With sound level meters easy mistakes include; not reporting where a measurement was made i.e. at the worker’s ear or at what distance from a source, the duration and representativeness of an activity the worker did, not reporting the effects of relevant conditions at the time of measurement or if reflections or other sources may have interfered with the measurement at a location. Environmental noise assessment mistakes include failure to report the weather conditions completely during the assessment period or reporting a reference measurement location which is independently accessible.

Common problems encountered with the use of both noise dose meter and sound level meter are that the assessor does not ask enough questions, or make and report observations, about the work/environmental conditions and activities and thus may miss some significant aspects that should have been included in the assessment.