



The delivery of noise and vibration study material and real life practice

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ABSTRACT

Presenting workshops, lectures and seminars on noise and vibration over the last 20 years has given the author an insight into the effectiveness of the 'taking on board and putting into practice' of the material studied by the participants. It has also demonstrated the need for constantly updating the study material to keep the presented material relevant and meaningful for the changing audiences. The inclusion of case studies enhances students' involvement and problem solving skills. The advancement of computer technology has made it possible to make the presentations more realistic by incorporating case studies and using audio and video of noise and its effects into power point presentations to which students and other participants can relate. Despite these advancements in study material delivery, in real life basic mistakes, which should not happen, are being observed regularly when it comes to noise assessment. This is particularly true with the use of noise dose meters and, to a lesser extent, the use of sound level meters. Basic mistakes include for noise dose meters the setting-up, attachment and removal of the instrument and for sound level meters not recording where the measurement was made and not obtaining additional information e.g. about the activities and exposure duration.

INTRODUCTION

The challenge with the presentation of lecture and training material for noise and vibration has always been to present it in such a way that students and course participants can relate to the material, become inspired and do something with it. Dry theory by itself does not do it for most participants. The challenge therefore was and still is to 'liven' the theory up with real life examples, case studies and sound effects such as how a person with noise induced hearing loss experiences music. Over the last twenty years enormous changes in technology enabled much more appealing training material to be developed and presented. Twenty years ago the use of overhead projectors was the generally accepted means of projecting the theory into classrooms etc. Videos and CDs with sound effects then supported the presented theory. The introduction of computers and PowerPoint has made things a lot more appealing to the students and the presenter alike in class contact and self paced learning situations. Virtual classrooms via so called webinars are gaining popularity as they can reach students virtually anywhere in the world. The other important component to the success or failure of the training is made up by the attitudes of course participants i.e. do they have to attend or do attend because they have an interest and want to learn and work in the field of noise and vibration.

TRAINING

What is training?

Training can be defined as structured efforts to enhance knowledge or achieve specific competencies. Depending on the purpose and desired level of knowledge the training can

be general, e.g. raising awareness, or specific, e.g. how to use the knowledge gained to manage things effectively. Over the years the author has written and presented training material for audiences in industry, governments and universities. The material catered for ranged from raising an awareness of occupational or environmental noise to providing a detailed know-how of acoustics, noise management and the pitfalls of conducting environmental or occupational noise assessments, with courses of several days duration. Included in these audiences were a large number of government inspectors in different states who needed the knowledge and competencies to enforce noise regulations, be they for occupational, environmental or for liquor licensing purposes. This makes it imperative that courses contain the necessary information, case studies and activities to enable inspectors to carry out noise assessments to a standard acceptable to the courts. Human vibration training material was presented predominantly to those working in an occupational hygiene role in the mining industry and to health and safety inspectorates dealing with hygiene or ergonomic issues.

Training is the way to better manage risks

In many industries the provision of training is acknowledged as a key component to enabling key staff members more effectively control occupational and/or environmental risk. As training providers we owe it to our clients to deliver training that meets the goals of the organisation and hereto we need to have a clear brief as to the objectives and desired outcomes of the training. This applies equally to private industry workers and government inspectors. However, a large component as to the effectiveness or otherwise, of the training depends on factors which are external to the training, i.e.

the support and commitment of management, the organisation's culture regarding health and safety or environmental management and workers' responsiveness to the training. Training is usually more successful where managements provide their workers with opportunities to apply their gained knowledge by making time and resources available to enhance the practical skills of these workers so they become successful and minimise mistakes. To stimulate such provisions it is usually beneficial to start with the training and education of managers and supervisor so they get an appreciation of the complexities of assessments and do not get caught out when question are asked. The selected trainees should ideally be those that have an interest in the subject and not attend because they were made to.

Ideally there is after-training follow up through a system of mentoring by the training provider and dialogue with peers or team members.

For workplace health and safety inspectorates there are three levels of occupational noise training available, i.e. basic, intermediate, and advanced level. The basic course can be seen as an introduction course enabling inspectors to conduct simple assessments to evaluate whether or not noise is likely to be excessive in a particular workplace. In Queensland this course has been a requirement since 1996 for all workplace health and safety inspectors as part of their induction training. In some other states this was less so and only an Intermediate noise course, comparable to Post Graduate level, was presented to the inspectors. In Queensland the intermediate course is a bridging course to the advanced course which is of four days duration plus a 4 hour open book exam. The advanced noise management course provides inspectors with indept knowledge of all aspects of managing occupational noise and if necessary, enforcement of the noise regulations to prosecution level. Both the intermediate and advanced level course are available to interested inspectors on a voluntary basis. Most general inspectors however, elect to do only the basic course and continue to work in their field of expertise for which they were hired in the first place. Inspectors working in occupational hygiene are encouraged to do the higher level courses as well. For inspectors working in the hygiene field or ergonomics a human vibration course is also available.

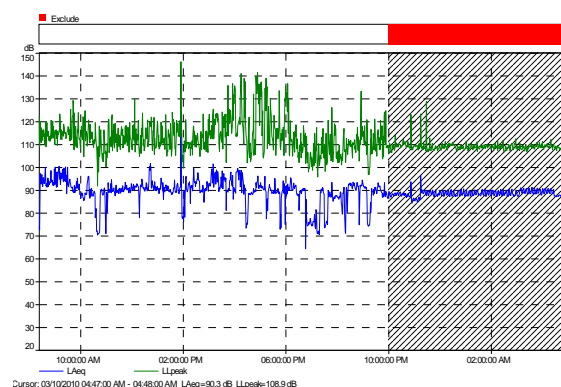
The provision of the two day training courses in occupational and environmental noise, and the one day human vibration training course for the private industry fell victim to the global financial crisis during 2008 and 2009 with companies reducing their training budgets and consequently abandoning proposed training programs. This no doubt has a flow-on effect on the ability to effectively and reliably conduct assessments to managing noise and vibration in some of these industries. The courses are normally presented at a central location but are flexible enough to be adapted to the specific needs of a company and, depending on numbers of participants, to be delivered on-site if so desired.

Modern university lecture methods have become very flexible and involve, next to presenting formal class lectures and tutorials, providing the lecture materials to students via the intranet to which students have remote access at any time. The lectures and tutorials are often recorded and can be listened to via the intranet at any time afterwards, which is particularly helpful for external students. Similarly assignments and study queries may be discussed via webchats between lecturer and students. These methods form therefore a more intensive method of teaching with a greater student and lecturer involvement compared to the traditional formal lectures as presented prior to the advent of computer technology. An added advantage of the availability of computer based lecture

material is that students can be anywhere in the world and follow the lectures. This is particularly true with post graduate students who often have a full time job as well and are unable to attend lectures due to distance or otherwise.

Some pitfalls observed despite training

The provision of training normally includes a practical component of actually using measuring instruments including instruction on the pitfalls associated with their use. Despite this some classic mistakes can be observed with noise assessments using noise dose meters. These include incorrect calibration procedures and the placing and removal of the instrument's microphone on the wearer whilst the meter is sampling. The extra noise created during these activities affect both the peak results and the L_{eq} 's. Another less often observed, but nevertheless regular occurrence is the inattention to ensuring the instrument is actually turned off after an assessment. An example is shown in Figure 1 where an assessment was carried out using a noise dose meter.



Source: (B. Groothoff, 2010)

Figure 1. Noise dose meter results, shade area is excluded

On finalisation of the assessment the meter was recalibrated but for some reason not switched off and was put in its box. The meter was not looked at until several hours later. Because of modern software programs it is possible to exclude the irrelevant data (the shaded area), rescue the relevant data and recalculate the worker's exposure during the actual measurement period and determination whether or not to validate the measurement, if needed, by repeating it. The validity of this particular measurement is of course in question. Other pitfalls, which despite having been extensively discussed during practical activity exercises, observed using noise dose meters include, the meter is sampling whilst being installed on a worker or removed, the microphones is incorrectly positioned on the worker, long hair or a collar is allowed to rub against the microphone, or the meter is not being worn for short periods of time during the measurement.

The use of sound level meters is preferred as it avoids the above pitfalls and in the hands of an experienced operator can provide more results in less time provided additional information about activities is also obtained. However, significant mistakes can be made by the novice assessor. The most obvious mistakes observed with sound level meter use are those of not reporting particulars of where a measurement was made i.e. near the worker's ears or at what distance from a source, including the duration and representativeness of an activity, not reporting the effects of relevant conditions at the time of measurement or if reflections or other sources may interfere with the measurement at a location. The other common problem encountered is that the assessor does not ask enough questions, or make observations, about the work conditions and activities and thus may miss some significant aspects that should have been included in the assessment.

With environmental noise the assessment problems, apart from instrument set up, could consist of the assessment not having been made at the relevant time or location, or the background conditions were not assessed properly by not excluding certain extraneous noises. Problems may also occur with applying weightings for tonality and/or impulsiveness of the source noise as the relevant Australian Standard (AS 1055) allows a subjective judgement to be made on the basis of how clearly the tonality or impulsiveness is audible. The assumption is that the assessor has good hearing which is of course not always the case. To avoid such ambiguity and potential questioning in court cases, objective calculation methods for tonality, in accordance with the Standard's requirements, should be followed. Mistakes like described here should not have to occur with appropriate training and instruction, extensive training material, case studies and follow up.

Training material

The provision of extensive training material is preferred over the popular handouts of PowerPoint slides often provided with workshop type seminars. The main reasons for this are that it is virtually impossible for participants to maintain a sufficient concentration span over many hours to contain large amounts of information in one go, as is typically presented in face-to-face forums as shown in Figure 2.



Source: (B. Groothoff, 2008)

Figure 2. Demonstration of vibration meter during seminar

Where extensive material is provided the participant can later go over the material again to refresh points missed during the presentation and keep the notes as a reference for future use.

The material should be as relevant to the participant and their work environment as it can be made. This will ultimately have a positive impact on the behaviour and attitude towards the management of noise and vibration by giving participants the necessary knowledge and understanding of why intervention action needs to be taken.

Input and feedback

Input and feedback on the subject contents and materials presented should be sought and invited. This approach leads to producing a greater level of engagement by participants and teachers alike as a closer connection will be formed with the course development and mode of presentation from the outset. Input into the development of the course material is required to accommodate and meet the expectations of the organisation. Feedback is also important from the point of view that it enhances opportunities for continual improvement of the training material and presenter.

Mentoring

Over the years the author has seen many mentoring programs being initiated and fail. The failing occurred predominantly because of no ongoing commitment by the party being mentored. The process of mentoring requires long term commitment from both parties and is initially quite intensive but will become less so with the mentored person gaining more experience and confidence in the chosen subject. This is where the initial training and follow up mentoring pays off. Mentored workers generally perform better than those who only received the training without follow up. The main reasons for this are; they have an interest in the subject and are generally able to work regularly in the field for which they are being mentored.