

Presentation: "Getting to Grips with Vibration"

Peter Wilson, Director, Industrial Noise and Vibration Centre (INVC)

Peter launched his presentation with a question to the audience about their experience of Vibration White Finger (VWF), which turned out to be minimal! He then said that the reality was not just that fingers went white, but that sufferers had no feel for everyday things. He reinforced this claim by quoting the case of a woman who could not even pick up a pencil from a table!

He went on to say that there were many mythologies surrounding noise and vibration issues, which very often resulted in poor management of the risks. He continued by saying that everyone should "mind the gap between expectation and reality". The reality, he said in a very graphic illustration, is that in the later stages of VWF, sufferers could not perform even the most personal, life-changing functions like "wiping their own bottoms"! The medical books don't tell you that, but it really does bring home the reality of not controlling the risks in earlier life.

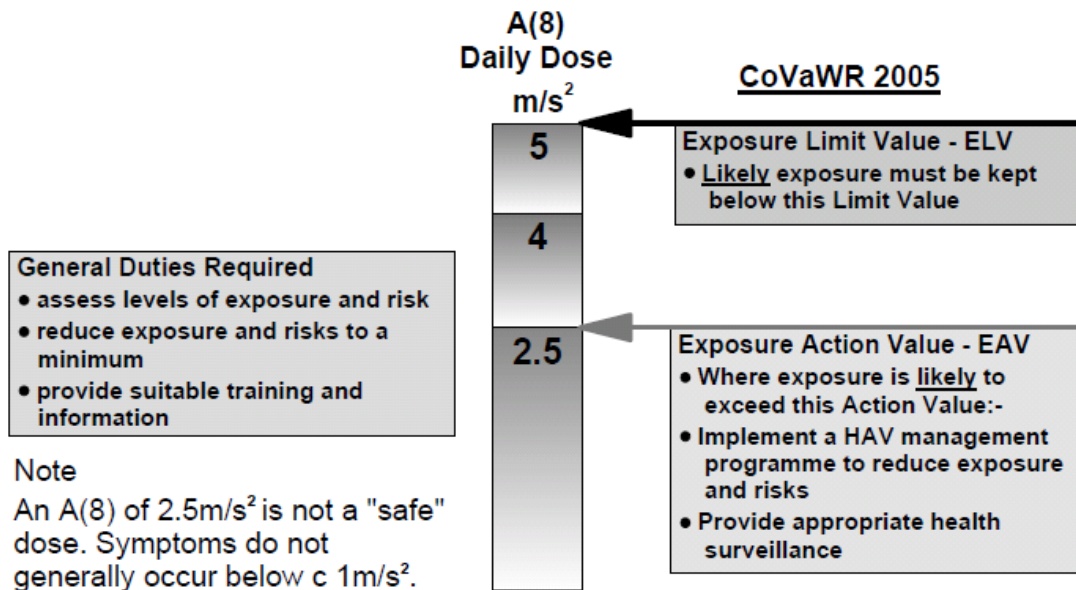


Peter then cited the HSE guidance on the subject of "The Control of Vibration at Work Regulations" which is "These Regulations are about controlling vibration exposure at work – they are not about measurement..." Peter explained that Peter Wilson, Industrial Noise & Vibration Centre. "People measure, as an excuse for doing nothing" and he recommended the HSE Website which, he said emphasised that it was all about the **Control** of Vibration Regulations not the **Measurement** of....!

In describing the basis for controlling risk, Peter then displayed the main elements of the Regulations (see next page). He commented that the physical health effects at the lower action levels were just an "educated guess" but that anything over the Daily Dose of the **Exposure Limit Value (ELV) of 5m/sec²** was certainly very dangerous! He went on to say that the level of the **Exposure Action Value (EAV) of 2.5m/sec²** could not be guaranteed as safe but added that symptoms do not generally occur below **1m/sec²**. Peter cited a case study where the HSE were involved in enforcement and the management had just done measurement enough to say "we

have a problem"! This did not solve the problem, however, as this needed the implementation of risk control measures!

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How do you decide how best to spend your budget to meet these requirements?

Effective Risk Control Measures Peter said, could only be implemented as the result of a systematic Vibration Management Programme, similar to the one that he proceeded to outline. The objective, he said, was to establish and implement “Best Practice” for each element - *in your particular circumstances*”....

- Identify potential hazardous tools and operations
List tool types, models, manufacturer, accessories/consumables + task types
- Assess risks for tools and operations
Take a representative sample and use published data
- Train managers, supervisors and operators.
- Implement the Risk Reduction Programme
Consider PPE ergonomics, operation conditions, maintenance, engineering modifications....
- Buy low vibration equipment
implement a vibration procurement policy
- Implement a Health Surveillance Programme
Where A(8) exposure is likely to be > 2.5m/sec²
- Reduce exposure times and introduce job rotation.
- Audit the Programme.

Risk assessments made as part of the programme, should additionally include: -

- Tools and Plant
list items of plant/tools that could pose a potential risk
- Vibration Data
acquire matching field data from reliable sources. Peter mentioned the The Off-highway Plant and Equipment Research Centre (OPERC) and INVC Databases that could provide reliable information.

He added that vibration assessments should be set up for the **minimum** number of tasks for which good information is **not** available. He added that measurement could not be made by handheld transducers.

- Trigger Times

Realistic estimates of likely finger-on-trigger times, for various tools and tasks, were necessary. Very often assessors'/operators' perceptions were too high. Peter mentioned the recently available **HAVi** meter that was very good at giving exposure estimates for initial assessments and as a tool for reminding operators of the actual risk levels. These cost only £35 -£50/unit and the Supplier had a display of these products in the meeting room.

Peter went on to emphasise that the only reason to carry out an assessment was to provide data to needed to develop a practical Plan of Action to reduce the risks. He identified these elements: -

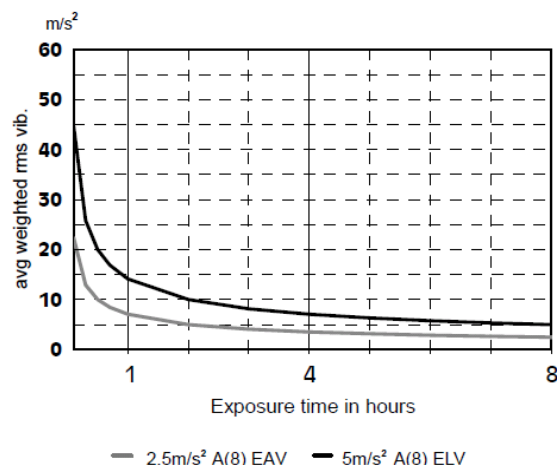
- Best Practice Objectives

- assess typical operator tool and/or task (for multiple tools) vibration exposures in terms of daily dose or dose per task e.g dose per wheel(wrench/wheel nuts); dose per metre of trench excavated.
- evaluate data to generate statistics for each task, which are then used in the risk assessment. Measure a representative range of vibration levels for each tool, not a precise figure.
- develop an Action Plan to implement a risk reduction programme.

- Resource Allocation

- spend the minimum on assessment of both vibration values and trigger times. once you have good representative statistics, any further expenditure on assessment is unnecessary
- spend as much of your resource as possible on risk reduction, **rather than measurement.**

Equivalent Daily Vibration Exposures



This graph clearly shows that, for short trigger times, the daily dose is more influenced by the magnitude of the vibration, than by duration of operation. The implication is that it is more beneficial to use low vibration tools than try to reduce trigger times. It also follows that accuracy of vibration values is much more important than accuracy of trigger times.

Importantly, Peter continued, unlike most other workplace risks, it is only necessary to carry out a full HAV assessment *once*. Unless you change the tools or the way they are used, there is no need to re-assess – simply update data to include any new plant. *This is a fundamental difference that affects the economics of purchasing vibration monitoring equipment for in-house use.* (e.g. Noise assessment have to be reviewed at least every two years). Peter recommended the HSE on-line tool for calculating exposure levels.

Having dealt with the stistical side of risk control, Peter then turned to the matter of Training. This, he added, is one of the most important programme elements as there is a considerable lack of knowledge of the risks and costs of vibration, plus substantial under-reporting by operators. It should cover: -

- **Management & Supervisors:** personal motivation, company policy, vibration management programmme
- **“Toolbox talks” for Operators/Supervisors;** personal motivation and risk prevention, symptom reporting procedures, company policy.
- **Competency Training;** for large companies

Personal behaviour, Peter added, has a very large impact on the health risk posed by any given vibration exposure, as he displayed this ‘action photo’!



16m/s²: 12 minutes re 2.5m/s²; 48 minutes re 5m/s².

Obviously he is trying to make a fashion statement by not wearing ear defenders, smoking and not wearing gloves! The last two are directly related as aggravating factors for VWF risk! Also, warm-to-touch handles would mitigate the effect of cold weather and would additionally reduce the need to grip the handles too tightly. Peter added that there was no PPE that would directly control VWF and that so-called “Anti-vibration” gloves have little or no effect on weighted levels of hand vibration. Moreover, he continued, they are so thick and unwieldy that they make the act of gripping handles so much more difficult and actually aggravate the symptoms. Conventional gloves keep the hands warm and provide better ergonomics as they are

so much more comfortable. As far as personal behaviour is concerned, Peter recommended reducing the risk by: -

- Maintaining a good blood flow by;
 - keep hands warm
 - exercise hands and fingers regularly during work
 - stop or reduce smoking before and during work
- Minimising grip strength (tool use ergonomics)
- Breaking up work – short periods are better than longer use
- Maintaining equipment and use the best tool for the job. Peter mentioned that any anti-vibration features on tools are a high priority for stringent maintenance. He also mentioned an incident where an operator noticed a distinct increase in vibration levels when a needle broke on a ‘gun’.

Dealing with health surveillance, Peter advised the early reporting of VWF symptoms, such as: -

- white fingers when cold
- numbness
- pins and needles
- Chillblains

He also urged members not to assume that changes are “normal” and due to ageing!

On the subject of prevention of the risk, Peter said that the ergonomics of any specific tool use have a substantial effect on the risks to the operator for any given vibration exposure. When purchasing tools he strongly recommended: -

- Selection of tools for ergonomic reasons as well as vibration and other factors such as noise.
- Creation of guidelines for correct tool selection and use on each type of operation
- Training of operators and ensuring that they understand the reasons for correct use

He asked the rhetorical question “What happens to your hand when you carry a heavy suitcase with a narrow handle for any length of time?”

Peter then quoted a risk reduction solution from the HSE Vibration solutions book, involving nut running on a car assembly line. The solution involved making it a group activity, to allow job rotation, selection of low vibration tools and a tool suspension system to take the weight off the operator. Other measures were aimed at changing a process like using a remote control on a vibrating plate to compact road bases or a jig mounted breaker to replace a manual riveting hammer to knockout casting shells.

when tools were new, they worked effectively but had to be maintained in order to keep working as effectively! He quoted these examples of how to do it: -

- use correct air pressure
- check condition of cushioning seals, bearings etc.,
- check condition of tool bits
- check condition of cutting discs and other rotating elements
- check for wear on spindles – accurate location is important for balance

- check condition of gears
- check condition of any vibration isolation features
- implement a policy that operators should report maintenance problems (particularly unusually high levels of vibration) so that they can be corrected

An increasingly useful facility in procurement, Peter commented, was to be able to hire equipment for an evaluation programme before buying the most suitable type of tool. The salient qualities of tools are: -

- **Impact Tools**
 - internal vibration cushioning (springs, air cushions) – effect on performance
 - weight increase – but reduced ergonomics
 - drill-bit design
 - vibration isolated handles
- Rotating tools
 - weight distribution
 - auto-balancer, accurate positioning of disc
 - geometry – less response to vibration
 - vibration isolated handles

When it comes to hiring tools for general use, Peter sounded a note of caution about manufacturers' declared data, because they are conducted on machines on artificial loads, to get consistent results. Field data, by contrast, were shown to be many times higher than the makers because, for instance, a road cutting disc on tests was changed very regularly indeed to give a better performance. He also quoted angle grinder field tests, where the results for fettling compared with cutting-off yielded very different vibration values.

In conclusion, Peter said, that if employers' actions were ever questioned in court, it was essential to be able to prove adoption of 'best practice', that basic data for assessments had been proven on site and that practical measures had been taken to reduce risk as distinct from just taking measurements.

Members' Questions

David Hughes of Hughes Business Services asked what the top priority was to control vibration risks and Peter replied that Engineering Controls offered the best solutions.

Chris Jones of the Key Consultancy asked what about the effect on cyclists of vibrations experienced outside their work situation. Peter countered that by saying that someone who did rockclimbing could suffer the same injuries as a scaffolder and they would be difficult to distinguish.

Another member commented that the HSE were now saying that manufacturers' data should be used for assessments. Peter replied that it was a good starting off point but you have to make a judgement on what the data meant. He commented that there

was no information on an activity operation or what accessories were being used. He added that the INVC HAV Tool Register was based on HSE principles and an article on HAV Assessment could be downloaded from

www.invc.co.uk/pdfs/hav-assessment-article-hsw09.pdf

Secretary's Note: Peter has also made available to me his Tool Register spreadsheet that members can use for a virtual assessment of their tools (at a cost, of course), which he says is faster than doing your own measurement

Andy Mee of the HAVi commented that vibration magnitude covers more than one source and **Ed Friend** agreed with this point. He added that manufacturers' measurements were not accurate and that SMEs placed reliance on them. He also questioned whether the courts were competent enough to understand the evidence to secure a conviction.

Steve Youngman of HSE Construction Group commented that there was not enough education in the workforce although many had received toolbox talks. Peter agreed and said that many knew friends with VWF! Steve spoke about the value of task breaks and commented that past history was more significant. Peter commented that operators also hide symptoms and quoted a case in the north of England where they had taped up the triggers of their tools because they could not apply sufficient pressure to make them work. This type of situation led to a degree of under-reporting of VWF.

Chris Jones of The Key Consultancy asked if there was a database for Whole Body Vibration. Peter said that this was a small problem, except for a limited application on major plant where the manufacturers' data was good. They still had to comply with the same set of Regulations.

At this point, Ed Friend said that there had been a terrific response to the presentation with questions from the members and asked them to show their appreciation to Peter, before he closed the meeting.