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SIMPLE ASSESSMENT OF NOISE EXPOSURE AT WORKPLACES

B. W. Hohmann

Suva, Bereich Akustik, Postfach 4358, CH - 6002, Luzern, Switzerland

Tel.: ++41 41 419 54 94 / Fax: ++41 41 419 62 13 / Email: beat_hohmann@compuserve.com

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ABSTRACT
Employers shall assess the noise exposure of their employees. Suva's 60 noise level tables list several hundred tools, machines or noise sources in the industry. But calculation of the individual noise exposure (LEQ) due to different noise sources remained complicated. Therefore typical noise exposures for almost all the occupations were calculated and published. This simple assessment is not always appropriate. In order to simplify also the calculation of noise exposures due to multiple noise sources, a method using arithmetic addition of "noise units per hour" instead of logarithmic calculations was developed.

1 - HEARING CONSERVATION IN SWITZERLAND

The Swiss National Accident Insurance Organization (Suva) is the supervisory body for the prevention of occupational accidents and diseases. Suva's Acoustics Section supports companies in noise control at workplaces all over Switzerland.
Despite noise control at workplaces there are still about 200'000 Swiss employees exposed to hazardous noise − including policemen (shooting exercises) as well as professional musicians.
Suva carries out about 50'000 hearing examinations per year, using five mobile hearing examination units called "audiomobiles". The hearing examinations are mandatory if the noise exposure over a representative period exceeds 87 dB(A). If the noise exposure is between 85 and 87 dB(A), then the hearing examination is just voluntary. As due to the limited capacity the interval between two subsequent examinations is already close to 5 years, examination of employees with no risk of occupational hearing loss should be avoided.

2 - ASSESSMENT OF OCCUPATIONAL NOISE EXPOSURE USING NOISE LEVEL TABLES

In Switzerland it is the task of the employers to assess the noise exposure and the hazard to hearing of their employees. But for small and mid-sized companies, individual noise measurements are hardly feasible.
Therefore Suva started in 1971 to publish noise tables which list typical noise levels of many tools, machines or noise sources in the industry. Today, the 60 noise level tables cover almost any branch of the industry, but also shooting, music, etc.
However, most users of these noise level tables were not able to calculate the long-term noise exposure of the workers. In most cases, this resulted in a overestimation of the noise exposure. Only the interview and calculation on the audiomobile revealed that the real noise exposure was below the limit and the hearing examination would not have been necessary.
Therefore, Suva's experts felt that a further simplification was needed.

3 - TYPICAL NOISE EXPOSURE PER OCCUPATION

During 1999, based on the extensive database on noise exposures, typical noise exposures for almost all occupations and activities were calculated.
The results are rounded to the nearest 5 decibels, i.e. to 90, 95, 100 dB(A) etc. In the critical range between 80 and 90 dB(A), finer steps are used: 80, 83, 86, 90 dB(A). The limit value of 85 dB(A)

is avoided as it is ambiguous, whereas the value of 86 dB(A) indicates clearly that hearing protection and hearing examination are voluntary (but the employer must provide hearing protectors and also the possibility of hearing examination).
Every noise level table contains now one or two yellow pages indicating the typical noise exposure per occupation.
The new noise tables (trilingual: German, French and Italian) will be available also on Suva's homepage www.suva.ch/suvapro (PDF for Adobe Acrobat Reader).

4 - ASSESSMENT OF COMBINED NOISE EXPOSURES

Wherever this simple assessment is not appropriate, the noise levels of tools or machines must be used for the calculation of the noise exposure. In order to avoid logarithmic calculations, "noise units per hour" are introduced. These noise units are proportional to the sound energy, but not expressed in Pa^2s or Pa^2h, because the scaling is optimized for simple calculation of noise exposure:

- the calculation starts at 80 dB(A) (1 unit per hour)
- 90 dB(A) is equivalent to 10 units per hour, 100 dB(A) to 100 units per hour etc.
- the final assessment may also be carried out based on noise units instead of decibels:
  - below 120 units per week: no risk
  - from 120 to 200 units per week: hearing protection and hearing examination voluntary
  - above 200 units per week: hearing protection and hearing examination mandatory
- the total L_{EQ} may easily be calculated by dividing the total weekly noise units per 40.

Tool, machine, location	Leq dB(A)	units/hour [A]	h/week [B]	units/week [AxB]
grinding machine	95	32	2	64
welding	86	4	2	8
cutting machine	100	100	0.1	10
noise floor in department	86	4	10	40
Total	85			122
Result	hearing protection and hearing examination voluntary			

Table 1: Assessment of the weekly noise exposure.

Early feedback from users indicates that this simple method is appreciated and that systematic overestimation of the individual noise exposure occurs less often.
Moreover, the linear (instead of logarithmic) scale of the noise units emphasizes the importance of higher sound levels.

REFERENCES

1. **B. Hohmann et al.**, *Dangers du bruit à l'emplacement de travail*, Suva, pp. 80, 1995