HPD-RAILROAD – ELIMINATING ACCIDENT RISK ON THE FINNISH RAILWAY

1. Organisations involved

Finnish railways and Finnish Institute of Occupational Health (FIOH)

2. Description of the case

2.1. Introduction

In the railroad yard there are many high-intensity noise sources, which cause the noise exposure level of 85 dB(A) to be exceeded daily for the workers (Table 1).

Table 1. High-intensity noise sources in the railroad yard

Noise source	Noise characteristics	Max level (dB)
Locomotive brakes	High frequency noise > 2.5 kHz	over 115
Wheel noise in turnings	High frequency noise > 2.5 kHz	over 115
Typhoons ([16]) high frequency	0.8 and 1.6 kHz	over 115
Typhoons low frequency	0.5 kHz	over 115
Pressured air	4–8 kHz	115

In addition to the noise, there is an accident risk caused by moving trains. All workers must be able to hear an approaching train and the direction from which it is coming. Failure to do this has resulted in fatal accidents. To ensure that all employees have adequate hearing the Railway Medical Services (UIMC) recommends the following criteria (Table 2).

Table 2. The minimum recommended hearing level

in rail yard work according to UIMC

Condition	1 kHz	2 kHz	3 kHz	4 kHz
When work starts (*)	20	20	20	25
When working (**)	25	25		

(*) Or hear whispering from 5 m with both ears.

(**) Or hears conversation from 5 m with both ears.

However, the Finnish railways has used somewhat different requirements (Table 3).

Table 3. The minimum required hearing levels according to the Finnish railways

Condition	Speech frequencies (0.5–2 kHz)	3–4 kHz
When starting work	20 dB	40 dB
When working (*)	40 dB	60 dB

(*) Speech must be understood from 2–4 m distance.

After several trials the Finnish railroad concluded that nothing can be done about the noise sources. So the only option left is hearing protectors. With hearing protectors on, the workers' hearing must still be better than the values given in Table 8 to avoid the risk of accidents.

Although the recommendations described above are clear, they are not easy to follow. As hearing may deteriorate very quickly, audiometry testing must be carried out at least every year on workers with hearing loss that is near the limits. Also, there is a limit to the attenuation provided by hearing protectors. Otherwise the hearing at work is worse than the limits in Table 8 even with minor hearing loss.

2.2. Aims

The Finnish Railway and the Finnish Institute of Occupational Health wanted to develop a simple method of selecting hearing protectors without compromising the safety of workers.

2.3. What was done, and how?

After a survey of the existing types of hearing protectors, two types were selected for further study:

- earplugs with appropriate audio filter; and
- level-dependent earmuffs.

Because typhoons (train whistles) have only discrete frequencies it might be possible to attenuate the noise levels without compromising the hearing by attenuating only the typhoons frequencies and frequencies above 2.5 kHz. A questionnaire was sent to the manufacturers about whether they could design such a filter. The answer was negative. Thus, only the second option was left.

For the level-dependent hearing protector the following requirements were made:

- lightweight
- stereo hearing
- amplification of low-level sound
- resistant to ambient conditions, like rain and cold.

Several hearing protectors designed for hunting were found to fill the requirements. The selection was made based on financial terms and user tests.

2.4. What was achieved?

The selected solution has the following advantages:

- the sound exposure of men working in the railway yard could be reduced below 85 dB without compromising the safety of workers;
- no more discomfort due to the high noise levels (Table 1);
- when using hearing protectors, the hearing level was always better than without protectors and, thus, the requirement of hearing was always fulfilled at work and very frequent hearing tests were no longer mandatory;
- the overall costs of the solution are lower than the cost of the previous solution: the price of electronic muffs was lower than the cost of frequent hearing inspections.

The major disadvantage of the solution was related to more complex logistics. Batteries and/or charging of the device had to be arranged.

Problems faced

No real problems were faced during the project.

2.5. Success factors

The major success factor in this project was the analysis of all the related factors. Without this detailed analysis it is not easy to motivate the additional cost of level dependent muffs.

2.6. Further information

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2.7. Transferability

Hearing requirements vary between rail companies, but the concept of the project can be transferred directly to other similar concerns. The concept is valid in all transport industries where good hearing is mandatory because of accident risk, provided that the possibility of adopting other solutions like combating risk at source and/or collective protective measures have been analysed previously.

3. References, resources:

- http://osha.europa.eu/en/publications/reports/TEWE09001ENC