FIT-TESTING TRAINING HELPS OIL AND GAS WORKERS AT BEERENBERG IMPROVE HEARING PROTECTION

Case Study

Honeywell
HOWARD LEIGHT

BACKGROUND

Noise induced hearing loss (NIHL) is one of the most commonly reported work-related injuries and represents a serious concern in the oil and gas sector, where noisy tasks are commonplace. Every day thousands of workers in Norway, a major oil producer, use earplugs to protect their hearing against harmful noise, but how much protection do they actually receive?

To answer this fundamental question, Beerenberg, one of Norway's leading providers of engineering and maintenance solutions to the oil and gas industry, began to offer its workers one-to-one hearing protection training and automatic fit-testing to reduce any uncertainty in noise attenuation.

CHALLENGES

When it comes to providing workers with hearing protection, it is still common practice to rely on SNR (Single Number Rating) or NRR (Noise Reduction Rating). These values represent the noise attenuation level that earplugs or earmuffs are able to achieve under ideal conditions. However, they do not reflect the actual noise reduction that can be expected in the field. It can range from over 40 to zero decibels (dB) depending on whether a worker is using earplugs of the appropriate size and whether they are inserted correctly.

To overcome this challenge, Beerenberg decided to perform a fit test using Honeywell's automatic fit-testing technology, VeriPRO®. As an initial step, a sample of 288 workers were asked to select their preferred earplugs from a selection featuring different models and sizes. The workers' attenuation levels were then tested without any guidance or instruction on how to insert the plugs, with 16 dB attenuation set as an acceptable threshold.

The results were astonishing: 4 out of 10 employees achieved insufficient attenuation levels (below 16 dB). Worryingly, for 2 out of 10 workers, the attenuation levels were even lower at only 10 dB.

The workers with low attenuation levels were then provided with one-to-one advice on how to best fit the earplug. The training emphasised the importance of three simple steps:

1. Roll the earplugs into a small cylinder without creases or wrinkles.
2. Pull the ear outwards in order to open the ear canal with your free hand, so that the earplug can be inserted further into the ear.
3. Hold the earplug in place for a few seconds while it expands to fill the ear canal.

These three steps also helped reveal if the worker required a different size or type of earplug. Once they had found a model that seemed to fit well, noise attenuation was measured again. Strikingly, after individual training was delivered, the proportion of workers with poor attenuation performance dropped to just over 5 percent, which demonstrates how effective one-to-one fit-testing training is.

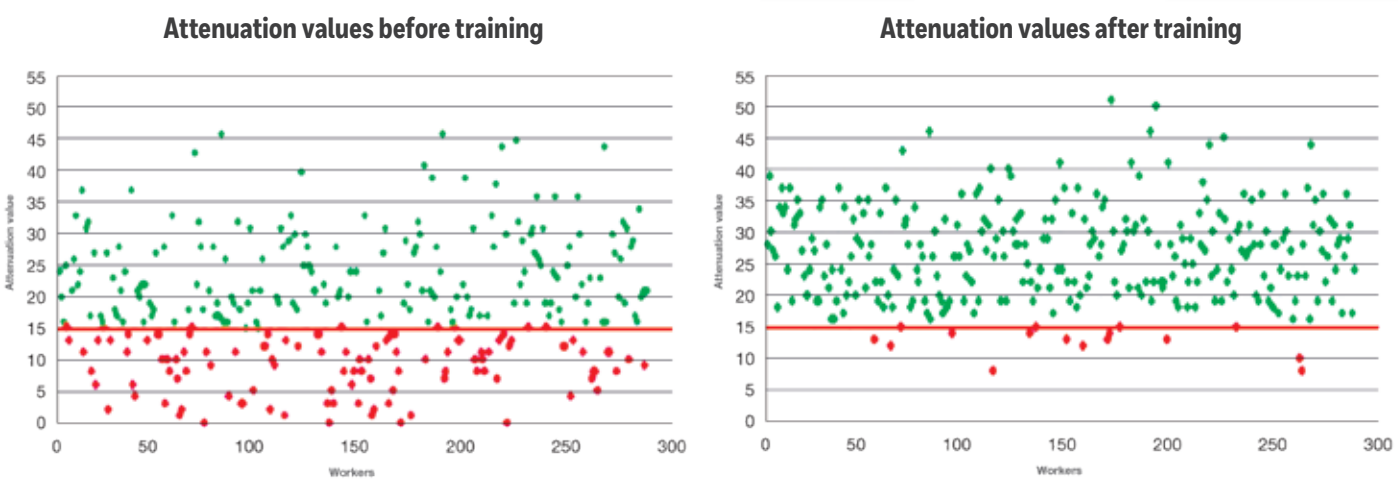

Figure 1. *Attenuation results for 288 workers. Each point shows the test values of each worker, with the red dots indicating the workers who received less than 16 dB of attenuation*

RESULTS

The training exercise Beerenberg carried out is a testament to the usefulness of fit-testing. When asked to share their feedback of the testing experience, 97 percent of workers stated that they found the individual guidance on how to insert earplugs either useful or extremely useful.

THE SHARE IN PERCENT (ABSOLUTE FIGURES IN BRACKETS)	EXTREMELY USELESS	SOMEWHAT USELESS	SOMEWHAT USEFUL	EXTREMELY USEFUL
How did you experience individual guidance in how to select and insert earplugs?	5.0 (8)	3.1 (5)	29.2 (47)	62.7 (101)
Knowing the attenuation properties was experienced as:	3.7 (6)	3.1 (5)	26.5 (43)	66.7 (108)

Figure 2. *Feedback from workers following the fit-testing training*

The fit-testing experience appears to have led to a greater awareness of the importance of selecting and fitting earplugs correctly. Following training, nearly 80 percent of workers said that they had become more conscious about inserting the earplugs correctly. Furthermore, almost half of those tested said that they had experienced improved noise attenuation after the training, with nearly 70 percent thinking that the training made using earplugs better.

THE PROPORTION IN PERCENT (ABSOLUTE FIGURES IN BRACKETS)	NO	PARTIALLY	YES
Are you more aware now than before about inserting earplugs?	13.3 (21)	9.5 (15)	77.2 (122)
After you received training and fit-testing with VeriPro, have you noticed better noise attenuation when using earplugs?	32.1 (50)	21.8 (34)	46.2 (72)
Do you think it is better to use earplugs now than before you received training?	31.3 (50)	29.4 (47)	39.4 (63)

Figure 3. *Feedback from workers about the benefits of the training received*

While the initial results of the training exercise were encouraging, Beerenberg wanted to know if workers gained any long term benefits from it. How well was the knowledge embedded? As NIHL develops gradually, achieving consistent attenuation from day to day is essential to optimise protection. To answer that question, a follow-up study was conducted a year after the initial training. The target group consisted of 41 workers who had achieved attenuation levels below the acceptance criteria of 16 dB during the first test.

The workers were again asked to choose the earplugs they typically used and to insert them in their usual manner, with no instruction or guidance provided. The results showed that 20 workers achieved results above the acceptance level. However, the number of workers receiving results below this had risen to 21, from only 7 after the initial training. When comparing these results to the test performed following the original fit-testing training it can be seen that the average noise attenuation had increased from 8.9 dB to 17.1 dB. If only average values are considered, this indicates that the employees displayed a significant improvement even 6-12 months after the training. Overall, the average value from the follow up test, 17.1 dB, is somewhat lower than the average from the tests performed immediately after training, which was 22.5 dB. This implies that even if the workers achieved a significant improvement after the original training, the average attenuation had fallen slightly during the year.

As before, workers who scored below the acceptance criteria received new training. Following this, the average score increased to an impressive 26.9 dB.

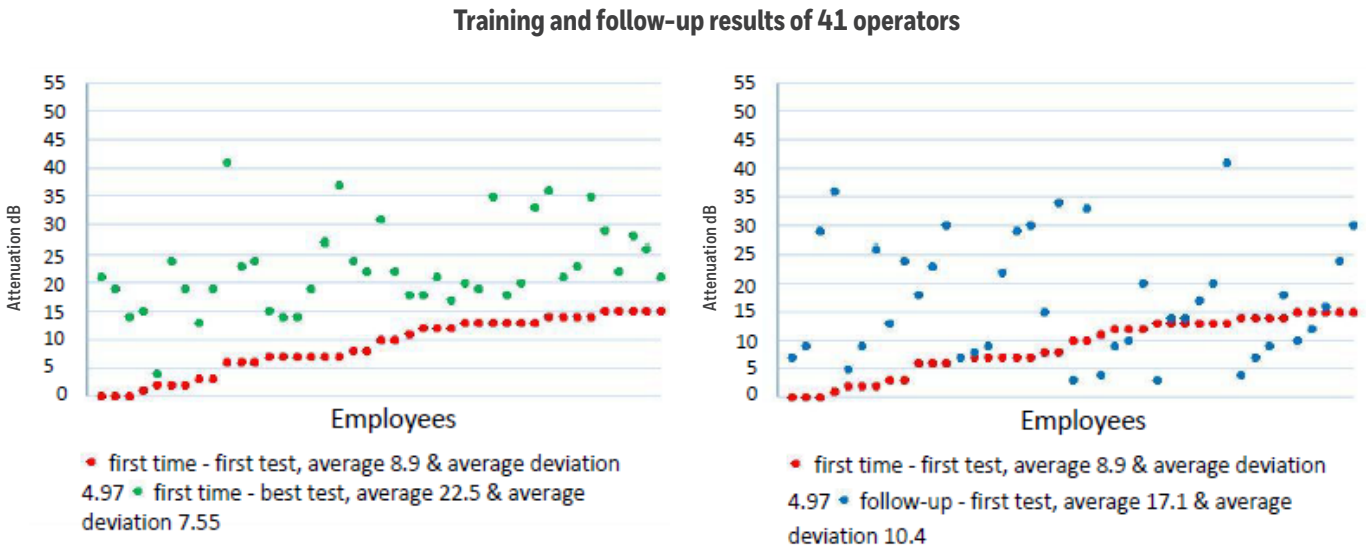

Figure 4. *The number of workers achieving lower attenuation had grown compared to the test performed immediately after the original training*

There could be a number of reasons why workers don't acquire or maintain the skill of inserting earplugs correctly, one being the perceived usefulness of the training. A reasonable interpretation would be that the workers who experienced a major benefit/impact from the training and fit-testing would be more inclined to maintain the skill of inserting the earplug correctly.

In order to test this hypothesis, a variable called 'effect of training' was developed to measure the perceived change in attenuation. This was defined by calculating the difference between the values from the first test and the follow-up carried out after fit-testing training. Workers were then divided into two groups depending on if they experienced more or less than 10 dB attenuation. The average level of attenuation was then studied to see if there was a difference in learning between those who experienced a major improvement in attenuation and those who did not.

The test showed that for the workers who achieved less than 10 dB increase in attenuation after the initial training, the average attenuation was now only 1.5 dB higher. On the other hand, the workers who experienced an increase of 10 dB or more following the initial training continued to achieve a significantly higher average attenuation score of 20.7 dB.

EFFECT OF TRAINING - EXPERIENCE OF CHANGE OF ATTENUATION	NON	AVERAGE	STD. DEVIATION
Less than 10dB attenuation - small improvement	**16**	**11.5**	**7.2**
10dB or more attenuation - major improvement	**25**	**20.7**	**10.6**

Independent Samples Test <0.01

Figure 5. *Attenuation in the follow-up test*

CONCLUSION

The findings highlight the role of individual training in ensuring that workers achieve adequate noise reduction when using earplugs. Through relatively simple means, such as individual counselling, testing of attenuation and possibly changing the type of earplugs used, employers can significantly increase the level of protection workers enjoy.

As well as improving attenuation, adopting an individual approach to hearing conservation can also educate and motivate workers: according to the feedback workers find fit-testing very useful and motivating. For years, many workers had believed they already gained sufficient protection from their earplugs and were surprised to discovered the importance of using earplugs that fit well and inserting them correctly.

The follow-up study suggested that more than half of the workers who initially received low attenuation fall back to below the acceptance criterion 6-12 months after receiving training. Furthermore, it appears that workers who experienced a marked improvement in the attenuation level during training were more likely to continue to achieve good attenuation levels compared to their colleagues.

These results show that refreshment training and continuous focus on individual hearing conservation measures are critical in order to ensure appropriate use of hearing protection over time. The study also highlights the importance of selecting hearing protection devices that integrate fit-testing upon start-up to ensure a minimum level of attenuation is achieved by each user.

For further information on fit-testing and effective training for hearing conservation programmes, download the eGuide **here**

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