Worker Safety

Reducing the Risks of Hearing Overprotection

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People in many different types of industries work in noisy environments where they need to wear hearing protection devices (HPDs). Wearing HPDs is critical for addressing hazardous noise levels and helping to protect an individual's hearing. However, as part of a risk assessment, it is also important to consider how HPDs may affect workers' ability to hear the important sounds needed to do their jobs safely and productively, because depending on the situation, too much noise reduction could have negative consequences.

A 2018 study conducted by Sayler, et al. for Alcoa US looked at two U.S. metal manufacturing facilities and "… demonstrated that a large percentage (84%) of our working population was overprotected…"[i] When workers are overprotected, they may have difficulty understanding their coworkers and hearing other important sounds in their environment. As a result, workers may be tempted to remove their HPDs to hear better which would, unfortunately, leave them exposed to hazardous noise. If this scenario seems familiar, maybe it's time to consider using other HPD solutions that can both help protect workers from hazardous noise and minimize the potential for overprotection.

Contributing Factors to Overprotection

The possibility of overprotection is often overlooked. Overprotection occurs when HPDs reduce sounds well below what is considered to be hazardous and prevents the wearer from detecting sounds or understanding speech that are critical to perform their job and do so safely. Think about it like wearing sunglasses indoors; it's more protection than what is needed and may overly diminish the sense. A Canadian Standards Association standard (CSA Z94.2-14)[ii] lists an optimal protected exposure range of 75-80 dBA, while the British Standards Institute (BS EN 458:2016)[iii] and other European Union members have recommended a target protected exposure between 70-80 dBA.

Many employers often err on the conservative side. Thinking more is better, they only provide HPDs with the highest Noise Reduction Rating (NRR) available. Some companies 'derate', or reduce, the NRR by a certain percentage to help ensure adequate protection for their population of workers exposed to noise. Solely using the time-weighted average (TWA) to determine the amount of hearing protection can oversimplify the variability and character of the noise environment over the duration of a work shift. Finally, safety managers often may not be aware of or don't take into consideration the audibility needs of workers. All of these factors can result in situations where workers are using HPDs that provide more protection than necessary for a particular environment and can lead to workers being overprotected.

Challenges Associated with Overprotection

When overprotected, the worker's ability to understand speech, hear important equipment operating sounds, and/or hear critical warning signals can be significantly impacted. This may reduce worker

productivity, or even worse, create other safety risks. If workers are not able to clearly hear the important sounds associated with their job, an unintended consequence may be that they are tempted to intentionally poorly fit their hearing protectors or remove them altogether. Wearing HPDs improperly or inconsistently, even for a short period of time, can be hazardous and could lead to a higher risk of permanent noise-induced hearing loss (NIHL).

Furthermore, hearing-impaired workers may be at a particular disadvantage when using hearing protection because the added attenuation may further reduce their ability to detect sounds and understand speech. It is critical for people with hearing loss to protect their remaining hearing while also balancing their need to be connected to their environment.

The Importance of Fit Testing

How do employers and safety managers know if workers are overprotected? One way to make an assessment is to ***fit test workers***. Starting with HPDs whose NRRs calculate sufficient attenuation for the workplace noise is the first step. Next, fit testing can be used to:

- Obtain a Personal Attenuation Rating (PAR) for each worker
- Ensure each worker can achieve a proper initial fit and correct use[iv]
- Identify the HPDs appropriate for each worker based on noise exposures, expected protection levels, and the anatomy of the worker's ear canal
- Observe and help optimize each person's fitting technique
- Train and motivate employees on the proper use and fit of HPDs
- Validate and document that the HPD is appropriate for the noise hazards/exposure

By fit testing, a PAR can be obtained for each worker for each particular HPD. Using the PAR and the worker's noise exposure, an appropriate HPD can be selected from the variety of HPDs offered. It also provides a valuable opportunity to teach workers about the hazards of noise and the importance of properly using HPDs.

This point is reinforced in the previously mentioned Sayler et al. study that concludes, "Careful selection of HPDs is necessary to minimize instances of overprotection to workers in low and moderate occupational noise environments. The use of fit testing in ***hearing conservation programs*** to evaluate PAR is recommended to avoid overprotection from noise exposure while also minimizing instances of under-attenuation."[iv]

In a different study, the cost-effectiveness of hearing conservation programs was evaluated and one finding was that higher expenditures on training and fit testing were a significant predictor of lower rates of standard threshold shifts (STS).[v] This suggests that safety managers can help reduce noise-induced hearing loss (NIHL) and long-term costs by incorporating fit testing into their hearing conservation program. (***Check out Christine Diestler's hearing conversation program story.***)

The beneficial impact of fit testing is also highlighted in a study by Alcoa Australia in 2006 that reported implementing 12 initiatives to improve hearing conservation throughout their mining facilities. They monitored outcomes for seven years and concluded that improvements in the numbers of age-corrected confirmed 10 dB hearing shifts (averaged at 2, 3, 4 kHz) were attributable to improved education and fit testing.[v]

Standards and regulatory guidance regarding fit testing are increasing. ***OSHA has recognized fit testing as a best practice*** and supports the use of fit testing to demonstrate proper initial fit as well as training on the use and care of hearing protectors.[vi] And a voluntary standard (ANSI/ASA S12.71-2018)[vii] published in 2018 specifies the performance requirements for fit testing systems.

As fit testing becomes more commonplace, the awareness and concern of providing the appropriate amount of protection are likely to increase, thus leading employers and safety managers to take a closer look at their HPD solutions to assess adequacy, appropriateness and audibility.

Advanced Hearing Solutions Can Help Address Overprotection

Safety managers should consider HPDs that align to the noise exposures of the workers to help ensure optimal protected exposure levels. Low attenuation HPDs may be more appropriate for workers exposed to lower levels of noise. HPDs that have flat or uniform attenuation could be considered to help improve the audibility of the worker.

Another way to help mitigate overprotection is to use protective hearing solutions that feature environmental listening capabilities. These advanced HPD products allow sounds to pass through the HPD when it's quiet but provide protection when it's loud. These solutions are beneficial when workers are exposed to intermittent noise or move between loud and quiet areas because the attenuation will automatically adjust with the noise level. These advanced HPDs can also be particularly advantageous for people with hearing impairments because not only do they help provide protection against noise, they may make it easier to hear the critical sounds in their environment.

The environmental listening technology from some of these hearing solutions allow sound to pass through the hearing protector when it is quiet, but once sound increases above 82 dBA, the technology compresses the sound, limiting it to 82 dBA. For example, if a worker is in an area where the sound is 90 dBA, the protective hearing solution will compress the noise to 82 dBA, thus providing 8 decibels of noise reduction (when appropriately fit and used). In moderate levels of noise, the protective hearing solution helps minimize overprotection because the amount of attenuation provided to the worker is proportional to the noise level. If the noise raises to an extreme level or the protective hearing solution is powered off, it will simply function as a passive hearing protector. Protective hearing solutions with environmental listening capabilities help provide a self-adjusting amount of protection and only when it's needed. It is smart hearing protection that automatically adjusts based on the noise level.

By validating protection with fit testing and considering audibility needs, safety managers can help protect their workers' hearing while improving the workers' ability to communicate and hear the important sounds needed to work safely and productively. Ultimately, if workers are provided an amount of noise reduction appropriate for their environment, they may be even more motivated to wear their HPDs continually and consistently.

To learn more about these advanced hearing solutions, ***contact 3M for assistance today***.

This blog article was originally published on the 3M Safety Now & Next blog. This article and more can be viewed at 3m.com/safetynow.

[i] K Sayler, Stephanie & Rabinowitz, Peter & Galusha, Deron & Sun, Kan & L Neitzel, Richard. (2018). "Hearing Protector Attenuation and Noise Exposure Among Metal Manufacturing Workers." Ear and hearing. 40. 10.1097/AUD.0000000000000650.

[ii] CSA Z94.2-14. Hearing protection devices – Performance, selection, care, and use. (2014-12-01)

[iii] BS EN 458:2016. Hearing protectors. Recommendations for selection, use, care and maintenance. (2016-03-31)

[iv] Sayler, SK, Rabinowitz, PM, Cantley, LF, Galusha, D, and RL Neitzel (2018). "Costs and Effectiveness of Hearing Conservation Programs at 14 US Metal Manufacturing Facilities," Int. J. Audiol. 57, S3-S11.

[v] OSHA Letter of Interpretation: "Ear plug personal fit-testing systems that measure real-time noise reduction" *https://www.osha.gov/laws-regs/standardinterpretations/2017-10-20*

[vi] Donoghue, AM, Frisch, N, Dixon-Ernst, C, Chesson, BJ, and Cullen, MR (2015). "Hearing conservation in the primary aluminum industry," Occup. Med. doi"1093/occmed/kqv168

[vii] ANSI/ASA S12.71-2018. American National Standard Performance Criteria for Systems that Estimate the Attenuation of Passive Hearing Protectors for Individual Users