How many times have you heard workers complain they can't hear their machines or can't communicate in noisy areas? Have you ever worried that your current hearing protectors are providing too much protection in your moderate noise work areas? When it comes to noise, not all environments are the same. New technologies for hearing protection devices (HPDs) are providing employers with more options than ever before.


## New Concerns about "Overprotection"

Many companies mistakenly choose hearing protectors for their entire company based on one feature alone: the Noise Reduction Rating (NRR). Historically, conventional wisdom dictated that the more protection, the better. Companies often searched for the highest NRR available, regardless of each employee's amount of noise exposure, preference, and work requirements. It's long been known that too much noise exposure can cause permanent hearing loss. But now there is growing concern that too much noise attenuation (reduction) can be problematic, too.

In a report from the National Institute for Occupational Safety and Health (NIOSH), researchers explain the concern:
"Overprotection is a condition in which the worker receives more attenuation than necessary, and the worker's exposure is reduced to less than 70 dBA . Overprotection results in the reduction in verbal communication with other workers, the potential to miss safety signals, and reduced acoustic feedback from their machine or work process. Overprotected workers report being 'out of touch' with their environment or feeling isolated. "

According to OSHA, $90 \%$ of workplace noise exposures are under 95 dBA TWA. For these "moderate" noise environments, employees typically need $10-15 \mathrm{~dB}$ of actual noise reduction to achieve adequate protection. Much beyond this, workers may actually be at risk of overprotection. More and more companies are now becoming aware of overprotection and taking steps to avoid it.

## Traditional HPDs Can Change Sound Quality

Comprehending speech in the presence of loud background noise and detecting subtle changes in the sound quality of machines or processes can be a challenge. Add a traditional hearing protector in the mix, and that challenge just got more difficult. As a general rule, most HPDs block out more high frequency (pitch) sounds than low frequencies. When workers are wearing a traditional earplug or earmuff, the sound quality can be affected. Listeners often say sounds are "boomy" or "bassy" because the treble is cut more than the bass. In addition, speech is "muffled" because the vowels (low frequency) come through more clearly than many consonants (high frequency). For a worker with high frequency hearing impairment, a common occurrence, wearing hearing protectors can exacerbate the high frequency deficit. Speech intelligibility is reduced even further. A common complaint for people with hearing loss is "I can hear you talking, I just can't understand what you're saying."

## Preserving Sound Quality through Uniform Attenuation

One solution is an emerging HPD technology called uniform (or "flat") attenuation. Uniform attenuation means the HPD is specially designed to reduce noise fairly evenly across a broad frequency range. These specialized HPDs generally utilize a sound filter ("HiFi dB reducer" in illustration at right) and acoustic resonance chamber to minimize the amount of high frequency attenuation. Combined

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 with a moderate amount of noise reduction, a uniform-attenuation HPD preserves the frequency balance of sound. The result is that attenuated sounds have roughly the same quality as the original sounds, only quieter. And although these protectors are not hearing aids, by their design they typically improve communication capabilities for all, including those with hearing loss. OSHA states that workers with high frequency hearing loss may find uniform attenuation HPDs beneficial. Because of filtering limitations, most uniform attenuation HPDs are not appropriate for extreme noise environments such as work areas over 95 dBA .


Figure 1 compares a uniform-attenuation earplug to a traditional hearing protector and also a "vented" earplug. Notice how both the traditional and vented HPDs cut out more high pitch sounds than low frequencies. The blue (uniform attenuation) curve, however, shows fairly flat noise reduction across a wider frequency range. This specialty earplug is designed to enhance sound quality and speech communication by preserving important high pitch sounds.

## Determining the "Right" Amount of Attenuation

When OSHA promulgated its Hearing Conservation Amendment for general industry in the early 1980s, it incorporated the Noise Reduction Rating (NRR) for quantifying hearing protector performance. The NRR is a laboratory-derived estimate of the attenuation expected from a hearing protector. Shortly after the Hearing Conservation Amendment went into effect, however, it became evident that the actual amount of attenuation achieved in the workplace often differed from the laboratory-predicted NRR. In 2008, an alliance between OSHA, NIOSH and the National Hearing Conservation Association identified an alternative to making HPD decisions based on the NRR or any other laboratory rating. With a review of research and emerging trends and technologies, the Alliance identified Individual Fit Testing as a recommended best practice for hearing conservation programs. Individual fit testing of hearing protectors is similar in concept to fit testing for respirators. Preferred methods produce a single number overall estimate of real-world attenuation, a Personal Attenuation Rating (PAR). Conducting individual fit testing for your workers will help you better determine the actual amount of protection the employee is receiving with his/her HPD. And with new concerns about sound quality and the risks of overprotection, individual fit testing can provide better assurance of optimal noise production for your employees.

Contact CavCom to learn more about uniform attenuation HPDs, individual fit testing, and other solutions for your hearing conservation program.

