Reducing Noise Exposure with Administrative and Engineering Controls – Quick Tips

Many employers use personal protective equipment (PPE) such as ear plugs or ear muffs to reduce employee exposure to damaging sound as their first line of defense. However, the Occupational Safety and Health Administration (OSHA) states in 29 Code of Federal Regulations (CFR) 1910.95(b)(1) that, ". . . feasible administrative or engineering controls shall be utilized to control employee exposure to high sound levels and PPE should only be used when these controls fail to reduce sound levels below regulatory standards."

While it may seem simpler to consider ear plugs or muffs for workers when noise levels exceed OSHA's action limit of 85 decibels (dB), employers must first explore all of the potential administrative and engineering noise reduction options first. And while it's a requirement for employers to evaluate alternatives to hearing protection PPE, it also makes good business sense. This is because in many circumstances, administrative and engineering control measures are much more cost effective and beneficial to all.

Administrative controls are considered employment measures or rules established by the employer to reduce worker exposure to a hazard. In terms of using administrative controls to address workplace noise, one specific option would be to rotate workers through jobs where excessive noise is present. Workers could spend a portion of their work day in a low noise environment and rotate with other workers into the task where noise levels are a concern.

The goal here is to create a work pattern where no employee is exposed to an eight-hour, time-weighted average (TWA) in excess of 90 dB. Ideally, from an employer compliance simplification standpoint, the exposure would not exceed OSHA's "action level" of 85 dB. For background information on OSHA's industrial noise exposure standard, please see our Quick Tips #260, Effective Hearing Conservation Program Elements.

Another administrative control is increasing the distance between the worker and the source of the noise. For many tasks this may not be a practical option, but where it can be implemented the noise reduction is significant. OSHA estimates that for every doubling of the distance between the source of the noise and the

worker the noise is decreased by 6 dB.

Engineering controls are defined as, “Methods of controlling employee exposures by modifying the source or reducing the quantity of contaminants released into the workroom environment” (Fundamentals of Industrial Hygiene, – 6th Edition, published by National Safety Council, 2012). Equipment or machinery maintenance is the first engineering control to consider and it’s so obvious it’s often overlooked. Regular lubrication and repacement of worn bearings, belts and other consumable machinery components can significantly impact noise levels.

Along the same line, equipment replacement is another engineering control option. Replacing older equipment models with a new model incorporating the latest in noise-reduction technology is a simple approach to an engineering control. Isolating or enclosing the noise source is one more option to consider if the logistics of the application allow for it.

Incorporating room treatments is another approach to engineering controls. In their Industrial Noise Control Manual, the National Institute for Occupational Safety and Health (NIOSH) defines room treatments as devices used to control the reflected sounds within a room. These are acoustically absorbent materials applied directly to wall or ceiling surfaces or suspended from the ceiling in the form of hanging baffles. NIOSH estimates these devices could reduce noise exposures by as much as 12 dB.

One general category of room treatments is comprised of products that can be cut, shaped and applied to most surfaces. Acoustic foam sheets or convoluted acoustical foam is used when low and mid-range frequency sound absorption is required. These sheets are suited to lining machine surfaces, cabinets, guards, walls, enclosures, ducts, privacy panels, computer rooms and recording studios. Acoustical foam rolls are used when high frequency sound absorption is required and they are ideally suited for lining machine surfaces, cabinets, guards, walls, enclosures, ducts, plenums, housings and sound traps. Quilted Rolls absorb sound similarly to the foam sheets and rolls, and should be used when ASTM-E84 Class I fire performance is desired.

Ready-to-use noise control products are pre-engineered and are designed for easy installation. Wall blankets mount on walls, ceilings and equipment by using grommets and are impervious to dirt, grease and solvents. Steel and fabric panels are a decorative option and mount on any flat surface. Portable screens are good to use in areas when temporary noise reduction is required. Overhead sound baffles and acoustical ceiling tiles are used to reduce reverberations and eliminate sound reflection from the ceiling in environments such as factories, gymnasiums and atriums.

Definitions

Here are some common terms that are often used when discussing engineering controls to help reduce noise exposure.

Absorbers – Materials used to reduce noise reflection and to dissipate noise energy.

Acoustical Material – Materials used to alter a sound field. The material may be used to absorb, damp or block acoustical energy.

Barriers – Materials used to block transmission of noise.

Damping – The process of dissipating mechanical vibratory energy into heat.

Decibel (dB) – A unit used to measure the power of a signal, such as an electrical signal or sound, relative to some reference level. An increase of ten decibels in the power of a signal is equivalent to increasing its power by a factor of ten. As a measure of sound intensity, a zero-decibel reference is stipulated to be the lowest level audible to the human ear; the speaking voice of most people ranges from 45 to 75 decibels.

Frequency – Pitch or the number of cycles that a sound wave completes per second and is measured in Hertz.

Loudness – Is the subjective human definition of the intensity of a sound.

Noise – Any undesired sound.

Noise Reduction Coefficient (NRC) – A scale representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect sound reflection; an NRC of 1 indicates perfect sound absorption.

Sound – Pressure waves that travel through the air or on other elastic materials.

Sound Absorption – The acoustical process whereby sound energy is dissipated as heat rather than reflected back to the environment.

Commonly Asked Questions

Q: Is a 10 dB reduction in sound significant in my production room?

A: Yes, a 10 dB reduction in sound is about a 90% acoustic energy loss or about a 50% reduction in perceived noise.

Q: What is a decibel (dB)?

A: A decibel is a logarithmic measure of sound pressure or sound power levels. It is based on the threshold of human hearing. As a result, 0 dB is the quietest environment a human can perceive. On the other extreme, 130 dB is the loudest sound a human can hear without experiencing immediate physical pain. Since it is a logarithmic scale, every three dB increase in sound level requires twice the amount of sound power or sound pressure to produce.

Related Content

Quick Tips article # 260, Effective Hearing Conservation Program Elements

Sources

29 CFR 1910.95

Fundamentals of Industrial Hygiene, 6th edition, published by National Safety Council, 2012

Source: Grainger Know How – https://www.grainger.com/know-how