Noise Controls

Noise control is essential to an effective Hearing Conservation Program. OSHA and MSHA require controls whenever noise exposure exceeds 90 dBA (decibels) as an 8-hour time weighted average (TWA) or whenever the dose exceeds 100%.

Behavior of sound

When designing engineering controls to reduce noise exposure, it is important to have a basic understanding of sound. Sound is always produced by changes in speed, pressure or force. Basic principles of sound behavior include:

- More noise is produced when great force is used for a short time than with less force for a longer duration.
- Airborne sound is usually caused by vibration of solids or turbulence in fluids.
- Vibrations can produce sound after traveling great distances.
- The slower the repetition, the lower the frequency of noise.
- High frequency sound is more easily reflected.
- Low frequency noise travels around objects and through openings.
- High frequency sound is greatly reduced by passing through air.
- The human ear is less sensitive to low frequency noise.

Design and planning

The first step in effective noise control is to design and purchase with noise control in mind. Take noise control into account when designing new facilities or renovating existing buildings. Isolate noisy operations in designated rooms where fewer employees will be impacted. Use qualified engineers and architects that understand noise control and request noise control in design specifications. It is much easier to account for noise during design rather than after machines and operations are already in place. Purchase equipment that produces less noise. Request technical data relating to noise generation and inquire about noise control options and accessories.

Administrative controls

There are two types of controls that can be used to reduce noise exposure. They are engineering controls, which involve changes in processes and equipment and administrative controls that involve changes in the way jobs are managed. Administrative noise controls include:

Train employees so they perform jobs in ways that minimize noise exposure.

Rotate employees between tasks with high and low noise exposure so that the overall noise exposure for the shift remains below the acceptable limits.

Administrative controls have limited application in most instances while engineering controls are more effective and are the preferred control method.

Simple engineering controls

Many simple or inexpensive controls can have a dramatic effect on noise. These controls should be evaluated first before exploring more complex solutions.

These include:

- Proper maintenance
- Changing operating procedures
- Replacing equipment
- Applying room treatments
- Relocating equipment
- Simple machine treatments
- Using proper operating speeds
- Proper maintenance

Malfunctioning or improperly maintained equipment makes more noise than equipment in good condition. Poor maintenance that contributes to noise includes:

- Leaks of steam or compressed air
- Bad or worn bearings
- Worn gears
- Loose belts
- Improperly balanced rotating parts
- Insufficient lubrication
- Missing guards or shields
- Improperly adjusted cams or linkages

It is recommended that a good preventative maintenance program with schedules and documented checklists be implemented to help minimize noise exposure.

Operating procedures
The way work is performed can impact noise exposure. Many operations involve employee monitoring of equipment or processes. In most instances exposures can be reduced by moving the employee farther from the equipment or process.

Equipment replacement
For some situations the easiest noise control may be to replace old worn equipment and tools with new, quieter models. Newer equipment works more efficiently and has probably been designed to reduce noise.

Room treatments
Reflected surfaces such as walls, ceilings, floors and equipment reverberate noise throughout the area. One of the basic principles of noise control is to reduce reflected sound. Reflected noise can be reduced by use of acoustically absorbent materials applied to the surface or suspended from the ceiling in the form of baffles.

Relocation of equipment
Sound level drops off significantly as the distance from the noise source is increased.

- Move noisy equipment as far as possible from employees.
- Spread equipment out so noise from surrounding equipment is reduced.

- Relocate noisy equipment to enclosed rooms.
- Relocate machine service units that do not need attention such as compressors, fans, pumps, drives, hydraulics and air or steam flows to unoccupied areas.
- Do not put noisy equipment in corners due to noise reflection.

Simple machine treatments
Many simple modifications to machines and equipment can significantly reduce noise exposure. These include:

- Reduce the dropping height of parts into bins or boxes.
- Line conveyors, bins or boxes with soft plastic or rubber to absorb noise from impact sources.
- Provide mufflers or silencers on air outlets of air driven tools, hoists, air motors, pumps and air valves.
- Reduce air pressure of pneumatic tools and equipment.

Proper operating speeds
As operating speeds increase, so does vibration and noise. Run equipment according to the manufacturer's recommendations.

Enclosures
Enclosures can be effective in reducing noise. They can be as simple as boxes lined with sound absorbing materials, to costly engineered systems. Enclosures can totally enclose or partially enclose noise sources. Openings should be minimized and good seals are required around doors and windows. Enclosures should be used with caution where motors or equipment produce heat to prevent damage or fires.

Shields and barriers
Shields and barriers are panels of acoustical materials placed between the worker and the noise source. These devices work well for high frequency noise and should:

- Be placed as close as possible to the noise source;
- Be as tall as possible.

Ducts and pipes
Vibrating ductwork is a common cause of noise. The source of the noise is usually the fan and is dependent on:

- Proper fan type and size;
- Proper fan speed.

Reducing fan speed will reduce noise. Backward curved blade type fans will also reduce noise generation. Other considerations include:

- Acoustically lining ducts can reduce noise, although care should be taken depending upon contaminants in the air, fire protection, and microbial growth.
- Use flexible connectors on pipes and ducts to reduce noise transmission due to pressure shock.

Employee enclosures
For some applications enclosing the employee rather than the noise source is

the best control. This works best for large noise sources that would be difficult or impossible to control. Heavy double walls with minimal connection points between the walls gives the best noise reduction.

Vibration

Noise can be produced by any solid vibrating surface. The vibrating member alternately pushes and pulls against the air creating noise. Vibration isolation techniques involve isolation of vibrating members from the force causing it to vibrate.

- Isolate the floor from machine vibration with springs, rubber pads or other isolation materials.
- Place large, heavy machines on separate heavy bases.
- Office areas should be isolated from vibrations with flexible joints in floors and walls.
- Close-fitting machine mounted enclosures should be vibrationally isolated to prevent the enclosure panels from vibrating.
- Densely perforated plates and panels produce less noise than solid plates or panels.
- A long, narrow plate produces less noise than a square one.
- Instead of a single, wide belt, a series of multiple narrow belts should be used in a drive system.
- Noise resonance can be reduced with a damping plate.