



Noise in workplaces

Identification, assessment and control

Effects of noise at the workplace

Noise at the workplace is the major cause of noise-induced hearing loss in Western Australia. Noise can also create stress, and can be a safety hazard at work, interfering with communication, acting as a distraction and making warnings harder to hear. Reducing noise levels at the source provides the most effective way of protecting workers' hearing as well as providing numerous other benefits to workplaces.

WorkSafe has a number of publications available on its website to assist you in meeting these requirements as well as a checklist on page four of this publication.

Are you at RISK?

If the noise around you makes it necessary for you to raise your voice to make yourself heard to somebody one metre away, your hearing is probably at risk.

Repeated exposure to excessive noise will eventually lead to permanent damage.

How big is the problem?-the noise assessment

When a problem has been identified but cannot be removed immediately, the extent and magnitude of the noise should be determined through a noise assessment. An assessment details the levels present, the items causing the most noise and the people affected by the noise. Thus, priorities for noise control can be worked out. In addition, where immediate changes cannot be made to solve the noise problems, suitable models of personal hearing protectors for the situation can be determined.

Organisations offering noise assessment services are listed in the Directory on the WorkSafe website www.worksafe.wa.gov.au

Is there a quieter process?

Before you buy plant or equipment, ask yourself if there is a quieter way of doing the job. For example, before buying a pneumatic impact wrench, consider the various hydraulic and torque-controlled units now available. While these units may cost more, they last longer and cause less damage to the nut, as well as lowering noise and hand-arm vibration levels.

Buy quiet

If you think the machine you are buying may be noisy, ask for noise level information from the supplier. The information is almost always available to the supplier from the manufacturer.

Using personal hearing protectors

When all practicable control measures have been taken, but the reduced noise is still above the exposure standard, personal hearing protectors must be supplied and worn all the time the noise is excessive. They must also be supplied while control measures are being planned and implemented.

It is important that they should be chosen for their noise reduction characteristics, comfort and suitability for the job. Remember! Uncomfortable equipment will not be worn.

What is the exposure standard for noise in WA?

In WA legislation sets a workplace exposure standard equivalent to 85 dB(A) averaged over eight hours, or a peak noise level of 140 dB(C). Where these values are exceeded, all practicable measures should be taken to reduce the noise level by engineering noise control. Failing this, ways should be explored to reduce the exposure time by half for every 3 dB the level is above the exposure standard.

Reducing the noise at source

The most effective and acceptable way to reduce noise in the workplace is to change the noise source (such as a machine) so that it makes less noise. This may mean using a quieter process instead of a noisy one (such as pressing rather than hammering), reducing the amount of metal to metal impact, treating radiating panels or using vibration isolation mountings. Regular maintenance is also important.

Some processes, such as metal and stone cutting and grinding produce very high noise levels. Noise reduced saw blades and clamping the work piece can help reduce noise levels but hearing protectors may still be needed.

If the noise cannot be sufficiently reduced at source then try to stop it from reaching people. This may be done by moving the item further away, by enclosing it or partitioning it off from quieter areas, by using sound-absorbing materials to reduce the build-up of noise or by using silencers. For more information see the following pages.

Regular hearing tests

A valuable check on the success of the noise control program can be obtained through the regular (audiometric) testing of workers exposed to excessive noise. The reason for any hearing loss found between tests should be investigated and action taken to remedy the situation.

Remember, noise does not have to be painful to be doing damage.

TOP 10 NOISE CONTROL TECHNIQUES

The following are 10 simple noise control techniques that have wide application across the whole of industry. In many cases, they will produce substantial noise reductions quickly and cheaply - with little or no effect on normal operation or use of plant.

Source: Health and Safety Executive UK

1 damping

Typical applications - Chutes, hoppers, machine guards, panels, conveyors, tanks

Technique

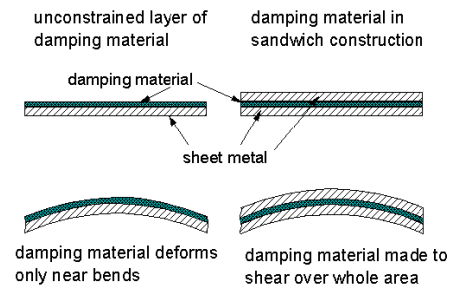
There are 2 basic techniques:-

- unconstrained layer damping where a layer of bitumastic (or similar) high damping material is stuck to the surface
- constrained layer damping where a laminate is constructed

Constrained layer damping is more rugged and generally more effective.

Either remanufacture steel (or aluminium) guards, panels or other components from commercially available sound deadened steel or buy self adhesive steel sheet. The latter can simply be stuck on to existing components (inside or outside) covering about 80% of the flat surface area to give a 5 - 25 dB reduction in the noise radiated (use a thickness that is 40% to 100% of the thickness of the panel to be treated).

Limitations : the efficiency falls off for thicker sheets. Above about 3mm sheet thickness it becomes increasingly difficult to achieve a substantial noise reduction.



2 fan installations

Typical applications - Axial flow or centrifugal fans.

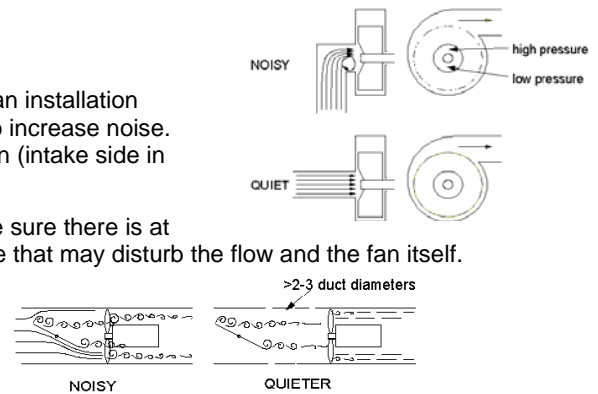
Technique

Maximum fan efficiency coincides with minimum noise. Any fan installation feature that tends to reduce fan efficiency is therefore likely to increase noise.

Two of the most common examples are bends close to the fan (intake side in particular) and dampers close to the fan intake or exhaust.

Ideally, for maximum fan efficiency and minimum noise, make sure there is at least 2 - 3 duct diameters of straight duct between any feature that may disturb the flow and the fan itself.

Noise reductions of 3 - 12 dB are often possible.



3 ductwork

Typical applications - Extraction, ventilation, cooling, openings in walls and enclosures.

Technique

Instead of fitting silencers, it is often possible to achieve a 10 - 20 dB reduction in airborne noise from a duct or opening by lining the last bend in the ductwork with acoustic absorbent (foam or rockwool / fibreglass). Alternatively, construct a simple absorbent lined right-angled bend to fit on the opening. Ideally, either side of the bend should be lined along a length equivalent to twice the duct diameter. Where flow velocities are high (> 3m/s), consider using cloth faced absorbent. Duct vibration can usually be treated by damping (as above).

4 fan speed

Typical applications - Axial or centrifugal flow fans.

Technique

Fan noise is roughly proportional to the 5th power of fan speed. So in many cases it is possible to achieve a large noise reduction from a small drop in fan speed by changing control systems or pulley sizes and re-setting dampers. The following table provides a guide to the trade-off that can be expected.

FAN SPEED REDUCTION	NOISE REDUCTION
10%	2 dB
20%	5 dB
30%	8 dB
40%	11 dB
50%	15 dB

5 pneumatic exhausts

Note : a well designed silencer will not increase system back pressure.

Almost invariably it is possible to reduce pneumatic exhaust noise permanently by 10 - 30 dB by fitting effective silencers. The following are the practical points that can make the difference between success and failure:-

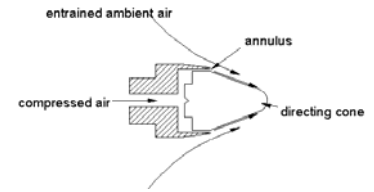
- *back pressure* : fit a larger coupling and silencer
- *clogging* : fit a straight-through silencer that cannot clog (and has no back pressure)
- *multiple exhausts* : manifold them into a single, larger diameter pipe fitted with the rear silencer from virtually any make of car (from your local tyre and exhaust fitter). Typically 25 dB reduction.

6 pneumatic
nozzles

Typical applications - Cooling, drying, blowing

Technique

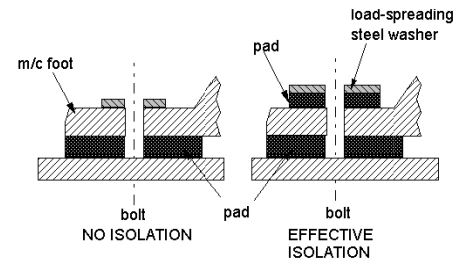
In most cases, it is possible to replace existing nozzles (usually simple copper pipe outlets) for quiet, high efficiency units. These not only reduce noise levels by up to 10 dB, but also use less compressed air. The types of nozzle to look out for are entraining units (schematic at right) from various manufacturers and in a variety of sizes.

7 vibration
isolation pads

Typical applications - Machine feet, pumps, mezzanine installations

Technique

Mounting motors, pumps, gearboxes and other items of plant on rubber bonded cork (or similar) pads can be a very effective way of reducing transmission of vibration and therefore noise radiated by the rest of the structure. This is particularly the case where vibrating units are bolted to steel supports or floors. However, a common error with the use of these pads is for the bolt to "short-circuit" the pad, resulting in no isolation. Additional pads must be fitted under the bolt heads as shown.



There are many types of off-the-shelf anti-vibration mounts available, for instance rubber/neoprene or spring types. The type of isolator that is most appropriate will depend on, among other factors, the mass of the plant and the frequency of vibration to be isolated. Any supplier of anti-vibration mounts will be able to advise you on this.

8 existing machine
guards

Technique

The existing guards on many machines can often be improved to provide a significant noise reduction. The two principles involved, which must be used in combination, are:-

(i) *Minimise gaps*

Reducing by half the "gap" open area in a set of guards can reduce the noise by 3 dB. If you can reduce the openings (flexible seals, additional close fitting panels etc) by 90%, then a 10 dB noise reduction is possible.

(ii) *Acoustic absorbent*

Lining a significant proportion of the inside of the guards with acoustic absorbent (foam, rockwool / fibreglass) will reduce the noise "trapped" by the guards.

Consequently, less noise will escape through any gaps. Failure to line the inside of the guards could result in an increase in noise at the operator's position if the gaps have been minimised as in (i) above.

In most cases, both sets of modifications can be tested in mock-up form using cardboard (and wide tape) to extend the guarding and temporarily fitting areas of acoustic foam inside. Not only does this process help with the practical aspects (access, visibility etc), but it usually also provides a very good indication of the noise reduction that can be expected. Guard vibration radiated as noise can also be treated via damping (as above).

9 chain & timing
belt drives

Technique

Noisy chain drives can often be replaced directly with quieter timing belts. Within the range of timing belts available, there are also quiet designs that use different tooth profiles to minimize noise. There is also a new design of belt for applications where noise is critical which uses a chevron tooth pattern to provide very quiet running. Noise reductions in the range of 6 - 20 dB are often possible using this approach.

10 electric
motors

Technique

Most companies have large numbers of electric motors used on anything from fans to pumps to machine tools. However, it is not very common knowledge that general duty motors are available (at little or no cost premium) that are up to 10 dB(A) or more quieter than typical units as direct replacements. The best approach is to feed these motors into the system over a period of time so that all replacement motors are quiet motors.

Noise Checklist

Check	yes	no	n/a
Identification of noise hazards - Reg 3.1(a) CoP section 4 Is there a noise hazard at the workplace? e.g. need to raise voice to speak with someone 1m away, very loud impact noises, workers have hearing loss or tinnitus.			
Have there been any workers' compensation claims for hearing loss?			
Noise risk assessment - Reg 3.1(b) CoP section 4 Has a noise risk assessment been carried out by a competent person?			
Any workers exposed above the exposure standard?			
Is the noise risk assessment current? – ie less than 5 years ago and noise exposure has not substantially changed since.			
Hazard Controls - Reg 3.1(c) or 3.46 CoP sections 5 and 6 Is the hierarchy of controls used? – elimination, substitution (“buy quiet” policy), isolation, engineering (at source where practicable or otherwise in noise transmission path), administrative.			
Are noise sources and noise controls maintained so as to minimise noise?			
Personal hearing protectors – Reg 3.34, 3.35, 3.47 CoP section 7 Are compliant hearing protectors supplied to and correctly worn by workers who may be exposed to a noise hazard?			
Are hearing protector areas signed in accordance with AS1319?			
Are workers trained in fitting, use, selection, maintenance, replacement and storage of hearing protectors?			
Information and training – S19(1) CoP section 8 Are information & training on noise hazards, effects and controls provided?			
Hearing tests – Reg 3.1(b) CoP section 9 Is an audiometric testing program made available to workers exposed above the exposure standard?			
Are appropriate actions taken if hearing loss is found to occur?			

Legend

CoP Code of practice for Managing noise at workplaces
 Reg Occupational Safety and Health Regulations 1996
 S19(1) Section 19(1) of *Occupational Safety and Health Act 1984*
 AS Australian Standard

Noise Levels and Exposure Times Equivalent to the Exposure Standard

Noise Level dB(A)	Exposure Time
82	12 hours
85	8 hours
88	4 hours
91	2 hours
94	1 hour
97	30 min
100	15 min
103	7.5 min
106	3.75 min

Further information

- Code of practice Managing noise at workplaces
- Code of practice Control of noise in the music entertainment industry
- Code of practice Occupational safety and health in call centres
- Standards Australia Australian New Zealand Standard AS/NZS 1269 Occupational noise management Parts 0-4
- WorkSafe website www.worksafe.wa.gov.au Search for 'noise'