

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.

1 DAMPING

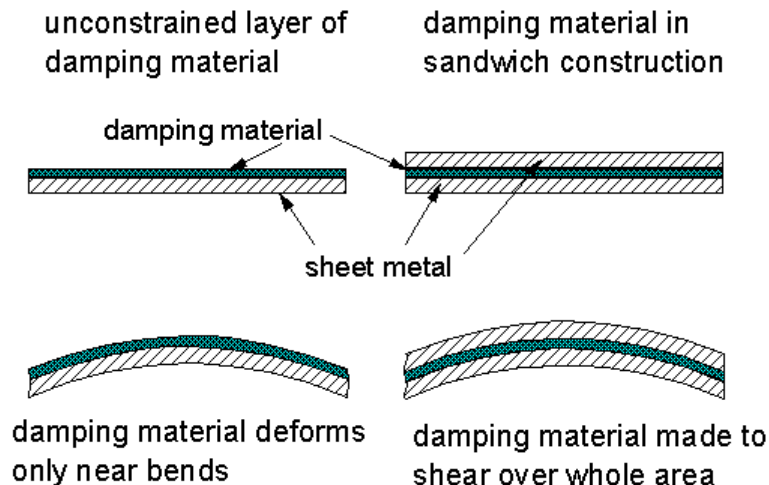
Typical applications

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 re-manufacture 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.

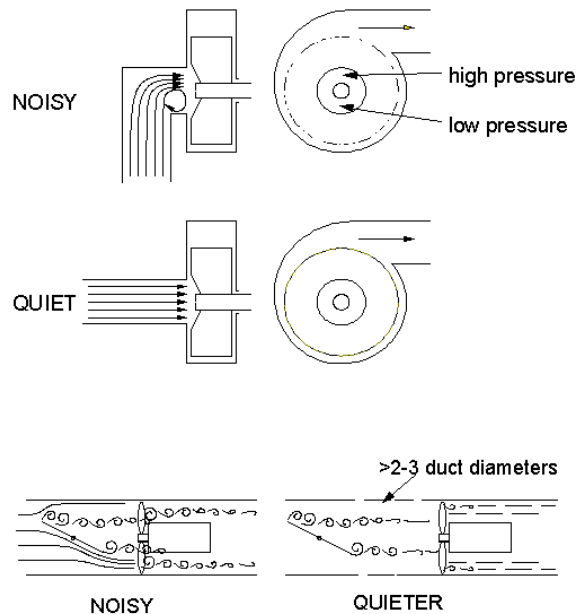
2 FAN INSTALLATIONS

Typical applications

Axial flow or centrifugal fans.

Technique

Maximum fan efficiency coincides precisely 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 ($> 3\text{m/s}$), 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.

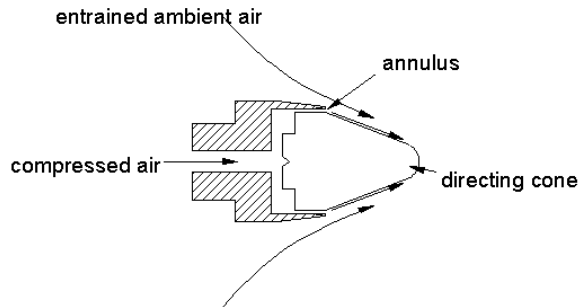
6 PNEUMATIC NOZZLES

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 below) from various manufacturers and in a variety of sizes.



7 VIBRATION ISOLATION PADS

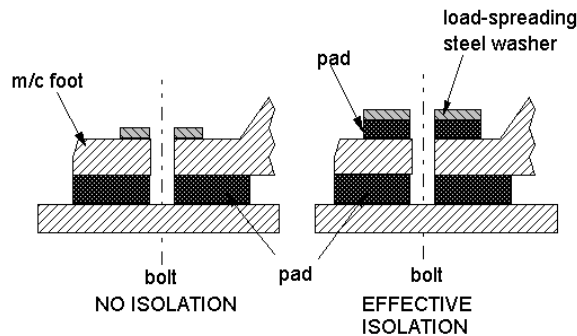
Typical applications

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 below.

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. Very “Blue Peter” but very effective. Guard vibration radiated as noise can also be treated via damping (as above).

9 CHAIN AND 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 minimise noise. There is also a very 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.

This sheet was produced by the Engineering Industry Noise Task Group (see <http://www.hse.gov.uk/noise/who.htm>).