5.6 CONTROL AND PREVENTIVE MEASURES OF NOISE POLLUTION

CONTROL METHODS OF NOISE POLLUTION

The noise pollution is controlled at source, transmission path and using protection equipments.

1. Control at Source

- **Reducing the noise levels from domestic sectors: –**

  The domestic noise coming from radio, tape recorders, television sets, mixers, washing machines, cooking operations can be minimized by their selective and judicious operation. By usage of carpets or any absorbing material, the noise generated from felling of items in house can be minimized.

- **Maintenance of automobiles: –**

  Regular servicing and tuning of vehicles will reduce the noise levels. Fixing of silencers to automobiles, two wheelers etc., will reduce the noise levels.

- **Control over vibrations: –**

  The vibrations of materials may be controlled using proper foundations, rubber padding etc. to reduce the noise levels caused by vibrations.

- **Low voice speaking: –**

  Speaking at low voices enough for communication reduces the excess noise levels.

- **Prohibition on usage of loud speakers: –**

  By not permitting the usage of loudspeakers in the habitant zones except for important meetings / functions. Now-a-days, the urban Administration of the metro cities in India, is becoming stringent on usage of loudspeakers.

- **Selection of machinery: –**

  Optimum selection of machinery tools or equipment reduces excess noise levels. For example selection of chairs, or selection of certain machinery/equipment which generate less noise (Sound) due to its superior technology etc. is also an important factor in noise minimization strategy.

- **Maintenance of machines: –**

Proper lubrication and maintenance of machines, vehicles etc. will reduce noise levels. For example, it is a common experience that, many parts of a vehicle will become loose while on a rugged path of journey. If these loose parts are not properly fitted, they will generate noise and cause annoyance to the driver/passenger. Similarly is the case of machines. Proper handling and regular maintenance is essential not only for noise control but also to improve the life of machine.

2. Control in the transmission path

- **Installation of barriers: –**

Installation of barriers between noise source and receiver can attenuate the noise levels.

- **Installation of panels or enclosures: –**

A sound source may be enclosed within a paneled structure such as room as a means of reducing the noise levels at the receiver. The actual difference between the sound pressure levels inside and outside an enclosure depends not only on the transmission loss of the enclosure panels but also on the acoustic absorption within the enclosure and the details of the panel penetrations which may include windows or doors. The product of frequency of interest and surface weight of the absorbing material is the key parameter in noise reduction through transmission loss.

- **Green belt development: –**

Green belt development can attenuate the sound levels. The degree of attenuation varies with species of greenbelt. The statutory regulations direct the industry to develop greenbelt four times the built-up area for attenuation of various atmospheric pollutants, including noise.

- **Using protection equipment:-**

The following are noise control techniques that have wide applications 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.

DAMPING

Normally required on steel sheeting that will 'ring' when struck with a hard solid object. This is because the sheeting vibrates and resonates generating and adding to any existing noise already in evidence. This is more usually a problem with steel guards surrounding machinery and if left untreated, can considerably add to any existing noise problems.

1.Typical applications

- Chutes
- Hoppers
- Machine guards
- Panels
- Conveyors
- Tanks

2.Technique

There are 2 basic techniques:-

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

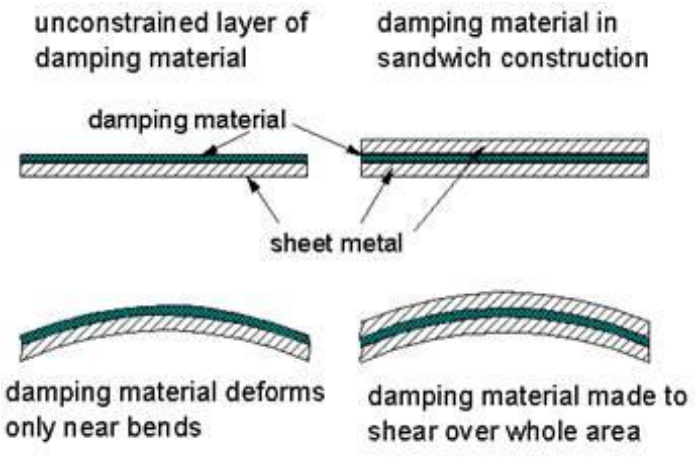

Figure 5.6.1 Damping

[Source: http://www.soundservice.co.uk/images/clip_image002_018.jpg]

Constrained layer damping is more rugged and generally more effective. Either remanufactured 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 – 25dB reduction in the noise radiated (use a thickness that is 40% to 100% of the thickness of the panel to be treated).

3.Limitations :

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

FAN INSTALLATIONS

Fan noise is a common problem and can vary from small fans used to ventilate areas to much larger air movement fans often used for cooling equipment such as air conditioning plants. This article will deal with fans that rely on ducting that is more easily soundproofed.

1. Typical applications

Axial flow or centrifugal fans.

2. 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).
- 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 – 12dB are often then possible

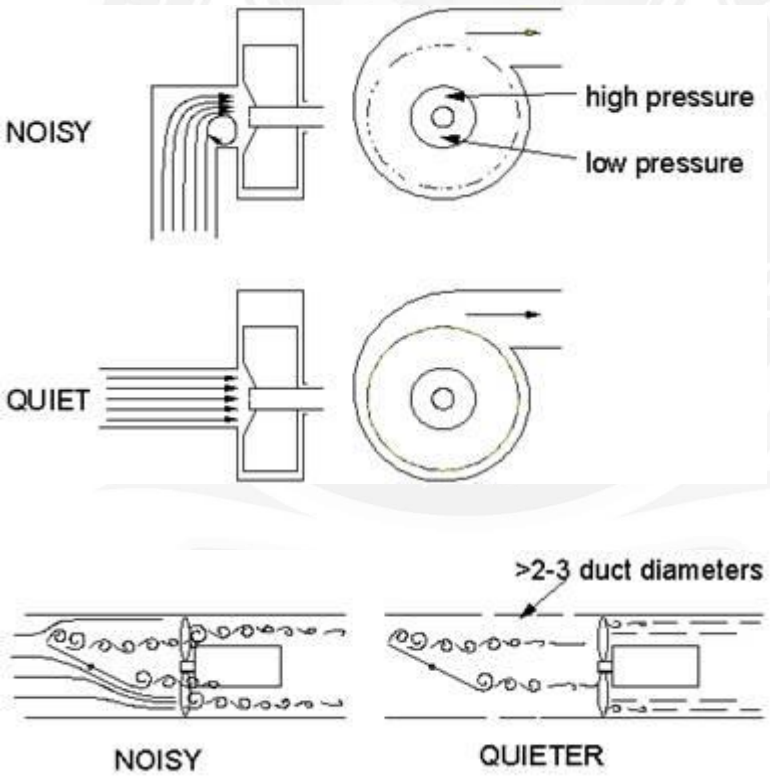

Figure 5.6.2 Fan Installation

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DUCTWORK

A lot of noise can break out through the walls of any uninsulated ducting as well as from any vents they may serve. Large air conditioning ducts are the main culprit and due to their thin steel walls can resonate and transmit noise along its length.

1. Typical applications

- Extraction
- Ventilation
- Cooling
- Openings in walls and enclosures.

2. Technique

- Instead of fitting silencers, it is often possible to achieve a 10 – 20dB reduction in airborne noise from a duct or opening by lining the last bend in the ductwork with non-flammable FR type acoustic absorbent foam.
- 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 a film faced acoustic foam. Duct vibration can usually be treated by damping (as above).
    - To stop noise being transmitted along the steel sections of ducting, acoustic resilient duct connectors can be fitted instead of the usual rigid fixing method.

FAN SPEED

1. Typical applications

Axial or centrifugal flow fans.

2. 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%	2dB
20%	5dB
30%	8dB
40%	11dB
50%	15dB

Table 5.6.1 Fan Speed Reduction & Noise Reduction

PNEUMATIC EXHAUSTS

- A well designed silencer will not increase system back pressure.
    - Almost invariably it is possible to reduce pneumatic exhaust noise permanently by 10 – 30dB 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

1.Clogging:

Fit a straight-through silencer that cannot clog (and has no back pressure)

2. 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 25dB reduction.

PNEUMATIC NOZZLES

1. Typical applications

- Cooling
- Drying
- Blowing

2. 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 10dB, 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.

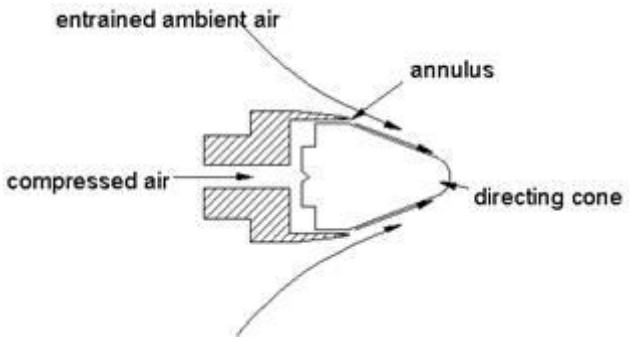

Figure 5.6.3 Pneumatic Nozzle

[Source:http://www.soundservice.co.uk/images/clip_image008.jpg]

VIBRATION ISOLATION PADS

1. Typical applications

Machine feet, pumps and mezzanine installations .

2. Technique

Mounting motors, pumps, gearboxes and other items of plant on rubber bonded cork or rubber Anti-vibration 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 resilient pads must be fitted under the bolt heads as shown below to stop any fixing bolts from bridging any other form of isolation.
- 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.

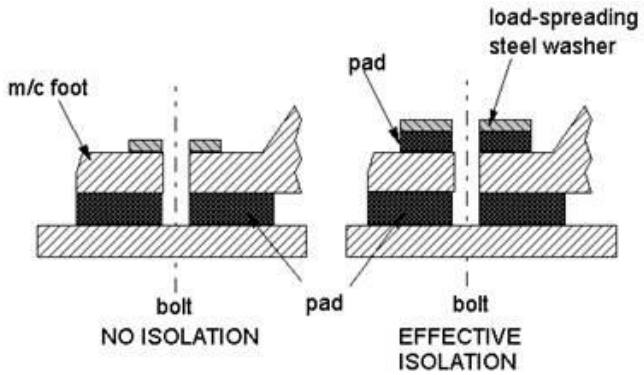

Figure 5.6.4 Vibration isolation pads

[Source:http://www.soundservice.co.uk/images/clip_image010.jpg]

EXISTING MACHINE GUARDS

1.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)Minimize gaps

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

(ii)Acoustic absorbent

Lining a significant proportion of the inside of the guards with sound absorbing foam 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.

(iii)Eliminate rattles

It is important that any guards or screening of machinery is tight and does not rattle because if left untreated can substantially add to the levels of noise pollution an operator and nearby personnel can be subjected to. Large thin panels may also resonate (vibrate) and this will also contribute to noise pollution. Panels such as this can be stiffened as described in the first chapter at the start of this document.

In the first two 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 detailed at the beginning)

PREVENTIVE MEASURES

- Construction of soundproof rooms for noisy machines in industrial and manufacturing installations must be encouraged.
- This is also important for residential building noisy machines should be installed far from sleeping and living rooms, like in a basement or garage.
- Use of horns with jarring sounds, motorbikes with damaged exhaust pipes, noisy trucks to be banned.
- Noise producing industries, airports, bus and transport terminals and railway stations to sighted far from where living places.
- Community law enforcers should check the misuse of loudspeakers, worshipers, outdoor parties and discos, as well as public announcements systems.
- Community laws must silence zones near schools / colleges, hospitals etc.
- Vegetation (trees) along roads and in residential areas is a good way to reduce noise pollution as they absorb sound.