TOP 10 NOISE CONTROL TECHNIQUES – 2015
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The following are 10 simple, engineering noise control techniques that have wide application across the whole of industry. In many cases, they will provide substantial noise reductions quickly and at low cost - with little or no effect on normal operation, hygiene or normal use. Many can even be self-financing…

The techniques include both specific case studies plus information on ways to generalise the technology for use across a wide range of applications. Whilst it may not be possible to apply some of the examples directly, simply knowing that the technology exists changes the thought processes associated with noise control.

Vibration Control
1. Vibration damping
decimate noise from guards, hoppers, conveyors, tanks…
2. Vibration isolation pads
isolate motors, pumps, hydraulics from noise amplifying sounding boards …

Fans
3. Fan installation and efficiency
maximum efficiency = minimum noise – fan installation best practice guide
4. Aerodynamic fan noise control – silencing without silencers
Quiet fan technology – retro-fit aerodynamic modifications = less noise and higher efficiency

Pneumatics
5. Pneumatic exhausts
efficient silencing with zero back-pressure
6. Pneumatic nozzles
efficient nozzles that produce less noise and use less air for the same performance…

Machines
7. Chains and timing belts
simple modifications to reduce noise levels
8. Electric motors
some are easily modified and some should be sent back due to excessive noise
9. Hydraulic power packs
many are designed to maximise noise levels – easily corrected

Existing Machine Guards
10. Convert to acoustically effective guards
existing safety guards can often be modified to make them effective acoustic guards

Technical support for all these techniques and further case studies are available from us – feel free to call or email: www.invc.com consult@invc.co.uk +441753 698800. Additional information and updates are also available at http://www.invc.com/profile/resources/top-10-noise-control-techniques/
1 VIBRATION DAMPING

The noise from mechanical sources is caused by the vibration of plant elements such as machine frames, panels, gears, casings, floors, castings etc. Damping involves dissipating a proportion of the vibration energy in relatively thin panels to reduce the level of vibration and hence the radiated noise. It also reduces fatigue which can reduce maintenance costs significantly. It is very widely applicable.

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

Benefits
Low cost, large noise reductions, rugged, hygienic.

Techniques
There are 2 basic techniques:-

i) unconstrained layer damping where a layer of bitumastic (or rubber or similar) high damping material is stuck to the surface

ii) constrained layer damping where a laminate is constructed in situ – by far the better technique

Unconstrained layer damping involves sticking sheets of proprietary high damping material to thin metal panels. As the panel vibrates, it bends and stretches the damping material, causing some of the vibration energy to be dissipated as heat. Constrained layer damping on the other hand, traps a layer of high damping material between two metal sheets to create a laminated sound deadened steel panel. As it vibrates, the whole volume of the elastomeric damping material is sheared, dissipating most of the vibration energy. As a result, constrained layer damping such as sound damped steel (SDS) is usually about 30 times more efficient than conventional damping treatments. Apart from much higher performance, SDS also avoids the hygiene, wear and "peeling" problems associated with stick-on damping.

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

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

Examples
There are many successful applications in the food and pharmaceutical industries for high performance damping (stainless sound deadened steel in particular as there are no hygiene implications for the treatment). Examples include weighing machine hoppers (10dB(A) noise reduction), vibratory feeders and conveyors (5 - 15dB(A) reductions) cowls and safety guards (3 - 9 dB(A) reductions) and complete close fitting enclosures (e.g. homogenisers). In the case of a vibratory separator used to grade confectionery, diagnosis showed that a major noise source was a large thin sheet distribution dome.
Forming this component in stainless sound deadened steel contributed significantly to the overall noise reduction of 16dB(A) (from 105dB(A) down to 89dB(A)). Moreover this modification could be incorporated into standard production machines at low cost.

The noise from this chiller included tonal components radiated by the frame and panels. The conventional treatments for these types of unit are silencers plus (often) an extensive acoustic barrier. Not only are these high cost, but they can reduce the efficiency of the chillers and cause access problems for maintenance. In this case, we used a combination of acoustic absorbent and retro-fit constrained layer damping to reduce the noise by 8dB(A) at very low cost and with no effect on system performance or efficiency.

Practical Design / Supplier
Constrained layer damping can be retro-fitted very easily for many applications. However, there are cases where some engineering development is required to get the most out of the technology e.g. building it into new or updated plant and machinery or combining with other noise control measures.

There are also design practices that should be used in forming, welding and in the choice of materials for more complex applications. Contact us for help in this area.

Supplier: SoundDampedSteel: [www.sounddampedsteel.com](http://www.sounddampedsteel.com) +44 (0) 191 259 0700
Manufacturer of a wide range of constrained layer damped galvanised steel, stainless steel, aluminium etc. Send drawings or templates for the damping areas and cut sheets can be supplied. Alternatively, you can buy complete sheets for local fabrication.

2 VIBRATION ISOLATION PADS

Vibration transmitted from machinery into “lively” structures such as steel beams and plates is then radiated very efficiently as noise. In effect, you have bolted your vibration source to a loudspeaker which amplifies the sound. Isolation pads provide a very simple and low cost way to reduce the transmission of vibration.

Typical applications
Machine feet, motors, pumps, bolting sources to steel beams or mezzanine floors…

Benefits
Low cost, large noise reductions, rugged.

Technique
Vibration isolation need not involve steel springs or rubber bushes. In many simple cases, mounting motors, pumps, gearboxes and other items of plant on rubber bonded cork (or similar) pads can be a very effective way to reduce the 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.

A high percentage of plant ostensibly “isolated” in this way is not actually isolated as the bolts short-circuit the flexibility provided by the pads. Any rigid connection across the pads will compromise the vibration isolation. In order for the vibration isolation pads to be effective, additional flexible elements (usually thinner layers of the same vibration isolation material) must be fitted under the bolt heads with load-spreading steel washers or plates as shown in the figure. Do not over-tighten the bolts, but make sure you use nyloc nuts or thread locking compound.
Limitations
Short-circuiting by bolts or other rigid connections is the most common issue. This approach does not generally reduce low frequency vibration significantly, but it is very effective at higher frequencies (above c 200Hz). If pumps, motors etc are bolted to steel plates, frames or tanks, then these behave as loudspeakers. The isolation prevents the transmission of the higher frequency vibration components, reducing the noise. However, if the source is bolted to the planet (e.g. concrete floor), then the isolation will not reduce the overall noise level – concrete floors only radiate low frequency sound.

Examples
Power press
A high speed strip-fed press used to blank electrical trip-catch components generated operator noise levels of 101 dB(A) Leq (at 270 strokes/minute) in a relatively quiet area. The press legs are welded boxes i.e. large loudspeakers that radiated most of the noise.

The press frame was isolated from the fabricated legs by inserting 6mm composite pads between frame and legs as shown in the photograph. This reduced the operator noise level by 9dB(A).

Motor-pump units
These units are well isolated from the concrete floor using conventional steel springs. However, the pumps and motors are rigidly bolted to thin steel formed plates which behave as noise radiating loudspeakers.

Provided the coupling alignment is not a problem (if it is, then you can fit a ladder frame to maintain alignment), fitting AV pads under the motor and pump typically reduces the radiated noise by 10dB or more.

Effective isolation pads and materials are available from:-
http://www.tiflex.co.uk/tico/tico_s.html
http://www.fabreeka.co.uk/Products&productId=39
http://www.farrat.com/neoprene-cr-23.html

3 FAN INSTALLATION AND EFFICIENCY

The geometry of duct runs into and out of fans has a very marked effect both on fan efficiency and on the noise produced. Noise is generated by turbulence in the flow – which is wasted energy.

Typical applications
Axial flow or centrifugal fans.

Benefits
Increased efficiency reduces both running costs and noise.

Techniques
Running a fan at maximum efficiency coincides precisely with the minimum noise level. Any fan installation feature or geometry that tends to reduce fan efficiency is therefore likely to increase noise.

Axial flow fan installations
Two of the most common examples are bends close to the fan (on the intake side in particular as fans tend to be more sensitive to inlet flow conditions) 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. In addition, you can make use of bell-mouth intakes to smooth intake flow. 3 - 12dB(A) noise reductions are often possible by ensuring that this approach is implemented.

Taking these two examples: the bend into the intake will significantly affect fan noise and efficiency; fitting the damper directly to the fan outlet means that the higher air velocity through some of the vanes will increase noise and reduce efficiency.

Fan noise is roughly proportional to the 5th power of fan speed. Consequently, in many cases it is possible to achieve a large noise reduction by reducing fan speed slightly via invertors, by changing control systems or pulley sizes and re-setting dampers. This process can also reduce running costs as well as noise levels.

The following table provides a guide to the trade-off that can be expected between noise level and fan speed. For example, if you can reduce the speed of a fan by 20%, then you reduce the noise output by 5dB – which is a 68% reduction in the noise.

<table>
<thead>
<tr>
<th>Fan Speed Reduction</th>
<th>Noise Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>2dB</td>
</tr>
<tr>
<td>20%</td>
<td>5dB</td>
</tr>
<tr>
<td>30%</td>
<td>8dB</td>
</tr>
<tr>
<td>40%</td>
<td>11dB</td>
</tr>
<tr>
<td>50%</td>
<td>15dB</td>
</tr>
</tbody>
</table>

Limitations
The main limitation to this approach as far as geometry is concerned is that it will often take up more space as you need to ensure that there are straight duct runs into and out of the fans. However, it is often possible to work round these issues to get close to the ideal flow conditions with shorter duct runs. Our experience means that we can often provide details of techniques and geometry changes that will provide efficiency gains. In the case of large fans, we can model the flow and suggest alterations that can markedly improve fan efficiency to reduce running costs. Contact us to discuss.

4 AERODYNAMIC FAN NOISE CONTROL

Some fan designs and installations generate tonal noise as well as broadband noise. The tonal noise is often not only an occupational noise problem (both in terms of overall level and “nuisance”), but also an environmental noise problem – annoying nearby residents. Aerodynamic noise control techniques are based on retro-fitting aerodynamic and acoustic elements inside fan casings and the associated ductwork. This is not only low cost, but it can also result in a significant improvement in fan efficiency.
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compared with conventional silencing – or even compared with the unmodified fan i.e. it can be worth fitting for the efficiency gains even if noise is not an issue.

Whilst this approach relies on specialist knowledge for both the design of the modifications and the predictions of the attenuation, the knowledge that this award winning Quiet Fan Technology is available can not only dramatically reduce costs, but it can also reduce energy consumption.

**Typical applications**
Axial or centrifugal flow fans (from 10cm to 4m diameter).

**Benefits**
Low cost, increased fan efficiency (often 10% - 25% improvement over conventional silencing), rugged (no maintenance for the life of the fan), fast, hygienic.

**Techniques**
It is based on a similar approach to that used in Formula 1 where teams invest heavily in the design of aerodynamic aids to control the airflow round their cars. As fan noise is the sum of the turbulence generated pressure fluctuations in the air shed by the blades, we have developed a range of aerodynamic inserts that are installed inside the fan casing to smooth the flow. This reduces the pressure fluctuations – and hence the noise – at source without introducing the back-pressure often associated with silencers.

This not only reduces the tonal noise travelling down the intake and exhaust ductwork (typically by 10dB – 20dB), but also the noise passing through the fan casing. This may not only eliminate the need for silencers, but also the need for acoustic enclosures or lagging. In a significant proportion of cases, this approach can actually improve fan efficiency which means that it pays for itself in reduced running costs.

In addition, as the low frequency noise has been reduced at source, it is also often possible to insert low cost, purpose designed acoustic elements into existing ducts and stacks that provide a substantial reduction (10 – 30dB) in the broadband noise without affecting system efficiency.

**Limitations**
The amount of broadband attenuation that can be installed without fitting silencers depends on the local geometry of the system.

**Examples**
**Can extract and chopper fans**
The high level of noise from 3 new fan systems was reduced by 22dB(A) through eliminating the tones by fitting aerodynamic inserts inside the fan casing. The cost was c 10% of the previously proposed conventional noise control measures (silencers, lagging and enclosures) and with no effect on fan efficiency – unlike silencers.

**Drier Fan**
Post modification, the blade pass tone was reduced by 20dB (99%), eliminating the noise problem. In addition, there was a 6% (16kw) reduction in fan energy consumption (saving £7625 p.a.) – which meant that the noise control project paid for itself in a few months. This is in stark contrast to the £100k of conventional noise control measures originally proposed. This capital cost was reduced to <£7k and the £8k or more additional running cost from the reduced fan efficiency due to additional silencing was turned into a total running cost saving of around £16k p.a. over the original proposal using conventional techniques.

www.invc.com
Combustion fans; HVAC Chillers; Extract fans etc...

Combustion fan modified overnight to reduce the tonal noise by 22dB and the overall noise by 9dB(A); 15dB(A) chiller noise reduction at a cost of £40k compared with £300k conventional without affecting efficiency...

More details, including sound files are available at:-

5 PNEUMATIC EXHAUSTS

Poorly or unsilenced pneumatic exhausts are a very common feature on many sites. Rumours also abound that silencers can introduce unacceptable back-pressure, reducing performance. **There is no technical reason for unsilenced exhausts** – zero back-pressure silencing giving attenuations that are 10dB – 20dB more than that achieved via commonly used silencers are easily achievable.

**Typical Applications**
Pneumatic cylinders, valves, pumps, pressure release valves...

**Note:** a well-designed silencer will not increase system back pressure at all.

**Benefits**
Low cost, large noise reductions, no impact on performance.

**Technique**
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:** for a well-designed silencer, the performance bottleneck is often the coupling – eliminated by fitting a larger coupling - and silencer
- **clogging:** fit a straight-through absorptive silencer that cannot clog (and has no back pressure)

**multiple exhausts:** manifold the ports into a single, larger diameter pipe fitted with either a specialist straight-through silencer – or the rear silencer box from virtually any make of car (from your local "Quick-Fit"). Typically 25 – 35dB(A) reduction.

**Limitations**
None.

Effective pneumatic exhaust silencers are available from:-

6 PNEUMATIC NOZZLES

Another common feature of many sites is the use of “nozzles” that are simply open ended pipes run at full factory line pressure, whatever the application.
**Typical applications**

Cooling, drying, blowing, cleaning, component ejection…

**Benefits**

Low noise and reduced compressed air use for the same duty, intrinsically safer…

**Technique**

In most cases, it is possible to exchange existing nozzles (usually simple copper pipe tube outlets) for quiet, high efficiency entrained air units. These will not only often reduce noise levels by 10dB(A) (or more), but they also use less compressed air (typically 20% less) for the same performance. Consequently, they pay for themselves quite quickly.

Also consider reducing the airline pressures wherever possible, running tests to determine the minimum pressure required for the job. This not only reduces the noise further, but it also reduces air consumption.

The generic types of nozzle to look out for are entraining units (see schematic and photograph) from various manufacturers. These accelerate ambient air to provide less turbulent mixing – which means less noise – and are available in a variety of sizes. As the outlet cannot be blocked with, for example, a finger, they are intrinsically safer than a copper tube outlet.

**Limitations**

Occasionally, space and performance requirements mean it is not practical to use an entraining nozzle.

**Examples**

Standard camshaft washer drying nozzles were replaced with suitable entraining units (after testing). These not only reduced the noise at source by 12dB(A), but also reduced the drying cycle time by around 20% and reduced the air consumption by a similar percentage.

Hand-held non-entraining nozzles used for cleaning and drying can always be replaced with entraining equivalents to reduce noise levels and improve safety. The same goes for vibratory bowl feeders and conveyors that use air to aid component movement.

Even high performance nozzles used, for example, in power press component ejection, can usually be replaced directly with entraining nozzles to provide a 10dB noise reduction (and a saving on compressed air) without compromising the speed of ejection.

Air lance nozzle change video example at [https://youtu.be/9yzqaMHlvJ0](https://youtu.be/9yzqaMHlvJ0)

Ranges of high efficiency nozzles are available from:-


7 **CHAINS AND TIMING BELTS**

Chain rattle (particularly on guides) and the banshee wail of timing belts are not uncommon noise sources that can often be reduced at source quite easily.

**Typical Applications**

Noisy chain or belt drives and conveyors.
**Benefits**
Reduced noise and wear rates.

**Technique**
Noisy chain drives can often be replaced directly with quieter timing belts. Within the range of timing belts available, there are quiet designs that use modified tooth profiles and pulley geometries to minimise noise. For applications where noise is critical, there are chevron (or helical) tooth patterned belts that can provide very quiet running. Noise reductions in the range of 6 - 20 dB(A) are often practical via this approach.

The noise from timing belts is also very sensitive to the correct belt tension. If the belts are over-tightened, the noise increases dramatically (5 – 10dB). Ensure that maintenance engineers know the correct tension – and make it easy for them to adjust the tension to the correct value. This also extends belt life.

The noise from chain drives can also sometimes be reduced by fitting laminated steel guides (the same material as recommended above for vibration damping) at key positions to smooth the path of the chain.

**Limitations**
It is not always practical to implement the quieter options (space, power transmitted, temperature...).

Low noise toothed belts are available from:
http://www.cross-morse.co.uk/timing_belt2.asp
http://www.transdev.co.uk/pages/belts/eagle/eaglepd_advantages.htm

Most of the major suppliers have quieter versions of their drives, usually associated with higher quality and performance products.

**8 ELECTRIC MOTORS**

Most companies have large numbers of electric motors across a wide range of applications.

**Typical applications**
Noisy motor drives – pumps, gearboxes, fans etc...

**Benefits**
Lower noise levels with no effect on performance.

**Technique**
Some electric motors can be very noisy (>90dB(A) at 1m), particularly higher speed (2950rpm) units. However, it is not necessarily 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 purchasing system over a period of time so that all replacement motors are quiet motors.

In many cases, the quieter motors are also more efficient units which means that the running costs are also reduced.

**Limitations**
This approach can take significant time (and some capital) to implement if the motors are replaced gradually – although more rapid implementation is possible where the new units reduce running costs.
However, we also have a standard modification design that can be retro-fitted to existing motors that typically reduces the noise by c 10dB(A). Contact us for more information.

9 HYDRAULIC POWER PACKS

Hydraulic power packs often seem to be specifically designed to be as noisy as possible. The classic example is a motor-pump unit that is not intrinsically noisy when suspended in free space, but is then bolted to a large sounding-board in the form of an oil tank. The conventional acoustic enclosures sometimes used cause thermal and maintenance problems. Most packs can be treated at low cost.

**Typical Applications**
Hydraulic power packs that include oil tanks, submerged pumps or pumps bolted to large steel structures

**Benefits**
No enclosure (thermal and maintenance problems), large noise reductions at low cost

**Technique**
The problem is that the vibration source (pump) is rigidly connected to a large radiating surface that amplifies the sound. The solution is to install a vibration break between the pump (or the motor-pump unit) and the tank. This can be achieved by fitting a vibration isolation pad (e.g. rubber-bonded cork – see section 2 above) between the pump and the tank and by ensuring that there are no rigid connections i.e. fit flexible hydraulic hoses and ensure that the heads of the bolts are also isolated as shown in section 2. This reduces the classic high frequency tonal noise from these units. Note that it may also be necessary to isolate valve blocks in a similar manner.

Where the motor-pump alignment could be an issue, then it may be necessary to construct a simple steel frame (angle iron) to which both motor and pump are bolted to maintain alignment and then isolate the combined structure from the tank. In addition, if there is any residual high frequency vibration radiated by the tank or associated steel mounting panels for control systems, it can be damped by creating a laminate in situ (as per vibration damping in section 1 above).

Noise reductions of 10dB – 20dB can often be achieved using this approach at low cost and without affecting temperature, access or visibility (potential oil leaks).

**Limitations**
Few as this approach almost invariably provides an elegant engineering solution to a common noise problem.

10 CONVERTING EXISTING MACHINE GUARDS INTO ACOUSTIC GUARDS

Provided the noise from a machine is dominated by the airborne components, the existing safety guards can often be converted into effective acoustic screens. If there is also a component of the noise that is vibration radiated as noise, then the guards can be damped (as section 1 above).

**Typical Applications**
Machine tools, power and printing presses, packing and filling machines, conveyors etc etc…

**Benefits**
Simple and low cost upgrade to reduce noise levels.
**Technique**

The existing guards on many machines can often be simply improved to provide a significant noise reduction. The two key principles involved are:-

i) **Minimise gaps:** halving the open area (“gaps”) in a set of guards will reduce the noise by c 3dB. If you can reduce the openings (flexible seals, additional close fitting panels etc) by 90%, then a 10 dB noise reduction is possible. This graph shows the trade-off between open area and attenuation. If the guard is made from steel with a theoretical attenuation of 42dB (see example shown on graph), looking up the actual attenuation achieved in practice with a total gap or leak of 5% (for the guard) gives a figure of 13dB i.e. the maximum attenuation will be 13dB. If you reduce the total gap to 1%, then the attenuation increases to 20dB.

In practice, the modifications can range from covering the whole of a mesh guard with steel or polycarbonate sheet, fitting a “roof” over simple vertical guards or blocking relatively small leaks round the edges of quite close fitting guards with seals or rebates.

ii) **Acoustic absorbent:** lining a significant proportion of the inside of the guards with acoustic absorbent (foam, rockwool / fibreglass, sealed hygienic absorbent modules) will reduce the reverberant noise “trapped” by the guards. Consequently, the noise level inside the guards will fall and therefore less noise will escape through any gaps. There is no necessity to cover the whole of any panels, just fit patches of absorbent on convenient flat surfaces or even hang small absorbent panels inside the volume.

In cases where hygiene is an issue, there are high hygiene sealed absorbent materials available such as Hygiene Advance A from:-

Ecophon: +44 (0) 1256 850977  

Custom Audio Designs  
[http://www.customaudiodesigns.co.uk/](http://www.customaudiodesigns.co.uk/)

In most cases, both sets of modifications can be tested in mock-up form using cardboard (and wide tape) to cover gaps or to extend the guarding. You can then fit areas of acoustic foam inside the guards to test the results (taking care to account for the background noise from other sources).

Not only does this process help with the practical aspects (assessing the potential effects on access, visibility etc), but it usually also provides a very good indication of the noise reduction that can be expected in practice. Note that you can cover open guards (mesh etc) with polycarbonate sheet if visibility is required. This may seem a very “Blue Peter” exercise, but it is a quick and effective way to assess the acoustic performance of the options before spending money on the final version made from steel, aluminium, polycarbonate or even plywood. Remember that guard vibration radiated as noise can also be treated via damping (as section 1 above).
Limitations
The law of diminishing returns sets in once you have closed the largest gaps and leaks, so there is a limit to the attenuation that can be achieved. Visibility can also be an issue that limits the area of acoustic absorbent that can be included inside guards. However, we have developed and used a few innovations for this type of application – contact us to discuss particular issues.

Further Information and Resources
Technical support for all these techniques and further case studies are available from us. Feel free to contact us or call to discuss particular applications via www.invc.com consult@invc.co.uk or call us on +441753 698800.

Additional information on this technical note and updates (e.g. to potential suppliers etc) is also available at http://www.invc.com/profile/resources/top-10-noise-control-techniques/

For more extensive noise problems across departments or whole sites – the next step...

Either - click the link below to find out how to implement the noise control best practice process yourself

Go Quiet Instead of Deaf – technical paper: IOHA conference 2015
How to Recommend Self Financing Noise Control Instead of Ineffective PPE: A practical guide to determining the best noise control options for any noise source(s).
Peter Wilson: Technical Director: INVC

Or - plug-in to our expertise

The noise control diagnostic process detailed above must always be followed to evaluate what constitutes best practice. The basic process does not require a high level of engineering skill, but you can also plug-in to our expertise to update a noise risk assessment with the noise control element or evaluate the options for a noisy machine. We have a very extensive noise control best practice knowledgebase that can sometimes be accessed by email (send us noise data, photos and smartphone recordings) or we can carry out the noise control audit following the procedure shown below.