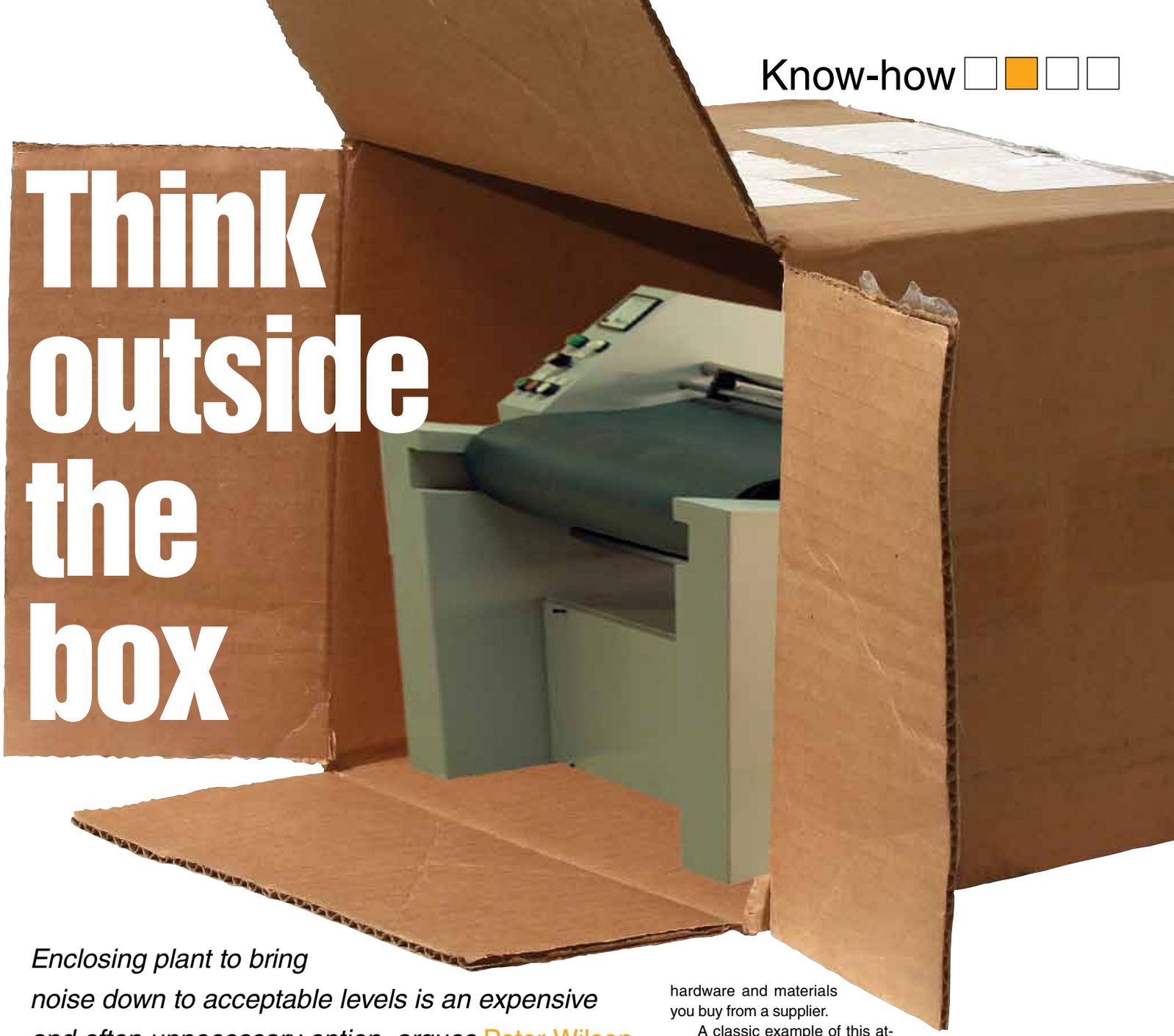
Think outside the box



Enclosing plant to bring noise down to acceptable levels is an expensive and often unnecessary option, argues Peter Wilson

"THESE regulations are concerned with controlling noise, not measuring it," says the HSE of the Control of Noise at Work Regulations. The emphasis is now very much on reducing the risks by controlling noise in the workplace rather than the once-common approach of relying on measurement and personal protective equipment (PPE) provision. The new emphasis on control has the consequences that:

- noise assessments must have an action plan that includes noise control — otherwise they are inadequate
- PPE cannot be used for long-term risk management unless you can prove that noise control is impractical.

This means any noise assessment must include an evaluation of the control options through a noise control audit, either as a stand-alone exercise or as an extension to, or replacement for, a typical risk assessment. Needless to say, the noise control measures should be based on current best practice rather than relying on high-cost conventional palliatives such as acoustic enclosures. There is only one approach that eliminates guesswork when deciding the best options.

The right attitude

"We have a noise problem. Get a few quotes from silencer and enclosure manufacturers." Variations on this theme are common in meetings across the land. The problem with this approach is that it leads to enclosures, silencers, barriers and even lining a building with acoustic absorbent, with no consideration as to why the plant is noisy in the first place. This attitude is a problem in that it sees noise control simply in terms of add-on hardware and materials you buy from a supplier.

A classic example of this attitude was a noise control project on a new grain drier. The farmer asked the installer to implement noise control measures after receiving numerous complaints from neighbours. The best solution was a set of low-cost modifications that fitted inside the fan casings to eliminate the noise at source, as these did not affect efficiency or hygiene. While these solved the problem, the farmer withheld payment until unnecessary "placebo" silencers were installed to satisfy his expectations.

The right attitude is to consider why the machine, line or department is noisy so that opportunities to control the noise at source can be considered first.

Return to the source

The following process is the one to follow for any noise control problem, from a single machine to a whole department, as it is the only way to determine best practice in controlling it. If you don't follow this procedure,

your choice of noise control measures will be based on guesswork that can double or quadruple the cost.

- Rank the noise sources in a machine in terms of their contributions to the overall noise level. Run each source separately, or temporarily cover all sources with an acoustic barrier mat or even cardboard and absorbent foam, and uncover each in turn. Alternatively, you can use frequency analysis to aid the process if you have access to the necessary software and hardware.
- Establish the noise-generating mechanisms involved and the paths by which the sound is transmitted from the dominant noise source. The key is to tackle this dominant source first, otherwise the effect of any noise control measures will be disappointing, limited to a maximum reduction of less than 3dB.
- If it's not practical to reduce the noise from the dominant source by engineering means, then (and only then) fall back on conventional enclosures, silencers and barriers, as you've proved that there is no alternative.

If there is more than one single significant noise source on the machine, then repeat the second step above in rank order until you encounter a source that can't be treated. In some cases, acoustic enclosure or other palliatives may be the best option, but only when you can prove that the noise cannot be reduced at source.

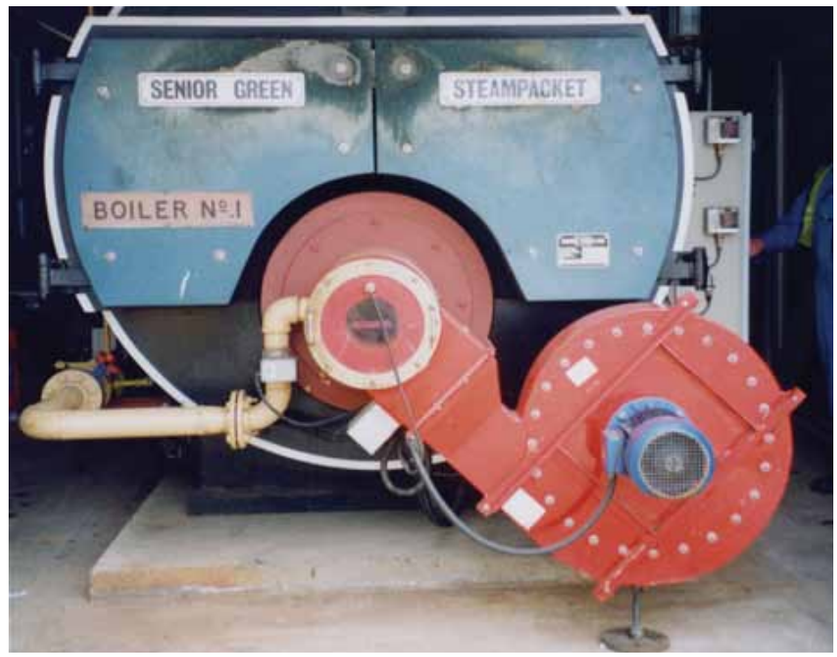
Applying the above diagnostic process to a perforating power press (measured at 102dB(A)) gave the following results as the sources were treated in rank order:

- tooling modifications reduced the noise level to 95dB(A)
- clutch and scrap fan silencing brought it down to 92dB(A)
- scrap extract system cyclone: down to 90dB(A)
- out-feed damping: down to 87dB(A).

Another press at the same plant with a conventional acoustic enclosure costing around £30,000 was still around 99dB(A). This illustrates the power of this diagnostic process, as the owners ended up with a press that is 12dB quieter than the enclosed unit for around £3000, without the access and maintenance problems associated with enclosure.

Hit list

Noise control auditing is an engineering evaluation technique, based on the above process, which gives you a costed list of the noise control options and associated benefits either for a single machine or across a whole site. The results are then used to generate cost-versus-noise-reduction trade-offs for each item of plant and to provide PPE use certification for any machines where noise control isn't practical.



At Heinz, a well-placed yogurt pot made this boiler 16dB quieter

Engineering expertise is needed to cost the options for each of the ranked sources and to predict the likely noise reduction in each case. But, as many noise control techniques are based on good engineering practice and can often be implemented as an extension to maintenance, they can be transferred in-house.

While the new Regulations stress the requirement to reduce noise levels to the minimum practicable, there are considerable incentives to achieve the following target levels:

- <95dB(A): PPE can be made to work reliably (increasingly difficult above 95dB(A))
- <85dB(A): PPE becomes advisory; no health surveillance; reduced training and management
- <80dB(A): complete deregulation!

This simple approach is based on good engineering practice that can not only slash the cost of noise control, but also reduce operating costs in two ways. Firstly, it cuts noise levels sufficiently so that PPE and health surveillance are no longer required. Secondly, engineering noise control modifications sometimes improve the performance of the plant itself, making a noise control programme a self-financing or even a profitable exercise.

The following case studies illustrate the effect the systems engineering approach can have on noise control projects.

An audit on an automatic weighing machine (of the type used in the food and pharmaceutical industries) showed it was possible to remove the existing enclosure and replace it with engineering modifications that reduced the noise level from 94dB(A) with enclosure down to 82dB(A) without enclosure. These included installing high-performance, high-hygiene damping and redesigning chutes. This saved around £10,000 per machine, reduced the down-time required for cleaning, and eliminated the need for PPE.

Cost and performance problems led steelmaker Corus to seek a second opinion on noise control options for the large fans at its Scunthorpe works. A detailed diagnosis led to modifications to the fan casings that eliminated the noise problem at source. Compared with the conventional silencing option the company had considered previously, this reduced the capital cost by £800,000 and the running costs by some £200,000 a year.

The default approach to burner noise control is to fit large silencers and to turn the boiler house into an acoustic enclosure. But at Heinz, the engineering audit revealed the problem was down to poor burner design. In the only known example of yoghurt-based noise control, a domestic yoghurt pot was adapted to modify the burner head internals and stabilise the air flow inside the burner head to minimise combustion variations. This reduced the noise level by 16dB, eliminating the problem.

The owners of a thermal welding machine used to seal plastic tubes assumed they needed an enclosure to cut its 94dB(A) noise level. But diagnosis showed the cooling air was the only significant noise source. This was redesigned to improve efficiency, not only cutting the noise level down to 82dB(A), but also reducing air consumption by around 20%.

In the next issue we'll look at how to get your equipment suppliers to use an engineering controls approach, so you don't have to. ■

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