Good vibrations

When it comes to industrial plant, the only good vibrations are virtually no vibrations – and the same goes for noise. Dr Tom Shelley reports on the latest thinking and equipment

Now that both noise and vibration are being seen as less acceptable – thanks to legislation limiting exposure (the Control of Noise (April 2006) and Control of Vibration (July 2005) at Work Regulations) – technology is emerging not only to protect operators better, but increasingly also to help engineers determine and, where possible, design out or at least tackle the causes.

At one end of the spectrum, excessive noise and vibration from a machine usually means something is not working properly: energy is being wasted, and both machinery and users are being subjected to damage. Plant engineers know that finding the problem can be simple, yet, more often than not, is anything but – and hence the range of diagnostic tools, some simple, some more sophisticated.

One device though – this from C-Cubed – looks set to make machine diagnostics quicker and easier than ever. Launched at the recent Drives and Controls Show, its rugged Pocket VibrA Pro separates vibrations resulting from bearing noise, out of balance and misalignment problems, identifying the cause using what managing director Dr Russell Sion describes as an 'asset wizard'. This compares frequencies and amplitudes detected against industry standard figures for motors, pumps and fans, and unerringly tells operators the problem, along with an indication of its severity.

Worn bearings can, of course, run happily for years under the right circumstances, but, if they are deteriorating, they need to be replaced fairly quickly. So the instrument also provides trend information, by downloading data onto a PC equipped with software bundled with the device. There's also barcoding equipment to ease maintenance management, with the instrument automatically recognising the test point, taking a reading and logging it to that machine location.

Remote specialists

There are other ways of making sense of noise and vibration data, though, and if your plant is large and critical, you'll probably want to bring in experts both for set-up and diagnostics – whether you collect the data manually or automatically, using a fixed system. Greek steel producer Halyvourgiki, which specialises in mesh and rebar reinforcing products for the construction industry, and French-owned Montupet, which supplies cast components such as cylinder heads to Ford and PSA Peugeot Citroen, both say they have found a low-cost solution using Spi-VR (spectrum inspection and vibration recorder) vibration data collectors from AV Technology.

Montupet, for example, says that operators collect the plant vibration data, but that it's then uploaded to the AV Technology website, where it is analysed remotely by AV's diagnosticians – with reports fed back to help plan and prioritise

Pointers

- Instruments detect causes of vibration automatically
- Worsening trends are what matter, and modern equipment reveals all you need to know
- Remote help is at hand, with instruments linked to the web
- HAV avoidance is at least in part about looking for alternative approaches
- 'Toolbox talks', on subjects from HAV to dust awareness, are available from Speedy Hire
- Wearing the right personal protective equipment remains essential for everyone

maintenance. On the other hand, Halyvourgiki is doing the work itself with two data collection units, managed using Spi-VR.

It says these were easy to set up for the 250 or so machines across its two rolling mills, thanks to simple wizards and templates. Now, every piece of equipment gets its own pictogram, highlighting individual monitoring points on the PDA screen, and engineers can make notes directly on the instrument, with traffic light alerts and trends highlighting hotspots for attention.

So much for noise and vibration monitoring: but, if these are inherent properties of the machine, then the challenge is either to design it out, or to change working practices in order to reduce or eliminate human operator hazards. Easier said than done and each solution is likely to be individual. However, sometimes enhancements are so simple, they must be transferable to other situations where operators

currently experience excessive levels.

Such is the case with surface conditioning disks for hand-held grinders from 3M, which are now designed with a central hole for locating on a pin on the backup pad. The approach ensures concentricity with the drive axis, which, in turn, greatly reduces any potential for vibration. A team at 3M's UK Abrasive Systems Technical Centre in Atherstone, Warwickshire, designed scotch-Brite centre-pin discs – and the claim is there's a full 50% reduction in hand-arm vibration (HAV).

In an entirely different industry, Giovanni Bisutti, whose road breaker business InnoMatica is based in Bottisham, near Cambridge, has invented a pneumatic breaker said to slash vibration. In use, it automatically blows 15kg of fluid into the unit, but then, when the trigger is released, that fluid drains into a reservoir, cutting the weight back to 25kg, so it can be moved. On test, Bisutti's VM (variable mass) 25—40 cut vibration to less than 1.5m/s^2.

Then again, forklift trucks manufactured by Linde Materials Handling now include several features that insulate operators from vibrations caused, for example, by uneven surfaces. Engineering director Phil Ireland explains that the drive axle has been equipped with a novel suspension system. "In addition, the mast is directly attached to the drive axle [and] the tilting cylinder is separated from the operator's cabin and chassis by maintenance-free rubber supports," he says.

"Also, our air-suspension seats effectively protect the driver from jolts and vibrations. By allowing the operator to have control over air pressure, he can ensure that the vibration dampening is optimised for their bodyweight and comfort level," he adds.

There is a better way

Meanwhile, for an entirely different approach, Speedy Hire suggests that much can be done to alleviate vibration exposure simply by finding alternative ways of working. Health and safety manager Graham Neave gives the example of a breaker attachment on a micro excavator – which not only protects the operator from vibration, but allows use of larger tools, speeding up the job. He also suggests using cartridge guns for fixings, instead of drilling holes, and using diamond drills on rigs and cut-off saws on trolleys, so that they don't have to be held.

"We are offering 'toolbox talks' free of charge on hand arm vibration," he says, explaining that these come in the form of visual aids. "All our salesmen are trained to deliver them, if the customer is prepared to listen, and most of them do." Other toolbox talks, incidentally, cover working at height and dust awareness. Speedy hire provides stickers, booklets, pocket guides, posters and CDs, which together go a long way towards helping employers with their legal obligation to inform employees and provide training on methods of controlling risks in the workplace.

The final tool, at least in the noise reduction toolbox, is personal protective equipment. There are plenty of suppliers, but one with new products is Sperian Protection, formerly the Bacou-Dalloz Group. Among recent introductions are Howard Leight high visibility earmuffs, a polar hood designed to be worn with earmuffs and, incidentally, also a slim belt clip.

The Thunder T2HV earmuffs incorporate bright green ear cups and a reflective head band. The polar hood is balaclava style, with patented side panels that eliminate gaps between the ear cups and ears, forming an acoustic seal around the ears, without distorting sound. The slim belt clip attaches to a belt or trouser pocket and has a low profile, so that it won't get in the way when not in use. Earmuff headbands slip onto the underside of the clip and remain readily accessible. PE

Left: 3M's approach to concentricity slashes vibration Centre: Linde's forklifts, now with better suspension Above: You can't beat PPE Below: fluid-filled breaker from InnoMatica