



Reducing noise from CNC punch presses

Engineering Information Sheet No 39

Introduction

This information sheet aims to help machine users and manufacturers/suppliers reduce employees' exposure to noise when using CNC punch presses. It should be read in conjunction with *Noise in engineering*¹ which gives further background information.

Applying noise control measures to existing machines can involve simple modifications, although occasionally it may require specialist advice from press suppliers, trade associations or noise consultants.

The problem

CNC punch presses are capable of producing high levels of noise, depending on the type of material and operation they are performing. An older machine, for instance a 30-ton, 40-station mechanical press, can expose an operator at the control panel to 95 dB(A) during a typical punching cycle on 3 mm steel. Improvements in design have made newer machines generally quieter than older ones, although according to manufacturers' figures the noisiest operations can still result in noise levels above 100 dB(A) at the operating position.

Newer machines are, however, more likely to benefit from partially or fully automated sheet loading/unloading systems. Consequently, there is much less need for an operator to be working at or near the tool area, where the highest noise levels can be expected.

The type and gauge of material being worked have a significant effect on the amount of noise generated. For example, stainless steel will produce more noise than aluminium, and 3 mm sheet will produce more noise than 1 mm sheet.

Sources of noise from CNC punch presses

Punch presses generate noise from a number of sources, including:

- tool impact;
- the driving mechanism;
- hydraulic pumps;
- sheet manipulation;
- the clamping mechanism;
- transfer and collection of punched components; and
- vibrating machine panels.

Duties of manufacturers and suppliers

The Supply of Machinery (Safety) Regulations 1992² require machinery to be designed and manufactured so that risks from noise are reduced to the lowest level. This has to be achieved, where possible, by using engineering methods to control the noise at source, and is best planned at the design stage when the noise-generating mechanisms should be carefully considered.

Noise control measures should be seen as an integral part of a machine. Only in certain special circumstances may they be sold as an optional extra, for example where an existing noise enclosure is going to be re-used. In such cases there has to be a specific written agreement between the machine supplier and the purchaser regarding the provision of these particular measures.

Manufacturers and suppliers must also provide users with information on noise emissions. They should generally supply two figures:

- the noise level generated at any normal work positions around the machine; and
- the 'sound power' (a measure of the total amount of noise emitted by the machine).

The data should be measured by following relevant standards and an appropriate test code, where one exists. They relate either to the noisiest operation that the machine may typically carry out or to a range of typical operations.

Duties of machine users

The Noise at Work Regulations 1989³⁻⁵ require employers using noisy equipment or processes to reduce their employees' risk of hearing damage to the lowest level reasonably practicable. If any employee's daily personal noise exposure exceeds 90 dB(A), reduction of that risk should be achieved by means other than the use of personal hearing protectors, so far as is reasonably practicable. Businesses using CNC punch presses should therefore adopt the engineering controls described in this information sheet, or other suitable measures where it would be reasonably practicable to do so.

Common noise control techniques

A new CNC punch press would be expected to have at least the following noise control measures:

- proportional/optimal punching force technology (where possible);
- choice of table mechanism (brushed tables are quieter than ball tables and should be fitted where practicable; urethane/nylon ball transfers are also available and are quieter than conventional ball tables);
- acoustically treated chutes, bins and conveyors, with minimised component drop heights;
- acoustically enclosed tool carousel and punching area;
- non-metallic clamping devices (eg hard rubber or neoprene);
- damped/isolated machine panels to reduce radiated noise; and
- anti-vibration mountings.

Noise control on existing machines

Some of the above noise control techniques can be applied retrospectively to older machines. For instance, it should be possible to apply acoustic treatment to chutes, bins and conveyors on older machines, and to minimise component drop heights by adjusting the position of collecting bins.

Case study

A metal chute was used to transfer components taken from a related machine tool. The application of a 5 mm layer of wear-resistant rubber matting to the inside surface of the chute achieved a noise reduction of about 15 dB(A). The treatment also protected the chute and the components from impact damage (*Sound solutions: Techniques to reduce noise at work*,⁶ page 71).

Punch presses can also be mounted on anti-vibration mountings such as thick rubber pads. These can play an important part in preventing the transmission of noise through structure-borne vibration, as well as helping to extend the machine's life.

Case study

A high-speed punch press generated noise levels of 101 dB(A). Composite pads, 6 mm thick, were inserted between the press frame and its supporting legs. A layer of self-adhesive damping sheet was also applied to the sheet metal surfaces of the machine's guards. A noise reduction of 9 dB(A) was achieved (*Sound solutions: Techniques to reduce noise at work*,⁶ page 61)

Noise levels can also be reduced by replacing a conventional ball table with either a urethane/nylon ball table or a brushed table. Such tables also have the

advantage of helping to prevent component surface damage.

The use of barriers to separate the machine from the operator, such as noise enclosures, acoustic screens or personal noise refuges, should be considered. Full enclosure of a press should be possible provided the problems of access for setting etc can be overcome.

Case studies

A noise reduction of 10 dB(A) was achieved by fitting a PVC strip enclosure around an automatic punch press while still allowing all-round access to the press (*Sound solutions: Techniques to reduce noise at work*,⁶ page 59). In another published example an acoustic enclosure was fitted to a high-speed press used to manufacture components for the motor industry. The press could be controlled from outside the enclosure. A noise reduction of 30 dB(A) was claimed (*100 practical applications of noise reduction methods*,⁷ page 72).

Operators should minimise the time spent in high-noise areas around the press. These areas should be clearly identified from a noise assessment.

Careful choice of tooling may have benefits in reducing the noise exposure of machine operators. For example, using a 30 x 6 mm tool instead of an 80 x 6 mm tool for a 'slitting' operation may reduce the noise level by up to 5 dB(A). As a general rule, the smaller the surface area of the tool, the lower the noise. However, substitutions of this kind may also lead to longer turnaround times and a greater number of 'hits' per pattern.

Quiet tooling

A noise control measure, which can be effective on older as well as new machines, is to use 'quiet' tooling. This type of tooling has an optimised shear angle at the tool face, and may have other noise-reducing features such as vibration damping rings. Noise reductions over standard tooling of up to 10 dB(A) are claimed, although this will depend on operating conditions. The machine supplier should always be consulted about the potential to use quiet tooling; where possible, it should be offered as standard on new machines.

Maintenance

All noise control measures, whether supplied with the machine or fitted at a later date, should be subject to regular inspection and the necessary maintenance to ensure that they continue to be effective. For instance, where machine panels have been treated with acoustic linings, it is important that these are regularly checked and replaced if degraded. Gaps should be prevented from developing between machine panels. Seals or skirts placed either around panels or between the machine and the floor should also be regularly checked and replaced as necessary. Just a small gap in the

sound-proofing can release a significant amount of noise. It is therefore important that the whole body of the machine is well maintained and kept in good condition.

Anti-vibration mountings should be periodically examined to make sure they remain in good condition. When a machine is moved to a new location, it is important for the mountings to be correctly refitted at the new location. This will also provide an opportunity for the mountings to be examined and replaced where necessary.

Buying new machines

Buyers should ask manufacturers and suppliers for information on the noise levels of machinery they are considering buying. Manufacturers should be able to demonstrate a low-noise design by reference to their use of the common noise-control techniques outlined earlier, and by the provision of noise emission data. Manufacturers should quote the noise level at the operating position, which will give some information on the potential risk to an operator. If the noise level at this position exceeds 85 dB(A) the manufacturer should also provide a 'sound power' figure which will be more relevant to the impact of the machine on noise levels in the rest of the workshop.

However, noise emission data can only ever be a guide, as other factors including operating conditions and the layout of the workshop will also have an effect on the noise levels generated by machinery. Nevertheless, if manufacturers meet their duty to supply information on the operating conditions under which the machines' noise emissions were measured, this information can be used to find the quieter or quietest machines. At the very least it should be possible to eliminate the noisiest machines. By documenting this decision process, employers will have gone some way towards demonstrating that they have met their legal duties to reduce workplace noise.

Further advice can be found in *Buying new machinery*.⁸

Training

The Noise at Work Regulations require employers to give appropriate information, instruction and training to employees. This will include information on noise control measures fitted to punch presses and on how such controls are to be used and, where appropriate, maintained. Specific matters that need to be covered should be identified by means of a noise assessment undertaken by a competent person.

References

- 1 *Noise in engineering* Engineering Information Sheet EIS26 HSE Books 1998
- 2 *Supplying new machinery: A short guide to the law and some information on what to do for anyone supplying machinery for use at work* Leaflet INDG270 HSE Books 1998 (single copy free or priced packs of 15 ISBN 0 7176 1560 X)
- 3 *Noise at work: A guide for employers* Leaflet INDG362 HSE Books 2002 (single copy free or priced packs of 10 ISBN 0 7176 2539 7)
- 4 *Protect your hearing or lose it* Pocket card INDG363 HSE Books 2002 (single copy free or priced packs of 25 ISBN 0 7176 2540 0)
- 5 *Reducing noise at work: Guidance on the Noise at Work Regulations 1989* L108 HSE Books 1998 ISBN 0 7176 1511 1
- 6 *Sound solutions: Techniques to reduce noise at work* HSG138 HSE Books 1995 ISBN 0 7176 0791 7
- 7 *100 practical applications of noise reduction methods* HSE Books ISBN 0 11 883691 9 (out of print; photocopies of the case study quoted are available from HSE's Engineering and Utilities Sector, Tel 0191 202 6200)
- 8 *Buying new machinery: A short guide to the law and some information on what to do for anyone buying new machinery for use at work* Leaflet INDG271 HSE Books 1998 (single copy free or priced packs of 15 ISBN 0 7176 1559 6)

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