Noise reduction at multi-spindle planing and moulding machines

Woodworking Sheet No 8

Introduction

This information sheet is one of a series prepared by HSE's Woodworking National Interest Group. The Noise at Work Regulations 1989[1] came into force on 1 January 1989 and require employers to reduce the risk of hearing damage to the lowest level reasonably practicable. Risk of hearing damage exists at a daily personal exposure level ($L_{EP,d}$) of 85 dB(A) - the first action level of the Regulations.

Control of noise at source by engineering means is the preferred approach. Where employees are exposed to daily personal noise exposures at or above 90 dB(A) (the second action level) employers must reduce exposure as far as reasonably practicable by means other than personal ear protectors.

Designers, manufacturers, importers and suppliers are required under the Health and Safety at Work etc Act 1974 to ensure that noise from machines is reduced so far as is reasonably practicable and, as modified by the Noise at Work Regulations, to provide adequate information concerning the noise likely to be generated.[1]

Multi-spindle planing and moulding machines (MCMs) are widely used in the woodworking industry for the high speed machining of timber on all four sides. Typical products include squared stock, tongued and grooved boarding, skirting board etc.

Virtually all these machines produce noise levels in excess of 85 dB(A) and noise levels of up to 105 dB(A) have been recorded at the infeed operator's position. It is known that many operators of MCMs are exposed to noise levels well in excess of 85 dB(A) even when the machines are provided with noise enclosures.

HSE commissioned a research project to establish what should be done by suppliers of new machines and users of existing machines to reduce the exposure of operators to noise.

This information sheet provides guidance on how MCM noise is generated and what can be done to reduce it using design and engineering controls.

Main sources of noise

1 Idling noise generated aerodynamically by the rotating cutter heads.

2 Cutting noise generated by the impact of the knives on the timber.

3 Noise created by the transmission of vibration along the timber length.

4 Poorly designed and sited chip extraction systems.

Methods of noise reduction at source

Planing and straightening heads often produce most of the idling noise. This can be reduced by up to 10 dB(A) by using smoother profile blocks with low blade projection. Slotted or perforated table lips can reduce idling noise levels by more than 5 dB(A) at the bottom first head (straightening cutter).

Helically bladed cutter blocks can significantly reduce cutting noise when planing. However, this type of cutter is not readily available for moulding machines. Segmented blocks (which are more widely available) can reduce infeed noise levels by 5 dB(A) if used at the bottom first head.

Reductions in cutting noise can also be made by reducing the cutter's rotational speed, and increasing the number of knives on the cutter - without detriment to the finish.

Correct design of chip extraction systems can reduce idling noise levels significantly, where the system is not part of a noise enclosure.

Design of high-speed drive motors should embody up-to-date noise reduction techniques.

Noise attenuating hoods

Integral noise reducing hoods/enclosures can be very compact and very effective at reducing idling and cutting noise levels when machining short lengths of timber. However, they are often ineffective at reducing noise levels below 85 dB(A) when processing long and wider lengths of timber where the timber extends outside the hood.

If integral enclosures are combined with a well-designed segmented or helically bladed first bottom head, the two techniques of enclosure and noise reduction at source can reduce noise levels to below 90 dB(A).

Full noise attenuating enclosures

Full enclosure (see Figure 1) of the machine is currently the only available noise reduction technique capable of bringing idling and cutting noise levels below 90 dB(A). Enclosures will only be effective if the following factors are considered:

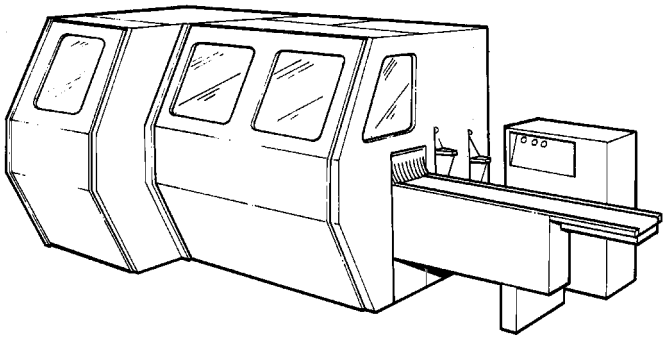
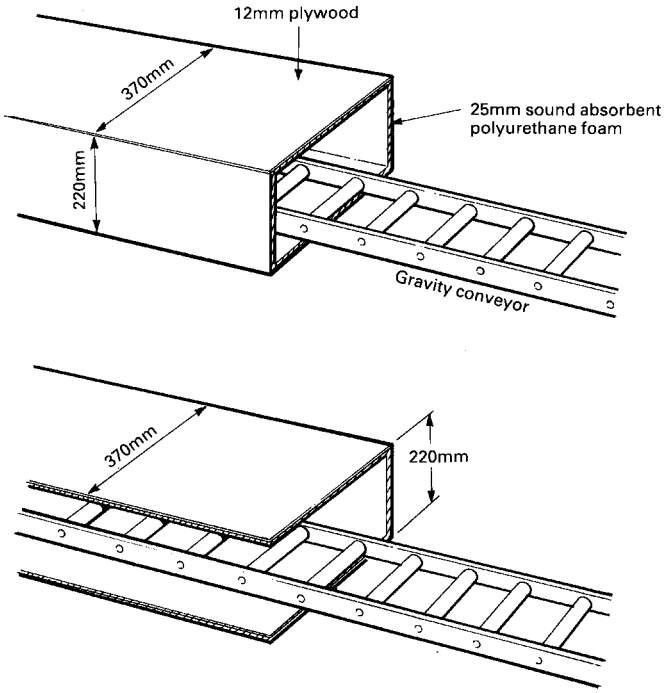


Figure 1 Integral enclosure - close fitting round feed area with controls outside and overlapping strips across opening.

1 Designers should pay particular attention to the feed and delivery openings. Feed apertures should be as small as possible and, where a wide range of timber sizes are processed, may need to be adjustable, but in any case restricted to the maximum cross-section of timber the machine can process. Use of PVC or rubber overlapping strips across feed openings can reduce idling noise by 3 dB(A).

2 Fence and feed speed controls should be positioned outside the enclosure, either remotely mounted or moved to the beginning of the infeed bed. Many existing enclosures are ineffective because these controls can only be reached through the feed opening.



Figures 2 and 3 Schematic - full tunnel and partial tunnel. NB: The size of the tunnels is dependent on the maximum workpiece dimensions the machine can process. Tunnels should be a little larger than the maximum size of the timber.

3 Cutter impact causes the timber to vibrate. Longer and wider workpieces will therefore carry noise outside the enclosure. This can be overcome in two ways:

(a) by constructing larger and longer enclosures so that there is a significant gap between the enclosure and the ends of the machine; or

(b) by constructing sound absorbing tunnels at the feed apertures which effectively extend the length of the enclosure. Such tunnels can be effective even if open fronted.

4 Transmission of noise along the timber can also be reduced by completely separating the infeed and outfeed conveyors from the machine bed.

5 Consideration should be given to the application of damping techniques to reduce vibration transmission along the workpiece. Maximum noise levels often occur as the workpiece makes contact with the bottom first head. Noise levels then fall off as the feed system takes hold of the timber. Doubling the timber width is likely to increase feed position noise levels by 6 dB(A). The use of feed altachments can reduce infeed noise levels by 5 dB(A), by damping out the vibration.

6 If openings in the enclosure are essential, these should be kept to a minimum and should be acoustically treated to limit the escape of noise.

References

1 *Reducing noise at work: Guidance on the Noise at Work Regulations 1989* L108 HSE Books 1998 ISBN 0 7176 1511 1

2 *Sound solutions: Techniques to reduce noise at work* HSG138 HSE Books 1995 ISBN 0 7176 0791 7

Further information

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This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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