

Focus on IFA's work

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Hand-arm vibration: hazard analysis of reciprocating saws

Problem

Reciprocating saws (sabre saws) have a wide range of uses. Electric saws are increasingly used for the cutting of wood and metal. Pneumatic saws are primarily used in metalworking, and are also termed pneumatic panel saws. The reciprocating movement of the saw blade (translational movement) results in vibration being transferred to the user. The vibration is determined essentially by the stroke, the saw blade, and the material being cut. An unfavourable combination of these factors may cause the user to be exposed to exceptionally high vibration. In response to frequent complaints, vibration measurements were performed under plant conditions for the purpose of hazard analysis and the development of preventive measures.

Activities

Vibration was measured on pneumatic and electric power tools under typical working and operating conditions. The exposure parameter was measured in the form of the total vibration value a_{hv} , which is composed of the frequency-weighted accelerations in the three axes of measurement.

Results and Application

The vibration exposure generated by the electric tools studied is during the cutting of wood in the order of $a_{hv} = 1.9$ to 10.2 m/s^2 and $a_{hv} = 12.8$ to 15.2 m/s^2 during the cutting of metal.



Use of a reciprocating saw in metalworking

Pneumatic tools yielded higher exposures in plant use, in the region of $a_{hv} = 23$ to 36.4 m/s^2 .

In some cases, the manufacturer's data differ considerably from the value measured in practice, thereby presenting a risk of the hazard being underestimated.

The users of the tools can however reduce their specific vibration exposure by not using worn blades and by selecting blades geared to and recommended for the material and task. The manufacturers are called upon to design low-vibration tools.

Area of Application

Metals industry, trade sector, construction sector, woodworking

Additional Information

- Vibration exposure calculator for hand-arm vibration (in German)
www.dguv.de/ifa, Webcode [d3245](#)
- DIN V 45694: Mechanical vibration – Guideline for the assessment of exposure to hand-transmitted vibration using available information including that provided by manufacturers of machinery (07.06). Beuth, Berlin 2006
- Lärm- und Vibrations-Arbeitsschutzverordnung (LärmVibrationsArbSchV), 6 March 2007. BGBl. I (2007), pp. 261-277
- Gesetz über die Durchführung von Maßnahmen des Arbeitsschutzes zur Verbesserung der Sicherheit und des Gesundheitsschutzes der Beschäftigten bei der Arbeit (Arbeitsschutzgesetz – ArbSchG), 7 August 1996. BGBl. I (1996), pp. 1246-1253
- Kaulbars, U.: Technischer Vibrationsschutz bei Hand-Arm-Schwingungseinwirkung. Code 230 302. In: BGIA-Handbuch Sicherheit und Gesundheitsschutz am Arbeitsplatz. Vol. 34 VI/1998. Published by: Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA), Sankt Augustin. Erich Schmidt, Berlin 1985 – loose-leaf (in German)
www.bgia-handbuchdigital.de/230302

- Wiegand, J.; Kaulbars, U.; Kraus, W.; Seumel, M.; Mädler, J.: Vibrationsbelastung des Hand-Arm-Systems durch handgeführte Maschinen in der Holzbearbeitung. 3rd Nationale Tagung Humanschwingungen, 8-9 October 2007, Dresden – lecture. VDI-Berichte (2007) No. 2002, pp. 85-98. Published by: VDI, Düsseldorf

Expert Assistance

IFA, Division 4: Ergonomics – Physical environmental factors

Literature Requests

IFA, Central Division