Hand-arm vibration: risk analysis of chainsaws

Problem

Chainsaws are used for sustained periods during timber harvesting. Manufacturers' information may be used for assessments of the vibration exposure conducted in accordance with the German Ordinance on noise and vibration protection. However, the values declared by the manufacturers are obtained in accordance with a specified test method performed under optimum laboratory conditions, for example with brand-new machines, ideally sharpened cutting chains and knotless timber. Obtaining discrete measurements under real-case conditions is highly resource-intensive, and transferring the measured values to other workplaces is difficult owing to the numerous influencing variables and the associated scatter. The objective of the systematic practical measurements was to obtain meaningful data for the purpose of risk assessment and to create a basis for vibration abatement measures.

Activities

Vibration measurements to EN ISO 5349 were conducted during felling work on 30 trees under typical working and operational conditions and in consideration of the following influences:

• Wood type

• Various working procedures (felling, cutting to size, delimbing)

• Various machines and users

Tree-felling work involving chainsaws

The artefacts arising during the long-term measurements (e.g.: hand not on handle) were recorded by a video camera mounted on the helmet, and subsequently eliminated.

Results and Application

In all studies, the higher stresses occurred on the side handle of the chainsaw. The average stress dose was higher during the felling of spruce than during the felling of beech.

The manufacturer's declared total vibration value a_{hv} of 3.5 m/s² with the measurement uncertainty K of 2.0 m/s² to EN 12096 covers the overlap from 1.5 m/s² to 5.5 m/s². This means that 95% of all values are below the value of 5.5 m/s². The maximum values measured in this study are above this limit.

When the manufacturers' data are used without consideration of the uncertainty, underestimation of the risk cannot therefore be ruled out. A need for action thus exists for the Technical Rule pursuant to the Ordinance on noise and vibration protection to require more precise consideration of the confidence interval for the manufacturer's declaration.

Area of Application

Forestry work

Additional Information

- Vibration exposure calculator for hand-arm vibration and CHAV vibration exposure calculator, www.dguv.de/webcode/d3245

- Lärm- und Vibrations-Arbeitsschutzverordnung (LärmVibrationsArbSchV), 6. März 2007. BGBI. I (2007), S. 261-277

- Technische Regel zur Lärm- und Vibrations-Arbeitsschutzverordnung (TRLV Vibrationen), 10. März 2010. GMBI. (2010) Nr. 14-15, S. 271-273

- EN ISO 5349: Mechanical vibration – Measurement and evaluation of human exposure to hand-transmitted vibration – Part 1: General requirements (12.01). Part 2: Practical guidance for measurement at the workplace (12.01). Beuth, Berlin 2001

- EN ISO 22867: Forestry and gardening machinery – Vibration test code for portable hand-held machines with internal combustion engine – Vibration at the handles (04.12). Beuth, Berlin 2012

- EN 12096: Mechanical vibration – Declaration and verification of vibration emission values (09.97). Beuth, Berlin 1997

- Kaulbars, U.: Gefährdungsbeurteilung der Hand-Arm-Vibration bei der Waldarbeit mit Motorkettensägen. IFA Report (in preparation). Hrsg.: Deutsche Gesetzliche Unfallversicherung, Sankt Augustin

Expert Assistance

IFA, Division 4: Ergonomics – Physical environmental factors

Literature Requests

IFA, Central Division