

Focus on IFA's work

Edition 5/2011

617.0-IFA:638.222

Hand-arm vibration: risk assessment in dental laboratories

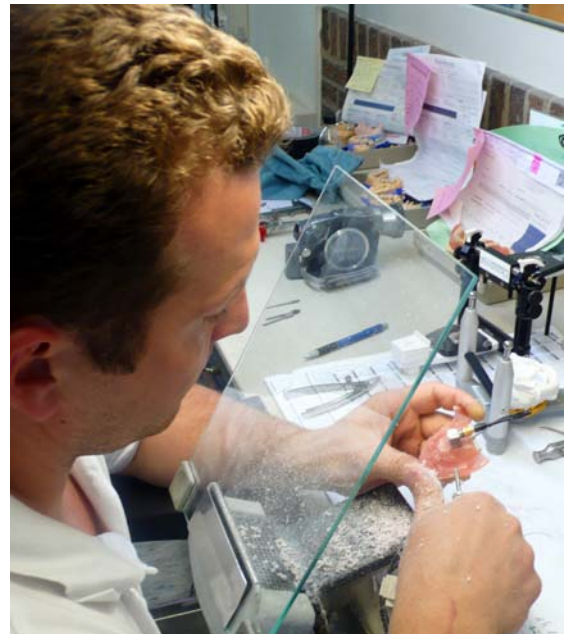
Problem

Workers in dental laboratories employ straight grinders, known as "handpieces", for the machining of supports for dentures. The hand-held electric drive unit can be fitted with a range of tool heads, for example for milling, grinding or bur-nishing. Depending upon the material to be machined, the tools rotate at speeds of 1,000 to 50,000 rpm. Dental technicians spend a large part of their working time using these tools. Vibration is transmitted not only through the handpiece, but also through the workpiece held by the technician. This hazard has not however been included up to now in the manufacturer's information.

In response to frequent complaints, vibration measurements were performed under the conditions found in commercial operation. The objective was the performance of a hazard analysis and development of preventive measures.

Activities

Vibration was measured on various handpieces and workpieces during work with typical tools and materials and under typical working and operating conditions. The exposure parameter measured was the vibration total value a_{hv} , which comprises the frequency-weighted accelerations in the three axes of measurement.



Vibration transmission through the workpiece

Results and Application

The vibration exposure a_{hv} presented by the workpieces studied lies in the range between 0.5 and 0.9 m/s^2 – up to 2.4 m/s^2 for older equipment – and therefore below the threshold of 2.5 m/s^2 for mandatory reporting by the manufacturer. The substantially higher exposures however were measured for the hand on the workpiece.

During machining work on steel frame supports for dentures, vibration was in the range of $a_{hv} = 3.9$ to 6.9 m/s^2 , reaching 12.6 m/s^2 in exceptional cases. During the machining of plastic dentures, the vibration exposure was lower, at an a_{hv} of 1.8 to 3.6 m/s^2 (up to 4.6 m/s^2 in exceptional cases).

Decoupling the hand from the workpiece is not a suitable way of reducing the vibration, as it would result in loss of the sensitivity required for the task. Consequently, the only recommendation possible at this time is that of an organizational measure, namely reduction of the daily exposure duration.

Area of Application

Dental laboratories, dentists, model-building.

Additional Information

- Vibration exposure calculator for hand-arm vibration. www.dguv.de/ifa, Webcode **d3245**
- Fachausschuss-Informationsblatt 052: Hand-Arm-Vibration. Checkliste zur Gefährdungsbeurteilung (12.2010). Published by: Fachausschuss Maschinenbau, Fertigungssysteme, Stahlbau der DGUV, Mainz 2010, www.bg-vibrationen.de
- Lärm- und Vibrations-Arbeitsschutzverordnung (Lärm-VibrationsArbSchV), 6 March 2007. BGBl. I (2007), p. 261
- Technische Regel zur Lärm- und Vibrations-Arbeitsschutzverordnung (TRLV Vibrationen), 10 March 2010. GMBI. (2010), Nos 14-15, pp. 271 ff.

- 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
- Kaulbars, U.: Developing Measuring Strategies for Unusual Workplaces, 10th International Conference on Hand-arm Vibration, 7-11 June 2004, Las Vegas – paper. www.dguv.de/ifa, Webcode **d36121**

Expert Assistance

IFA, Division 4: Ergonomics – Physical Environmental Factors

Literature Requests

IFA, Zentralbereich