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Focus on IFA's work

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Reduction of vibration on an all-wheel-drive off-road vehicle

Problem

Off-road vehicles may sometimes be used for inspection patrols on dumps. High vibration exposure was observed on an all-wheel-drive off-road vehicle, as the original suspension seat was unsuitable for the vibration excitation occurring in practice. The seat manufacturer indicated that the seat fitted had been designed primarily with highway use in mind. The seat appeared subjectively to provide inadequate lateral support of the body. It was not possible to reduce the vibration exposure arising by reducing the vehicle speed, as uneven terrain upon which the wheels were unable to grip could be traversed only by momentum and a higher speed.

An orthopaedic seat without suspension was therefore to be fitted, and the anticipated vibration exposure measured.

Activities

The vibration exposure was measured in all three axes of vibration on the existing suspension seat, on the orthopaedic high-comfort seat and at the seat mounting points, and the vibration transmission functions recorded. The resonance frequency and vibration amplitude of the suspension seat were found to be unsuitable for off-road use. Although it provided better body support, the orthopaedic high-comfort seat exhibited very high vibration exposure owing to the absence of a suspension component.

Off-road vehicle

Results and Application

In conjunction with the manufacturer of the vehicle, the vehicle suspension and tyres were modified. The manufacturer's recommendations regarding the tyre pressures were also followed. Levelling of the tracks enabled the vehicle speed to be reduced. These measures led to a substantial reduction in the vibration excitation. Recommendations were made for a suitable suspended part of the seat with spring and damper system; if followed, these should reduce the vibration further.

Area of Application

Municipal services operators, dump operators, forest rangers

Additional Information

- DIN V 45696-1: Whole-body vibration – Guidelines for vibration hazards reduction – Part 1: Engineering methods by design of machinery (02.06). Beuth, Berlin 2006

Expert Assistance

IFA, Division 4: Ergonomics – Physical environmental factors

German Social Accident Insurance Institution for the energy, textile, electrical and media products sector (BG ETEM), Regional Administration Düsseldorf

Literature Requests

IFA, Central Division

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