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Focus on IFA's work

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Exposure of professional divers to noise when wearing heavy diving helmets

Problem

Professional divers using heavy diving apparatus and various tools during their work are already exposed to high noise levels owing to the flow noise of their air supplies. This noise exposure is exacerbated by that of communication through integral speakers within the helmet, and finally by the noise from the tools used.

Measurements of exposure to flow noise and communication noise within copper helmets were conducted as long ago as 1989 and 1990. The average sound levels measured at the diver's ear were around 97 dB(A). These helmets have now generally been replaced by other types, and the tools used for underwater work have also been developed further. The noise exposure which may now be assumed was to be determined by measurements.

Diver during calibration measurement

Activities

On the heavy diving helmets, air is supplied from the surface through a compressed-air supply line. The suits are watertight dry suits.

By its nature, the diver's exposure to noise can be measured only by personal measurement. For this purpose, a miniature microphone was attached to the entrance to the ear canal. The amplifier and noise meter were carried within the diving suit. The sound-level characteristic and the third-octave band spectra were recorded at intervals of 1 second.

Recordings were also made of the noises, in order to make the processes more comprehensible during subsequent laboratory evaluation.

The measurements were performed in a divers' training pool. Wearing three different helmets, divers performed various tasks in each case with 16 different hydraulic and pneumatic tools. The tools comprised demolition hammers, rotary hammers, drills, angle grinders, impact screwdrivers and needle hammers. Measurements were also conducted during work involving a high-pressure cleaner and a branchpipe with C coupling.

Results and Application

An average flow noise level of the supplied air of 85 to 90 dB(A) was measured at the diver.

When the tools were used, the noise exposure increased by up to 20 dB(A). These high values were measured in particular when older, pneumatic tools were used. When equivalent hydraulic tools were used, the sound-pressure levels were no more than 13 dB(A) higher.

Communication is an additional source of noise exposure. Short-time averages of 108 to 110 dB(A) were measured during the reception of external speech signals via the speakers in the helmet. At such high values, communication may also constitute a significant component of the overall exposure, depending upon how frequently it occurs.

The conclusion from these measurements is that during the tasks studied, the upper exposure action value of 85 dB(A) stated in the German Occupational Health and Safety Ordinance on Noise and Vibration (LärmVibrationsArbSchV) will certainly be exceeded during usual durations of work. Professional divers must therefore wear hearing protection. The form of hearing protection selected must consider the particular working conditions of the divers (e.g. pressure equalization, communication).

Area of Application

Prevention services of the social accident insurance institutions, occupational disease case workers, diving businesses

Additional Information

- Paulsen, R.: Exposure of professional divers to noise. Inter-Noise 2010. 39th International Congress and Exposition on Noise Control Engineering "Noise and Sustainability", 13-16 June 2010, Lisbon. CD-ROM. Ed.: Institute of Noise Control Engineering of the USA Inc., Washington, DC 2010

Expert Assistance

IFA, Division 4: Ergonomics – Physical environmental factors

Literature Requests

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