

Focus on IFA's work

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Acoustic trauma caused by disconnection of a compressed air line

Problem

Flexible compressed air lines are often used to power pneumatic machinery and tools. Depending on the pressure in the lines and their cross-section, they may contain considerable volumes of compressed air. This poses a risk: if, for example, such a line should burst or pressurized connecting elements break, the compressed air expands abruptly. Besides the risk of workers being injured by flailing line ends, bursts can also potentially cause acute harm to hearing: an acoustic trauma.

Release of a claw coupling on a large, pressurized pneumatic hose, resulting in sudden release of the compressed air, was the cause of an accident reported to the social accident insurance. The end of the line was flung through the air and a loud burst of sound occurred. The responsible accident insurance institution tasked the IFA with determining the possible occurring peak sound pressure levels.

Activities

The peak sound pressure level was first estimated by a theoretical model. The incident was simulated in a cooperative effort between departments and studied under realistic conditions in the IFA's fluid laboratory.

In a test arrangement set up specially for the purpose, the IFA's experts adjusted the key parameters of the line cross-section and length, the type and model of coupling used and the pneumatic pressure to the conditions of the incident. The controlled laboratory environment enabled the incident to be reproduced safely.



Test set-up for simulation of the incident

A number of test series were performed in order to eliminate various uncertainties in the course of the incident and deliver reliable results. Based on the results of the calculations carried out beforehand, suitable measurement equipment was selected for reliable determination of the sound pressure levels arising at different pressures and at different distances from the source of the detonation.

Results and use

The study revealed that a sound pressure level presenting an acute risk to human hearing may well have occurred during the incident. The laboratory test thus also supports the results of the calculation model used and serves to validate it.

The findings of such studies assist in the identification of workplace hazards and are therefore an important element in purposeful prevention activity. The IFA supports the German Social Accident Insurance Institutions in such cases with calculations, database searches and laboratory studies.

User group

All German Social Accident Insurance Institutions

Technical enquiries

- IFA, Department “Ergonomics – Physical Environmental Factors”
- IFA, Department “Accident Prevention – Digitalisation – Technologies”

Literature enquiries

- IFA, Department “Interdisciplinary Services”

Further information

- DIN EN ISO 4414: Pneumatic fluid power – General rules and safety requirements for systems and their components. DIN Media, Berlin 2011
- VDI 2058 Part 2, Assessment of noise with regard to the risk of hearing damages. Beuth, Berlin 2020

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