

workplace noise and hearing conservation

Prepared by CONCAWE's Special Task Force on Guidelines for
Hearing Conservation Programmes in the Petroleum Industry

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ABSTRACT

Prolonged and repeated exposure to loud noise can lead to the development of noise-induced hearing loss (NIHL). This report addresses the subject of workplace noise in the petroleum industry and the role of hearing conservation programmes in preventing NIHL. It outlines the essential features of such programmes, including the evaluation and control of workplace noise, hearing surveillance, and worker education about NIHL and effective preventative measures, as well as indicating the management and employee responsibilities in their implementation.

Langdurige en herhaalde blootstelling aan hard geluid kan leiden tot de ontwikkeling van gehoorverlies. Dit rapport behandelt het geluid op de werkplek in de olie industrie, en de rol van de programma's tot voorkoming van gehoorverlies als gevolg van blootstelling aan geluid, tevens de meting van en controle op het geluid, controle op het gehoor en de opleiding van de arbeider met betrekking tot toepassing van doelmatige preventieve maatregelen. Het wijst ook op de verantwoordelijkheden van de bedrijfsleiding en de employee met betrekking tot de uitvoering van genoemde programma's.

Fortdauernde und wiederholte Exposition gegenüber Lärm kann geräuschbedingte Hörverluste hervorrufen. Dieser Bericht behandelt das Thema Lärm am Arbeitsplatz in der Mineralölindustrie und die Rolle, die Lärminderungsprogramme zu ihrer Verhinderung spielen können. Es werden die wesentlichen Elemente solcher Programme behandelt, einschliesslich der Beurteilung und Kontrolle des Lärms am Arbeitsplatz, der laufenden Hörkontrolle, der Unterrichtung der Mitarbeiter über solche Massnahmen, Beschreibung wirkungsvoller Massnahmen sowie Aufklärung über die Verantwortung, die Vorgesetzte und Mitarbeiter bei der Durchführung solcher Programme haben.

Une exposition prolongée et répétée aux bruits de forte intensité peut conduire à une diminution de la capacité auditive causée par le bruit (noise-induced hearing loss", NIHL). Ce rapport traite du bruit sur les lieux de travail et les programmes de protection de l'ouïe par une prévention du NIHL. Il présente les caractéristiques essentielles de tels programmes, y compris l'évaluation et le contrôle du bruit sur les lieux de travail, la surveillance de l'ouïe, et l'éducation sur le NIHL et les mesures de prévention. Il fait état aussi des responsabilités de la direction et des employés dans la mise en oeuvre de ces programmes.

Una exposición, prolongada y repetida, a fuertes ruidos puede llevar a desarrollar una pérdida de audición inducida por ruidos (PAIR). Este informe se refiere al tema de los ruidos en los lugares de trabajo de la industria petrolífera y al papel que desempeñan los programas de conservación de la audición y prevención de PAIR. Desarrolla las directrices esenciales de dichos programas, incluyendo la evaluación y control del ruido en los lugares de trabajo, controles de audición y control del ruido en los lugares de trabajo, controles de audición, la educación del trabajador sobre el PAIR y medidas preventivas efectivas, al igual que indica las responsabilidades de directivos y empleados en su cumplimiento.

Una prolungata e ripetuta esposizione a forti rumori può portare alla "perdita d'udito indotta dal rumore" o "NIHL" dalle iniziali del termine inglese (noise-induced hearing loss). Questo Rapporto tratta l'argomento del rumore nel posto di lavoro nell'industria petrolífera ed il ruolo dei programmi di tutela dell'udito nella prevenzione del "NIHL". Lo studio evidenzia gli aspetti principali di questi programmi, compresi la valutazione ed il controllo del rumore nel posto di lavoro, il controllo dell'udito, e l'informazione del lavoratore riguardante il "NIHL" ed efficaci misure preventive, indicando anche le responsabilità del datore di lavoro e del lavoratore nella loro realizzazione.

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1. INTRODUCTION

Prolonged and repeated exposure to loud noise can cause permanent damage to hearing, resulting in noise-induced hearing loss (NIHL). In the work environment prevention of NIHL may be accomplished by means of a hearing conservation programme, which is aimed at identification, evaluation and control of personal noise exposures in the workplace. Exposure to noise outside of work may cause similar damage but is beyond the control of management. Therefore the measures outlined herein can never guarantee full protection but minimise the risk of hearing loss as a result of exposure to workplace noise.

This report describes the general principles of protecting employee hearing ability. A companion volume, CONCAWE Report no. 85/58, "Guidelines for hearing conservation programmes in the petroleum industry", available on request from CONCAWE, provides more detailed technical guidance on the implementation of hearing conservation programmes in the petroleum industry.

2. NOISE-INDUCED HEARING LOSS (NIHL)

Exposure to noise can produce an impairment of hearing, known as noise-induced hearing loss, which can be either temporary or permanent, depending on the type of noise and the amount of exposure. Temporary hearing loss recovers rapidly after cessation of exposure and full recovery usually takes place in the first 48 hours. Permanent hearing loss, however, does not recover and a permanent impairment remains despite removal from noise exposure. The extent of this impairment depends upon the amount of noise energy received by the ear. The total amount of this energy, or noise dose, is a function of intensity of the noise and duration of exposure.

Persons exposed to the same amount of noise energy usually show differing amounts of hearing loss, indicating that there is a difference in individual susceptibility. An individual's degree of susceptibility cannot be predicted in advance.

Another cause of hearing loss is increasing age, i.e. presbycusis. This is additive to NIHL and the combination determines the total hearing impairment.

Since NIHL usually develops gradually over many years persons may not be aware of their deafness in the early stages and by the time the handicap becomes apparent extensive irreversible damage has occurred already in the inner ear.

Another form of NIHL is the so-called acoustic trauma which is an instant irreversible hearing loss due to a single exposure to explosive or extremely loud noise.

As NIHL progresses, the ability to understand speech is reduced, especially in the presence of background noise such as conversation in a crowded room. Using a hearing aid or turning up the volume of radio or TV only intensifies the blurred and indistinct sound.

It is important to realise that there is no treatment for NIHL, and that loss of hearing ability affects communication, is a serious social disadvantage and may have safety implications.

3.

NOISE LIMITS

Legislation or guidelines to limit workplace noise exist in most countries where CONCAWE member companies are operating.

Noise limits are expressed in terms of noise level or noise dose. Noise level refers to the intensity of noise and is measured as an A-weighted sound pressure level, expressed in decibels and abbreviated as dB(A). The A-weighting has been introduced so that the reading of the sound measuring device corresponds approximately to the characteristics of the human ear. The term noise dose refers to the quantity of noise in the hearing zone and thus is a function of the noise level and exposure time. This is normally expressed as the "equivalent continuous noise level" to which a person is exposed over an 8 hour per day, and written as dB(A) Leq (8 hr.). Many of these criteria are accompanied by an overriding condition that the unprotected ear should not be exposed beyond a specified maximum noise level, irrespective of duration, as such levels may cause immediate and irreparable damage to hearing.

Some CONCAWE member companies have their own recommended noise limits, which may be more stringent than national recommendations.

4. HEARING CONSERVATION PROGRAMME

The objective of a hearing conservation programme is to prevent occupational hearing loss by the identification and control of excessive exposure to workplace noise.

The essential features of a hearing conservation programme are as follows.

4.1. EVALUATION OF WORKPLACE NOISE

Noise surveys should be undertaken in areas where exposure to noise in excess of the adopted limit* is suspected. As a general rule, for 90 dB(A) this may be assumed to be the case if a person has to shout in order to be understood at a distance of one metre. In workplaces where the noise levels are reasonably constant the measured level more or less reflects the individual noise dose over a working day. However, in areas where the noise levels fluctuate widely, such as in a workshop, measurements should be carried out over full shifts to establish the personal noise doses associated with each job. The noise data should be assessed in terms of the adopted limit.

Considerable changes in the noise environment may be caused by factors such as the ageing of machinery, the introduction of new machinery and the alteration of operating practices. Therefore the measurements should be repeated periodically following the initial evaluation.

4.2 NOISE CONTROL

4.2.1 Reduction of noise emission

All workplace noise should be reduced at source, so far as is reasonably practicable, even where the noise level is already below the adopted noise limit. This is the best means of limiting personal noise doses, will protect the more susceptible persons and may also result in increased work efficiency.

Apart from control of noise at source, reduction of workplace noise can be achieved by engineering control measures such as the enclosure, isolation and separation of noisy equipment, the use of sound absorbent material and the regular maintenance of noisy equipment. All such measures must take account of operational consequences.

*The term "adopted limit", as used in this document, refers to the appropriate company, national or other guidance/legislative noise limit(s) used in the assessment of workplace noise levels and/or personal noise doses.

Noise specifications should be developed for all new machinery and processes, taking account of the existing workplace noise environment, and incorporated in equipment requisitions.

The advice of a noise control specialist should be sought where appropriate.

4.2.2 Reduction of noise exposure

Where workplace noise cannot be reduced sufficiently, personal noise exposure may be reduced by the use of sound refuges in noisy areas, reduction of exposure time, or the use of personal hearing protective devices.

The selection, use and maintenance of personal hearing protective devices are vital factors in achieving effective protection. The devices should provide adequate attenuation of noise, be acceptable to the wearer, and be easy to clean and maintain. Procedures should be established to ensure that these factors are properly observed.

4.3 HEARING SURVEILLANCE

Hearing acuity can be measured by means of an audiometer and consideration should be given to assessing the hearing acuity of those persons potentially exposed to noise in excess of the adopted limit. Audiometry allows the detection of hearing loss long before a person notices difficulty in understanding conversation. It also enables an evaluation of the effectiveness of the hearing conservation programme and the identification of noise susceptible individuals. In addition it provides an opportunity for individual advice and education about noise, noise-induced hearing loss and the role of hearing conservation programmes, and the chance to stress the importance of the full participation by the individual (see 4.4).

4.4 EDUCATION AND TRAINING

All persons who are potentially exposed to excessive noise at work should be fully informed of the hazard, the principles of hearing conservation and their role in the hearing conservation programme. Information may be given in various ways, e.g. courses, written guidance, competitions, films. A patient, continuous education and persuasion campaign on the part of management, employee organisations and individuals will generally result in a real acceptance that a hazard exists and the measures for its prevention. Non-occupational noise exposures may also represent a potential hazard to hearing and this should be emphasised in education and training programmes.

5. RECORDS

Comprehensive records should be maintained on all aspects of the hearing conservation programme, including:

- workplace noise measurements;
- personal noise exposure data, including job title and location;
- information regarding noise control measures;
- selection, use and maintenance of personal hearing protective devices;
- audiograms and appropriate medical records;
- education and training programmes;
- calibration and maintenance of all measuring equipment;
- enquiries from and responses to individual employees or employee representatives concerning any aspect of noise, hearing or hearing conservation.

All records should be retained for the minimum period specified in appropriate company, national legislation or other guidelines. It is recommended that individual medical records should be kept for a minimum of 30 years after the worker leaves or retires from employment.

6. PERSONNEL REQUIREMENTS

The various elements of a hearing conservation programme require adequate trained staff to implement the programme and to act as focal points for actions in specialist areas. This will include personnel competent to carry out:

- noise level and noise exposure measurement and assessment;
- control of noise;
- selection, use and maintenance of hearing protective devices;
- hearing surveillance, including audiometry.

In the absence of competent personnel within a company, it will be necessary to seek advice from external specialists.

7. RESPONSIBILITIES FOR IMPLEMENTING A HEARING CONSERVATION PROGRAMME

Responsibility for the implementation of a hearing conservation programme lies with management.

Management may appoint a Hearing Conservation Coordinator to be responsible for all aspects of the hearing conservation programme for the whole company, or for each local installation or site concerned.

Employees have a responsibility to cooperate in the implementation of the hearing conservation programme. In some countries this may be a legal obligation.

Problems encountered in the implementation of the hearing conservation programme should be reported to management or the Hearing Conservation Coordinator. Normal consultation procedures between management, specialist advisers and employees, or their health and safety representatives, should be used to facilitate the implementation and to monitor progress of a hearing conservation programme.