

# Hearing trends in noise-exposed oil refinery workers



Prolonged exposure to excessive noise may cause damage to an individual's hearing ability or a so-called 'Noise-Induced Hearing Loss' (NIHL). In EU Member States, occupational exposure to noise is controlled by legislation based on the requirements of European Council Directive 86/188/EEC of 12 May 1986<sup>1</sup>.

According to the current legal requirements, workers exposed to daily personal noise levels above 85 decibels A-weighted (dB(A)) must be provided with hearing protection equipment and given the opportunity of having their hearing checked to allow early diagnosis of any hearing impairment. CONCAWE had previously evaluated the daily personal noise exposures of refinery workers and is currently preparing an update of these data. It appears that the 85 dB(A) criterion is regularly exceeded in oil refineries when process or maintenance work is carried out during prolonged periods in noisy areas. Many noisy areas have been identified and demarcated, and the use of personal hearing protection (muffs, plugs) has been made mandatory. As a consequence, actual exposure to noise is in most cases lower than the measured levels, which are normally measured with a microphone attached to the collar of the worker for the duration of the work-shift. Hearing checks, known as audiograms, are now carried out routinely in many oil refineries.

Directive 86/188/EEC contained a provision for a future review of the specified daily personal noise exposures levels (85 and 90 dB(A)) that requires control measures to be taken. As part of an amended proposal for a new EC directive on physical agents published in 1994, a threshold level for daily noise exposure of 75 dB(A) was specified. A previous article published in volume 8.1 of the CONCAWE Review (April 98) assessed the scientific data available and suggested that

<sup>1</sup> Directive 86/188/EEC deals with the protection of workers from the risks related to exposure to noise at work. It required European Member States to bring into force legislation and provisions for the evaluation of occupational noise exposures and the protection of workers' hearing capability

the daily exposure threshold level may be set at a level higher than 75 dB(A) (for instance 80 dB(A)) and still prevent noise-induced hearing loss.

In order to evaluate the impact of national regulations based on Directive 86/188/EEC and the implementation of the guidelines for hearing conservation programmes, CONCAWE's Medical Subgroup analysed the hearing trends of noise-exposed oil refinery workers in Europe. The study was carried out with the assistance of the Institute for Sound and Vibration Research of the University of Southampton (UK) and the Epidemiology Unit of the School of Public Health of the Université Catholique de Louvain (Belgium).

Audiometric data covering a period of approximately twelve years (from the mid-eighties to the late nineties) were retrieved from the occupational health departments of ten refineries in seven European countries. The change of the hearing thresholds over the period was assessed in a study population of over 1000 oil refinery workers regularly exposed to noise (this was defined as exposure to a noise level above 85 dB(A) for at least 1 hour per working day or more than 200 hours per year for the duration of the study period).

Hearing thresholds are known to increase with age, particularly at the higher frequencies, even without illness or exposure to noise. A correction is therefore needed if the influence of workplace noise exposure is to be evaluated in isolation. Normal hearing threshold data for people not exposed to noise are available from international guidelines as averages and standard deviations for various age groups. These data were used in this study.

The data were screened for non-noise related hearing deficiencies using established procedures and then corrected for age according to the international guidelines. Statistical analysis was undertaken to identify any time trends and differences between subgroups of younger and older workers.

At the start of the study period, the average hearing thresholds of the refinery worker population were higher than those of the general population. This in itself was not an unexpected finding for a population of industrial workers. However, when the increase of the average hearing of the refinery workers over the 12-year study period was compared with the increase that one would expect to see in the general population caused simply by the ageing process, there was no indication of additional hearing loss due to noise exposure. In fact, the average refinery worker's hearing at the end of the study period was closer to the average general population hearing than at the start of the study period. This gives a strong indication that, although there is potential for noise exposure to reach hazardous levels in some oil refinery workplaces, the level of protection is such that it prevents the development of more hearing loss than can be attributed to ageing alone. A comparison of the age-corrected data for the two subgroups showed that less hearing loss had occurred in younger workers than in older workers. This is a further encouraging sign that standards of protection have improved.