NOISE AND HEARING CONSERVATION

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Noise is now recognised as a nuisance and there is a growing awareness in the society about its deleterious effects on general well being, efficiency of work and health. Leaving out the extreme cases of mild noise causing irritation to psychologically or physically predisposed subjects and very intense noises which may be a health hazard, the disturbing effect of noises in general is divided under three main categories:

(i) annoyance to listener,
(ii) interference with speech communication and
(iii) risk of impairment of hearing.

Short exposure to intense noise affects the acuity of hearing and the result manifests itself as an upward shift in the hearing threshold of the recipient—the extent of impairment depending on the noise intensity and duration as also on the sensitivity of the individual. The effect is described as a temporary threshold shift (TTS) if the elevation shows a progressive return toward the pre-exposure level and ultimate recovery in course of time. Prolonged exposure or habitual continuous or intermittent exposure over a long period produces a lasting effect on hearing acuity resulting in a permanent threshold shift (PTS) without indication of progressive recovery. Hearing conservation aims at preventing impairment of hearing by exposure to noise and the term may include in its purview studies on noise induced threshold shift (NITS), noise analysis, formation and application of rules and the use of practical procedures for minimising the risk.

In moderate cases the noise induced impairment of hearing becomes permanent when the habitual exposure continues for several hours a day over a period of years. Experimental work to gauge the elevation in threshold due solely to noise and to correlate it with the nature of noise exposure is difficult because of the time element involved in the study. Data available on the subject are limited but the studies carried out so far suggest, however, a correlation between the temporary threshold shift and the corresponding permanent threshold shift in case of habitual exposure. It may be assumed that in case of habitual exposure a permanent shift of threshold takes place which gradually assumes the same value as the temporary threshold shift observed soon after a work days exposure and compared with the pre-exposure level.

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The temporary shift in threshold after a short-term exposure is closely related not only to the overall intensity of the noise but also to the nature of the noise, its frequency spectrum and distribution with time. For the same sound pressure level in decibels two specific noises may have different effects so far as impairment of hearing is concerned. In practice it is necessary to obtain a correlation between the physical parameters of noise and the resulting hearing loss.

There are individual differences in susceptibility and all people do not respond in the same manner or show the same degree of reaction to their physical environments. The damage risk criteria for noise are, therefore, judged in terms of averages. A method has been suggested for evaluating the risk on this basis. The difference in the percentage of people with impaired hearing in a noise exposed group and the percentage of people with impaired hearing in an otherwise similar but non-noise exposed group is taken as a measure of the risk with respect to a particular kind of noise.

For practical purposes the noise can be fairly well defined in terms of the sound pressure levels in octave bands. The octave band levels so measured may be evaluated in terms of the accepted noise rating schemes. It has also been suggested that overall sound pressure level as measured with a sound level meter with the 'A' weighting net work may be employed to describe the noise where octave band analysis is not practicable. In any case it is necessary to conduct a statistical analysis of noise level over a period of time to obtain the average value of noise intensity by taking the time average of repeated observations or the continuous intensity record.

A variety of criteria can be adopted to define the hearing loss depending on the purpose of the study and experimental accuracy obtainable. Mild hearing loss may be of interest for certain specialised studies. For the purpose of evaluating industrial noise the hearing loss can be considered to be significant if it materially interferes with speech communication and affects the subjects ability to follow normal speech. According to one suggestion average of the hearing loss at 500, 1000 and 2000 Hz. can be taken as a direct measure of the effect on speech communication. If marginal loss is ignored, an elevation in threshold of 25 dB in 10 per cent of noise exposed people averaged over the frequencies 500, 1000 and 2000 Hz. can be taken as a significant risk criterion.

Experimentally, an estimate of noise induced hearing loss requires a full measurement and analysis of the generally encountered noises with the help of sophisticated and calibrated equipment including automatic recorders. On the other hand, it involves audiometric examination of a chosen group of people before and after noise exposure over a period of time. To obtain reliable results a fairly large number of subjects have to be examined at regular intervals. The audiologists as also the subjects may find it difficult to spare the time required for the purpose. Self recording audiometers may have to be employed in the study.

In India work on this aspect of noise and hearing has not been done so far on a significant scale. Many research workers are keen to carry out these studies but no single institution has all the requisite facilities in terms of time, resources, man power, equipment and expertise to handle the problem in entirity. The situation requires that a plan of study be drawn jointly by institutions concerned such as Hearing Institutes, Medical Institutes, Acoustics Laboratories, Labour Institutes and others connected with the problem and concerted and co-ordinated work be carried out with pooled resources from the institutions concerned.