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## Combating the Traumatic Effects of Industrial Noise

W. F. Scholtz\*

**T**ODAY'S INCREASED INTEREST IN FACTORY NOISE is partly created by the fact that exposure to sound under certain conditions may cause hearing impairment. This interest has been reflected in both management and labor circles. The seriousness of the problem is evidenced by a sudden increase in the number of claims filed for industrial hearing loss, presumably caused by exposure to high intensity sound.

Unfortunately, major uncertainties exist, making the establishment of standardized tests and measurements difficult. Allis-Chalmers Manufacturing Company and competent medical authorities have done a great deal of valuable preliminary study, making it possible to set tentative standards and chart a course for programs which ultimately will control the noise problem.

In 1948, under the guidance of the late Dr. Grove, the initial steps at Allis-Chalmers toward an industrial hearing conservation program were begun. Instruments to make sound level studies were acquired, as well as personnel trained in their use. Surveys were made of various industrial operations, and these were used as a basis for future studies. Audiometric instruments were later added and examinations of personnel begun.

As result of the experience gained in these basic studies, a program toward ultimate control of the problem was established. For anyone interested in a program to combat the effects of noise, the following steps merit consideration:

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[*Editor's Note:* Some noise and modern manufacturing are almost, if not wholly, inseparable. Since it is almost impossible, in the near future, to eliminate all noise, the hazard of hearing impairment to employes cannot be ignored. The approach is twofold: reduce the noise to a minimum, and establish a protective program against the effects of the minimum. If hearing impairment is a compensable injury under Workmen's Compensation Laws (see Gasser, *Industrial Noise Causing Acoustic Trauma*, 5 Clev.-Mar. L. R. 111 (1956) and the companion article by Fox in this issue of this Review), the problem is of obvious interest to management, labor, and the legal profession. This article is an interesting account of what one manufacturer is doing to reduce the effects of factory noise. It also may well indicate the proper standard of care required of manufacturers faced with the same problem.]

*Plant Surveys:* The complete plant area is tested by a sound-level meter. Such testing establishes how much noise is in the plant, and its location. In locations of levels 95 decibels or above, a program of audiometric examinations is in order. These spot checks should be followed by a complete sound-level survey of the plant. After the general survey, a sound band analysis should be made at locations above 95 decibels. This data will be particularly helpful in planning a noise abatement program. Thereafter, periodic follow-up surveys should be made. All new, repaired, or transferred equipment is also checked.

A level of 95 decibels has been accepted only as a starting point for sound band analysis study. Such a level does not establish a level at which hearing loss begins.

*Audiometric Examinations:* All new employees are given a pre-employment audiometric examination. It is desirable to take an audiogram on a pure-tone audiometer in the frequency range of 125 to 12,000 cycles per second. Ordinarily, the range of 250 to 8,000 c.p.s. is used. It is also important that the age, sex, and occupation of the employe are recorded. The previous work history is also important and should reveal the operations he was exposed to in the past. For example: "Did he work as a milling machine operator, a ribbon salesman, or a boilermaker?" "What was his opinion of the noise level where he worked?" "Did he think it was noisy?" "Could he carry on a conversation without difficulty?" The military record is important. The branch of the service, what he did, and for how long should be recorded. For example: "Was he a machine gunner, an M. P., an office worker, radar operator, etc.?"

Finally, a present history of his hearing should be elicited. "Is your hearing good?"; "Can you hear over the telephone?"; "In the theatre?"; "In a single conversation?"; "In a group conversation?" It is necessary to ask whether he has or is using a hearing aid, and if so, for how long. Another important question is: "Do you, or have you ever, used ear protection?", especially if it can be followed with such questions as "regularly?" "often?" "seldom?" It is interesting to note some of the ear protectors used are: oil soaked cotton or dry cotton, 32 caliber shells, round-head screws, gum, and even rubber erasers. It may seem to some that the value of this type of data is questionable, but for research purposes and industrial compensation inquiries, it is indispensable.

An otoscopic examination should follow, to exclude any existing pathology in the external ear canal or drum membrane. This is a routine part of the pre-employment physical examination.

As a result of over 6,000 pre-employment audiograms, 27% of the new employees were found to have had some type of audiometric loss. It must be recognized that this represents only hearing losses found in the industrial segment of the population. It might not necessarily reflect the hearing ability of the whole population. New employees going into areas where sound level readings are above 95 decibels should be rechecked before their probationary period has ended (in many plants this is three months) and then again in six months after hiring. Thereafter, annual examinations of hearing ability should be carried on. The arbitrary figure of 95 decibels has no significance except that it was set by the medical department as the level at which they desired to study possible audiometric changes in employees. It is emphasized, however, that audiometric examinations should be made a part of every physical examination, whether pre-employment or during the course of employment.

*Job Placement and Transfers:* If an employee shows a significant loss of hearing on the recheck, particularly the new employee, he may have a "noise susceptible ear." If so, he should be provided with the best possible hearing protection and sent to a competent otologist for evaluation. Sufficient factual information cannot be found to justify transferring an individual from a noisy environment to a less noisy environment, except in those few instances where the hearing loss is progressing in spite of protective measures. The advantages of a noise abatement program should overcome the necessity for transfer and should reduce the overall noise level.

*Audiometric Room:* Such a room is preferably located in the plant as a part of the first aid facilities or medical department. Location of such a room is difficult because the ideal audiometer reading should disclose a noise level of 50 decibels or less. In addition the noise level must be fairly constant. Competent acoustical engineers are required in order to locate such a room. The construction of such a testing room to meet these requirements may necessitate the expenditure of a relatively large sum of money. However, some authorities feel that any room can be used for audiometric purposes if the noise level is

reasonably constant, has been measured, and is such that it does not interfere greatly with the audiometric tests in the lower frequencies.

Audiometric tests can be carried out by technicians who are adequately trained by any competent otologist.

*Noise Abatement Program:* A noise abatement committee was appointed from members of the maintenance department and shop supervisions. The Hygiene Section of the Safety Services Department cooperates with these committees, acting as staff assistants. In this capacity, an educational program on noise was presented to acquaint them with the problem. Sound level readings were taken at their request and previous noise surveys were evaluated.

In the absence of noise abatement standards, the committee felt that the logical place to start noise abatement work would be at locations where we had complaints that the area was too noisy. In the limited time in which the committees have been functioning, it has been found that a good share of the noise in the shop can be reduced through good maintenance of machines and equipment.

At a number of locations where loose gears and bearings were replaced, the noise level was reduced from 8 to 10 decibels. By replacing metal safety guards with wire mesh safety guards, a low frequency hum was reduced ten decibels. On several production operations where compressed air is used to blow chips from recessed parts, we were able to reduce the general noise level as much as 12 decibels by performing the operation in a small cubicle lined with acoustical board. The overall noise level was lowered an average of seven decibels in the Tabulating Room. It is interesting to note that in similar situations, acoustical treatment of a room produced no change in the overall noise level. This points out that the indiscriminate use of acoustical material, in the absence of competent acoustical engineering, will not always bring about the desired result.

Other interesting results from the noise abatement program are as follows:

The reduction of the noise on the six-spindle automatic screw machine was achieved by lining the bar stock feed tubes with coil springs. The noise level fell from 95 decibels to 85 decibels.

Installing mufflers on the exhaust of air vises reduced the noise level from 94 decibels to 79 decibels.

Covering metal bench tops with wood reduced the noise level by as much as 15 decibels on some operations.

At the present time tumble barrels and metal skid boxes are being treated with a tar compound to reduce noise. Such changes produce significant noise abatement at relatively little cost. There are, however, many operations within a manufacturing plant which resist efforts in noise abatement programs. These include such operations as cleaning of castings, forging, and the like. Inasmuch as this is a relatively new field in industrial hygiene, this report can serve only as an introduction into the problem. Extensive research and application is yet necessary in the project before the noise problem can be controlled or evaluated.