

STUDY OF MECHANICAL NOISE OF A SELECTED AGRO-BASED INDUSTRY AND ITS IMPACT ON WORKER'S HEALTH

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Faisalabad city is famous for its agro-based industries which vary from textile to farm machinery manufacturing units. There are hundreds of small and big textile industries located in the populous areas of the city. The noise level of these industries not only affects the health of the workers but also the neighboring residents of the area. To estimate the attenuation in noise level of textile industries, the weaving unit of Chenab Fabrics, Limited, Faisalabad was selected. A digital sound level meter was used to record the noise level during 12 hours working shifts. The noise level of the weaving unit was found to vary from 88 to 102 dB (A) which was very high as compared to International Standards Organization (ISO) limit of 87 dB (A) set for eight hours working shift. To determine the impact of mechanical noise on hearing loss of the workers, tuning fork and audiometric tests were conducted. It was found that 10 workers who have been working in the Chenab Fabrics for the last 14 to 40 years have suffered from different stages of Binaural Sensor neural hearing impairment. In the light of these results, it has been suggested that the factory owners should provide ear protectors to their workers and decrease their exposure time from 12 to 8 hours.

Key Words: Noise pollution, weaving unit, hearing impairment, audiometry

INTRODUCTION

Environmental pollution has recently become a burning issue all over the world. Important constituents of our environment include air, water, soil, plants and animals. Any kind of imbalance in the constituents of our environment gives rise to environmental pollution. There are different sources of environmental pollution such as chemicals, radiation, and noise. Noise pollution is mostly the outcome of sound attenuation generated by agriculture and industrial machines. Sound generation and its propagation at undesirable level which irritates the listener's is called noise pollution. Industrial noise is complex and varies with the design and direction of the working parts and its method of mounting on the machine.

Faisalabad city is full of agro-based industries which includes textile, food processing industries and manufacturing of farm equipment. Most of the factories are situated in the populous areas which are not only affecting its worker's health but also the neighboring community. Noise pollution can induce temporary or permanent hearing loss ranging from slight impairment to total deafness. However, this damage to hearing depends upon the exposure time and the intensity of noise. Ahmad (1996) reported that a noise greater than 90 dB(A) in the mid night frequency reduced the auditory sensitivity of the listener. Nawaz and Tauseef (1977) described that noise pollution not only affected the ears but also the cardiovascular system. It increased the cholesterol level in the blood and raised blood pressure. According to the International Standards Organization, the noise level more than 85 dB (A) is dangerous for ears and it has physiological

and psychological effects on worker's health. Noise also affect the heart rate, stomach functions, nervous emotions and personality. Ramsey and Robert (1996) stated hazardous effects of noise on worker's health, moral and productivity. Noise tends to develop constriction in blood vessels. In addition to health effects, noise also causes disturbance in sleep. Carter (1996) described that intermittent noise created more interference to sleep than continuous noise. Therefore, for this paper we studied the mechanical noise level in different sections of textile factory and its impact on worker's performance.

MATERIALS AND METHODS

In this study, attenuation of noise level was measured in the weaving unit of Chenab Fabrics (Private) Limited which is located on Sheikhpura Road close to Nishatabad Railway Station, Faisalabad. The textile factory has weaving unit, stitching unit, processing unit and boiler house, etc. In the weaving unit about 56 workers are working in two shifts. The weaving unit has three sections and each section has different number of machines and workers. Section I had 24 machines and 14 workers in two shifts. While Section II had 28 machines and 18 workers in two shifts. Similarly Section III had 32 machines and 24 workers in two shifts. A digital sound level meter DSM-100 was used to measure the noise level at 9 different locations of each weaving section. Four noise-readings were taken at four corners and one at the center of each section. Further four readings were taken at a distance of about 2.5 m around each weaving section. Noise readings were also taken in the beginning, at half time and at the end of a shift. Accumulative effect of number of

machines on noise level was studied by turning on two machines at a time until all the machines of a section started working. Thermo-Hygrometer was used to measure air temperature and humidity in and outside the sections. Tuning fork and audiometry tests were conducted for 25 selected workers of different age and service to determine hear loss.

RESULTS AND DISCUSSION

Noise pollution has received special attention in the present industrialized world. Noise pollution is produced from different sources and industrial noise is one of them. In the industries the workers are mostly exposed to the noise for eight hours but in some industries like weaving industries the workers are exposed to noise for 12 hours. Compared to the other pollutants, noise pollution not only affects the human health but also the surrounding environment. Therefore, it is necessary to measure the noise levels produced by variety of machines in these industries. In the present study the noise levels were taken in different sections of weaving unit of Chenab Fabrics (Private) Limited, Faisalabad.

Noise Attenuation in Weaving Unit

Table 1 represent the level of noise at different locations of three weaving sections under prevailing ambient conditions. A maximum noise level of about 101.7 dB(A) was observed between the rows of weaving machines whereas a minimum noise level of about 82 dB(A) was recorded in the beam filling location. An average noise level for two shifts and three weaving sections in the weaving hall was measured to be 98 dB(A) which is quite high as compared to noise level of 87 dB(A) prescribed by International Standard Organization (ISO) for 12 hours working shift. It was further observed that the noise level in all the sections of the weaving unit remained the same during day and night. Moreover, the noise level was found independent of ambient temperature and humidity.

Effect of Number of Machines on Noise

The effect of number of machines on the noise level was studied by switching on 2 machines at a time and thus increasing the number to 24, 28, and 32 for Sections I, II and III, respectively. The background level of noise when all the machines were off was about 66 dB(A) in all the three sections of weaving unit. When two machines were started the noise level was about 90 dB(A) in all the sections. The noise level for 24 and 28 machines (Section I & II) was recorded about 100 dB (A). In case of section III when all the 32 machines were working, the noise level was measured to be about 102 dB(A). From these results, it may be concluded that the increase in noise from 66 to 90 dB(A) due to working of two machines is more significant than increase in noise from 90 to 102 dB (A) due to 36 machines working together. This also indicates that the noise level generated by just one weaving machine is about 3 dB (A) higher than set by ISO.

Effect of Noise on Hearing Loss

The second objective of this study was to determine the impact of noise pollution on worker's hearing impairment. For this purpose tuning fork and pure tone audiometry tests were carried out for selected workers by an audiologist. After conducting the medical tests and interview, it was found that 10 out of 25 selected workers with job duration of 14 to 40 years had different stages of hearing impairment. After conducting pure tone audiometry tests on these 10 workers, the following results were found. Three cases had bi-neural mild, 6 cases had moderate and one case had severe hearing impairment. A pure tone audiogram for moderate and severe hearing impairment is given in Table 2. All the workers in weaving sections had daily noise exposure for 12 hours. It was also observed that besides hearing impairment they have also suffered from other diseases like sleep disturbance, speech interference, hypertension and blood pressure.

Table 1. Average noise level recorded at different locations of three weaving sections of Chenab Fabrics, Faisalabad

Location	Section I dB (A)	Section II dB (A)	Section III dB (A)	Avg. of 3 Sections dB (A)	Temperature CC)	Humidity (%)
Between machines	98	98.6	99.6	98.73	40	45
Between row	100	101	101	100.67	41	48
Around machine	98.5	98	98.8	98.43	41	47
Overall Hall	97.5	98.5	97.6	97.87	43	46
Winding Place	97	98	97.8	97.6	42	48
Outside Shed	84.4	85	86	85.13	40	46
Beam Filling Place	81.5	81.8	81.8	81.7	39	47

Table 2. Hearing threshold level measured by audiometry for moderate and severe hearing impaired worker.

Frequency (Hz)	Moderate Hearing Impairment		Severe Hearing Impairment	
	Left Ear	Right Ear	Left Ear	Right Ear
250	50	45	70	75
500	55	55	75	75
1000	60	60	85	90
2000	60	55	90	90
4000	90	85	100	105
8000	80	85	100	105

CONCLUSION

During this study the average noise level in all sections of the weaving unit was found in the range from 88.2 dB (A) to 101.6 dB (A) inside the shed. This level was very high as compared to International Standards given by Occupational Safety Health Administration (OSHA) and International Standards Organization (ISO). According to these two organizations the maximum noise level for eight hour work shift should be 87 dB (A). It was observed that high level of noise in working areas had developed moderate to severe hearing impairment in 10 out of 25 selected workers. Therefore, it was concluded that workers should be provided with some kind of ear protectors to save them from the ill effects of industrial noise.

RECOMMENDATIONS

Noise pollution studies should also be carried out in other industries such as food industry, power house, foundries, sugar and ghee factories, etc. The researchers should also study the abatement and control measures for noise. Studies to discover some cheap and effective noise absorbing material should also be conducted.

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