The Status of Occupational Noise in Some Selected Factories on Libya

Muftah Elammari
Nuclear Research Center
Tajura, Libya
mfelammari@yahoo.com

Azzam M. Helmi
Nuclear Research Center
Tajura, Libya
azzamly@yahoo.com

Alsdik Gazi
Nuclear Research Center
Tajura, Libya
alsddekghazi@yahoo.com

Abstract—**In this paper occupational noise levels at selected factories were measured and compared with the international permissible levels using the integrating sound level meter (Quest 2800) during the year 2007. The calibration of the instrument was carried out before and after each measurement using the acoustic calibrator (Quest CA-12B calibrator). The method which was followed was measuring the sound pressure level of the different noise sources over a broad frequency band covering the audible frequency range using the (Octave band filter, model OB-100), disregarding variation with time.**

From the obtained results, some noise levels which were recorded were within the permissible levels i.e. below 90 dBA and some noise levels were higher than the permissible limit as at Janzoor textile factory (95dBA), Benghazi Macaroni factory (100dBA), and near the air blowers at Zletin cement factory, Benghazi cement factory (97-100 dBA) in these cases suggestions were made to minimize the problem.

Index Terms: **Occupational noise, Quest 2800, Octave band filter, 97-100 dBA.**

I. INTRODUCTION

High levels of environmental and occupational noise remain a problem all over the world. Complaints from occupational noise increased dramatically by the end of the19th and beginning of the 20th centuries as the USA and European societies became more urbanized and industrialized. In developed countries occupational noise is the cause in more than one third of those with hearing impairment. In many countries, occupational noise is the biggest compensable occupational hazard.

Reports issued by the World Health Organization (WHO), 1997 stated that 16% of deafness around the world is due to occupational noise, with a higher proportion in males now the situation in developed countries is improving as workers and employers became more aware of the hazard. Occupational noise in different regions of the world is stated below:

A. Occupational Noise in Africa

There are high noise exposure levels in the formal and non-formal occupational sector, there is a little public awareness among employers and employees, most countries do not have effective programs to prevent noise induced hearing loss (NIHL) [1].

B. Occupational Noise in Eastern Mediterranean

Noise comes from different sources such as industry, traffic and leisure activities, most countries in the region have environmental legislations but it is difficult to implement also compensation is hard to be obtained [1].

C. Occupational Noise in Latin America

The problem in this continent is thought to be large but the magnitude of the problem has not been assessed yet, there is a poor enforcement of the legislation and poor implementation of the conservation programs, but recently improvements of legislation have occurred [1].

D. Occupational Noise in Europe

Although the scale of industrial work in Europe is too large, industrial noise levels were reduced over the last two decades and the risk and hearing protection equipment is supplied to workers in order to prevent the risk of hearing damage. Nevertheless in Germany there are about four to five million people who are exposed to hazardous noise levels, this number represents 12 to 15% of the total workforce [2].

E. Occupational Noise in the USA

In the USA more than thirty million workers are exposed to hazardous noise [3].

It was reported that 44% of carpenters and 48% of plumbers had a perceived hearing loss and 90% of coal miners have hearing impairment by the age of 52. It was also estimated that 70% of metal and non metal miners will have hearing impairment by the age of 60 [4].

F. Occupational Noise in Japan

Many studies have been conducted on hearing conservation and the control of noise. Administrative

Received 18 April 2015; revised 11 May 2015; accepted 23 June 2015.
Available online 1 July 2015.

guidelines for the time a person can spend in a noisy place are implemented. Education and training on this topic is given to workers and supervisors. Audiometric testing is performed at recruitment and relocation and periodically every six months. Noise induced hearing loss is noticed in the shipbuilding industry where most compensation has been paid [1].

II. MATERIAL AND METHOD

Measurements of noise was made using the integrating sound level meter, Quest (Model 2800) - made by Quest electronics together with the octave band filter (Model OB-100) The Quest model 2800 functions as a sound level, impulse, or integrating meter. The method which was followed in this work was measuring the sound pressure level of the noise emitted from the different machines over a broad frequency band covering the whole audible frequency range, disregarding variation with time.

Since the human ear is most sensitive in the 2 – 5 kHz range of frequencies and least sensitive at extremely high and low frequencies, the instrument was adjusted on the A weighting net work which varies with frequencies in a very similar way as that of the human ear. Measurements which were taken by the A-weighting network is referred to as dBA or dB(A). The accuracy of the sound level meter which is used in these measurements is 0.5 dB at 25° C and within 1 dB over the temperature range of -10° C to 50° C [5].

III. RESULTS AND DISSCUSION

A- Noise Level at the Main Hall in Janzoor Textile Factory:

There are 148 machines in this hall; the number of workers is around 100. During the measurement, there were only 6 machines working at the time of measurement. The floor of the hall is covered with cement. Noise levels were measured at 3 different positions, the highest noise level recorded was 95 dBA, at the operator's position, in front of machine No.4, Figure 1 . Workers should not stay for more than 3 hours in such noise, ear plugs should be put on throughout the shift. Since the noise measured is the same so are the pattern of the curves, the fall of the curves is well expected due to the use of the A-weighting network.

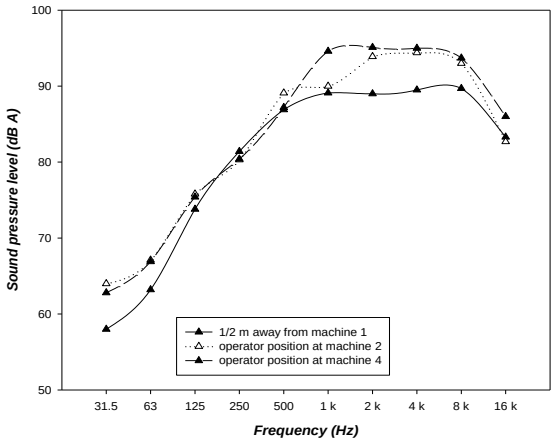

Figure 1 . Noise Level in the Main Hall at Janzoor Textile Factory

B- Noise Level: Benghazi Macaroni Factory

Workers at the factory work for 8 hours in 3 shifts. They relax for 1 hour during the shift. Measurements were taken at 3 different places, (i) at macaroni packing hall, (ii) the flour packing hall and (iii) the soft wheat grinding mill. Noise level measured at the flour packing hall was above the permissible limits. There were 6 workers per shift who were exposed to such high noise. The highest noise level recorded at this hall was 93 dBA, Figure 2 .

The peaks of the curves were at 4000 Hz. 500 Hz., 250 Hz., all curves tend to fall at both ends of low and high frequencies which is a normal case when using the A-weighting network.

According to the U.K criterion for permissible noise exposure, workers may be allowed to work for 4 hours a day under these conditions.

Noise levels recorded in the macaroni packing hall and the soft wheat grinding mill were below the limits but still workers are advised to put on their hearing protection devices that were distributed to them by the management. As informed during our visit that all workers in the factory do not wear hearing protection devices and also the problem of occupational noise effects on human health was not well understood by them.

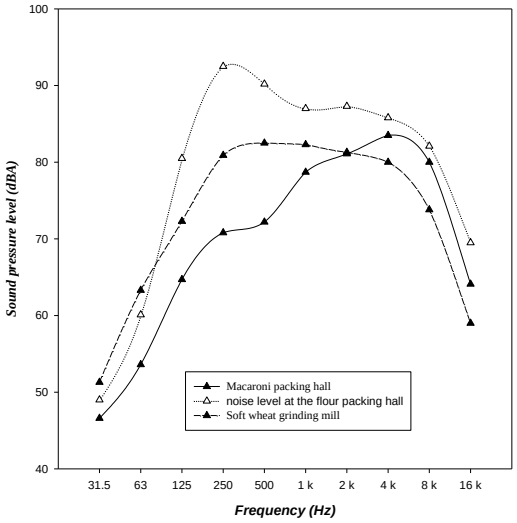

Figure 2 .Noise Level At Benghazi Macaroni Factory

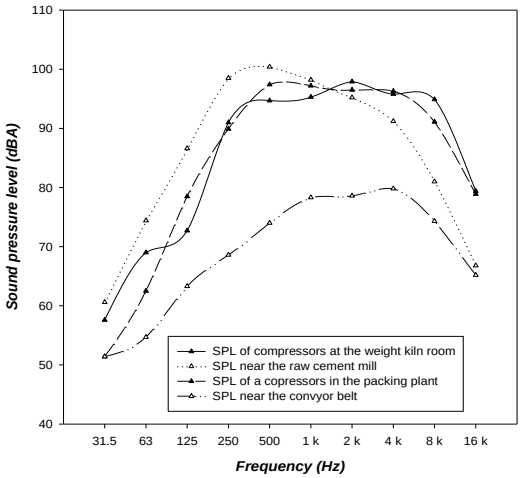

Figure 3 . Noise Level At Benghazi Cement Factory

C- Noise level at Benghazi Cement Factory

Benghazi Cement factory started production in 1972 with a capacity of 200000 tons/yr. This capacity was increased to reach 600000 tons/year in 1974. Another production line was added in 1977 to increase the production capacity to 1000000 tons/yr. Since 1991 the production capacity decreased to 800000 tons/yr. Measurements were performed in 4 different places, (i) 1m away from the air compressors at the weight kiln room, (ii) 2m away from the raw cement mill, (iii) 3m away from air compressors in the packing plant and finally (iv) 1m away from the conveyor belt where cement is delivered to the trucks. In the first three places there was no real existence of workers except during maintenance. In the fourth place there were 6 workers in the hall in each shift. Noise levels in the first three places were well above the international standards, (97.9dBA, 98.2dBA, 97.4dBa) at frequencies 500, 500 2000 Hz respectively, but noise level near the conveyor belt was within the international standards (79.8dBA) at 4000Hz. Also the falls of the curve endings at low and high frequencies is due to the A-weighting network. It was reported during the visit that the machines are subjected to regular preventive maintenance.

D- Noise level at Zletin Cement Factory

Zletin Cement factory started production in 1984 with a capacity of 1000000 tons/yr.

Noise levels were measured in different places in the factory, the crusher of the raw material, inside and outside the control room, near the engines of the crusher where noise reaches 90 dB A, Figure 4.1 .These places are visited by maintenance workers daily, and maintenance work can be carried out in these conditions during the stoppage of any production line. It was reported during the visit that the machines are subjected to preventive maintenance if the spare parts are available. As most industrial noise occurs at the frequency 500 -1000 Hz, this can be clearly seen on Figure 4.1. Measurements were also carried out in other places like (i) Raw material mill, (ii) the fans of the raw material mill by which dust is withdrawn from the mill and sent to the rotary kiln, and (iii) the air blowers room which is located under the raw material homogenizing silos, this place has the highest noise level in the factory which reaches 105 dB A, Figure 4.2 at 20000 Hz., we were informed during the visit that workers enter this room with their hearing protection devices on. Noise levels near the raw material mill and the fans recorded the highest peaks at 500 Hz. Zletin cement factory recorded higher levels than Benghazi while the latter is older factory this is because measurements in both factories were not taken at the same places.

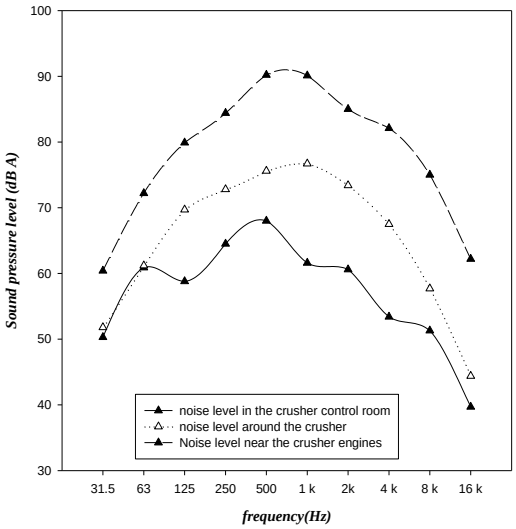

Figure 4.1 . Noise Level Around The Crusher At Zletin Cement Factory

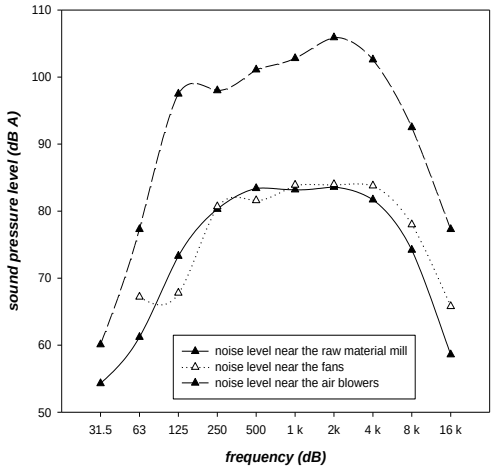

Figure 4.2 .Noise Level around the Raw Material Mill at Zletin Cement Factory

IV. CONCLUSION

Noise is one of the most pervasive occupational health problems. It is a by-product of many industrial processes. The purpose of noise measurement is that this subject has not been studied well enough in our country which led to a widespread of ignorance of the hazard.

The problem of occupational noise is increasing every day due to the fast developments which are experienced worldwide. The objectives of the study is to measure noise levels in different industrial locations and comparing them with international standards, increasing the public awareness about this problem and finding some solutions for the noise problems that were faced during measurement.

The instrument used for this purpose is the integrated sound level meter type Quest (2800) which records the sound pressure level of the machine, measurements of machine noise was carried over a broad frequency band covering the audible frequency range.

Occupational noise levels were recorded high at many places like the textile industry, the flour mill, some places in the cement factories in Benghazi and Zletin and the highest recorded level among all studied locations were as follows: the air blowers at Zletin cement factory (105 dBA), around the raw material mill at Benghazi cement factory (100.4 dBA).

Male workers were more exposed to high occupational noise than female except in the textile industry where female workers were exposed to dangerous levels of occupational noise.

Engineering and administrative controls are undertaken to reduce exposures to less than 90 dBA, this include good design of equipment, its location and layout, selection of quieter machines, proper maintenance and isolation of workers from noisy sources. Control measures should be realistically designed to meet the needs of each situation, and different options should be considered in view of factors such as effectiveness, cost and technical feasibility.

ACKNOWLEDGMENT

The authors wish to thank the technical and administrative personnel at the mentioned factories for their cooperation.

REFERENCES

[1] Prevention of Noise-Induced Hearing Loss. (1997). WHO Report, Geneva.

[2] Occupational Exposure to Noise, Evaluation, Prevention and Control (2001), WHO
Report, Geneva.

[3] Criteria for Recommended Standard: occupational noise exposure revised criteria,
(1998). National institute for occupational safety and health, USA.

[4] NOISH report (1991). National Institute for Occupational Safety and Health, USA.

[5] Integrating Sound Level Meter Operation Manual, Quest Electronics, USA

BIOGRAPHIES

M.F.Elammari, a Senior researcher at Tajura Nuclear Research Centre, received his degree in Chemical Engineering from London South Bank University, received his MSc. Degree in environmental Engineering from the Libyan Academy, published many papers related to environmental pollution.

Azzam M. Helmi, a Senior researcher at Tajura Nuclear Research Center, received his BSc degree in Mechanical Engineering (1981), the Higher Institute of Mechanical and Electrical Engineering, MSc in Power Engineering (1999), the National Technical University of Ukraine, Kiev.

Alsdik A. Gazi, a researcher at Tajura Nuclear Research Centre, received his BSc degree in physics from Tripoli University and his MSc degree in Medical Engineering from the Libyan Academy, he contributed in many published papers connected to his field.