The African Review of Physics (2017) **12**: Special Issue on Applied Physics in Africa 0011

Assessment of Occupational Noise Level Effect on Millers in Ibadan, Nigeria

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Abstract

Noise is a form of pollution usually referred to as irregular sounds that cause disturbance and could be classified based on occupational or environmental conditions. Acoustical assessment of the level of noise produced by milling machines were carried out at the various milling sections of the Bodija market, Ibadan (Nigeria) using digital sound level meter. Noise level measurements of these various types of milling machines were investigated for a consecutive period of two 14 days during the activity periods. A total of 12 different types of milling machines were investigated, and their readings recorded in order to determine their average noise level and that of the neighborhood of the food related milling sections of the market. The maximum noise level, L_{max} and minimum noise level L_{min} measurements were also deduced in order to determine the range of the noise level. The result of our analysis showed that the average ambient noise level produced by these machines was within the range of 85dB to 120dB, a value that exceeded the daily 90dB maximum allowable 8 hours of noise exposure recommended by global noise monitoring agencies. This result indicates that people working around these mills are exposed to excessive noise and hence are prone to noise associated health effects.

1. Introduction

It is not an easy thing to differentiate between sound and noise since both are sensory perception, only that noise corresponds to that undesired sound [1]. In essence, noise is a disordered and an unpleasant sound that causes disturbance in the environment. By extension, noise is an unwarranted disturbance within a useful frequency band [2]. It can be simply explained as unwanted sound, or sound not desired by the recipient [3]. Noise as pollution is said to occur when the noise level is above the maximum permissible level for a given environment [4]. Noise effects can be separated into two broad categories: auditory (noise-induced hearing loss (NIHL)) and non-auditory (behavioral and physiological effects) [5, 6]. Noise pollution has long been recognized as affecting quality of life and well-being. Over past decades it has, in addition, increasingly been recognized as an important public health issue [7]. Noise is also associated with almost every work activity and it is a potential hazard for most jobs that involve abrasive or high-power machinery, impact of rapidly moving parts (product or machinery), or power tools. [2] has suggested that noise exposure in mechanized industry poses a greater threat to one's health than noise exposures occurring in the general environment. Some of the activities associated with particular levels of NIHL include those in manufacturing, transportation, mining, construction, agriculture and the military. The average noise levels in developing countries may be increasing because industrialization is not always accompanied by enforced legal protection [1]. High levels of occupational noise remain a problem in all regions of the world [8]. Environmental noise, like other forms of pollution, has wide-ranging adverse health, social, and economic effects. Numerous studies on the adverse health effects of noise, many of recent vintage, have been published as in [9]. The World Health Organization (WHO) has also documented seven categories of adverse health effects of noise pollution on humans [10]. These problems include stress related illnesses, speech interference, hearing impairment, sleep disruption, lost productivity, hypertension, annoyance and ischemic heart disease [11, 12].

Noise level data are scarce for developing countries and there is the need to determine the average noise levels for these developing countries including Nigeria. Noise level measurements were taken for Bodija market located in the Ibadan north local

government area of Oyo state, Nigeria, which has various sections where trading and different business activities are transacted. Among these sections are the milling sections for grinding cereals and sawing planks. The milling sections of this market is highly congested in that all of the machines were installed at very close distances from each other, especially the grind millers, thereby making the millers and their customers severely exposed to the noise generated by these machines. This necessitate the need to determine their exposure levels. Also there would be the need to ascertain whether noise control measures should be put in place using the WHO guidelines [13]. Also, [14] had stressed the importance of using engineering controls to reduce noise exposure to the point where the risk to hearing is significantly reduced or eliminated.

2. Material and Methods

Noise level measurements were taken at the milling sections of Bodija market, Ibadan, using Mini Sound Level Meter (Model DSM 325). The Mini Sound Level Meter measures sound in decibels and display the reading on the LCD screen that has a backlight button for easier viewing. Prior to carrying out measurements, the background noise levels in the study area were measured using the same precision sound level meter to ensure that the noise effects due to the generating sources were accurately determined. Noise level measurements were made for both grind milling machines and saw milling (circular and planning) machines.

Noise levels of grind milling machines for a period of 14 days between 10 to 24 August, 2015 were recorded close to and at some distances near the source of the noise for different periods of the day (i.e., morning, afternoon and evening). Six grind milling machines sampled for investigations were represented as G1, G2, G3, G4, G5 and G6. The average values of measurements for each period of the day were computed for each of these grind milling machines. Similar measurements were also recorded for 6 sampled saw milling machines represented as S1, S2, S3, S4, S5 and S6 for different periods of the day during the peak of activities, only that the reading for saw milling machines Sundays (non-working day) were excluded. The saw milling machines represented as S1, S2 and S3 are circular machines, while those represented as S4, S5 and S6 are planner machines. For this period of investigation only 11 of these days, measurements were taken simultaneously for both the grind milling and saw milling machines, while for the remaining four (4) days measurements were taken only for either the grind milling machines or the saw milling machines.

In the grind milling section, there were 5 rows of blocks with 23 shops in each of these rows where grind milling machines were stationed. Each shop is of about 3.5m x 2m in dimension. However, in the plank section of the market where saw milling machines were located few of these machines were confined to particular locations while the rest were mobile unlike those of the grind milling machines in which all of them were confined to a particular location. The plank sections of the market have a dimension of 75m x 40m and only a few of these machines are stationed, while others are mobile. Thus the saw milling machines in the plank section of the market are not as congested when compared to that of the grind milling machines in the cereal section of the market (Fig. 1).

Standard statistical analyses including descriptive statistics were used to investigate the recorded data.

3. Results and Discussion on Noise Level Measurement

Figs. 2 to 8 showed the result of noise level for the milling machines (grind mill and saw mill) investigated at Bodija market and that of the mill surroundings. However, majority of the millers depend on generators to power their machines due to inadequate supply of public electricity. These generators produce inherent noise, which may also be contributing to high noise level recorded since it was observed that when electricity was used by the millers rather than generators in powering their milling machines noise level measurements were reduced. Most of the high noise levels (> 100 dB) recorded in this study was during the use of generators. Also, highest noise levels were obtained for saw milling machines than grind milling machines. The highest daily noise level obtained for saw milling machines was 119.4dB from the noise level range of between 84.7dB – 119.4dB, while that for grind milling machine was 112.9dB from the noise level range of between 85.6dB and 112.9dB. Noise from the surroundings of the milling sections range between 76.4dB and 97.5dB and showed that the machines were contributing to the noise pollution of the environment (Fig. 9).

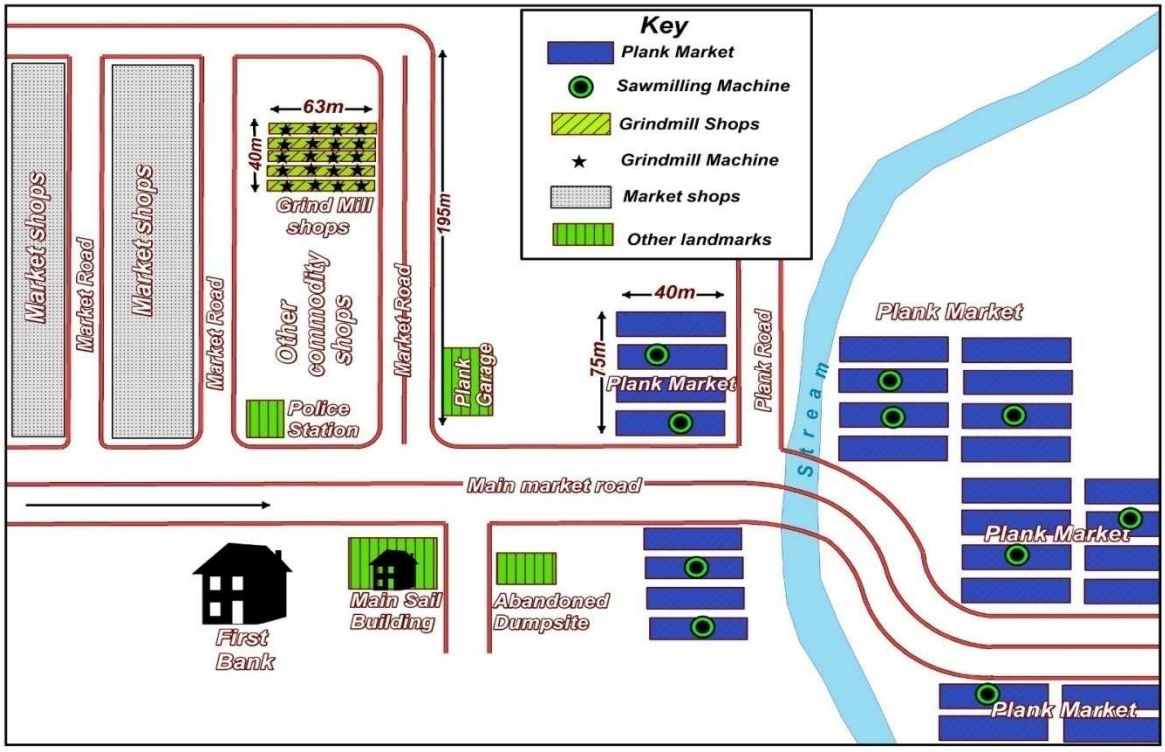
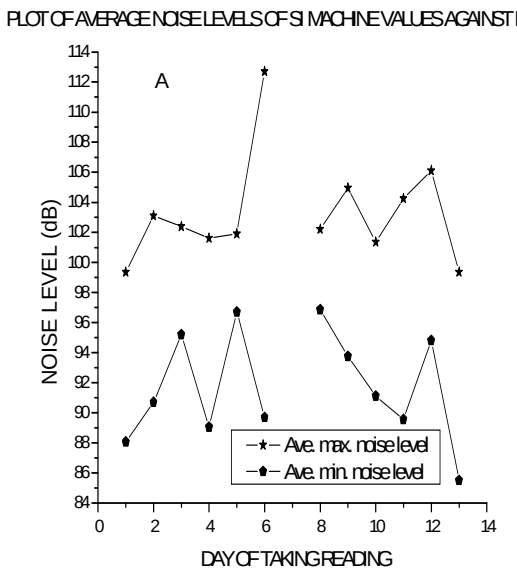
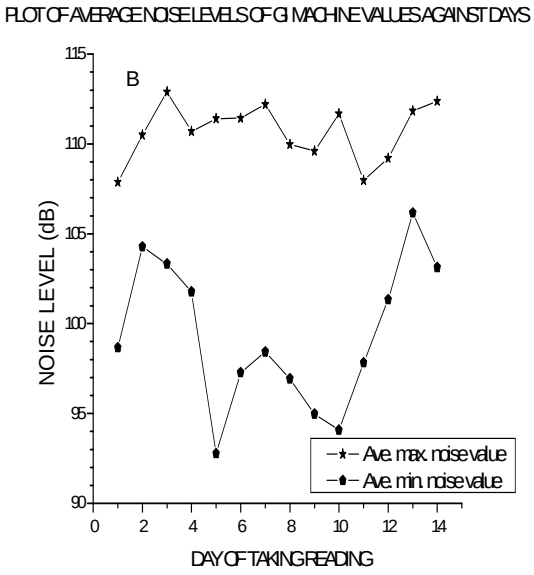


Fig. 1 Layout of Bodija market milling section, Ibadan





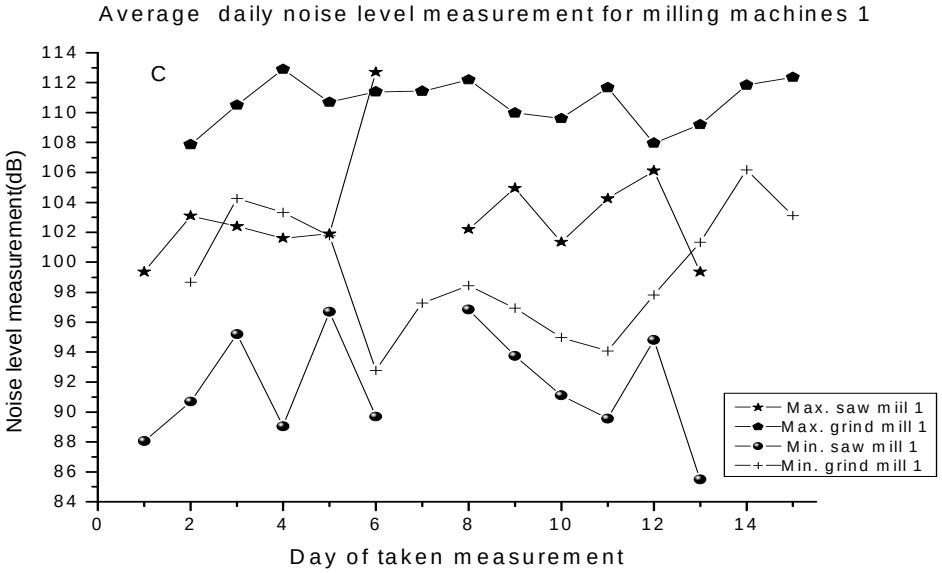
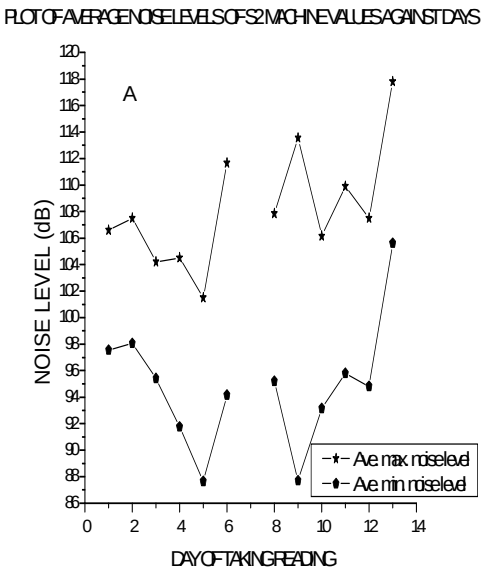
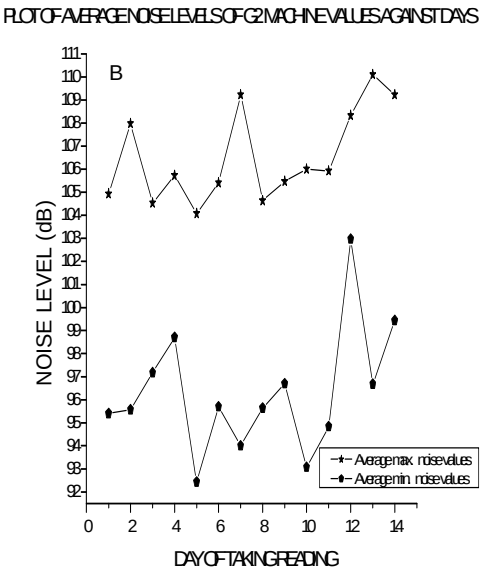


Fig. 2 Plots of average noise level against days for milling machines 1





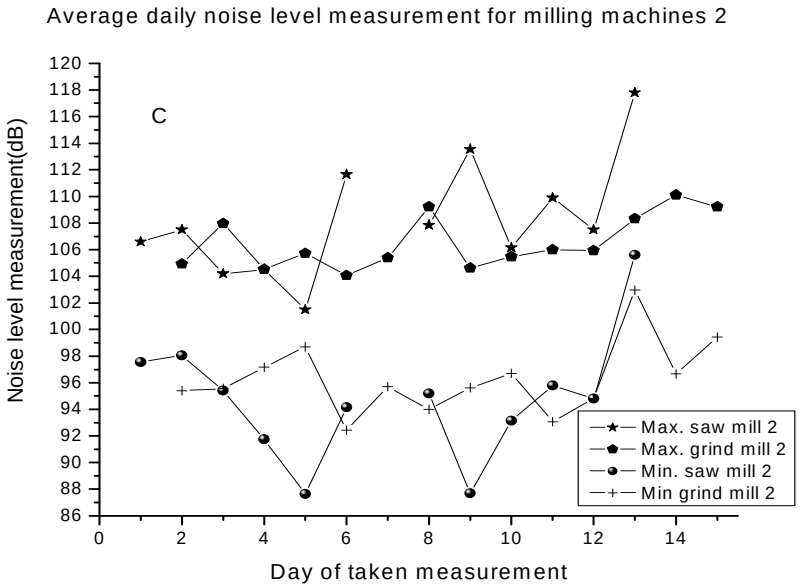
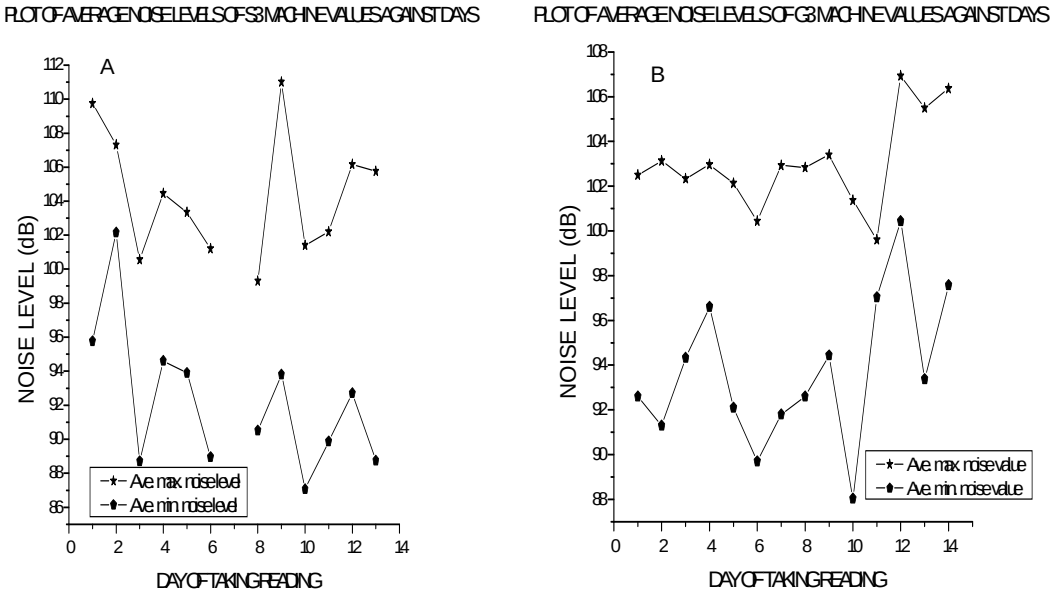


Fig. 3 Plots of average noise level against days for milling machines 2



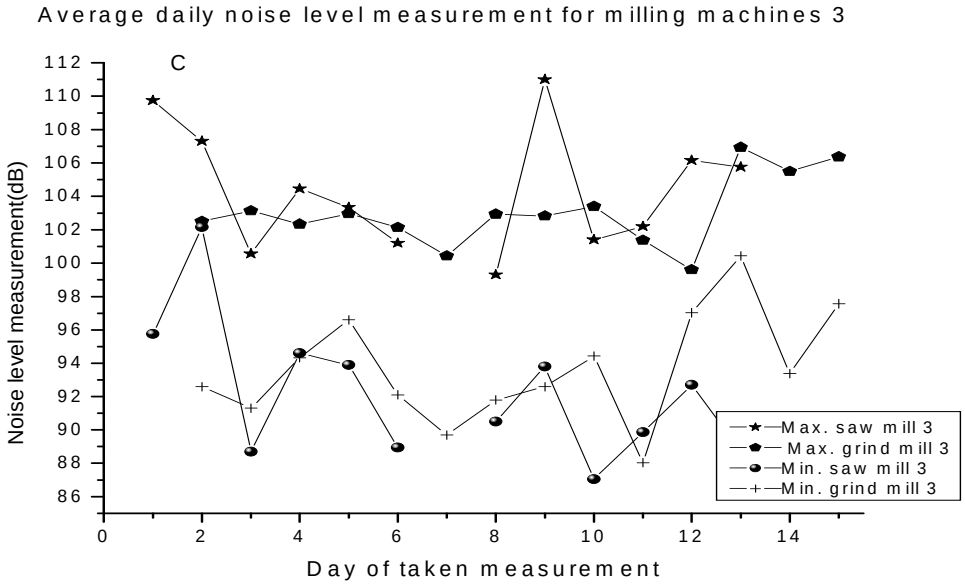
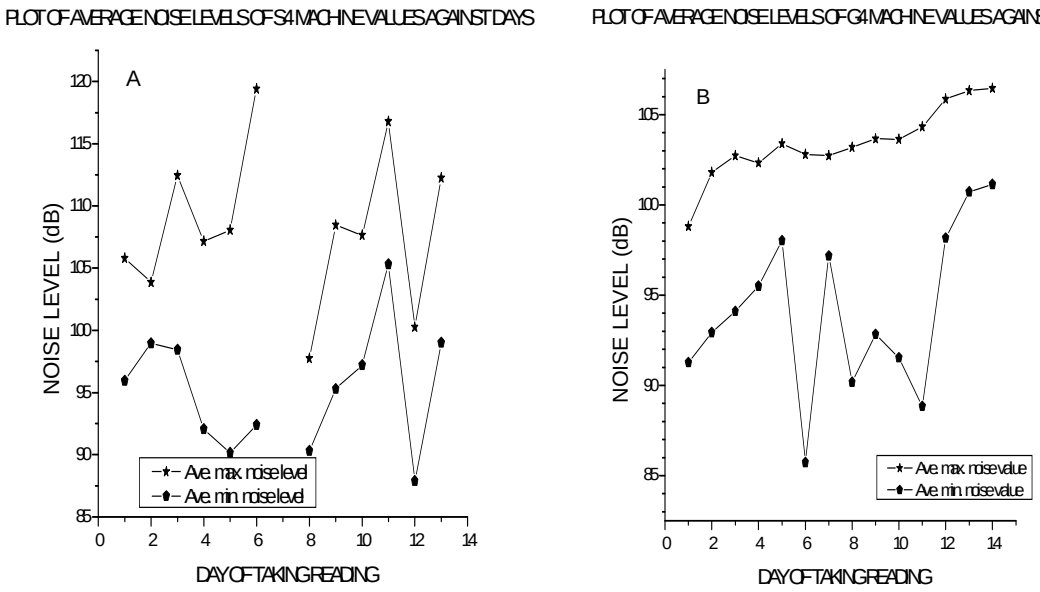


Fig. 4 Plots of average noise level against days for milling machines 3



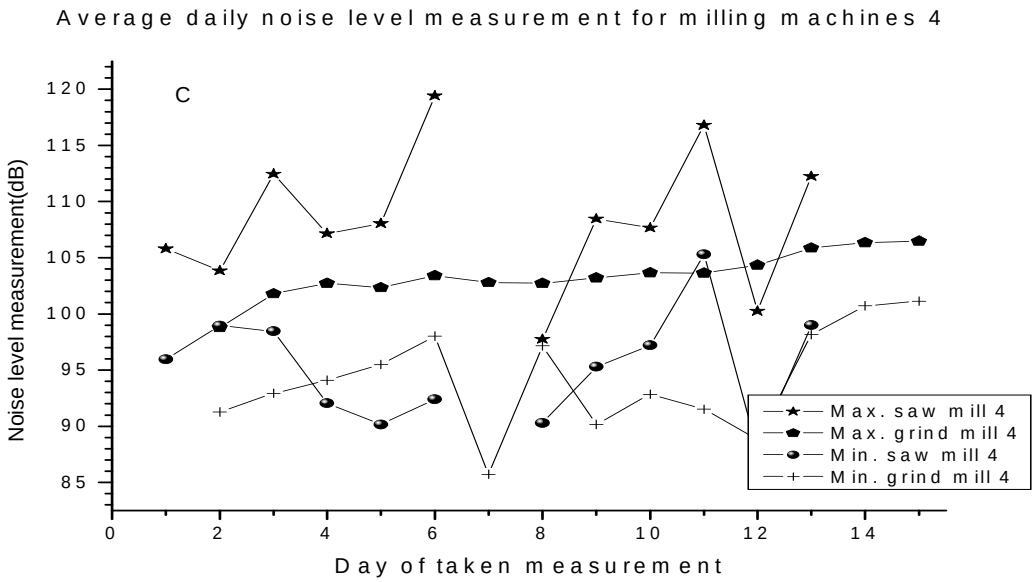
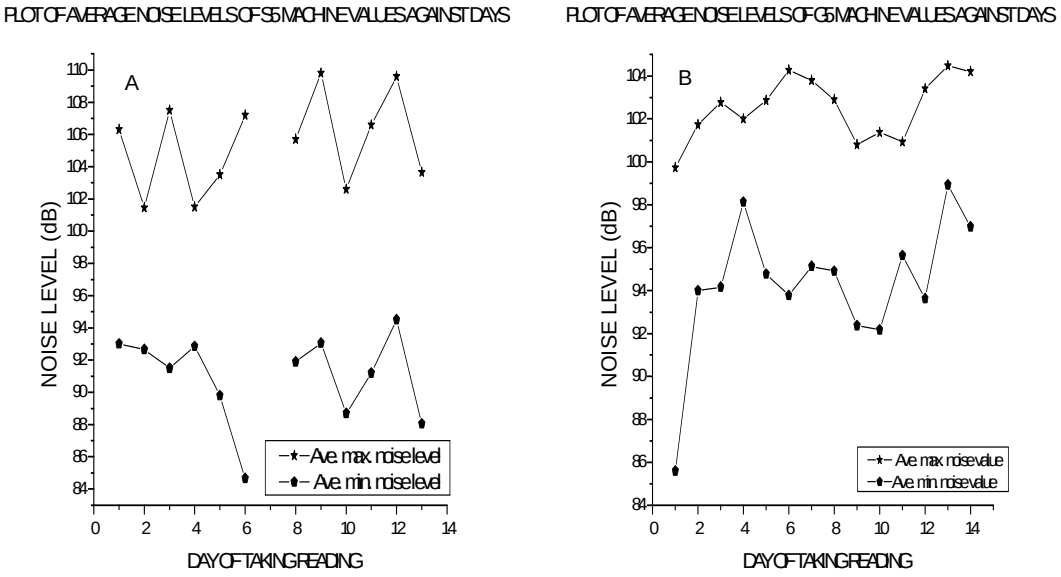


Fig. 5 Plots of average noise level against days for milling machines 4



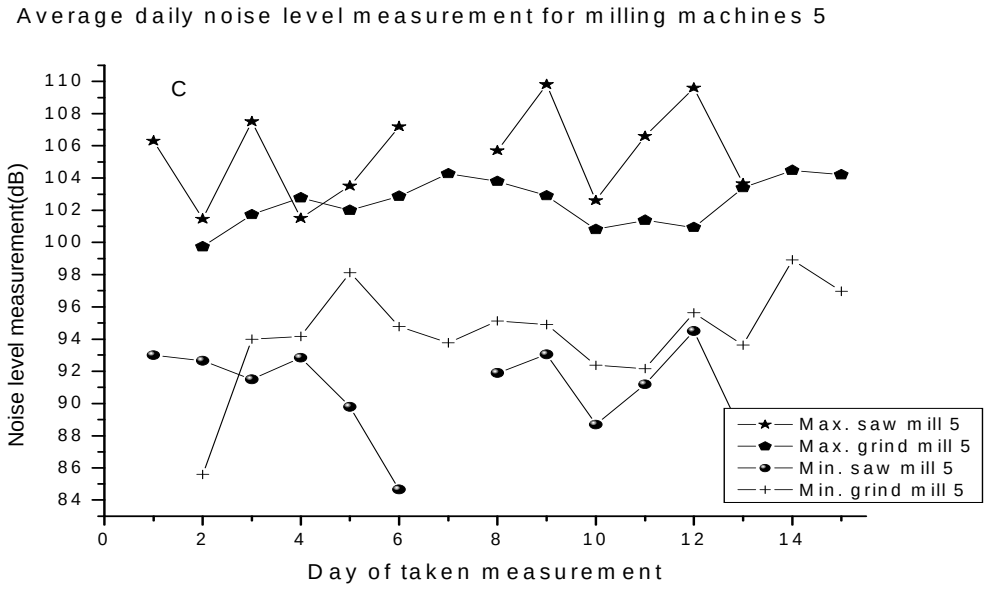
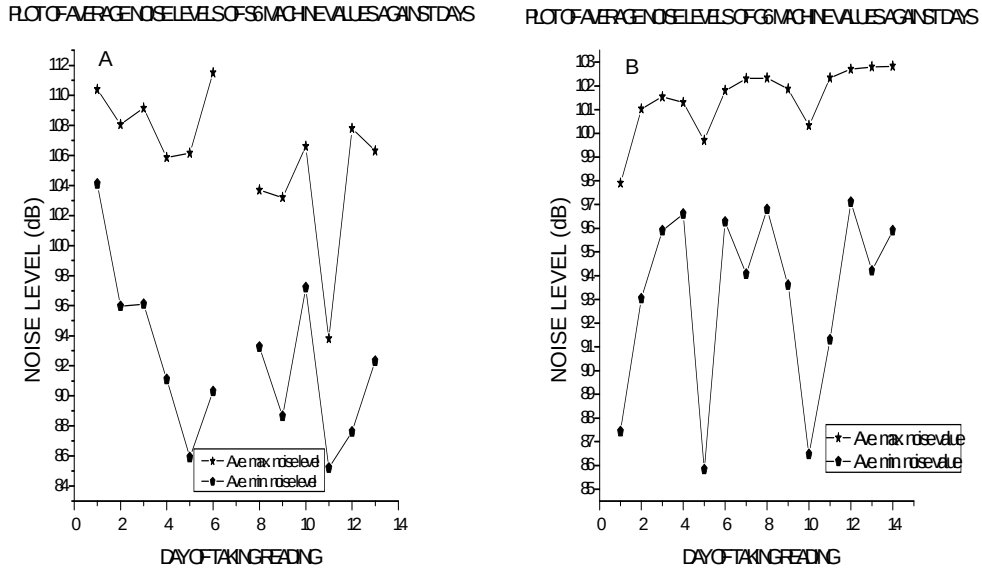


Fig. 6 Plots of average noise level against days for milling machines 5



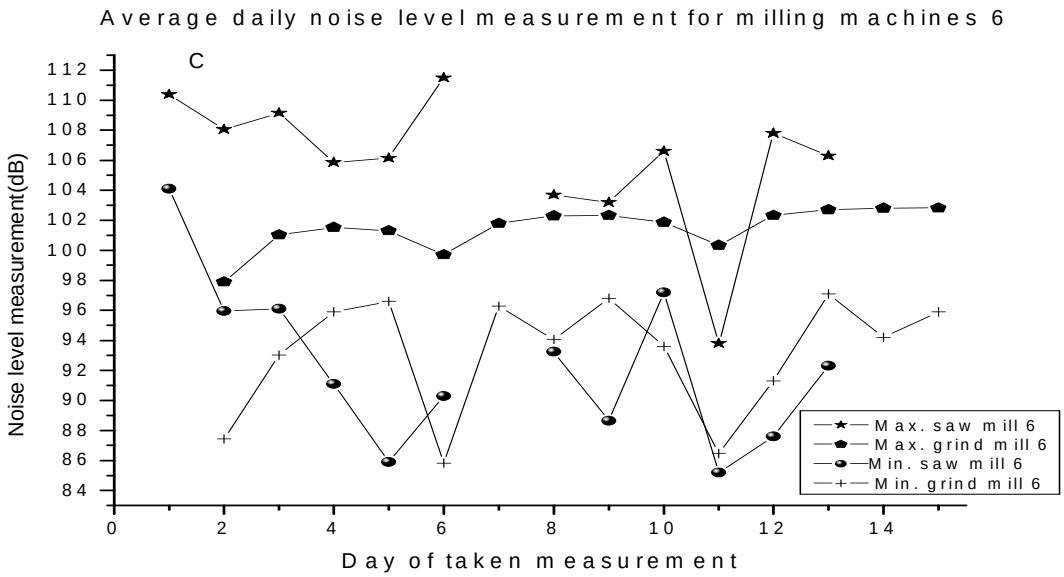
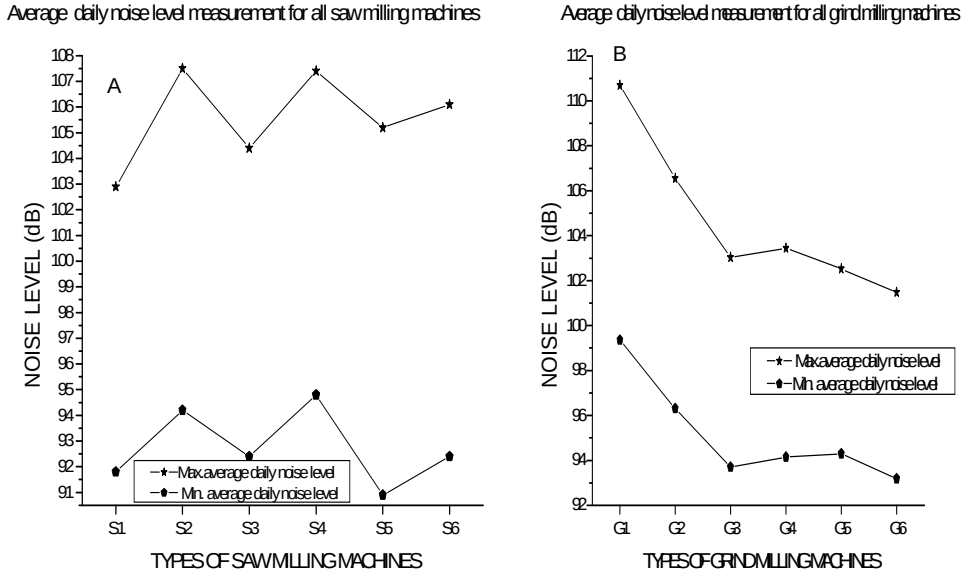


Fig. 7 Plots of average noise level against days for milling machines 6



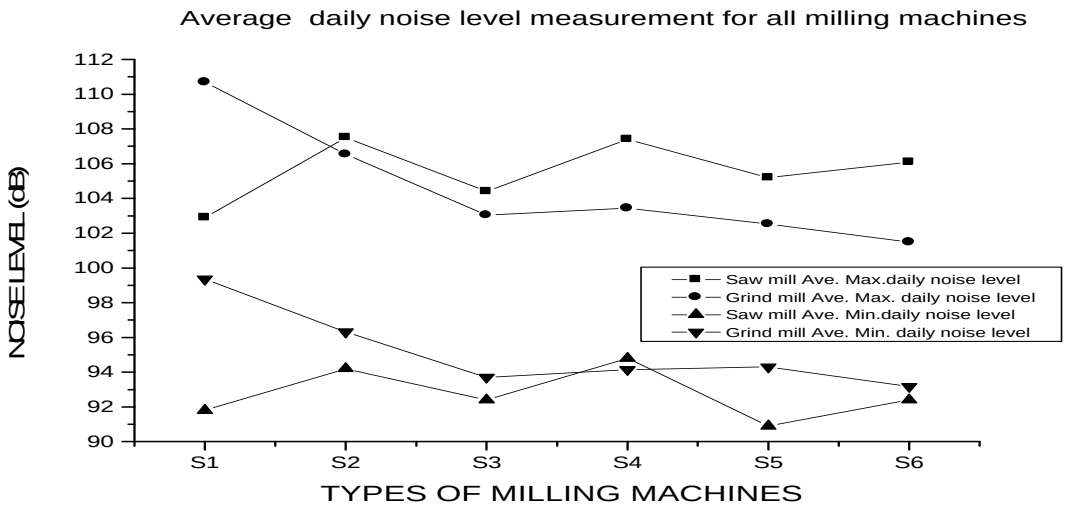


Fig. 8 Plots of average daily noise level for all milling machines

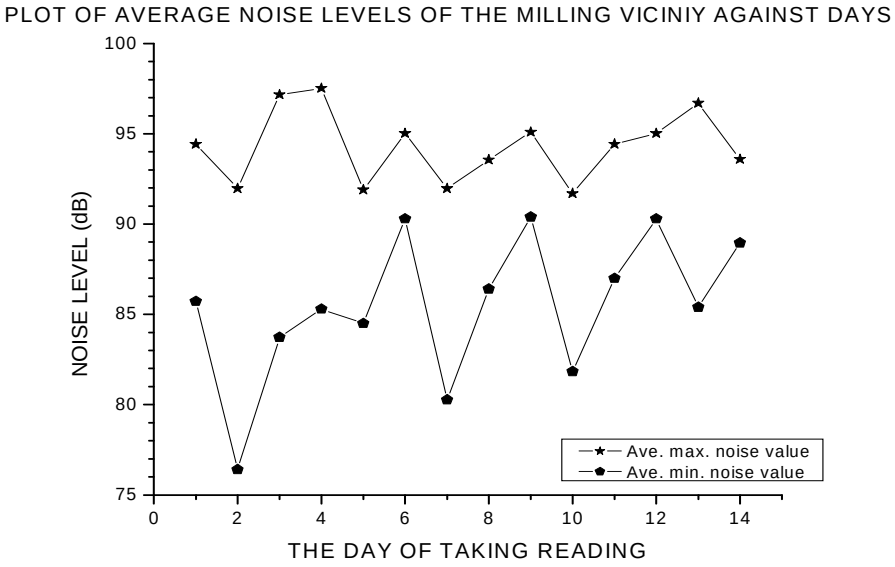


Fig. 9 Plots of average noise level of the milling vicinity against days

The daily average noise level during the period of study for each of the machines (Table 1) showed that the grind milling machines produce noise at an average of 99.9 ± 2.8 dB while the saw milling machines produce noise at an average value of 99.2 ± 1.5 dB. Circular saw machines produce at an average noise level of 98.9 ± 1.8 9dB, while the planner machines produce at an average noise level of 99.5 ± 1.5 dB and the mill surrounding has an average noise level of 89.9 ± 6.2 dB. Most of the millers usually work for more than 8 hours in a day, especially the grind millers who usually work

throughout the day time of the week as compared to the saw millers who usually rest on Sundays. These results indicated that the millers and their neighbors in this vicinity are exposed to average noise levels of between 89.9 ± 6.2 dB and 99.5 ± 1.5 dB. The implication of this is that both the millers and their neighbors in this vicinity are at the risk of ailments associated with high noise level because these measured noise levels exceeded the recommended noise level of 90 dB for an 8-hour exposure by global noise monitoring agencies, such as OSHA and NIOSH. These hazards would be affecting the quality of life and well-being of these millers including ailments such as annoyance, sleep disturbance and hearing impairment. Based on the aforementioned it would however be recommended that millers in this market should endeavor to cultivate the habit of using protective devices like ear muffs, ear pads or plugs, and nose cover. They should also ensure they visit hospitals regularly for medical checkup on stress related illnesses, hearing impairment, hypertension and ischemic heart disease. Breaks at regular intervals should also be observed and adequate rest taken in quiet environments.

Table 1: Daily average noise levels for milling machines at Bodija, Market, Ibadan for the period of study

S/N	Grind milling machine	Mean noise level	Saw milling machine	Mean noise level
1	G1	105.0 dB	S1	97.4 dB
2	G2	101.4 dB	S2	100.9 dB
3	G3	98.4 dB	S3	98.4 dB
4	G4	98.8 dB	S4	101.4 dB
5	G5	98.5 dB	S5	98.1 dB
6	G6	97.3 dB	S6	99.3 dB
Average noise level for all grind milling machine		99.9 ± 2.8 dB	Average noise level for all saw milling machine	99.2 ± 1.5 dB

3. Conclusion

The average ambient noise levels in the milling sections of Bodija market were found to be in the range of 89.9 ± 6.2 dB and 99.5 ± 1.5 dB. This result showed that if both millers and their neighbors in this vicinity are daily exposed to this kind of noise level for about 8 hours, they might be prone to the same noise associated health effects since the noise levels obtained have exceeded the recommended noise level of 90dB for an 8-hour exposure by global noise monitoring agencies. This level of noise is enough to affect their quality of life and well-being in terms of sleep disturbance and hearing impairment amongst other health hazards. The administrators of the market should endeavor to create more space for these millers in order to reduce noise interference; especially the grind millers who are clustered together at the limited space provided for them and should be located far away from residential areas close to the market. They should also ensure that adequate policies to reduce noise control including proper maintenance of milling equipment and generators are enforced. In addition to all these, adequate provision of electricity to the milling sections should be sought for from the electricity providers to the market.

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Received: 11 August, 2016

Accepted: 12 March, 2018