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Occupational noise exposure in high- density residential area in Basrah city and perceived health effects.

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Abstract

An assessment of the level of noise produced by sound generating machines was carried out in Basrah. Acoustical measurements were made using a digital sound level meter 814 SL model, range:40dB -130dB. Measurements were made at intervals of 100cm from each source and a total of five machines were investigated to determine the noise generated and its level at each of these distances. Results show that the average ambient noise levels around these machines were lowest for source S2 (air compressor) which had between 84.5dB at 600 cm and 98dB at 100cm and highest for source S5 (Hammer drill) which had between 125.5dB at 600cm and 130dB at 100cm. This result indicates that people working around source S5 are more exposed to noise and hence more prone to noise associated health effects. The results in S5 exceed the recommended noise level of 90dB for an 8-hour exposure by OSHA. A confirmatory analysis of annoyance, general discomfort, and temporary hearing impairments indicated that people around these areas are already being ignorantly affected by these sources of noise.

Keywords: Noise Level, Measurement, Noise Effects, Basrah city.

Introduction

The most common job-related exposure factor is noise (Cordeiro et al., 2005). Excessive noise exposure can result in permanent hearing loss. Surgery and hearing aids cannot remedy this hearing loss problem (Achutan,2009). Annually 22,000,000 workers are exposed to possibly harmful noises (CDC,2015). For workers who have faced with a standard threshold shift, hearing protectors should diminish their exposure to an eight-hour time-weighted average of 85 decibels (dB) or lower (Jamesdaniel S et al., 2015).

Noise exposure measurements are often expressed as dBA (Rabinowitz, 2000). Hearing protectors should be worn if the source of the noise cannot be enclosed or isolated. A hearing conservation program containing audiometric testing and training should be introduced. Although noise is associated with almost every work activity, some activities are associated with particularly high levels of noise, the most important of which are working with impact processes, handling certain types of materials (NIOSH, 1998). Development of industry and technology and the use of

industrial new techniques have presented a comfortable life for the human being, but with negative aspects that have caused workers to be exposed to numerous harmful effects, the environmental impacts of processing operations, in the form of noise, have highly significant consequences. Noise pollution is one of the important issues of pollutants in work-places and is almost one of the harmful agents (Vaishali et al., 2011). Most machines generate noise as a by-product during their operations. This increasingly results in an environmental nuisance that affects human health and well being (Haris, 1957). Industrial machinery and processes are composed of various noise sources such as rotors, stators, gears, fans, vibrating panels, turbulent fluid flow, impact processes, electrical machines, internal combustion engines, etc. The mechanisms of noise generation depend on the particularly noisy operations and equipment including crushing, riveting, shake-out (foundries), punch presses, drop forges, drilling, lathes, pneumatic equipment (e.g. jackhammers, chipping hammers, etc.), machine tools such as lathes, milling machines and grinders, plant conveying systems and transport vehicles (Parsons, 2000). The people around an industrial facility and the people within it are both affected by industrial noise, it is the workers within the plant that generally bear the brunt of most of it (Bugliarello et al., 1976).

The Occupational Safety and Health Administration (OSHA) recommends hearing protection in the workplace if there is exposure to noise greater than 85 dB for eight hours or more because of the potential of permanent hearing loss(Table1)

- minimum noise exposure: <85 dB(A)
  - moderately high noise exposure: 85−90 dB(A)
  - high noise exposure: >90 dB(A). (Ahmed et al., 2001).

Materials and Methods

Sound level measurements were made around areas where sound generating machines were installed using a digital sound level meter, 814 SL model with range 40dB-130dB. Sound Level Meter measures sound in decibels and display the reading on the LCD displayer that has a backlight button for easier viewing. Measurements were made at some distances from the source of the sound in steps of 100cm. A total of six readings each for maximum sound level (Lmax.) and minimum sound level (Lmin.) were recorded for 5 sites and the average sound level (Lav.) evaluated for each. The "F/S" response time button was used for slow response measurements of comparatively stable noise and fast varying noise respectively, while the “Max/Min” button setting was used to measure the maximum/minimum noise level of sounds and updated continuously whenever a louder sound was detected. (S1) cutting machine iron, (S2) air compressor, (S3) car wash machine, Electrical generator, and Hammer Drill (S4, S5). The reason for measuring the sound level at intervals of 100 cm was to determine at what distance the noise generating source could be placed to reduce the health risks on the inhabitants of the area. The choice of six measurements for each of the measurements was because the sources were installed within six meters from the populace.

Results

The results of the measurements represent the noise level obtained from five different categories of sound sources which were:

The results are presented in figures 1 to 5. A close look at the results shows that all the sound generating machines produced average noise levels above 80dB at a distance of 100 cm from the source. In source S1, the average sound level was about 119.75 dB at 100cm and decreased to about 114dB at 600cm from the source (Iron cutting machine). Source S2 (air compressor) which represents noise level from another showed an average noise level range of between 98dB and 84.5dB at 600 cm and 100cm respectively. Sources S3 and S4 represent noise generated from the car wash machine and Electrical generator. The average values ranged from 98.5dB to 85.5dB and 109.4 dB to 86dB at 600cm and 100cm respectively, while the average sound level was about 130 dB at 100cm and decreased to about 114.dB at 600cm from the source S5 (Hammer drill) The interaction with people within the areas where these noises were generated revealed that they were not happy with the discomfort because of the noise. But since it cannot be avoided, they have to accept it.

Discussion

These machines were installed within six meters from workers in the area, thereby making them prone to exposure to the noise generated by these sources which in some cases exceeded the recommended levels. Ignorance and carelessness on the part of these noise prone people have increased the risk associated with such exposures and the need to monitor the noise level in these areas has become imperative.

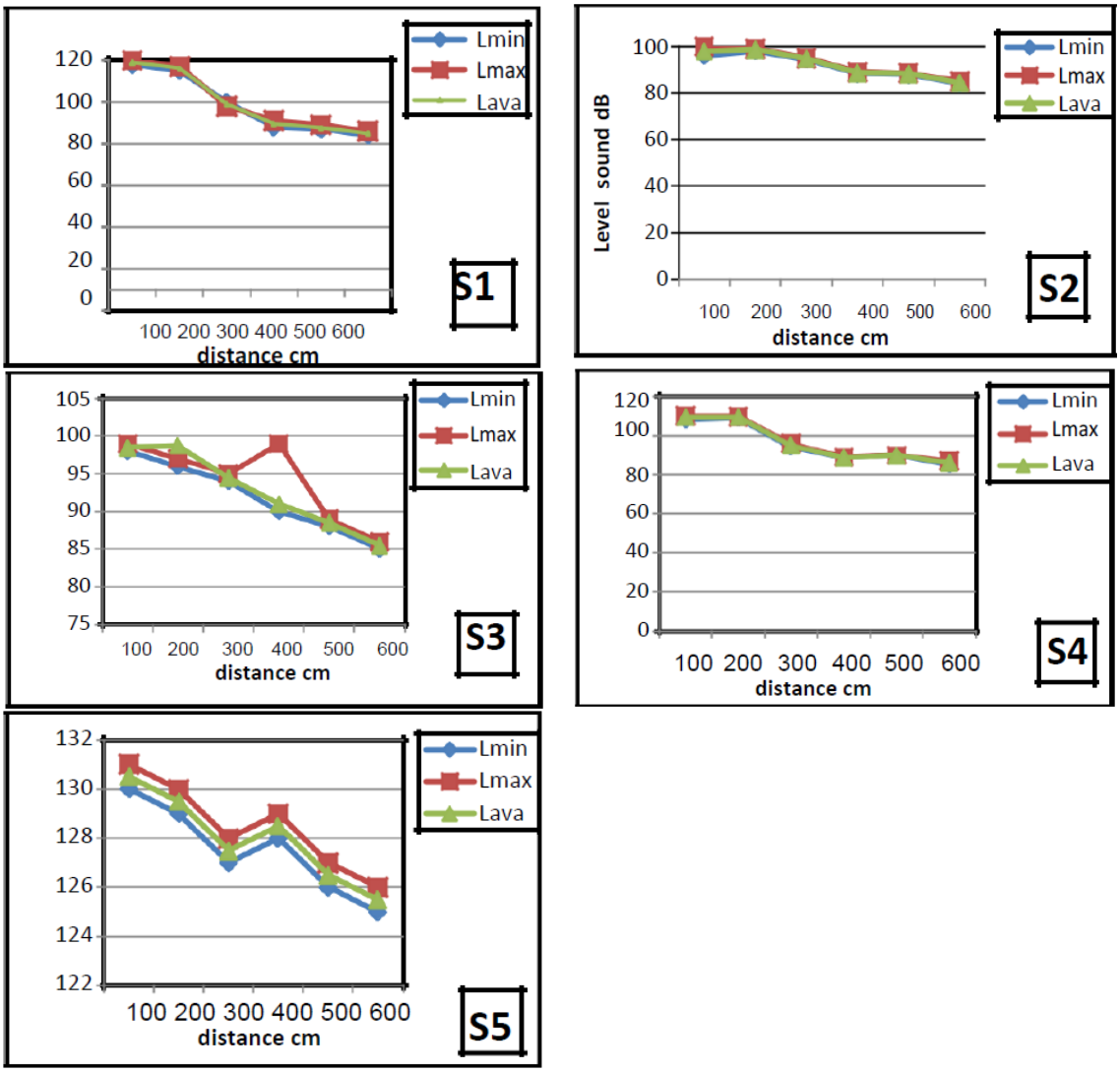
The results indicate that of the five categories of noise sources investigated, only S2, S3 a produced an average noise of less than 98dB, even at 100cm distance from the source as recommended by OSHA for an 8-hour exposure period. The other sources produced noise above 90dB at 100cm from the source. The implication is that anybody operating around this perimeter will be exposed to the hazardous noise level.

The slight difference between the machine investigated could be attributed to their model, age, and capacity and hence had a higher noise-generating capacity.

At 100cm of operation from the source, only people working in sources S1 and S4 will be exposed to noise above the OSHA limit.

The noise from source S1 exceeded the OSHA standard at 400cm while source S4 produced the highest noise of all the sources assessed. This means people should not operate within 300cm distance from these sources for adequate safety.

From the interview conducted on the people operating within these noise ranges, it was discovered that all of them complained of serious discomfort and temporally hearing difficulties which according to them disappears after some time. They, however, failed to understand the cumulate effects.



Figures1- 5: Graphs of Sound Level versus Source Distance for the Investigated Sources

Conclusion

Machines noise level and perceived health effects experienced by workers and residents in this study. The findings of this study showed that noise levels were significantly higher than the WHO permissible limit. Major health problems experienced by participants include ear pains tinnitus and sleeplessness. There is a need for the design of proper containment measures which would help in the reduction of the hazards associated with the usage of these machines. Wearing hearing protection devices in other to reduce the effect on the users may outright affect the relationship between the user and the customer as protection will block even human conversation. Consequently, machines' noise does not only affect human but also the natural environment also. Therefore, building sound barriers in other to reduce the noise emitting from the machines will help reduce sound and hence the effect.

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التعرض المهني للضوضاء في مدينة البصرة ذات الكثافة السكانية في مدينة البصرة وآثاره الصحية المحتملة.

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الملخص

تم تقييم مستوى الضوضاء الناتج عن أجهزة توليد الصوت في البصرة. تم عمل القياسات الصوتية باستخدام جهاز قياس مستوى الصوت الرقمي SL 814 ، المدى: (130 - 40 ديسيبل). تم إجراء القياسات على مسافات 100 سم من كل مصدر ، وتم فحص ما مجموعه خمس آلات لتحديد الضوضاء المتولدة ومستواها في كل من هذه المسافات. أظهرت النتائج أن متوسط مستويات الضوضاء المحيطة حول هذه الآلات كانت أدنى لمكبس أو مضخة الهواء المصدر (S2) الذي كان يتراوح بين 84.5 ديسيبل عند 600 سم و 98 ديسيبل عند 100 سم وأعلى للمصدر S5 (المثقاب المطرقي او مطرقة الحفر) التي يتراوح بين 125.5 ديسيبل عند 600 سم و 130 ديسيبل عند 100 سم تشير هذه النتيجة إلى أن الأشخاص الذين يعملون حول المصدر S5 أكثر تعرضًا للضوضاء وبالتالي أكثر عرضة للتأثيرات الصحية المرتبطة بالضوضاء. تتجاوز النتائج في S5 مستوى الضوضاء الموصى به وهو 90 ديسيبل من أجل التعرض لمدة 8 ساعات بواسطة OSHA. أشار تحليل تأكيدي على الإزعاج والانزعاج العام وضعف السمع المؤقت إلى أن الأشخاص حول هذه المناطق يتأثرون بالفعل بجهل من مصادر الضوضاء هذه.