

FUTA JEET

Vol 11 Issues 1&2

December 2017

Journal of Engineering and Engineering Technology

ISSN 1598-0271



School of Engineering and Engineering Technology,
The Federal University of Technology, Akure, Nigeria





Survey of the Effects of Operational Noise on Quarry Workers in Akoko-Edo Local Government Area of Edo State

Afu D. J.¹, Ifelola E. O.¹, Ayodele S. G.², Ekun A.² and Itunu A.²

¹Department of Mining Engineering, Federal University of Technology Akure, Ondo State, Nigeria.

²Department of Mineral and Petroleum Resources Engineering, Federal Polytechnic Auchi, Edo State, Nigeria.

A B S T R A C T

Key words:

Noise, Quarry, effects, questionnaire and workers

This study employed subjective well structure questionnaires for data collection at three different quarries, namely; The Freedom Group of company, Somak Industry Nigeria Limited and Beez in Akoko Edo Local Government Area of Edo State, Nigeria. 50 questionnaires were distributed to quarry workers for their subjective assessment of the effects of noise on workers without any restrictions. Works at the quarry face and mill processing plants responded quite well. Based on the results obtained from questionnaires analysis using SPSS (Frequency distribution and bar charts), 20% of the workers admitted to a change or deterioration in their hearing ability over time, 48% affirmed that they observe continuous ringing in the ear after work hours, headache after the day's work was a common experience for about 74% of the workers and 24% complained of sleep disorder. In light of these, this study suggested that the effects of noise on the workers would be minimal if the quarry can employ some hearing conservation programs and measures be put in place.

1. Introduction

Noise is an unwanted sound (Annex, 2009). Sound is produced by vibrating objects and reaches the listener's ear as waves in the air or other media. Sound is also a physical event that comes into existence with waves in which a source forms vibrations in air pressure and that stimulate the human sense of hearing, this receives the sound waves and converts it into information, which are hence relayed to the brain and the brain interprets the information as sound (Scott et al., 2004).

Noise is an unpleasant, unwanted, disturbing sound. Sound which is disagreeable, discordant or which interferes with the reception of wanted sound becomes noise (Cantrell, 2013). However, Cinar and Sinsogut 2013, described noise as a subjective concept. Meaning that the effect of noise on individuals, at different levels, varies due to individual tolerance, yet a high level of noise or sound is still unaccepted to the human psychological and physiological composition.

Quarrying is a surface mining method which deals with the excavation of rock and mineral deposit which are located near surface and deals majorly on dimension stone; this involves drilling, blasting, haulage and transportation and processing

operations. However these operations make use of heavy machineries and equipment which emits high level of noise and vibrations. One of the major contributing sectors to noise in our present times is the industries and the mining industry stands out amongst them, due to the use of heavy machineries and equipment. Mining engineering deals with the identification, exploration and exploitation of mineral deposits and one of its methods is the Quarrying method.

One of the most important occupational illnesses in the mining industry is noise-induced hearing loss. In addition, measuring the negative physiological and psychological effects of noise on human beings still cannot be performed with the current devices. Because the excessive noise in the work place prevents the hearing of the audible warning devices along with causing an effective understand-by-listening ability loss; it can also lead to important issues in terms of worker health and work safety (Cinar, 2013).

In the USA, the National Institute for Occupational Safety and Health (NIOSH) is of the opinion that 'Over-exposure to noise remains a widespread, serious health hazard in the U.S. mining industries despite over 25 years of regulation (Rink, 1996)

Correspondence:

E-mail address: afudj@yahoo.com, seylfel2k4@yahoo.com,

1.1 *Effects of Noise on the Health of Mine Workers*

As a rule, industrial noise is not a direct cause of accident but they contribute considerably to discomfort and weaken the attentiveness of the operators (Tawo, 2003). There is need to maintain close attention because the noise bring about nervous strain. This increases the danger of accident because the signals might be overshadowed by the noise of the operating equipment. Noise can interact with other workplace hazards to increase risks to workers. Exposure to noise may pose a variety of health and safety risks to workers.

1.2 *Noise Effects on the Hearing Capability of Mine Workers*

Effects of noise on human health depend upon length of exposure, the loudness of the sound, and the ability to recover after that exposure. It has long been recognized that exposure to high noise levels can result in temporary or permanent impairment of hearing ability (Tawo, 2003). Some of the effects on hearing capability of mine workers include the following;

- a) Temporary threshold shift (TTS): which is a temporary loss of hearing. Exposure to a very noisy job, by the end of the shift may lead to a loss of hearing sensitivity. The greatest portion of temporary hearing loss occurs within the first two hours of exposure. Full recovery from a TTS occurs within about 14 hours (Carroll, 2004).
- b) Permanent threshold shift (PTS): which is a permanent hearing loss that is very similar to the pattern of temporary hearing loss without any form of recovery. Permanent hearing loss does not respond to any known treatment or cure (Carroll, 2004).
- c) Tinnitus: is a ringing in the ears, similar to high-pitched background squealing with TVs and computers. It may accompany temporary and permanent hearing loss (Carroll, 2004).
- d) Presbycusis is a hearing loss as a result of aging (Carroll et al, 2004).

1.4 *Other Effects of Noise on the Health of Mine Workers*

Noise has other several dangerous effects on mine workers which have been discovered over the years. These potential health impacts were associated with exposure to noise, some of these impacts include;

- a) Sleep disorder: Sleep is necessary to restore biological processes and the cycle of waking and sleeping provides a rhythm to life. Studies of sleep have found that sleep occurs in various stages categorised as 1, 2, 3, 4, and rapid eye movements (REM) based on patterns seen in electroencephalograph (EEG) recordings (Carroll,

2004).

- b) Performance: There is good evidence, largely from laboratory studies that noise exposure impairs performance and speech perception (Stansfeld et al., 2000). There is moderate evidence that chronic noise exposure affects motivation, blood pressure, and catecholamine hormone secretion (Carroll et al, 2004).
- c) Cardiovascular Diseases: Cardiovascular diseases are those related to the heart and blood vessels. The effects of noise on cardiovascular system, particularly hypertension and ischaemic heart disease, have been studied in humans and it was discovered statistically, by Babisch (1998, 2000), that there is a significant relative risks of hypertension for those living or working in areas exposed to 65–70 dB(A).
- d) Mental Health Problems: Several studies report that noise sensitivity does not interact with noise exposure to increase vulnerability to mental ill-health (Stansfeld et al., 2003).
- e) Increase Risk of Accident: High noise increases the risk of accident by masking warning signals and makes it difficult for staff to hear and communicate together.

2.0 *Objectives of the Paper*

The objectives of this study were to;

- a) determine the effects of noise on quarry workers.
- b) provide measures to control resultant noise effects on workers.
- c) create awareness for employees to protect themselves against ill health resulting from noise .

2.1 *Study Location*

The study location is Akoko – Edo local government area which is well known for her quarry operations, processing factories and industrial mineral productions by most companies involved in industrial mineral productions . Her major mineral deposit is the Dolomite and Calcite. In light of this, three different organizations were used for this research and they are;

- a. The Freedom group of company (07008'45.4"N and 006011'50.6"E)
- b. Somak industries Nigeria limited (07008'16.8"N and 006011'24.2"E); and
- c. Beez quarry (07008'45.3"N and 006012'28.0"E all in Ikpeshi

4.3 Common Sickness Among Workers

Table 3 represents the frequency table of common sickness among workers at the quarries respectively. Workers at the quarries are exposed to several health hazards which require frequent medical attention. 40% of the workers have malaria, 22.2% often have fever, internal heat affected 6.7% of the workers and headache is a common sickness among 13.3% of the workers.

4.4 Effects of Noise on Quarries and Mill Workers

Effects of noise on mine workers were discussed under the noise impact on the workers such as change in hearing ability, ringing in ear, headache and sleep disorders. Results from their responses were presented in tables 4, 5, 6 and 7 and in Figure 2.

Table 1: Change In Hearing Ability Experienced by Mine Workers

		Frequency	Percentage, %	Valid percent, %	Cumm. Percent,%
Valid	8 hours	23	46	46	46
	12 hours	18	36	36	82
	Others	9	18	18	100
Total		50	100	100	

Table 2: Attitude of Workers to Noise

	Frequency	Percentage, %	Valid percent, %	Cumm. Percent,%
Those affected	35	70	77.8	77.8
Those not affected	10	20	22.2	100.0
Total	45	90	100.0	
No Response	5	10		
Total	50	100		

Table 3: Frequency Table Showing Sicknesses Common among Workers

	Frequency	Percentage (%)	Valid Percent (%)	Cumm. Percent (%)
Valid Malaria	18	36	40	40
Fever	10	20	22.2	
Internal Heat	3	6	6.7	62.2
Headache	6	12	13.3	68.9
Body aches	8	16	17.8	82.2
Total	45	90	100.0	100.0
No Response	5	10		
Total	50	100		

Table 4: Change In Hearing Ability Experienced by Mine Workers

	Frequency	Percentage, %	Valid Percent. %	Cumm. Percent, %
Valid	Yes	10	20	20
	No	13	26	46
Not really	27	54	54	100
Total	50	100	100	

Table 5: Worker Experiencing Ringing In Ear after Work

	Frequency	Percentage, %	Valid percent, %	Cumm. Percent,%
Valid	Yes	24	48	48
	No	23	46	94
Not really	3	6	6	100
Total	50	100	100	

Table 6: Frequency Table Showing Workers Experiencing Headache after Work

	Frequency	Percentage, %	Valid percent, %	Cumm. Percent,%
Valid	Yes	37	74	74
	No	4	8	82
Not really	9	18	18	100
Total	50	100	100	

Table 7: Frequency Table Depicting Workers Experiencing Sleepless Nights or Sleep Disorder

		Frequency	Percentage, %	Valid percent, %	Cumm. Percent, %
Valid	Yes	11	22	22.4	22.4
	No	15	30	30.6	53
	Not really	23	46	47	100
	Total	49	98	100	
Missing System		1	2		
Total		50	100		

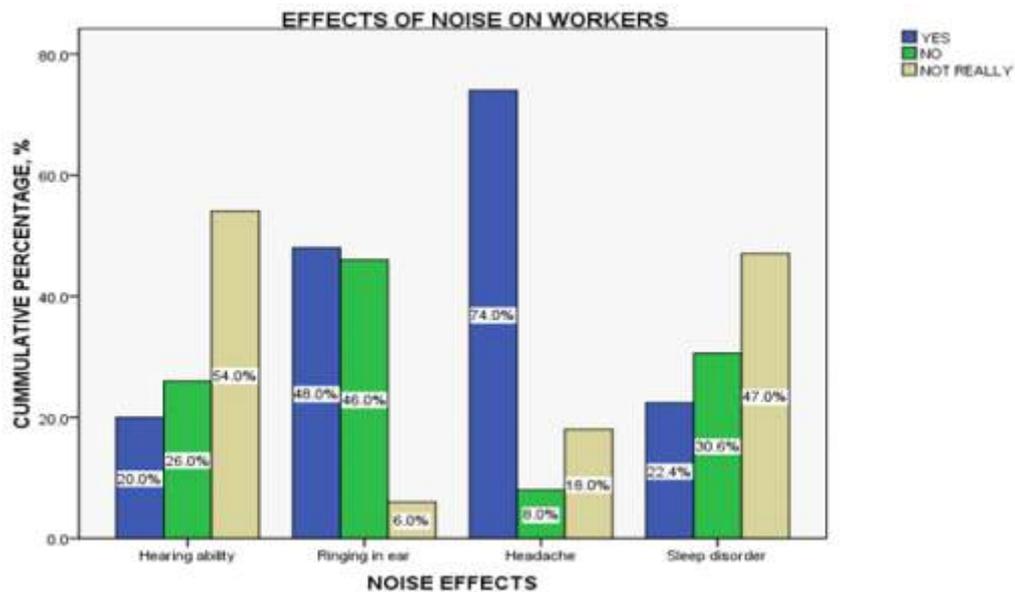


Figure 2: Charts Showing Effects of Noise on the Workers

4.4 Effects of Noise on Quarries and Mill Workers

Tables 4, 5, 6 and 7 represent the frequency distributions of the effects of noise on quarry workers. Figure 2 is a bar-chart showing noise effects in relations to workers' percentage response. It is therefore observed that a higher percentage (74.0%) of the workers complained of headache after work. Also, 48.0% of the workers experience a ringing in the ear after work hours, this result in deteriorating hearing ability.

4.5 Safety Measures practiced by Workers

Workers are to be protected from hazards associated with their operations, thereby companies were to put in place measures to mitigate the effects of operational noise on mine workers. Responses of mine workers on safety measures in the affected quarries were presented in table 8, 9, 10, 11 while Figure 3 represents bar-charts of safety measured practiced by workers.

Table 8: Frequency Table Showing the Use of Hearing Protection

		Frequency	Percentage, %	Valid percent, %	Cumm. Percent, %
Valid	Yes	2	4	4	4
	No	48	96	96	100
	Not really	0	0	0	
	Total	50	100	100	

Table 9: Frequency Table Showing Workers Awareness of Safety Regulations on Noise

		Frequency	Percentage, %	Valid percent, %	Cumm. Percent, %
Valid	Yes	11	22	22.9	22.9
	No	30	60	62.5	85.4
	Not really	7	14	14.6	100
	Total	48	96	100	
Missing system		2	4		
Total		50	100		

Table 10: Frequency Table Showing Whether Company has Clinic or Insurance for Health of Workers

		Frequency	Percentage, %	Valid percent, %	Cumm. Percent, %
Valid	Yes	35	70	70	70
	No	15	30	30	100
	Not really	0	0	0	
	Total	50	100	100	

Table 11: Frequency Table Showing Whether Workers Visit Hospital for Checkup

		Frequency	Percentage, %	Valid percent, %	Cumm. Percent, %
Valid	Yes	2	4	4.2	4.2
	No	3	6	6.4	10.6
	Rarely	42	84	89.4	100.0
	Total	47	94	100.0	
	Missing	3	6		
	Total	50	100		



Figure 3: Charts Showing Safety Measures Practiced by the Quarry Workers

Tables 8, 9, 10 and 11 represents the frequency distributions of the safety measures practiced by the quarry workers. Figure 3 is a chart showing safety practices and workers response to these practices. It is described that 96% of all workers do not use any hearing protection; this could be due to 62.5% non-awareness of safety regulations relating to noise and just 4.2% of the workers regularly visit the hospital for checkup. This shows that poor attention is given to health by the quarry workers.

5.0 Conclusion and Recommendations

5.1 Conclusion

Repeated and prolonged exposure to excessive noise has led to adverse effects on the physiological and psychological wellbeing of the quarry workers in Akoko-Edo, such as chronic headache,

sleep disorder and discomfort, while others have hearing losses arising from undulating sound ringing in the ear and gradual reduction of hearing ability. Adequate attention and care were not given to the health of quarry workers in Akoko-Edo, implying the low level of awareness on safety measures practiced among workers. Whereas, noise generated from the equipment during operations, cannot be controlled, and the 85dB(A) limit for 8hour working shift was not adhere to, then a Hearing Conservation Program (HCP) can be implemented (Gerald and Paul, 2007).

5.1 Recommendations

The following recommendations are hereby made;

- a) The importance and benefits of using personal protection should be relayed to the employees by giving seminars

and posters and banners related to the noise hazards and encouraging the usage of personal protection should be hung in places which are visible to the workers.

- b) The employers should provide healthy and suitable working conditions for their employees and the employees should heed the dangers of noise and use their personal protectors.
- c) As a personal measure, ear plugs which provide 8-30 dB(A) noise insulation or ear muffs which reduce the exposure of noise level by 25-40 dB(A) should be provided.
- d) Workers are to ensure to be at a noise free zone or put on noise protection when approaching noisy zones.
- e) The moving parts of the operating machinery should be lubricated on regular basis; this prevents the noise resulting from the friction of the non-lubricated parts.
- f) The worn and old parts should be replaced.

References

- Annex, D. (2009): Measurement of noise, <http://www.goodquarry.com>. Accessed 19/05/2015
- Babisch, W. (1998): Epidemiological Studies of Cardiovascular Effects of Traffic Noise', Noise Effects 1998 Congress Proceedings, Vol. 1, pp 221–29.
- Babisch W. (2000): Traffic noise and cardiovascular disease: Epidemiological review and synthesis. Noise Health 2000; 8: 9–32
- Cantrell R. (2013): The Effects of Noise Exposure, AGARD Conference Proceedings, No. 171, Effects of Long Duration Noise Exposure on Hearing and Health, NATO
- Carroll A. (2004), Health Effects of Environmental Noise- other than Hearing Loss, <http://www.dcita.gov.au/cca>, assessed 22/June/2015. ISBN 0 642 82304 9 Publication approval number 3311 (JN 7845)
- Cinar I. and Sensogut C. (2013), Noise analysis of the konya karaomerler (Turkey) stone quarry and stone crushing sifting plant, www.timejournals.org/tjeps, assessed 22/June/2015. Vol. 1(1) pp.9-18
- Cinar I. and Sensogut C. (2013), Evaluation of Noise Measurements Performed in Mining Sites for Environmental Aspects, Int. J. Environ. Res., 7(2): pp383-386, Spring 2013, ISSN: 1735-6865.
- Gerald J. and Paul J. M. (2007): "Noise Exposure and Hearing Conservation in U.S. Coal Mines—A Surveillance Report," Journal of Occupational and Environmental Hygiene, January, Vol. 4. ISSUE 1 pp. 26-35
- Rink, T.L. (1996): Hearing Protection Works. Occupational Health and Safety, 65, pp. 58-64.
- Scott, D. F., Grayson, R. L. and Edward, A. (2004): Disease and illness in U.S. mining, 1983-2001, Journal of Occupational & Environmental Medicine, 46 (12), pp. 1272–1277.
- Stansfeld A. S and Mark P. M. (2003): Noise pollution: non-auditory effects on health. Department of Psychiatry, Medical Sciences Building, Queen Mary, University of London, United Kingdom British Medical Bulletin 2003; 68: 243–257
- Tawo, A.N. (2003): Effects of Industrial Noise Pollution on Workers and Residence of a Quarrying Environment, <http://www.noisenet.org>. Accessed 07/06/2015 www.uhs.berkeley.edu/S:\handouts\Clinical\Assessment of Noise Exposure.doc

Journal of Engineering and Engineering Technology

Contents

Volume 11 Issue 1, 2017

- | | | |
|----|---|--|
| 1 | Ajibade, F. O. and Adewumi, J. R. | Performance Evaluation of Aquatic Macrophytes in a Constructed Wetland for Municipal Wastewater Treatment |
| 12 | Fadeyibi, A., Osunde, Z. D., Yisa, M.G. Okunola A. A. | Investigation into Properties of Starch-based nanocomposite materials for fruits and vegetables packaging - A review |
| 18 | Melodi, M.M. and Agboola, D.A. | Labour Productivity Assessment of Dredging Operations in Some Selected Companies in Lagos State, Nigeria |
| 23 | Olubanjo, O. O. | Effects of Wastewaters From an Abattoir on Surface Water Quality in Akure, Ondo State, Nigeria. |
| 29 | Jabar, J. M., Lajide, L., Adetuyi, A. O., Owolabi, B. J. and Ayoade G. W. | Chemical modification of coir, empty fruit bunch and palm kernel fibres for polymer reinforcement |
| 37 | Awopetu O.O. | Effect of Rake Face Reinforcement on Cutting Tool Life of Cemented Carbide Tools during Turning of a-Titanium Alloy |
| 43 | Famurewa, J.A.V. and Faboya, E.T. | The Effects of Drying Temperature on the Physicochemical Properties of Ogbono (Irvingia Gabonensis) |
| 48 | Olutomilola E. O. and Ogedengbe T. I. | Evaluation of the Effect of Constituents on Insulation Quality of Selected Biomass Composites |
| 56 | Mogaji, P.B., Abioye, T.E., Ohuruogun, N.O. | Development of Epoxy Resin Composite Reinforced With Cow Horn and Cassava Particles for Car Dashboard |
| 62 | Akingbade, K. F. and Apena, W. O. | Modelling of Electric Power Subsystem for a Weather Balloon Microsatellite |
| 68 | Daniyan I.A., Bello E.I., Ogedengbe T.I., Lajide L. and Mogaji P.B. | Development of a Model For Predicting the Yield of Biodiesel During Biodiesel Production |

Volume 11 Issue 2, 2017

- | | | |
|-----|---|--|
| 73 | Ayodeji S. P., Adeyeri M. K. and Oni O. O. | Conceptual Design of Battery Powered Vehicle for Children Amusement Park Using Nigerian Anthropometric Parameters. |
| 81 | Owolabi, H. A., Omidiji, B. V., Oke, A. O. Morakinyo, A. T. | Development of a Small-Scale Motorized Dough Kneading Machine |
| 89 | Akingbade K. F. | Development of Chemical Proportion Formulation Model for Quality Control in Flexible Polyurethane Foam Production. |
| 96 | Isa J. and Aderotoye M. A. | Effect of moisture content on the physical and aerodynamics properties of cashew nut |
| 103 | Abegunde, A. J., ¹ Omidiji B. V. and Ajewole P. O. | Characterization of Ado-Ekiti River Sand for foundry applications |
| 112 | Yaru S. S. and Adegun I. K. | Analyses of Biogas and Digestate from Cattle Dung Anaerobic Digestion |
| 119 | Awopetu O. O., Farayibi P. K., Ismail K. A. | Optimization of Major Process Parameters for Surface Roughness of ASTM 25 Grey Cast Iron using Taguchi method |
| 126 | Afu D. J., Ifelola E. O., Ayodele S. G., Ekun A. and Itunu A. | Survey of the Effects of Operational Noise on Quarry Workers in Akoko-Edo Local Government Area of Edo State |
| 133 | Melodi, M. M. and Onipede, T. G. | Economic Appraisal of Some Selected Quarries Operation in Ondo State, Nigeria |
| 139 | Ojediran J.O., Fasinmirin J.T., Owa O.P. | Development and Performance Evaluation of an Indigenous Fish Feed Palletizing Machine |

Available online at
www.jeet.futa.edu.ng

Design & Print by



FUTAJEET