



Study to assess the impact due to Noise and Vibration around the Tilakhera Open Cast Limestone Mines District Chittorgarh, Rajasthan

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ABSTRACT

Noise pollution is a major environmental problem in many rapidly urbanizing areas of District Chittorgarh, India. Heavy earth moving machineries, different type's dumpers and loaders, blasting and drilling make the mining industry noisy. A study was done to assess the impact due to the noise level around opencast mine in district Chittorgarh. An increase in mechanization also has resulted in an increase in noise levels, in open pit mines which generate enormous levels of noise. The equipment and environment conditions continuously change as the mining activity progresses. Depending on their placement, the overall mining noise produce from the mining equipment varies in quality and level. Hearing loss from noise created by mining industry can impair the quality of life through a reduction in the ability to communicate with each other.

Keywords: Noise, dumper, mining, open pit mine, hearing loss, impair, hearing loss

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INTRODUCTION

Noise pollution is the second biggest industrial hazard in the Indian mining industries. A cumulative effect of mining activities produces enormous noise and vibrations in the mining area, which constitute a source of disturbance. The availability of large diameter and high capacity pneumatic drills, blasting of hundreds of tonnes of explosive etc. are identified as noise prone activities [1, 2]. Blasting is an essential part of mining. A part of energy released from the ignition of explosive results in ground vibration similar to the earthquake. When the intensity of ground vibration is very high, it damages the permanent structures and buildings in the surrounding areas [3]. The introduction of mechanized and large scale-machinery in mining has accentuated the problem of noise pollution in recent years [4]. Though, the opencast mining has become most favourable due to its economic viability, better safety and conservation; the noise produced in such activities is the most prevalent environmental stress in the mining industry [5]. In mining industry, hearing loss or hearing damage is considered as a serious health problem, as reported by various health organizations like the U.S. Environmental Protection Agency (USEPA), the National Institute for Occupational Safety and Health (NIOSH) and the WHO etc. The impact of noise in opencast mines depends upon the sound power level (SWL) of the noise generators, existing geo-mining conditions and the meteorological parameters of the mines.

Study area

Limestone is an important factor of cement industry. This district can be identified as a limestone district of Rajasthan, since the districts is endowed with large deposits of cement grade limestone as well as splittable limestone. The Tilakhera limestone lease area is located at a distance of about 2 Kilometers from Gambhiri Road Railway Station in the eastern direction near Mangrol Village This mining area is situated in the Nimbahera Tehsil of Chittorgarh District of Rajasthan. The Latitudes 24° 41' 30" N - 24° 42' 43" N and longitudes 74° 41' 02" E - 74° 41' 50" E.

MATERIALS AND METHODS

Noise sample is collected from and around the mining area for analyses of noise level. The noise levels in the study area are done by using a weighted sound pressure level meter. (Model No. SL-4012). The noise measurement was conducted in the working hours in and around the mining area at different location

which were heavily occupied by the mining machinery. To explain about the noise and its significance on health of mine-workers, a nearby villager were interviewed on a very extensive scale using a questionnaire. Duration of analysis of noise level in study area was Dec. to Feb. 2013-14.

Table 1: Noise level recorded at different sites in around the opencast limestone mines:

Site	I	II	III	IV	V	Min.	Max.
Location 1	78.2	86.5	98.4	79.8	72.7	72.7	98.4
Location 2	77.5	96.1	80.7	70.2	94.3	70.2	96.1
Location 3	90.2	85.5	79.4	82.8	78.7	78.7	90.2
Location 1	48.4	56.3	49.8	51.6	64.8	48.4	64.8
Location 2	47.3	45.8	59.7	58.2	57.1	45.8	59.7
Location 3	60.4	76.5	69.8	71.4	72.6	60.4	76.5

Table 2: Noise level due to various sources

S.No.	Equipment	Measurement Location	Noise Level dB (A)
1	Drill Operating	Operator's position	94-98
2	Dumper, operating	10 m away	88-102
3	Dozer & Dumper both, operating	05 m away	95-110
4	Diesel Excavator	Near location area	80-85
5	Derrick cabin	Near location	75-80
6	Vehicular Movement		86-90
7	Road side	10 m away	56-60

Table: 3 Detail of Noise quality standards

S.No.	Category of area	Limits in DB (A)	
		Day Time	Night Time
1	Industrial area	75	70
2	Commercial area	65	55
3	Residential area	55	45
4	Silence zone	50	40

RESULTS AND DISCUSSION

A) Day time Noise Levels: The daytime noise levels are observed above the range of 70.2 to 98.4 dB (A) which is above the prescribed limit.

B) Night time Noise Levels: The daytime noise levels are observed above the range of 45.8 to 76.5 dB (A) which is above the prescribed limit.

The studies discovered that in some of location noise exposures were above 90 DB (A). In total, 53% respondents were not satisfied about the noise level in this mining belt. The study also exposed that 40% of interviewees were not satisfied with the noise created by heavy earth moving machineries. None of the mining workers was using proper ear protection (ear plugs or ear muffs). Mine worker told that they had at least one experience of being temporarily "deafened" due to loud noise specially during blasting. Same result got by Zannin *et al.*, [6, 7]; Yang and Kang, [8] that prolonged exposure to high sound levels leads to hearing damage.

Impact due to Noise and Vibration:

Collective impacts of drilling, blasting, transport, crushing, grinding, and can affect wildlife and nearby residents. Vibration has affected the stability of infrastructures, buildings, and homes of people living near large-scale open-pit mining operations. Exposure to high levels of noise over a long time causes hearing damage, permanent damage to the inner ear, speech interference, chronic stress, behavior disorder, Damage to old structures due to vibrations, Public nuisance vis-à-vis trouble of sleep, Disturbance of sewerage and water supply line. Noise creates other health effects; reduce work performance and makes communications more difficult. Besides, the fauna in the forests and nearby areas surrounding the mines is also affected by noise and it has generally been believed that wildlife is more sensitive to noise and vibrations than the human beings.

Blasting: The blasting frequency and techniques are considerably different and dependent on various factors such as geology, topography and weather etc. Blasting noise usually increases with the amount of

explosive, particular atmospheric conditions, and closeness to a blast. The area closer to a blast generally receives greater impacts than areas further. People also differ seriously in their response to blasting.

CONCLUSION

The present study proved that the noise level was more than the permissible limit in most of the sites including residential, commercial and during both day and night time, while in some cases noise levels were within the prescribed limits. Therefore, control measures should be adopted in mines for machinery as well as hearing protection aids should be supplied to the workers in order to protect the mine workers from NIHL (Noise induced hearing loss) & to keep the environment safe.

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