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NOISE LEVELS IN LIGNITE MINING AREA OF KUTCH (GUJRAT) AND MITIGATION MEASURES

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ABSTRACT

In opencast mining use of explosives for excavation is common method to loosen overburden ranging from 20-45 meters. Noise beyond limits; interfere with communication in the work spot apart from annoyance and health hazard. Impact of noise on the environment depends on various factors such as intensity, distance from source, time of exposure and nature (impulse or continuous) the type of activities. The present study was carried out for a year in different season and during blasting. Noise levels were within limits, still recommendations are made for future safety.

INTRODUCTION

Mining for coal, metals and other industrially and economically important minerals forms the care sector of a country's industrial empire. Like elsewhere in the world, mining industry has shown a rapid expansion in India too. According to the Mineral Year Book (1980–1986), the estimated values of mineral production since 1947 to the eighties went up by over 100 times. The growth of mining industry is also reflected in the economic value of production. The value of mineral production rose by 64 crores in 1947. The share of about 2000 crores in 2000–2001 metal mining sectors is about 13% in the total output. The total area under mining in India is equivalent to 1/3 of that under agriculture. Mining in India are spread over an area of 800,00ha. In the year 2000 there were about 4052 working mines in India of which 2,854 were for mining of non metallic minerals, 720 for mining of metallic minerals and the remaining 478 for mining of coal and lignite.

Lignite mining in Kutch area of Gujarat is spread over large area and is an opencast mine. Blasting to loosen over-burden, ranging in depth from 25–45 meters, lifting and dumping. Hence it is necessary to measure the levels, to determine the environmental impact so that abatement measures could be undertaken if arranged.

MATERIALS AND METHODS

Sampling Sites

Noise level measurements were taken at the selected six locations by using Sound level meter during day and night-time.

Six location were selected for measuring the noise levels. The noise level measurement locations are mentioned below.

Akrimota Mine Office (AN1); situated in core zone, Fulra Village (AN2); situated at 5km from mining area in west, Akri Village (AN3), Located in 1.0 km in

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southwest direction form core zone, khanot Village (AN4); Located 5km in southwest direction, Dhareshi village (AN5); Located at the distance of 2km form core zone, Ghaduli Village (AN6); Located 6km from core zone in north east direction. The sampling sites mentioned are well populated and mine office sites represents core zone. Although illegal mining is rampant in adjoining areas but without any use of heavy machinery and blasts.

Method of measurement

The measurement of peak pressure level (dB) during blasting operation was carried out by B & K type 2636 measuring amplifies in conjunction with B & K 2636 preamplifier and A B & K type 4163, ¼ inch condenser microphone. A total of five observations were made form different distance and for different charge masses in tons.

RESULTS AND DISCUSSION

The results of peak pressure levels in decibels are given in Table 1 for different seasons. As seen from the table, in peak pressure levels for different seasons varied form 36 to 52 dB charge masses used in blasting varied form 1.0 to 4.8 tons. There does not appear a straight relationship between the charge mass and sound levels in the present case, however higher charge masses are known to produce intense transients. As per the damage risk criteria (CHABA 1968) peak pressure level of 140 dB is considered upper safe limit of human exposure to impulsive noise from weapons and explosion if the number of such impulses do not exceed 100 per day.

Noise level Measurement

The location of noise lee measurement are also shown in given tables (Tables 2). Noise is being produced due to operation and movement of Heavy Earth Moving machinery, drilling, blasting various other allied equipments and transport vehicles. Pronounced effects of noise generation will be felt in the core zone, where active mining and allied activities will be carried out. Such sources will be of intermittent nature. Sufficient measures will be adopted to maintain the noise level within permissible limits so as to protect the workers and staff from higher noise levels. The blasting operation for the extraction of coal brings about fluctuation in local air pressure and produce sounds similar to that of explosions and firing of high caliber weapons. These sound waves originating from point source travel in all directions. The sound pressure level (dB) at any point in the environment around the blasting site depends on the charge, mass and distance form source. The evaluation of auditory effects due to exposure to such impulsive sounds requires the measurement of peak pressure level (dB) effective duration and the number of events during eight hour daily work schedule. Damage Risk Criteria (DRC) has been formulated based on these parameters (CHABA, 1968). Several workers have utilized these parameters of transient sounds for assessment of possible risk to hearing system of man. (Pfarder *et al*. 1980, Price 1979, Singh *et al*. 1983, 1965).

Impact on Noise Quality

The existing noise levels in the area range form 34 to 52 db. Operation on heavy earthmoving machineries and other allied mining operations, such as transport, workshop activities, etc., may produce noise pollution in the area, unless appropriate abatement measures are planned and effectively carried out. The impact of higher noise levels on humans and fauna are annoyance and irritation, mental and physical fatigue, interface in normal activities, health hazards resulting from impaired hearing, in extreme cases, cardiovascular diseases and interference with communication

The Director General of Mines Safety (DGMS) has prescribed the limits for noise level for workers in an 8 hours shift with unprotected ear, as 90 db (A). DGMS, which an unprotected ear may run a risk of hearing impairment and appropriate ear protective devices should be used 140 db (A) as the noise level no worker should enter without ear protection. As the higher levels will be noticed only in active areas of mining and processing activities, Proper protection and preventive measures as far as possible will be needed. Necessary remedial measures, such as provision of noise-proof cabins for operations, proper preventive maintenance of machinery and equipments, green belt development around infrastructures and mine areas, etc., will be adopted to minimize the adverse impacts likely to arise out of the project operations. These measures are described in this theory also. The noise levels recorded in six different locations are all the four seasons show that these values were within the permissible limits in all the locations.

The seasonal variation in background noise level data is given in Table1. The measurements are taken without any heavy machineries and blasting in operation. The result of present study (Table 2) shows that the peak pressure levels are within the safe limits for effects on auditory system, yet blasting operations

Table 1. Seasonal Variations in Background Noise Level (in dB) Year during 2002-03

Season	AN1		AN2		AN3		AN4		AN5		AN6	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Post Monsoon	52	36	46	36	44	35	48	37	48	3351	35	
Winter	54	38	46	34	46	37	47	37	51	31	50	33
Summer	52	41	42	36	45	34	46	36	50	31	52	34
Monsoon	50	42	49	38	48	38	52	35	51	36	48	36

Table 2. Peak pressure level (dB) at different distances in mining area

Location of observation	Distance form blasting site	Peak pressure level (db)
Akrikota mine office (AN1)	200 m	132
Flura (AN2)	5000m	62
Akri (AN3)	1000m	78
Khanot (AN4)	5000m	73
Dhareshi (AN5)	2000m	64
Ghaduli (AN6)	6000m	54

may constitute risks at close ranges. Maximum of 132 dB was recorded from Akrikota mine office. Surrounding populated villages did not show any significant increase in peak pressure level except Akri village(AN3), where peak pressure level was recorded to be around 78 dB. Although blasting operations are less frequent still single intense impulse from short distance may cause auditory damages to workers (Price, 1983). The risks may be of auditory or extra auditory types. Thus few preventive measures are suggested. The impact on the surrounding population in the buffer zone can be minimized from propagated noise levels from the mining area with the adoption of following control measures. Planting rows of trees with thick foliage along roads and other noise generating centers to act as acoustic barriers, good preventive maintenance schedules for heavy machineries to eliminate noise as far as possible. Balanced and properly aligned conditioning of machines to reduce vibration, provision of ear muffs/ear plugs to workers at noise prone zones. It is also suggested to maintain noise data for all noise prone activities as well as noise exposure records of the employees. Additionally, noise level status of operational machineries may be displayed on the machines to enable control measures.

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