

NOISE POLLUTION IN STONE QUARRYING INDUSTRY -A CASE STUDY IN BANGALORE DISTRICT, KARNATAKA, INDIA

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ABSTRACT

Noise pollution is any unwanted sound, which is unpleasant and objectionable to human health. Noise in the stone quarrying industry is regarded as a major annoyance and may lead to hearing loss and perhaps even cause adverse physiological and psychological effect. The consequences are significantly by way of a higher rate of accidents, general ill health and in industry possess occupational health hazards and decrease in productivity. It can interfere with communication, disturb sleep, lack of concentration, irritability and reduced efficiency. It is said that continues exposure to high noise levels causes headache, increase in blood pressure, nervous breakdown and finally leading to hearing loss and deafness. Though a substantial work has been carried out on the noise pollution aspect it still appears to be one of the relatively neglected areas of investigation in the field of stone quarry. Hence this paper is an attempt to evaluate the effect of noise on the working environment and to suggest possible control measures to minimize the effect in the study area.

INTRODUCTION

Noise pollution in stone quarrying industry is one of the environmental problem penetrating all the corners and areas of working environment. There are a number of activities, which lead to high noise levels in quarrying industry like blasting, drilling, crushing, heavy machineries and transportation. The

intensity of noise within the industry and workplace in general is rising continuously and causing severe nuisance in the immediate surroundings and to the people working therein causing occupational health hazards. Hence this paper is an attempt to evaluate the effect of noise on the working environment and to suggest possible control measures to minimize the effect.

Effect of noise

Noise pollution is any sound, which is unwanted, unpleasant and objectionable to human health. Noise in the quarrying industry is regarded as a major annoyance and may lead to hearing loss and perhaps even cause adverse physiological and psychological effect. Severe Noise Induced Deafness is a disabling disease which is compensable under the law (Tay, 1996). The consequences are significant by way of a higher rate of accidents, general ill health and in industry possess occupational health hazards and decrease in productivity. It can interfere with communication, disturb sleep, lack of concentration, irritability and reduced efficiency (Ricky, 1995). It is said that continuous exposure to high noise levels causes headache, increase in blood pressure, nervous breakdown and finally leading to deafness.

Noise sources in quarries

A quarrying operation for building material includes drilling, crushing, transportation etc. The quarrying activities in the study area is going on since many decades. In the quarry noise is produced by both fixed and mobile sources. The mobile sources are blasting, diesel generators and heavy motor vehicles. Keeping this fact in view the impact study is carried out in selected quarry locations in Bangalore District to evaluate the effect of noise on the quarry workers and residents and to make possible suggestions to combat the effect.

MATERIALS AND METHODS

Ambient noise level monitoring is carried out in few quarry locations in Bangalore District. Noise levels were monitored using Q-100 Noise Dosimeter, which consists of two frequency weighting characteristics of which have been termed as A and C weightings. In the present study noise levels were monitored at A weightings. Noise levels were recorded at the quarrying/crushing sites during transportation, inside the villages etc.

RESULTS

In the present study noise levels were recorded during various quarrying operations and crushing activities. The noise levels recorded were summarized in the table 1. In general noise levels due to gas jet burners crushing units, drilling operations seem to have most significant impact on the health of quarry workers and local residents. It can be seen however that the noise level due to manual type of quarry is relatively lower when compared to semi-mechanized and mechanized quarries.

The noise levels due to manual type of quarrying in Bettahalsur village

ranged from 54 dB (A) to 79.6 dB (A) measured at various distances. Similarly in semi-mechanized quarry the noise levels ranged from 65 dB (A) to 112dB (A) and in mechanized quarries noise level ranged between 78.3dB (A) to 153 dB (A) (Table 1).

Noise level due to blasting operations at various locations is high and ranged from 133 dB (A) (Anjanapura) to 156 dB (A) (Kailancha). The noise level measured during drilling ranged from 99 dB (A) (Doddabettahalli) to 116 dB (A) (Nidagallu). Similarly the noise level recorded during crushing operation ranged between 92 dB (A) in Kogilu village measured opposite to the wind direction.

Similarly the noise level measured inside villages ranged from 59 dB (A) (Nidagallu) to 89.3 dB (A) (Bettahalsur). The noise level due to vehicular movement ranged from 65.6 dB (A) (Kailancha) to 101 dB (A) (Bettahalsur). The noise level measured in road side ranged from 63.8 dB (A) to 90.7 dB (A). The high noise level recorded in the road side may be attributed to heavy vehicular movement.

In Bettahalsur village noise levels were measured during various quarrying activities at various distances. The highest noise level recorded during crushing activity is 97.8 dB (A) at 0 distance and the lowest noise level recorded is 65.0 dB (A) at 500m distance. Similarly during drilling activity the highest noise level recorded is 109.5 dB (A) and the lowest noise level recorded is 72.5dB (A).

Table 1. Noise levels during various quarrying activities as measured in quarries of Bangalore districts

Location	Noise level in dB (A)						
	Quarry-	Crush-	Blast-	Drill-	Vehicular movement	Road side	Inside village
Bettahalsur	79.6	97.8	138	109.5	101	90.7	89.3
Bandehosur	74.5	93.0	135	111.8	75	76.5	68.2
Kogilu	70.1	99.5	139	108.6	82	85.4	75.0
Basavanahalli	72.8	98.6	-	-	72	65.2	60.0
KallugopanaHalli	75.0	95.3	147	112.9	83.6	75.4	70.0
Nidagallu	-	-	-	116	76.0	68.4	59.0
Tamasandra	-	-	-	114	70	66.8	65.2
Kailancha	-	-	156	106.8	65.6	63.8	60.6
Doddabettahalli	74.6	96.0	148	99	69	65.0	66.2
Anjanapura	73.8	92.0	133	101	70	64.0	62.0

Table 2. Range of noise level at quarries during manual, Semi- mechanized and mechanized operations.

Distance in (m)	Bangalore district		
	Manual	Semi Mechanized	Mechanized
0	65.0-79.6	101-112	146-153
50	62.0-76.0	87.0-96.0	118-122
100	59.4-74.0	75.0-79.0	102-110
150	56.0-70.3	70.0-74.0	95.0-101
200	54.0-68.6	67.0-71.0	83.9-97.5
In village	60.0-73.5	65.0-75.1	78.3-81.3

The noise level measured during blasting is 138 dB (A) and 107 dB (A) at 250 and 500m distances respectively. Similarly the noise level recorded during the operation of various machineries in working condition ranged from 51.0 dB (A) to 86.9 dB (A). The highest noise level recorded is during jack hammer drilling.

Impact of noise

Impact of noise on surrounding environment due to various quarrying / crushing activity can be in various forms ranging from annoyance to hearing loss. A questionnaire based interview with workers, owners and the local residents staying nearby were made to understand the consequences of noise due to various quarrying activities revealed that many quarry workers and local residents were suffering from ear related problems. It is known that noise results in both temporary (short period exposure) and permanent hearing loss (long period exposure), which are referred as temporary threshold shift (TTS) and permanent threshold shift (PTS) respectively (NIOSH, 1978). The impact can range from the bursting of eardrum, permanent hearing loss, stress, fatigue, irritation, inefficiency, interference with work task and speech communication, head ache and many others. The detrimental effect of noise on working efficiency and production has been proved in several fields of industry, production drops and workers make more errors when exposed for a sustained period to a high noise level, above 80 dB (A) (Delle, 1972).

Though the noise generated during blasting operation is high but it has short life lasting for few seconds. The impact can be noticed more on workers, livestock and people living very close to the quarry site. Besides the vibration and waves generated is causing damage to the houses and buildings in few of the quarry locations. Falling of rock fragments on the houses and agricultural land is commonly noticed in few villages in the study area. Unscientific blasting in Kogilu village in the year 2001-2002 resulted in fall of rock fragments on the residential area resulting in damages and cracks. Rock fragments even 500m away from the blasting site are reported to have flown and landed, which injured the people with some being admitted to the hospital.

DISCUSSION

The primary objective of noise survey in the study area is to monitor the noise sources and to assess the likely impact on the work exposure environment. Noise as pollutant produces contaminated environment which becomes a nuisance and affects the health of a person, his activities and mental abilities (Chatwal, 1999). The noise pollution in the study area is mainly resulting due to blasting, drilling, crushing, loading, unloading, machineries and transportation. Noise due to quarrying is posing serious problems, as these activities are taking place very much near to the residential area. Illegal and unscientific practice of quarrying especially drilling, blasting and crushing is posing health problems to the people, workers, livestock and wild animals etc. in general and causing serious threat to the working environment as a whole. From the ambient noise level monitoring the obtained results showed that workers engaged in semi-mechanized and mechanized quarries are exposed to high

source of noise levels for a long period and hence facing health problems.

The building stones, concrete aggregates, road metals, bricks are required by modern society for hi-tech civil engineering constructions. Therefore quarrying and crushing activities will continue as long as man is concerned about the comforts and standards of living. The major beneficial impacts of stone quarrying is employment, community development, income opportunity etc. Hence these activities are essential for the sustenance of man and country, but appropriate safety and protective measures should be adopted towards mitigating the noise hazards. Some of the suggestions are as follows.

Suggestions

- Potential hazardous areas must be identified by undertaking sound level surveys and after analysis of the results, the risks to the population is identified.
- Personal protective devices such as earplugs and muffs play a major role in protecting the individual and their use must be made compulsory in the noisy working environment.
- Controlling noise levels at source or in the working area is ideal.
- Workers working very close to crushing and screening plants should be provided with filter masks, ear protection devices (ear plugs, ear muffs and helmets etc) and wearing them should be made mandatory.
- Plants can act as barriers for noise transmission. Development of green belt can reduce noise by its screening effect. The effectiveness increases with thickness, height and density of plantation. Hence plantations should be made mandatory.
- Erection of walls, preferably designed as "acoustic scums" around the source of noise.
- Worker should be shifted from his work environment, if he progressively develops noise induced hearing loss i.e. that is rotation of job
- Health education should be given to the workers. This can be done by social work organizations, educational institutions, NGO'S and quarry owners.
- Hearing protection takes care of the problem of the noise for the short term, but the key to real hearing protection is education and communication both of which are easier to achieve.
- Any loss either to the workers/households should be compensated by the quarry owners.
- Noise induced deafness is entirely preventable but totally incurable and this serious problem must be tackled on an urgent footing.

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