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A Study on Blast Induced Effects on Environment

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Abstract - *Mining activity plays a major key role in the development of any country. The development of the nation depends on the industries and most of the industries requires raw material to run it. Mining is the basic source of raw material for most of the industries. Blasting is the economic way for the extraction of the minerals and execution of blasting will results in various environmental effects. In the current study the effect of blast induced ground vibration and air over pressure on environment was studied.*

Key Words: **Mining, Blasting, Blast induced ground vibration, Blast induced air over pressure.**

1. INTRODUCTION

Mining activity plays a major key role in the development of any country. The development of the nation depends on the industries and most of the industries requires raw material to run it. Mining is the basic source of raw material for most of the industries [1]. Drilling and Blasting are the two key operations in the mining industry Drilling is a process in which the holes are made into the rock surface and Blasting is the process of breaking of rock with the help of explosives [2]. When the explosives are subjected to initiation, blasting will happen and during this process huge energy and pressure will be generated, which will help to break the rock. As per past research only 20 to 30 % of the energy which was released during the blasting will be utilized for rock braking and 70 to 80 % of the energy gets wasted in the form of other blast induced effects like Blast Induced Ground Vibration (BIGV), Fly rock, Noise generation and Back Break which can be said as the side effects of blasting[3]. The generation of these side effects have impacts on the environment. Among all the generated side effects the vibration and noise has several adverse effects on environment [4]. So, it is important to design a proper blast design to reduce the Blast Induced ground vibration and noise to mitigate the environmental effects of blasting operation. In this present study the blast induced vibration and noise were monitored at a stone quarry where the blasting activity is carried for breaking the rock.

METHODOLOGY

An extensive field investigation is carried out at a blasting quarry in Andhra Pradesh state in India. On the selected site blasting activity is being carried for converting solid rock mass into small fragments and that was supplied for the construction industry to use as raw material in building and road constructions. In the study site for carrying blasting, first the holes are drilled with the help of drilling machines which are operated with the help of pneumatic power, the drilling machined used at the site was depicted in the Figure 1.

Figure 1: Drilling machine at study site

After the completion of the drilling the drill holes will be charged with explosives which is technically termed as the charging of holes. The drill hole is divided into two parts namely, charge column and the stemming column. The charge column consists of explosive and the stemming column will be filled up with some non-combustible material like sand or drill chippings. The charge pattern of drill hole shown in Figure 2.

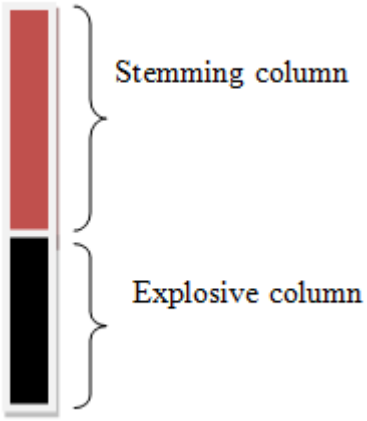

Figure 2: Charge Pattern

After the completion of the charging the holes the connections are made from hole to hole for the purpose of passing of shock wave to each hole so that each hole got blasted.

During the design of blasting operations there are three important things to be considered namely, the drill hole pattern, charge hole pattern and initiation pattern. The drill hole pattern used at study site is multi row pattern and it is shown in Figure 3, the charge hole pattern used at site is shown in Figure 2 and the initiation pattern used at site is 25 milli second delay between the hole to hole and 42 milli seconds from row to row.

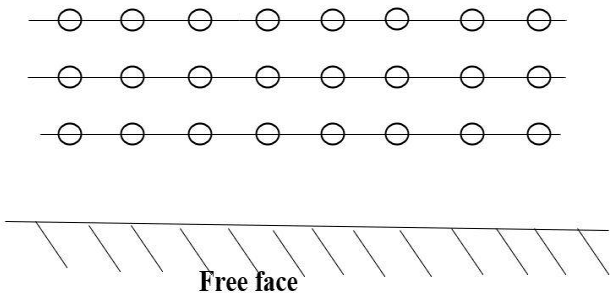

Figure 3: Drill hole pattern at study site

During the blasting operation the vibration and noise levels were monitored with a special equipment called minimate and it is depicted in Figure 4. This equipment is connected with the two kinds of sensors namely, geophone and microphone which are capable of sensing the vibration and noise levels and they are depicted in Figures 5 & 6. During the blasting operation the instrument was installed at a distance of 300 meters from blast site and the vibration and noise levels are noted.

Figure 4: Vibration and Noise monitoring device

Figure 5: Geophone

Figure 6: Microphone

There are various blasting parameters on which the blast result depends. The blast parameters used at the study site are shown in the Table1.

Table1: Blast parameters followed at study site

S.no	Parameter	Quantity	Units
1	Hole depth	8	m
2	Bench height	8	m
3	Hole diameter	115	mm
4	Spacing	3	m
5	Burden	3	m
6	Top stemming	3	m

CONCLUSIONS

Blasting is the cheapest way of breaking the rock. This technique is widely used in the civil and mining engineering works. As various effects are induced during this operation the design of blasting activity should be done by considering various parameters in order to reduce impact of those effects on environment as well as surrounding structures and humans.

In the present study a field investigation is carried out at a blasting quarry for measuring the intensity of the blast induced effect. And the results shown that the intensity of the blast induced effects are within the limits of government regulation. In case if the intensity of blast induced effects are above the permissible limits, necessary actions to be taken for reducing the effects on environment and as well as the surrounding structures.

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