1st National Congress on Soil Mechanics and Foundation Engineering
Shahid Rajaee Teacher Training University, Tehran, Iran
3-4 December 2014

Assessing the effect of delay blasting on measuring the size distribution of blasted rock at Alvand Qoly limestone mine

Mehdi Hosseini[1], Mehdi Seifi baghikhani[2]
1-Assistant Professor, Imam Khomeini international University, 02833901126
2-M.SC Student, Imam Khomeini international University

meh_hosseini18@yahoo.com

Abstract

The degree of fragmentation plays an important role in order to control and minimize the loading, hauling, and crushing costs. The purpose of this study is to measure the size distribution of blasted rock using Gold size software. Site of study is a limestone quarry producing limestone for Kurdestan cement company. Fragmentation analysis by digital image processing is a low cost and quick method. Gold size is one of the digital image software developed to compute the size distribution of fragmented rock from digital images. Results show that delay blasting was decreased the size of fragmented rock and energy consumption for crushing rock.
Keywords: Fragmentation, Alvand Qoly Limestone mine, Blasted rock, Gold size software.

1. INTRODUCTION

Blasting is the first step of the size reduction process in mining and it follows by crushing and grinding. The efficiency of these unit operations is directly related to the size distribution of muckpile. Therefore, a reliable evaluation of fragmentation is a critical mining problem[1]. Producing finer fragments in blasting operation reduces the work- load of primary crushers. It will result in an increase in the crusher efficiency and a reduction in the crushing cost. There are several methods of size distribution measurement and organized into two broad categories, direct method and indirect methods. The sieve analysis is the direct and accurate method of measuring size distribution. Although it is the most accurate technique, it is not practical for such a large case study due to being both expensive and time consuming. For this reason, indirect methods which comprise observational, empirical and digital methods have been developed [1]. Observational methods include the visual observations of muckpiles immediately after the blasting. It is widely used by blasting engineers to obtain an estimate. In some empirical models such as Larsson's equation, SveDeFo formula, KUZ-RAM model etc, blasting parameters are considered to determine the size distribution of blasted rock [2]. Using digital image processing programs in newly developed fragmentation assessment techniques allows rapid and accurate assessments of blast fragmentation size distribution. The first digital image software was developed in 1990s and at the moment it is a worldwide accepted tool in mining and mineral processing industries. Its main advantage is that it can be used on a continuous basis without affecting the production cycle, which makes it the only practical tool for evaluating fragmentation of the run of mine.
However, some errors are made largely due to the nature of the digital image analysis. It is extremely hard to obtain accurate estimates of rock fragmentation after blasting. In the following lines, some main sources of errors in using image analysis tools are briefly explained [3].
a. Image analysis programs can only process what can be seen with the eye. They cannot take the internal rock into account, so the sampling strategies should be carefully considered.
b. Analyzed particle size can be over-divided or combined; which means larger particles can be divided into smaller particles and smaller particles can be grouped into larger particles. This is a common problem in all image-processing programs. Therefore, manual editing is required.
c. Very fine particles can be underestimated, especially from a muckpile after blasting. There is no good answer to avoid these problems.
There are several software namely SPLIT, WipFrag, GoldSize, FragScan, TUCIPS, CIAS, PowerSieve, IPACS, KTH, WIEP, etc. The accuracy of these systems varies between 2 % to 20 % [4 & 5]. In this investigation, the Gold size software was used for size distribution computation in Alvand Qoly Limestone mine. Once the images are taken and saved to a computer, the gold size software has five progressive steps for analyzing each image [6].