BLASTING DESIGN DEVELOPMENT AREA DECLINE CIBITUNG AND CIKONENG UNDERGROUND MINE PT CIBALIUNG SUMBERDAYA BANTEN

RaimonKopa[1], Afdhal Husnuzan[1], Bambang Heriyadi[1]
[1]Department of Mining Engineering, Faculty of Engineering,UniversitasNegeri Padang
E-mail: raimon_unp@yahoo.co.id

ABSTRACT

The purpose of this research is to design blasting pattern and improve the blasting parameters. There are two problems that caused unoptimum blasting result parameters for the III class of development rock mass in the underground gold mine PT CibaliungSumberdaya. First, there is no blasting design specified for the III class of development rock mass. Second, bad implementation of blasthole drilling activity. The actual blasting activity result parameters are unoptimal blasting advance (79,34%), high powder factor/PF (1.43 kg/ton), fine fragmentation (P80 = 20 cm) and high overbreak percentage (33%). The blasting design used for this research was calculated by Jimeno, et al, 1995: 217-230. The enhanced parameters are 93.10% blasting advance, 0.81 kg/ton of PF, coarser fragmentation (P80 = 24 cm) and smaller overbreak percentage (8.20%).

Keywords: Blasting design, development, Jimeno, rock constant

1. INTRODUCTION

Standard drilling and blasting patterns for development areas have been established by the Quality Control Department of PT CSD. However, the standard is made in the absence of blasting design and is not adapted to a specific rock mass classification, so it is intended for application to the overall mass of the rock. Because the mass of the development area has unequal classes at each point, it is necessary to design the blast according to the class and rock mass characteristics in order to make the blasting more efficient.

In addition, the implementation of poor heading development drilling activities resulted in less drilling geometry and less optimal blasting results. The drilling points are made only on the basis of the estimates and experience of the drill carrier operator without the measurement or the creation of auxiliary lines first. The absence of geometric measurements of the drilling points in the development area influences the success indicators of blasting, including progress, powder factor (PF), fragmentation of blasting and overbreak.

Based on observations and field measurements, the blasting progress resulting from actual blasting activity was 79.33%. This figure has not reached the standard of progress set by the company, 90% of the burrowing hole depth. While the resulting PF is 1.45 kg / ton with a small fragmentation percentage (<4.4 cm) is 32.16% and the optimum fragmentation percentage (25-50 cm) is only 9.85%.

Small fragmentation is associated with too large a PF value. According to Dessureault (2004: 82), the higher PF will result in subtle fragmentation. While the lower PF will result in a more violent fragmentation. The standard PF set by the company for blasting development decline is 0.6 kg / ton. Based on the curve of the relationship between the width of the heading and the diameter of the explosive hole (Jimeno, 1995: 225), the PF value for the development area is about 0.79 kg / ton. In addition, based on graph of the relationship between rock constant and RMR (Febry, 2012: 55), for RMR 46,29 obtained rock constant 0,82 kg / ton.

Based on field observations, the dimensions generated from the blasting development activities have different sizes compared to the planned dimensions of the design. Generally, the resulting dimensions are larger (overbreak). This can be caused by several things, such as drilling deviation, rock geological factors on the heading and overfilling of explosive materials at the contour burst pits.

This research has several main objectives, among others, to know the actual drilling and blasting pattern applied to the blasting activity of the development area, to know the blasting design in accordance with the class III rock mass in order to increase the parameters of the successful detonation of CBT DC and CKN DC areas, and to know the blasting results of the design blasting made against explosive success indicators.

2. Method

The research focused on Cibitung decline (CBT DC) development site and Cikoneng decline (CKN DC) lower gold mine PT CSD land with class III rock mass based on the classification developed by Bieniawski in 1989.

The research method applied is experimental where the control of certain variables to determine the relationship between variables in the study.

The initial phase of the study began with a literature study of blasting activities and the calculation of underground mine drilling designs. Then followed by field observation that aims to find out the drilling and blasting activities applied and the actual blasting parameters, ie blasting progress, PF, fragmentation and overbreak. The next stage is the evaluation of the actual blasting parameter and then the blast design calculation. After testing the blasting design, a blasting parameter analysis was performed by comparing the results of the blasting test experiment with actual blasting results. In addition, the blasting test I design aims to validate one of the important parameters in the calculation, ie the rock constant.

The results of the comparison analysis of the actual blasting parameters with the blast design test results will determine whether the rock constant used for the blasting II design will be raised or lowered. After the improvement of explosive blast I design parameters, the research stages are continued with blast II design trials so that the blasting success parameters can be optimized.

3. Result and Discussion

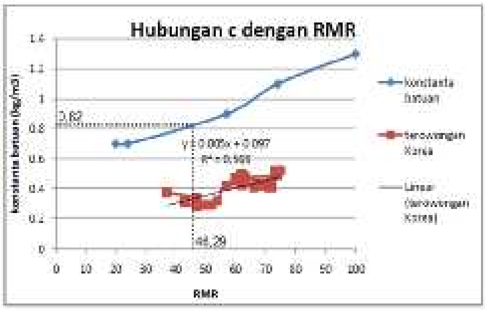
3.1 Actual Drilling Geometry

Drilling activity in heading development is done without measurement to mark the drilling points first. Therefore, there is a wide range of burden and space values that are considerably higher than the existing drilling standards. Burden and spaces range from 0.45 to 1.02 m. While the value of the burden and spacing in the drill pattern standard is constant at 0.84 cm. An example of the explosion slope results can be seen in Figure 1.

Figure1. Drilling PatternHeading CKN_DC (16-02-2015)

3.2 Blasting Design I

Based on the curve of the relationship between the RMR and the rock constant (c), the c value for the average RMR weight of 46.29 at the development sites of CBT_DC and CKN_DC is 0.82 kg / ton (Figure 2).



Febry, 2012: 55

Figure2. Graph of Relation Between Rock Constants (c) with RMR

After doing some calculations using the formula that has been made based on the reference calculation in the book Drilling and Blaststing of Rocks (Jimeno, et al, 1995: 217 - 230), the blasting design I used for blasting test is made with the value c = 0.75 kg / ton. Detailed draft design and patterns can be seen in the following data:

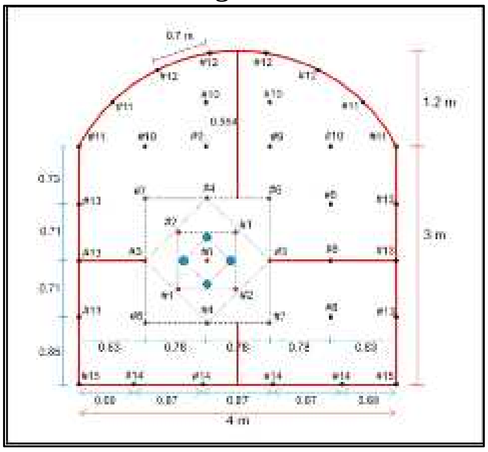


Figure3. Blasting GeometryPeledakan*Development* (c = 0.75), *Jumbo drill*

Drilling Depth	=	2.7 m
Number of Drilling Hole	=	46hole
Number of Empty Hole	=	4 hole
Number of Blasing Hole	=	42 hole
Diameter of Empty Hole	=	0.102 m
Diameter of Blasting Hole	=	0.051 m

The blasting test of I was conducted at CKN DC location on April 06, 2015. Rock masses at the blasting site were in Class III with a weight of RMR 47. The results of the trials showed an increase in blasting success parameters. However, due to the influence of the discontinuity field or the weak plane in the heading resulted in great progress and overbreak, respectively 113.71% and 38.81%.

A large percentage of overbreaks indicates that the rock constant used is still not in accordance with the class III rock mass. Therefore, blast design is required with a lower c value.

3.3 Blasting Design II

The value of c used in the calculation of the blasting design II is 0.7 kg / ton. In contrast to the blasting plan I, the blasting II design is calculated with slight differences in the basic parameters of the calculation, namely:

Drilling Depth	=	1,8 m
Number of Drilling Hole	=	46 hole
Number of Empty Hole	=	4hole
Number of Blasing Hole	=	42 hole
Diameter of Empty Hole	=	0.051 m
Diameter Blasting Hole	=	0.038 m
Dynamitϕ 30 mm	=	50 kg

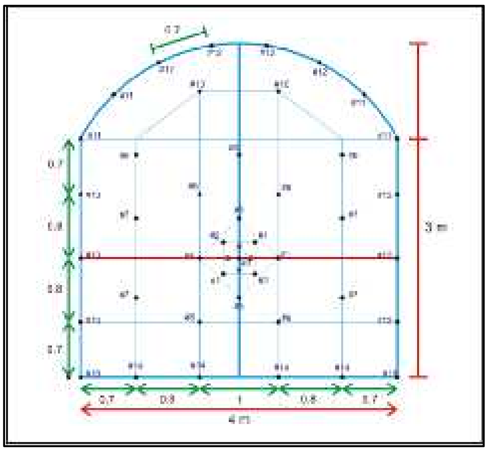


Figure4. Blasting Geometry *Development* (c = 0.7), *Jack leg*

The experiment was carried out on the mass of development class III rock with the value of RMR 42 - 46.5. The results of blasting trials show that the parameters of blasting success can be increased from actual blasting activities.

3.4 Comparison of Blasting Test Results

After analyzing the explosive success parameters, the actual test results and actual blasting results can be summarized in Table 1.

In the table it can be seen that the results of the blasting test design I showed a more optimum parameter increase of success. However, the blasting design I produces a larger overbreak when compared to other blasts.

Tabel 1. Result of research

Indicator	Actual	Blasting Design I	Blasting Design II
Blasting Advance (%)	79,34	131,71	93,10
PF (kg/ton)	1.43	0.62	0.81
Fragmentatition, P80 (m)	0,20	0,34	0,24
Overbreak%	33	38.81	8.20
Underbreak%	18	-	32

While the design trial II produces open dimensions with smaller overbreak rates, 8.2% of the planned designs, and other parameters tend to be better than the actual blasting results.

However, in practice, there are several obstacles that cause blasting II design to produce underbreak. Based on field observations, underbreak on heading development decline can be caused by several things:

1) Dimensions of openings before the blasting activities are not sufficient dimensions 4 m x 4.2 m.
2) Explosive holes on the floor that cannot be filled with explosives. Of the 6 drilled floor holes in the blast II design experiment on the CBT XC8ACC heading held on April 23, 2015, only two floor holes were filled with explosives. Even the charging is also not maximal, can only be inserted a total of 4 kepgel. The non-filled hole is caused by the height of the water rising up to 80 cm due to mucking waste around the location undertaken at the bottom drilling. The high water discharge causes the floor holes can not be cleaned from the waste material.
3) Arch lines to be lowered for subsequent blasting activities sometimes result in dimensions of openings for subsequent blasting activities to be reduced. High aperture is not full and the floor holes are not maximal in general will result in dimensions of the underbreak openings.

4. CONCLUTION

4.1 Conclution

a. Burden and spaces used in actual blasting activities have a less regular size with a range of values from 0.38 to 1.2 m. This is due to the determination of drill points that are not measured and not marked first. the actual blasting success parameters include: blasting advances 79.29%, PF 1.43 kg / ton,, minor fragmentation with 80% pass in 20 cm sieve, and 33% overbreak.
b. The blasting II design is more suitably applied with the class III rock mass. The design was calculated using rock constant parameters (c) 0.7 kg / ton, corrected rock constant (C) 0.75 kg / ton, explosion diameter

(D1) 38 mm diameter, 51 mm hole diameter (D2), drilling depth (L) 1.8 m, and produces burden and spacing with a range of values 0.7 - 1 m and 42 explosive holes.

c. The results of the blasting II experiments are known to increase the blasting success indicator by blasting 93.10% progress, PF 0.81 kg / ton, 80% fragmentation of blasting results increased from 20 cm to 24 cm, and overbreak can be lowered from 33% to 8.2 %.

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