BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

OPTIMIZATION OF DRILLING AND BLASTING PARAMETERS TO MINIMIZE BOULDERS

Case Study: TORORO CEMENT LIMESTONE QUARRY

BY

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ABSTRACT

Tororo cement limestone quarry is located at a distance of 3.5 km (2.2 miles) to the South East of Tororo downtown. Drilling and blasting operations are used to extract the limestone for the urgent need to manufacture cement, lime and aggregate. Drilling and blasting have been associated with a number of challenges like fly rocks, vibrations, slope instabilities and boulders. The drilling and blasting crew is facing many difficulties due to the geological complexity of the area and poor blast designs, significantly –boulders. However, most important is the drilling and blasting parameters implemented for such geologic complexities.

Recent studies about drilling and blasting has it that parameters rely on each other –spacing, burden and charge length correlate most of the parameters like drill hole depth, stemming, sub-drilling, among many others. Some parameters can be fixed for the sake of avoiding costs for changing conditions.

So the procedures consist of acquiring the current drilling and blasting parameters, then analyzing these data to determine specifically which parameters have influence on the generation of boulders and finally a simulation was done to provide optimal parameters for which they yield desirable fragment size at a minimum cost as compared to the rest.

The Kuz-Ram model has been essential in fragmentation analysis in which the parameters established from the Rule of Thumb were inputs to the model. Smart iteration was done to cater for significant changes.

The results of this study spells out the parameters that seek to minimize the generation of boulder whilst ensuring minimum drilling and blasting costs.

In conclusion, though drilling and blasting has been often apprehended with the challenge of boulders, and this hikes the company's costs as boulders necessitate secondary blasting. Identifying and optimizing drilling and blasting parameters identified help to reduce cost hence profits are realized as desired.

Then adopted practices has been recommended for the future drilling and blasting activities for achieving desired fragmentation whereas ensuring the company's profit for the stipulated production. Which other challenge exists? Fines? Let's research about it.

DECLARATION

I, **SAM MANDE, BU/UG/2013/1607,** do declare that this research project report is my original work and has never been presented to any university or institution for the award of a bachelor's degree in mining engineering or any other related award.

Signature: .....

Date: 02.06.2017

APPROVAL

This project report has been ideally submitted for examination with the approval of the following supervisors:

Signature: .....

Date: .....

Mr. Tugume Wycliffe

Signature: .....

Date: .....

Mr. Wangi Mario

DEDICATION

To God the Almighty, His care and goodness as my Pa has always ensured I accomplish this research.

Too, I dedicate this project research to my dear parents **Mr. Soyekwo Vincent** and **Mrs. Farantine Soyekwo** for all their continual financial, moral and spiritual support they have always offered to me during my education carrier.

May the good Lord bless them abundantly!

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LIST OF ACRONYMS

d	Drill hole diameter
H	Bench height
B	Burden
S	Spacing
J	Sub-drilling
D	Dill hole depth
Θ	Drill hole inclination
U	Stemming
l	Charge length
N	Holes charged
GPS	Global positioning system
VOD	Velocity of detonation
%	Percentage
ANFO	Ammonium nitrate
UCS	Uniaxial compressive strength

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

Today in the world, mining is turning out to be the most viewed potential activity to raise the economic standards of most countries, development of cities and the livelihood of many people, though still infant. In Uganda, the mining and quarrying industry is growing at a rate of about 11% per annum. Limestone, dolomite and pozzolana are mined for the production of cement, aggregate and lime for local, national and international market needs of construction, processing and also agriculture (Hinton, 2005).

However, its potential has initiated many investors, government, companies and individuals to engage in the mining industry.

Quarrying is one mining activity involving the production of aggregate and other construction material. Throughout Uganda, quarry establishment has enacted this activity.

Tororo cement limited has three company quarries found in the districts Moroto, Kapchorwa and Tororo district. The quarries were meant to supply the factory with material for cement manufacture, aggregate for construction purposes and lime.

There is vastly a high demand for cement, aggregate and lime in the market which has prompted Tororo cement limited to keep up in their production of 1000 tons per day.

To achieve this production, the company performs drilling and blasting. The basic objective of drilling and blasting program is to achieve optimum fragmentation since it is desired other than other rock breakage mechanisms.

However, drilling and blasting has been associated with several challenges owing from the implementation of inadequate design parameters. Fly rocks, boulders, ground vibrations, stope instability and generally poor fragmentation are some of the consequences associated with drilling and blasting. These consequences are experienced in many mining quarries around the world and have consequently increased on the costs of production, accidents and low productivity.

Boulders formation after blasting is a problem which Tororo Cement Quarry is facing currently. These boulders formation necessitate secondary blasting. A problem during material handling operation resulting into low and inefficient production

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