COMPARATIVE STUDY OF EMULSION AND WATER GEL EXPLOSIVES FOR ROCK QUARRYING

Bandula Herath

138453 G

Degree in Master of Science

Department of Earth Resources Engineering

University of Moratuwa

Sri Lanka

October 2017

COMPARATIVE STUDY OF EMULSION AND WATER GEL EXPLOSIVES FOR ROCK QUARRYING

Bandula Herath

138453 G

Thesis submitted in partial fulfillment of the requirements for the degree

Master of Science in Earth Resource Engineering

Department of Earth Resources Engineering

University of Moratuwa

Sri Lanka

October 2017

DECLARATION

I declare that this my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person unless where the acknowledgement is made in the text.

I do hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or in part, in future works (such as articles or books).

Signature of the candidate:

....   2017 -   -

Bandula Herath

The above candidate has carried out research for the Masters under my supervision.

Signature of the supervisors:

....   2017 -   -

Eng.P.V.A.Hemalal

Senior Lecturer,

Department of Earth Resources Engineering,

University of Moratuwa, Sri Lanka .

....   2017 -   -

Prof P.G.R .Dhramarathna

Senior Professor,

Department of Earth Resources Engineering,

University of Moratuwa, Sri Lanka

....   2017 -   -

Dr L.P.S Rohitha

Senior Lecturer,

Department of Earth Resources Engineering,

University of Moratuwa, Sri Lanka.

Abstract

In the mining field, blasting is the predominant method for breaking of consolidated rocks and the main objectives are to extract the large quantity at both minimum cost and having minimum damage to the environment.

Rock breaking , over the years , which was limited to just breaking of boulders for the use of building and road construction has developed vastly to various aspects of mining namely ,open cast, underground and underwater blasting. Manually drilled single shot bore holes are disappearing and making way to multiple bore holes of immense depth with the introduction of the latest blasting technologies.

Result of the introduction of optimum blasting techniques and sustainable development criteria, mining industry has twisted in the path of eco-friendly mining. Explosives and blasting techniques that are used nowadays are based on the above concept.

Use of Dynamite changed to lesser powerful explosives such as Water Gel and then to Emulsion explosives. Our country also discarded the use of Dynamite several years ago and Water Gel explosives was introduced. Water Gel explosives is eco friendlier than Dynamite but could not be substituted in areas underground and underwater blasting. Introduction of Emulsion explosives was mainly to overcome these disadvantages of Water Gel Explosives.

Aim of this study is to carry out a comparative study in all areas of open cast mining and to ascertain the most appropriate high explosive type for optimum output.

Acknowledgment

I would like to extend my sincere gratitude to my supervisors Professor P.G.R .Dhramaratna ,Senior Lecture Engineer P.V.A. Hemalal and Senior Lecturer Dr L.P.S. Rohitha of the Department of Earth Resources Engineering, University of Moratuwa Sri Lanka for the moral support and immense guidance given to me from the moment of choosing the appropriate thesis topic up to the completion of this MSc study.

I would also like to extend my gratitude to my past course coordinator Dr.A.M.K.B.Abesinghe and the present course coordinator, who is also the Department Head of the Earth Recourses Engineering Department Dr H.M.R.Premasiri and the academic staff of the Department of Earth Resources Engineering Department, University of Moratuwa Sri Lanka are acknowledged for the type of value support extended me to complete the above.

Laboratory tests conducted at Moratuwa University Earth Resources Departments laboratory were facilitated by Department Head of the Earth Recourses Engineering Department Dr. H.M.R.Premasiri and the Technical Officer Mr W.W.S Perera and like to forward my gratitude for that. The blast monitor instruments, Mining Engineer’s support and the technical facilities were provided by the Geological Survey and Mines Bureau (GSMB) and would like to extend my gratitude to the Director General of GSMB Engineer S. De Silva, Mining Engineer Mr D.Nuwan and Mr S.Jayabandara and their staff.

Blasting tests were performed at the “Metal Mix” quarries in Hanwella, Meepe area, which is belonging to Mr T.Illeperume, Senior Mining Engineer Mr M.D Wimal and Mining Engineer, Mr.S.Abeysundara extended valuable support and wish to extend my gratitude to them.

I wish to extend my gratitude to Secretary, Ministry of Defence and his staff for granting me the relevant funds and official leave to complete the Masters Degree.

Finally, I wish to extend my loving gratitude to my wife and sons for their moral support and unblemished encouragement made in fulfilling this enormous task.

List of Figures

List of Tables