

UNIVERSITY OF MINES AND TECHNOLOGY TARKWA



FACULTY OF MINERAL RESOURCES TECHNOLOGY

MINING ENGINEERING DEPARTMENT

TOPIC OF PRESENTATION :

**A STUDY ON CRUSHER THROUGHPUT AS A COMPARATIVE
MEASURE OF FRAGMENTATION USING VARI-STEM BLASTING
PLUGS AND CONVENTIONAL STEMMING-A CASE STUDY
BY
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Mode of Presentation

- Problem Definition
- Objectives
- Methodology
- Facilities Employed
- Scope of Work
- General Presentation
- Observations
- Conclusions
- Recommendations

Problem Definition

- Production of boulders had been on the increase and was affecting the mine's ability to increase its throughput to meet the demands of a competitive mining environment.
- Management therefore decided to acquire the **VARI-STEM**® Blasting Plugs to improve the quality of stemming hence better fragmentation.
- This project sets out to study from fragments results of the Crusher throughput as a comparative measure of the quality of fragmentation using the **VARI-STEM**® Blasting plug as against conventional stemming.

Objectives

- To Comparatively study the quality of fragmentation using **VARI-STEM[®]** Blasting Plugs and Conventional Stemming
- Suggest possible methods of improving fragmentation.

Methods Used

- Review of pertinent literature.
- Field visits to observe Stemming practices at the Mine.
- Consultations with Professionals in the Industry.
- Data collection from the Mine.
- Analysis of data using Graphical methods.

Facilities Employed

- Internet and Library facilities at University of Mines and Technology (UMaT).
- Internet Facilities at the Mine.

Scope of Work

- This work is limited to Blasthole stemming Practices at the mine.
- Crusher Throughput results considered for 11 months in 2006 & 2008 for conventional stemming & **VARI-STEM**[®] Blasting Plugs respectively.

Stemming

- Stemming is the plugging of the blast hole to prevent the escape of blast gases.

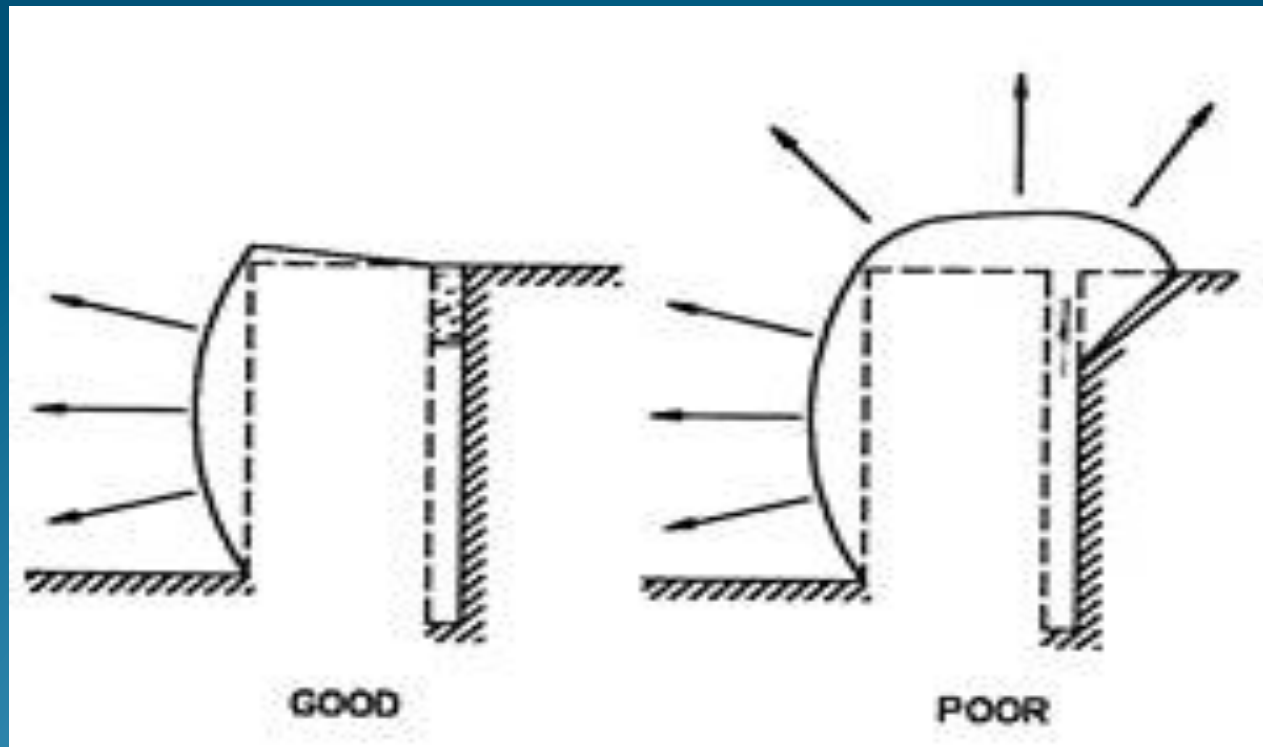


Fig 1 showing the effect of stemming in the Blasthole
(Source : Anon,2008)

Conventional Stemming

This is an inert substance, loaded on top of the explosive charge in the blast hole to give confinement to the explosion gases.



Fig 2.0 showing the Stemming Material (Chipping)

(Source:Anon,2008)

Stemming Practices using Conventional Stemming

- For each blasthole, a primer is made and lowered into it.
- Emulsion is pumped into the hole
- About 40 min. is allowed for gassing up to the final stemming height.
- The final stemming height is filled with crushed stones.

VARI-STEM® Blasting Plugs

- The **VARI-STEM®** Blasting Plug is manufactured from durable and resilient polythene.
- **VARI-STEM®** Blasting Plug works by creating a blocking effect within the drill hole by wedging the stemming material between the drill hole wall and the plug.

The Function of VARI-STEM Blasting Plug Gear Design

- Prevents plug collapse in undersized holes or when forced over jagged rocks.
- The numerous vertical grooves on the outside diameter of the plug prevent the detonator cord from being crushed or pulled into the drill hole during insertion.
- Gives structural strength to the plug.



Fig 3.0 showing the **VARI-STEM** Blasting Plug Gear Design

How the VARI-STEM Blasting Plug Works

Chipping

Detonating Cord

VARI-STEM Blasting Plug

Detonation reaction

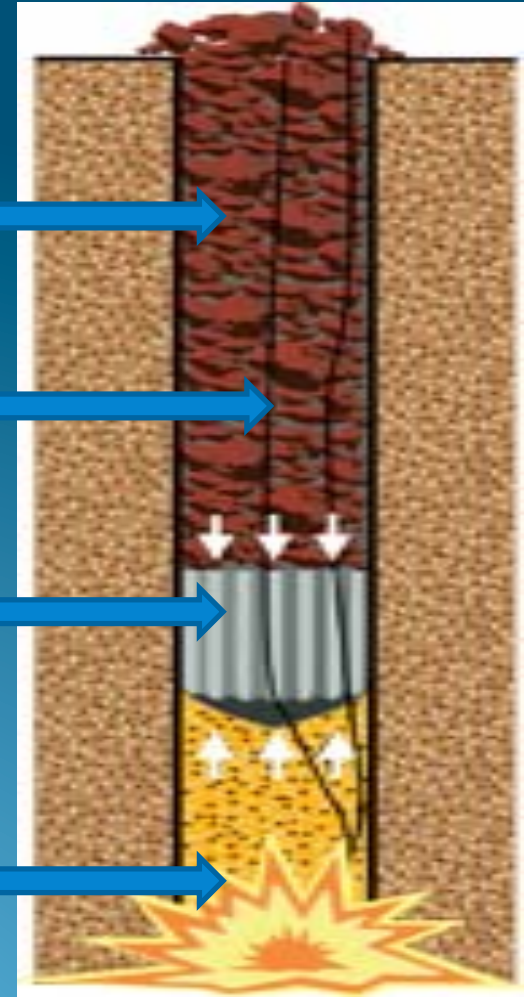


Fig 3.0 showing how the VARI-STEM Blasting Plug Works

(Source: Anon, 2008)

Stemming Practices using **VARI-STEM** Blasting Plugs

- For each blasthole, a primer is made and lowered into it.
- Emulsion is pumped into the hole.
- About 40 minutes is allowed for gassing up to the final stemming height.
- The **VARI-STEM** plug is inserted into the blasthole.
- The final stemming height was then filled with crushed stones.

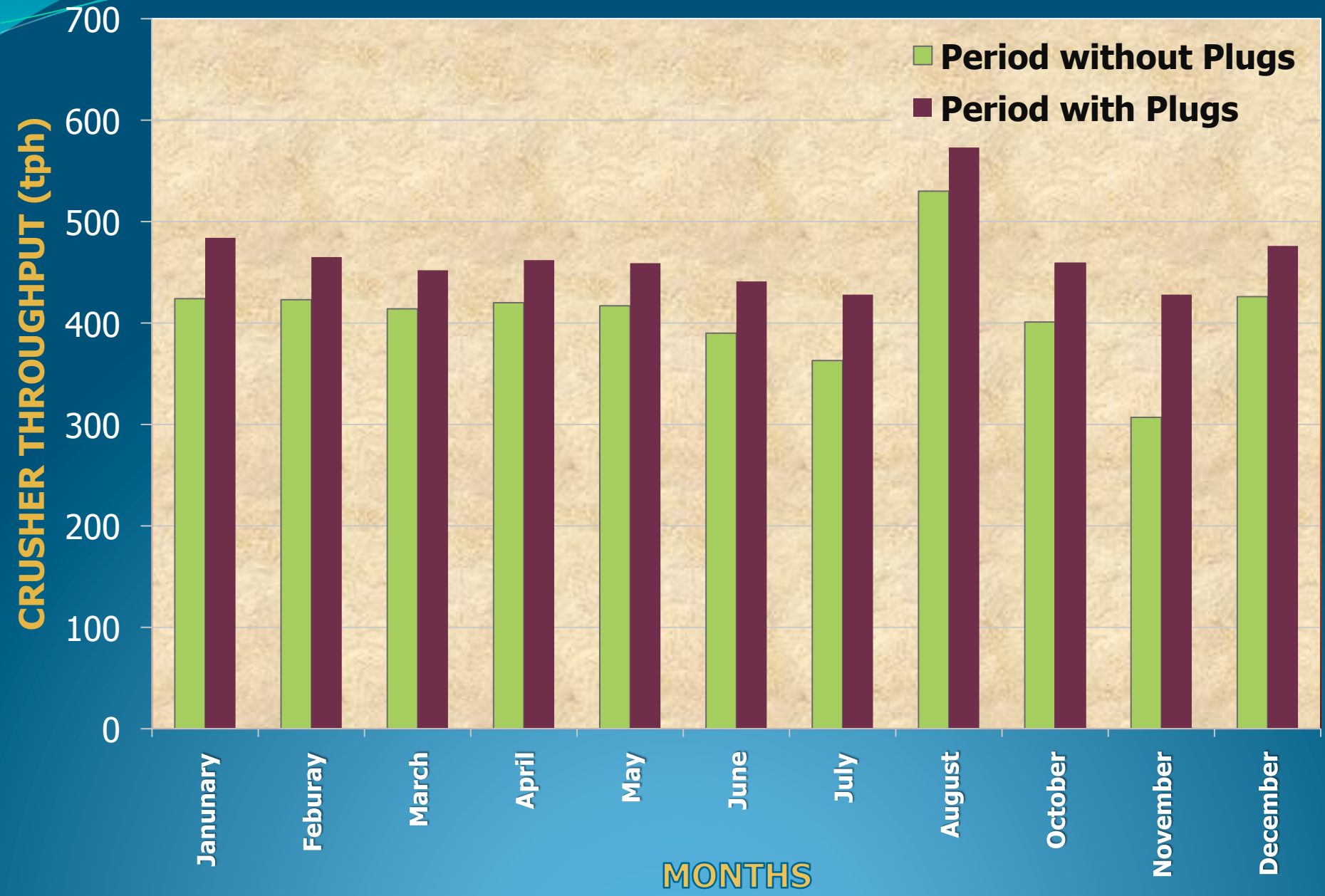
Fig 4.0 showing the
VARI-STEM Blasting Plug



Data Analysis

MONTH	CRUSHER THROUGHPUT (ton/hr.)		Increase crusher throughput (ton/hr.)	Comparative Percentage (%) increase (crusher throughput).
	Conventional Stemming	VARI-STEM Blasting Plugs		
January	424	484	60	14.2
February	423	465	42	9.9
March	414	452	38	9.2
April	420	462	42	10.0
May	417	459	42	10.1
June	390	441	51	13.1
July	363	428	65	17.9
August	530	573	43	8.1
Oct.	401	459	58	14.5
Nov.	307	428	121	39.41
Dec.	426	476	50	11.74

Data Analysis (cont'd)



Observations

- Good fragmentation was achieved in hard rock zones when **VARI-STEM®** Plugs were used in stemming blastholes.
- The excavation of material blasted using **VARI-STEM®** Plugs was easier.

Conclusions

- **VARI-STEM®** Blasting Stemming Plugs gave better fragmentation in hard rock zones.
- The average crusher throughput achieved with Conventional Stemming & **VARI-STEM®** Blasting Plugs were 410.45t/hr. & 466.09t/hr respectively.
- The average increase in throughput was 13.56 % when **VARI-STEM®** Blasting Plugs were used in stemming Blastholes as compared to the Conventional Stemming.

Recommendations

- The mine should continue to use **VARI-STEM® Blasting Plugs** since its use has increased its throughput.
- The Blast crew should be well educated on the use of the **VARI-STEM® Blasting Plugs** and its importance .