

VARI-STEM[®]

GEAR-UP

**FOR IMPROVED BLAST PERFORMANCE, FLY ROCK CONTROL,
SAVINGS IN SECONDARY BREAKAGE AND DOWN STREAM COSTS.
USE THE PLUGS WITH THE PATENTED
GEAR DESIGN!**



Patent #5,936,187

GREATER ROCK FRAGMENTATION

INDEPENDENT STUDIES SHOWED

**130% TIME REDUCTION IN STEMMING MOVEMENT
27% REDUCTION IN AVERAGE ROCK SIZE
GREATER TONNAGE AT PRIMARY CRUSHER**



EASY TO INSTALL: Simply insert a loading pole into the **VARI-STEM**[®], and push to the ANFO. *Takes Seconds!!!* Place the **VARI-STEM**[®] directly onto the ANFO. The shock wave is resisted, with slower heat waves destroying most of the plug.

LOW COST: Cost almost non-existent compared to the resulting savings!!

ADDED BENEFITS:

- Reduction in fly rock and air over pressure
- Higher ANFO loading in hard cap rock to reduce oversized and secondary breakage
- Gear design protects detonating cord. Permits insertion into undersized holes
- Savings in explosives with air decking, and allows consistent stemming heights with gas emulsions
- Ore loss minimized with even blast profiles
- Increased crusher output from more micro-fractures
- Stemming quality/size not critical

OUTSIDE BLASTER DOING YOUR QUARRY BLASTING???

Oversized rock, especially from hard cap rock, is *your* problem— *not* the Blaster's!!! Save at your primary crusher and all down stream costs. **Specify VARI-STEM**[®] **Plugs.**

Fragmentation Analysis

Complete reports, with blast data and timed photos, available on our website:

www.varistem.com

STUDY 1

MREL (Mining Resource Engineering Ltd.) tested stemming movement and ejection velocity. The longer time to stemming movement and the lower stemming ejection velocity means more blast energy is retained in the bore hole. Energy is directed into the rock, and not lost into the air. There is better fragmentation, less fly rock, and a reduction in noise.

Using **VARI-STEM**® with standard rock stemming, *slowed the stemming movement 100% and stemming ejection velocity was reduced 44%.*

	ROCK ONLY	VARI-STEM® PLUG
ANFO* Velocity of Detonation	12,000 ft/sec	12,020 ft/sec
Time to Stemming Movement	2.3 msec	5.3 msec
Stemming Velocity	1,580 ft/sec	920 ft/sec

*Similar "ANFO Velocity of Detonation" shows equal ANFO explosive force occurred in all tests

STUDY 2

DBA CONSULTING extended the MREL tests by computer analyzing "every truckload" taken to the primary crusher. This was a 100% muck pile study, and did not rely on carefully selected, biased photos of a muck pile. It is also more reliable than "eye balling" the surface of a muck pile. DBA tests confirmed the **MOCAP VARI-STEM**® effectively contained expanding gas roughly 3 times longer than drill holes using only crushed stone.

Basic Summary of the DBA Study: There was a 27% decrease in the mean average rock size in the post blast muck pile from 7.89 inches to 5.69 inches. There was a 25 tons per hour increase throughput at the primary crusher.

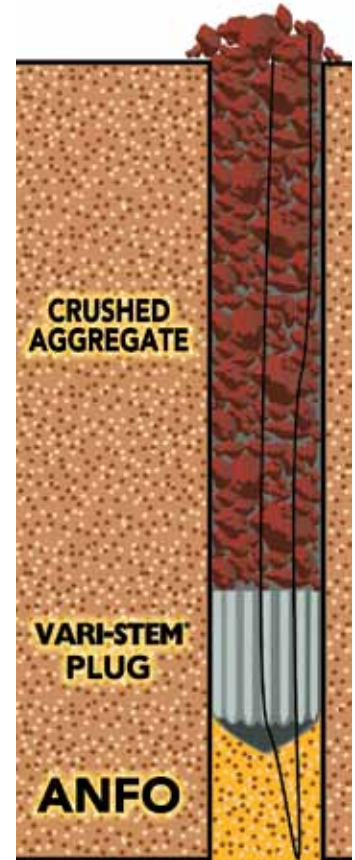
STUDY 3

UNIVERSITY OF MINES AND TECHNOLOGY in TARKWA, GHANA conducted a 12 month independent study which shows a **13.56% average increase** in crusher gold ore throughput when **VARI-STEM**® Plugs were used in stemming blast holes when compared to conventional stemming.

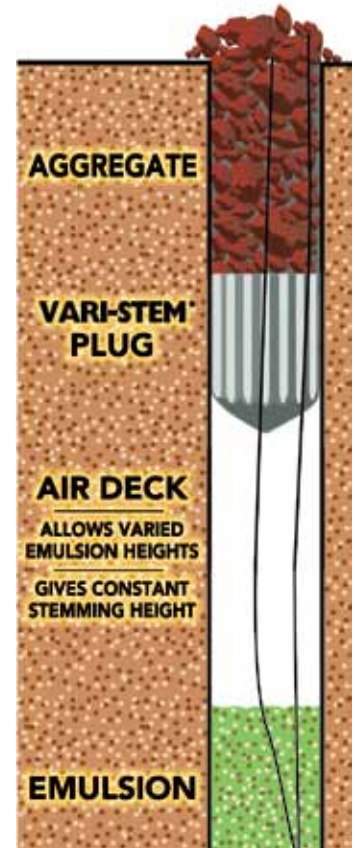
PART #	FITS HOLE SIZE	
BP-2	2" - 1 5/8"	51-40 mm
BP-2.5	2 1/2" - 2 1/16"	64-52 mm
BP-3	3" - 2 9/16"	76-65 mm
BP-3.5	3 1/2" - 3 1/16"	89-77 mm
BP-4	4" - 3 9/16"	101-90 mm
BP-4.5	4 1/2" - 4 1/4"	114-100 mm
BP-5	5" - 4 3/4"	127-115 mm
BP-5.5	5 1/2" - 5 1/4"	140-128 mm
BP-6	6" - 5 3/4"	152-141 mm
BP-6.5	6 1/2" - 6 1/4"	165-153 mm
BP-7	7" - 6 3/4"	177-166 mm

This size chart is only a guide. Undersized plugs normally used in cold weather. Air Decking might use larger **VARI-STEM**® Plugs. Contact us for samples.

VERTICAL



AIR DECKING



*Using **VARI-STEM**® Plugs in Air Decking allows ANFO savings. With inconsistent gas emulsion expansions, **VARI-STEM**® Plugs allow air decking for controlled stemming heights and blast results.*

Besides reducing average rock diameter in the muck pile, **VARI-STEM**® Plugs save equipment and labor costs by reducing the quantity of oversized cap rock. It is possible to reduce stemming height using Vari-Stem, allowing more ANFO for greater cap rock breakage. **VARI-STEM**® and ANFO is cheap compared to secondary breakage costs (chemical vs. mechanical costs).



PHOTO A

PHOTO A: Oversized boulders removed from muck pile, awaiting secondary breakage. The costs of separating boulders from the muck pile and secondary breakage is substantial.

PHOTO B: Even after costly secondary breakage, remaining large boulders can create delays at the primary crusher.

PHOTO C: Loaders wait for trucks stacked up at the primary crusher due to crusher delays from oversized boulders.



PHOTO B



PHOTO C