BLASTING AND/OR ALTERNATES: SELECTING/CHOOSING THE ALTERNATES

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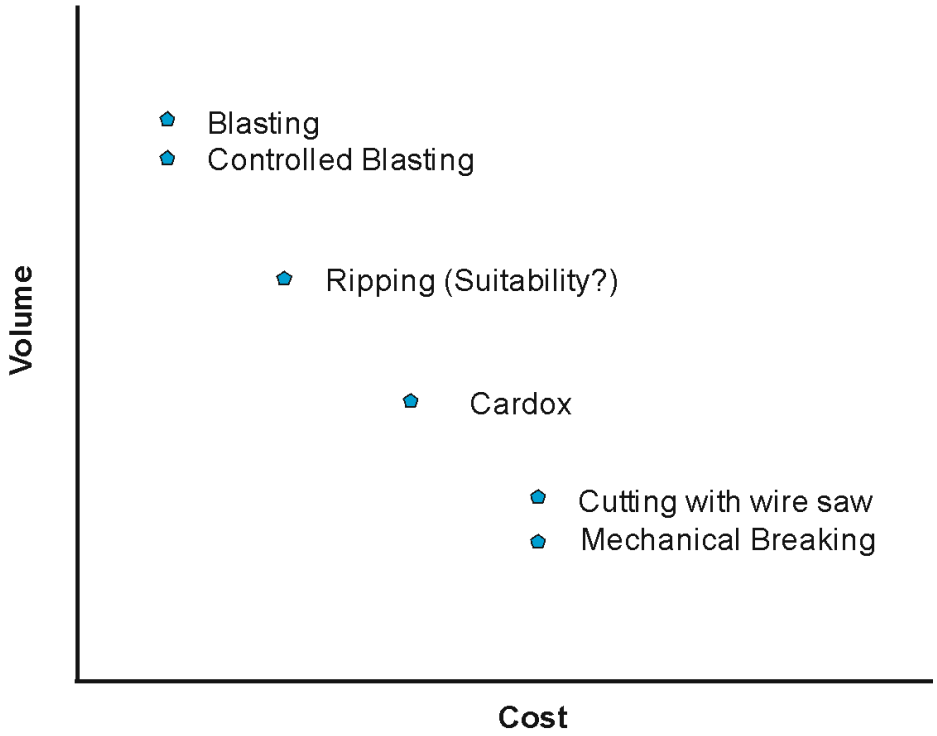
Rock excavation is as old as civilization, started the day, when the medieval man started living in huts and made pathways. Use of explosives is recorded as early as 2nd Century AD when Chinese reported to have used Gunpowder.

Use of Explosives for Rock Blasting picked up with the Industrial Revolution when mining caught on to satisfy the increasing demand for Minerals. Continued research resulted in safer and economical explosives.

Increasing environmental consciousness, increased awareness amongst stake holders, vested interests and the decreasing quality of explosives users worldwide, made blasting a dirty not sought after word. Unfortunately as depicted in the following table blasting still continues to be the cheapest, fastest solution for rock blasting.



NOTE: Figure Not to Scale

ROCK BREAKING OPTIONS

As can be seen from the above only choice left for non-dimensional stone hard Rock mining and large scale production are either blasting or ripping if the Rock is soft,as all other options are costly and are not capable of producing the desired large output as demanded by the modern Mining & Project Execution Schedules.

RIPPING/CUTTING:

Ripping is the most sought after and proven alternate to blasting, but has the following disadvantages.

1. Can't be used in very hard rock
2. Productivity comes down drastically with the increasing hardness as seen in TABLE 2
3. Capital Intensive.

So knowing where to rip and where to blast the most critical decision that a Mining Man has to take.

While correlation of seismic velocity to rip ability is well proven as can be seen in the following table

TABLE 1

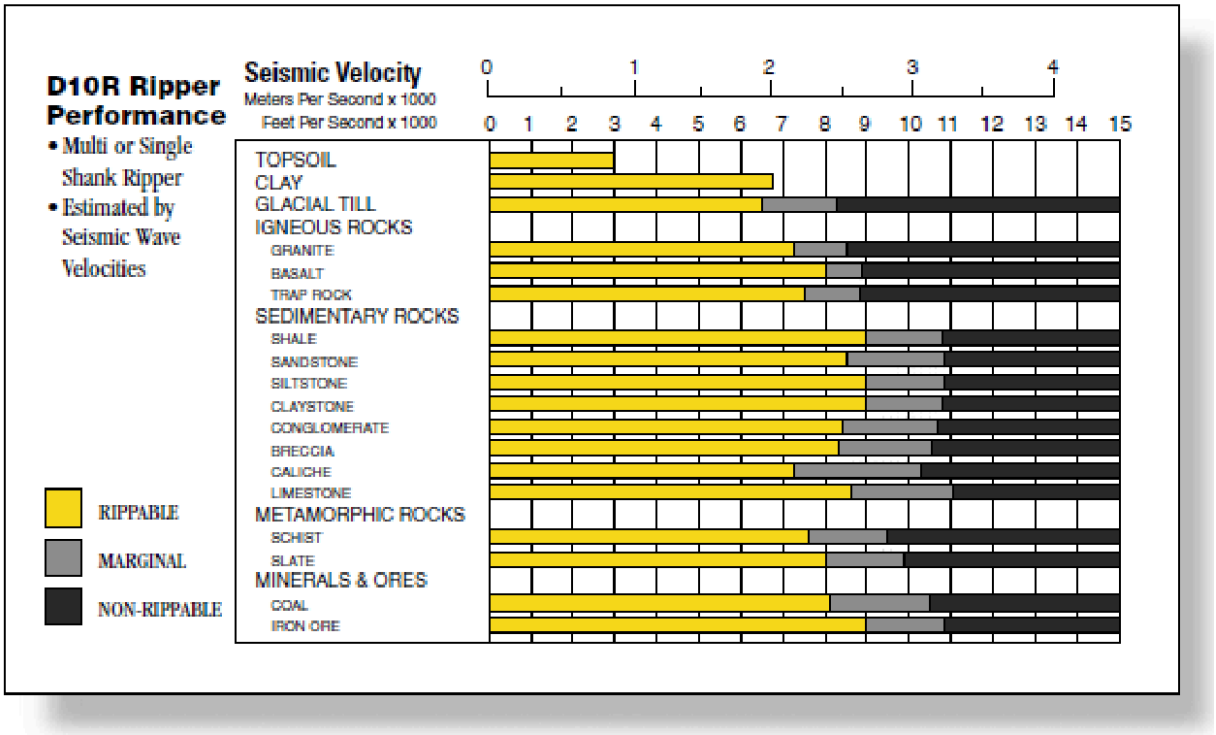
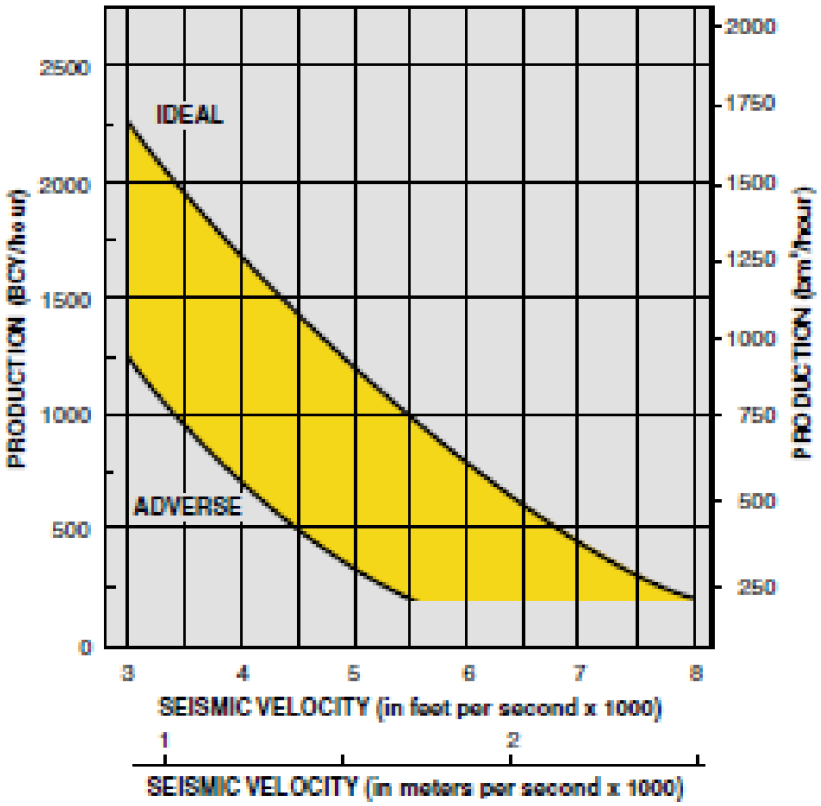

D10R Ripper Performance
• Multi or Single Shank Ripper
• Estimated by Seismic Wave Velocities
Seismic Velocity
Meters Per Second x 1000
Feet Per Second x 1000
0 1 2 3 4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
TOPSOIL
CLAY
GLACIAL TILL
IGNEOUS ROCKS
GRANITE
BASALT
TRAP ROCK
SEDIMENTARY ROCKS
SHALE
SANDSTONE
SILTSTONE
CLAYSTONE
CONGLOMERATE
BRECCIA
CALICHE
LIMESTONE
METAMORPHIC ROCKS
SCHIST
SLATE
MINERALS & ORES
COAL
IRON ORE
RIPPABLE
MARGINAL
NON-RIPPABLE

TABLE 2



Use of seismic velocity measurement for rippability has the following disadvantages.

1. It is not possible to assess the rock at a particular point

2. Cross section at close intervals can't be obtained.

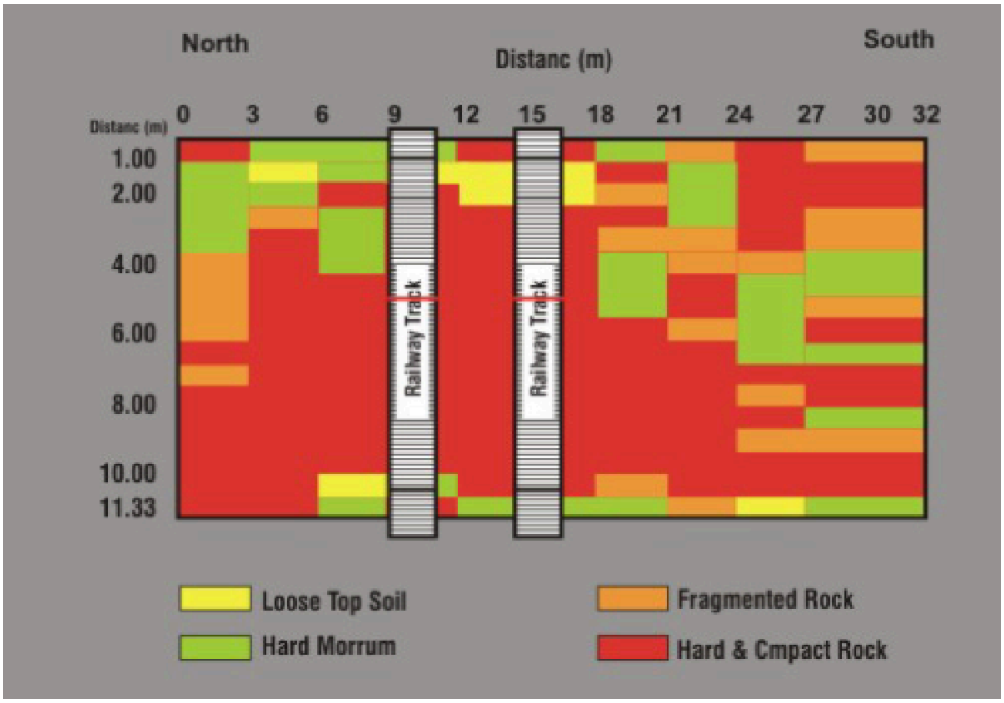
Above disadvantages can be overcome by using the electricalresistivity method. Which is nothing but plotting the Resistance and/or change in resistance and Or Electrical Properties of Rock with respect to the depth.

Harder the rock higher is the resistance is the simple science behind this

Following is a typical cross section obtained using Resistivity.

TABLE 3

TYPICAL CROSS SECTON BELOW A RAILWAYS LINE.



Disadvantages of this system are that these are interpreted readings means a reading of X may point out different things in different geological setups, hence needs the knowledge of Geology and Geophysics

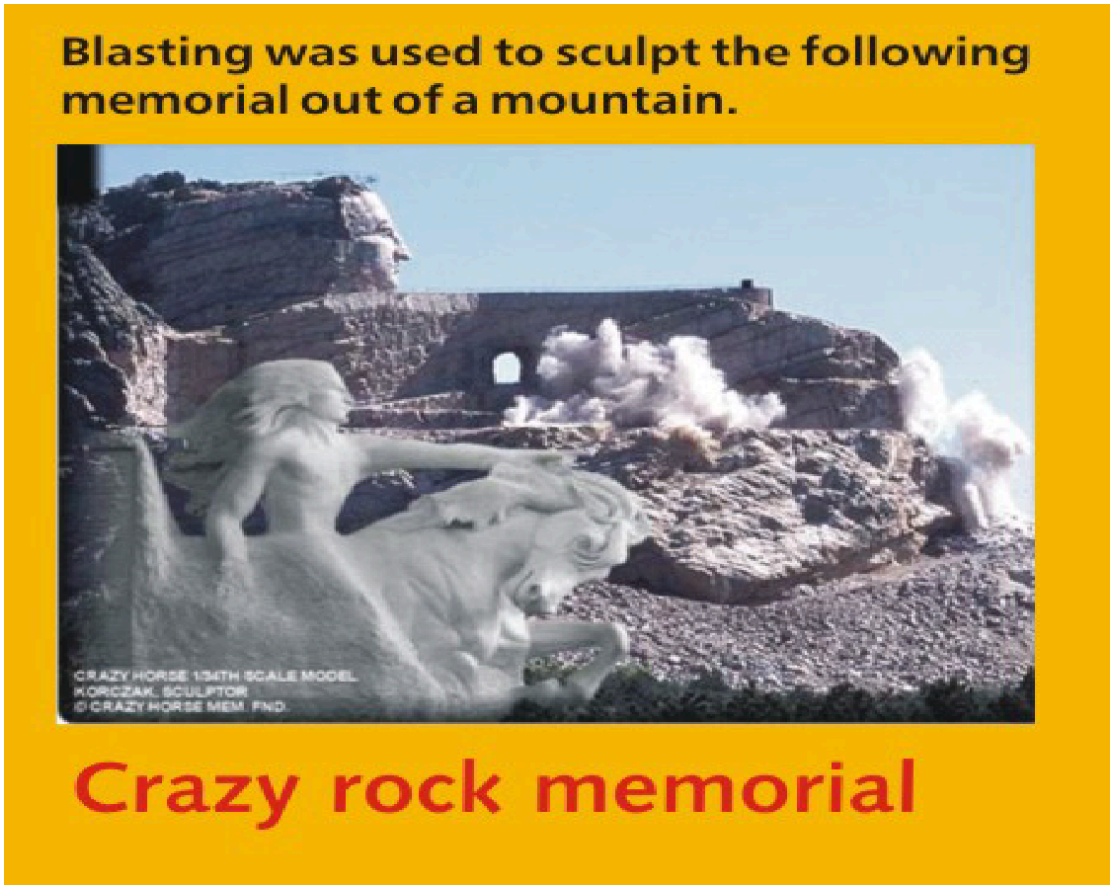
The system is fast and can also be used for extensive field interpretations other than the rock classification.

BLASTING

Blasting is often the most blamed activity among all the excavation activities. Truly so because of the sudden noise and vibrations though not damaging are a source of nuisance/displeasure. But blasting has been used at places demanding high precision such as carving of statue as shown below

FIGURE 1:

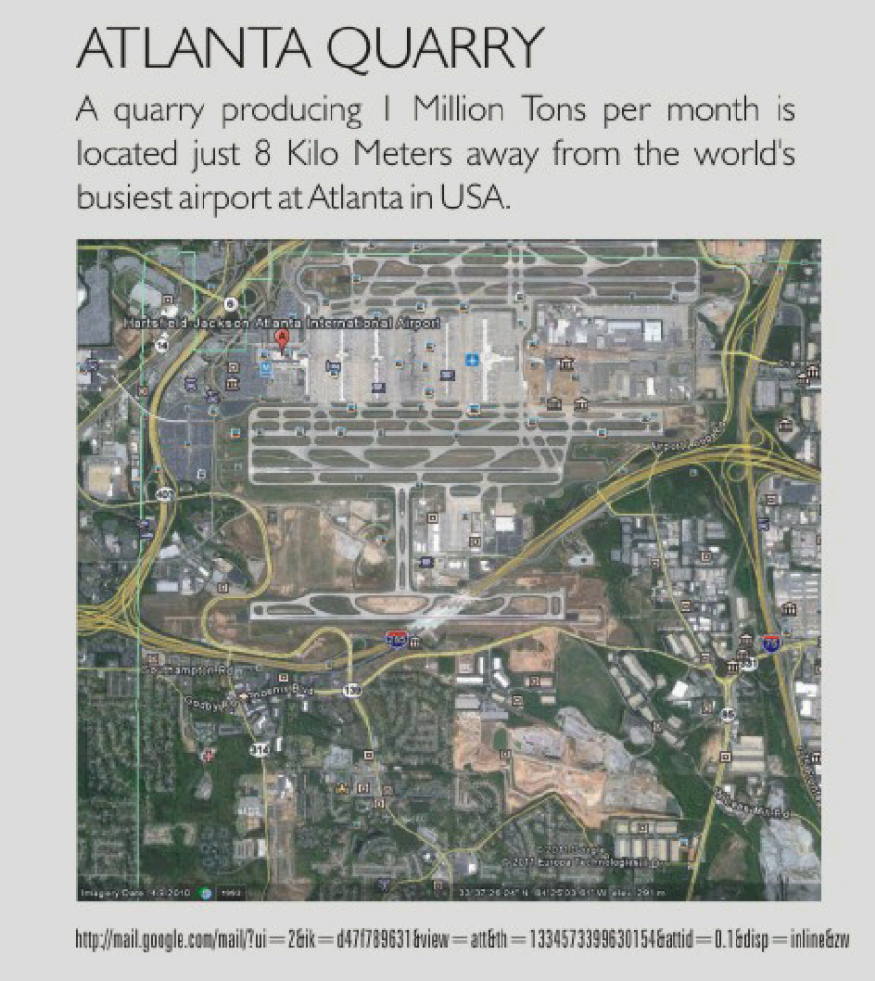
CRAZY ROCK MEMORIAL



There are several instances where blasting is being donevery close to the sensitive places.

FIGURE 2:

GOOGLE IMAGE OF ALTLANTA QUARRY.



What is required when you are working under the glare of public, media etc.is documentation? We are in an Industry which is taken as guilty without getting a fair trial. The reasons for the same are well known

HOW THESE PLACES ARE WORKING.

Preemptive documentation is the key. Creating documentation/ third party assessments that prove that complainant is wrong are essentials of working in these circumstances.

1st Step: documenting health of the structures in the area that are likely to be affected by blasting.

2ndStep: Internally agreeing on the limits of sound and vibrations. In advanced countries many companies have internal standards which are more stringent than prescribed by regulations

Continuous Process: adhering to the norms and documenting the same to act as witness in a court of law.

CONCULSIONS:

Blasting though is the cheapest form of rock breaking needs to be adopted very carefully with proper documentation.

Ripping is the best alternate that can be used in not so hard rock. Resistivity and Seismic Velocity are the best methods to determine the rippabiltiy, the quantity and the palaces of ripping. Combination of Resistivity and Seismic Methods can be used to obtain more data than just the rippability alone.

**Author is the promoter and Managing Director of M/s. Uttam Blastech Pvt Ltd., www.uttamblastech.com*

References:

1. Unpublished works of Uttam Blastech Pvt Ltd.
2. User manual of Caterpillar Tractors.