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Case study of Types of explosives used in Granites mines

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Abstract -*Nowadays, since the explosive liquids can easily be obtained by mixing simple substances, the electromagnetic methods developed for safety purposes have gained acceleration. In this study; liquids which may be explosive with chemical explosion, combustion and combination, as well as, non-explosive liquids which may be found inside baggages in airports are used to measure electromagnetic responses ranging from 1-50 GHz and complex permeability coefficients are calculated with commercial software. Explosive and non-explosive dielecssified a with the help of three different algorithms such as PLS, PCA and K-Means.*

There is an ever-increasing need for the development of new energetic materials for explosive applications. This include but is not limited to, the area of primary explosives and secondary high explosives. Primary explosives (or "primaries" as they are colloquially called) are defined as energetic materials that possess an exceptionally high initiation sensitivity to impact, friction, electrostatic discharge, heat, and shock. Primaries are known to reach detonation very quickly after such an initiation event. The large amount of energy released upon initiation of a primary—typically in the form of heat or a shockwave—is used to initiate less sensitive energetic materials, including secondary explosives, propellants, and pyrotechnics. Despite their highly sensitive nature, primaries are, in general, less powerful than secondary explosive materials In other words, primaries typically possess lower detonation velocities, detonation pressures, and a lower heat of detonation than a given secondary explosive. Despite the lower energy of a primary, extreme care is urged when handling these materials.

Primaries are ubiquitous in both military munitions and commercial items, where their main function is to serve as the key ingredient in initiators such as detonators, blasting caps, and pyrotechnic percussion primer formulations. By far, the most commonly used primary explosives by the U.S. military are lead azide (used most often in detonators and blasting caps) and lead styphnate (most often found in percussion primers). There has been significant interest in recent years to develop new primary explosive materials, as the lead content of these materials is highly objectionable from both a toxicological and environmental standpoint

Secondary explosives (colloquially known as "secondaries") differ from primaries in that they are much less sensitive to impact, friction, electrostatic discharge, heat, and shock. Instead, they are intended to be initiated by the heat and shockwave generated from a detonating primary explosive charge. There is a tremendous need for the development of secondary explosives that have higher performance, lower sensitivity, and lower toxicity than the currently fielded explosive compounds.

Higher performing secondaries are classified as those having higher detonation velocities, higher detonation pressures, higher crystalline densities, and a higher heat of detonation. Secondary explosives with a higher performance typically correlate to an increase in brisance, which is defined as the fragmentation ability or shattering effect of an explosive charge within a specific vicinity. As a rule of thumb, explosives with higher crystal densities and higher enthalpies of formation directly correlate to higher detonation pressures, detonation velocities, and overall greater energy release.

Key Words*: *Explosives, vicinity, shattering effect, detonation, crystalline electrostatic, friction

1. INTRODUCTION

This project mainly works on study of types of explosives used in mining and it's working parameters and it's condition, applications in the mines of singareni Collories Company limited in kothagudem area. Explosives constitute an important input in the production of coal, minerals, overburden or waste and also for construction/ demolition purposes. It touch the life of every individual in this modern world. Beginning from electricity generation to steel production. Civil construction, levelling of construction & agricultural sites, drivages in rock strata, etc. every where there is these of explosives. The list of its usage is endless so also its development. An explosive (or explosive material) is a reactive substance that contains a great amount of potential energy that can produce an explosion if released suddenly, usually accompanied by the production of light, heat, sound, and pressure. An explosive charge is a measured quantity of explosive material, which may be composed of a single ingredient or a combination of two or more. There are many types of explosive used in both underground & opencast mines. Some of explosives are give high energy during blasting. There are mainly two types of explosives are used they are

1) Low explosive

Gun powder

Black powder

Judson powder

2) High explosive

NG-based explosive

Granular Dynamite's

Gelatine Dynamite's

ANFO

Slurry explosives

1.1 OBJECTIVES

- To study the types of drilling patterns basing on explosive type
- To study the classification of explosives basing on parameters
- To study the types of blasting tools and accessories used in mines
- To study the computer application in blasting
- To study of the high powder factor getting by using low explosives

1.2DRILLING PATTERNS

- Equipment Utilized
- Drilling Patterns
- Wedge, plough or V-cut
- Pyramid or Diamond Cut
- Drag and fan cuts
- Breast Cut or Slashing
- Burn or parallel-hole cuts
- Sequencing
- Powder Factor
- Burden and Spacing

Blasting tunnels (or drifts) is a necessity in all underground mining operations. Drill and blast techniques are the most conventional and common method and is most useful in high UCS and homogeneous rock types albeit slower than other methods.

These tunnels are created for many reasons including:

- Using the excavated space for transport
- Using the excavated space as a transport route
- Using the excavation for an orebody access or a draw point

Or to use as a means of excavating ore

1.3 LOW EXPLOSIVRS

2. GUN POWDER
3. BLACK POWDER
4. JUDSON POWDER

Gunpowder

This is one of the oldest forms of explosive.

- This is a mixture of Potassium Nitrate(KNO3) or Sodium Nitrate (NaNo3) 75%
- Carbon (Powdered charcoal 15%)
- Sulphur (10%).

Fig 2.1 Gunpowder

JUDSON POWDER

A blasting explosive containing sodium nitrate, sulfur, coal, and a little nitroglycerin.

Black Powder

Fig 2.2 Black powder

- Potassium nitrate – 72%
- Carbon – 16%
- Sulphur – 12%

The ingredients being finely ground and intimately mix Gunpowder is initiated by sparks from a safety fuse or electric ignitor fa After

ignition it liberates large volumes of smoke and poisonous gas along with a long hot flame.

The products of gunpowder explosion contain

CO(carbon monoxide), CO2(carbon dioxide)Nitrogen,Hydrogen,Sulphur,CH4 (methane).

Hydrogen and a small quantity of so (alkali sulphates and sulphides," unused carbon and nitrates) At present its use is restricted to small manual quarries, granites quarrying, well digging etc. In view of its low rate of propagation of explosion liberation of poisonous gases, unsafe to handle etc, its use is gradually be restricted.

1.4 HIGH EXPLOSIVES

These are highly oxygen balanced, comprising of mechanical mixture of two or more explosives bases and other additives. The oxygen balance enables to maximize the explosive energy of the reaction by completely combustion and avoid the presence of toxic gases in the combustion products In the high explosives (HE) category nitroglycerine (NG), and ammonia nitrate (AN) are the chief explosives being manufactured in our country "can be categorised as NG-Based and AN based explosives.

NG-based Explosives, Granular dynamite, Straight GelatineAmmonia Gelatine dynamites,Semi Gelatine dynamitesAnfo, Slurry explosive

EMULSION

These are the most modern types of explosives. By increasing the surface area of contact between the oxidizer and fuel component the reactivity of an explosive is enhanced to a great extent. In 'emulsion' small droplets of AN solution is tightly packed in a mixture of oil and/or wax, depending upon whether they are pump able or cartridge form, With the addition of micro balloons having around 50-100 um in diameter, perlite or chemical gassing agents, the sensitivity of the emulsion can be varied. The extremely small particle size of the constituent of an emulsion gives it a very high energy level.

Addition of gassing agent vary the densities from 0.08 gm/cc to 1as gm/cc. It determines and controls the sensitivity of the resulting emulsion product, which affects whether the final product is detonator sensitive or primer to set it off. For bulk emulsion, it can be initiated by requires a strong rimer (cartridge) for cast booster Basic formulation of an explosive can be represented as follows percentage in weight basis

Ammonium Nitrate AN	60-70%
Calcium Nitrate CN Sodium Nitrate SN	0-20%
Fuel oil	2-6%
Aluminium	1-3%
TNT & WATER	Varies

Table 1 Emulsion composition

These are normally hot mixed at 50° C and a suitable gassing agent added to control density. Such an emulsion is called "Straight Emulsion When varying percentage of AN is added to achieve a wide range of straight it is called "Doped Emulsion". Pump ability characteristics of such emu are very good with higher VOD and water resistance properties

Table -2 Classification of Explosives

Class 1	Gunpowder
Class 2	Nitrate Mixture
Class 3	Nitro Compounds Division I: Blasting Gelatine, Special Gelatine etc. Division II: Guncotton PETN TNT PRIMEX etc.
Class 4	Chlorate Mixture
Class 5	Fulminate
Class 6	Division I: Safety fuse, Igniter cord, Safety electric fuse, Percussion caps Division II: Plastic ignitor cord, detonating cord, electric fuse DivisionIII: Detonators, Delay Detonators
Class 7	Fire Works
Class 8	Liquid Oxygen Explosives

Chart -1: Charge of Hole depth by the shown by graph

LOW TENSION DETONATOR

- In low tension detonator there is two brass foil of unequal length. These two brass foil is separated by hard board. The one end of the brass foil is soldered to leading wires and the other end is connected by a bridge of thin Nickel-chromium wire.
- The Ni-Cr bridge is then dipped in the adhesive mixture (flashing mixture) which formed of lead - mononitro - resorcinol. (LMNR) + Potassium chlorate + charcoal + colloidal cotton.

- The globule is formed around the brass foil and the bridge.

- The total resistance of the firing circuit including the resistance of blasting cable is approx 7 ohm and voltage required for blasting is 3.5 volt.
- The exploder used for blasting in such detonator are of capacity to produce 1.5 amp current at 5 volt.
- The Numbers of hole can be blasted at one time using low tension detonator with series connection.
- The LT detonator circuit is also used in delay detonator.

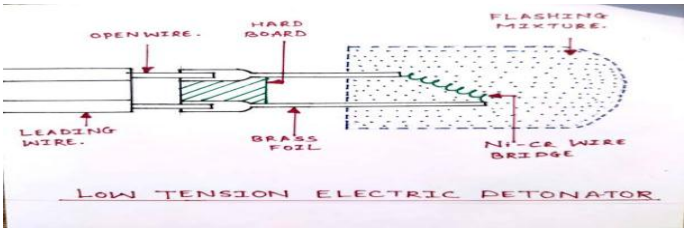


Fig 4.3 Low-tension electric detonator

2. HIGH TENSION ELECTRIC DETONATOR

In High tension electric detonator there is two brass foil of equal length, the one end of these brass foil are soldered to leading wires end, and another end of the brass foil is open.

There foil is separated by hard card board, the open end of the brass foil are dipped in the flashing mixture.

In this case the flashing mixture contains Lead-mono-nitro-resorcinol (LMNR) + potassium chlorate + charcoal + Nitro cellulose + graphite powder and copper acetylide.

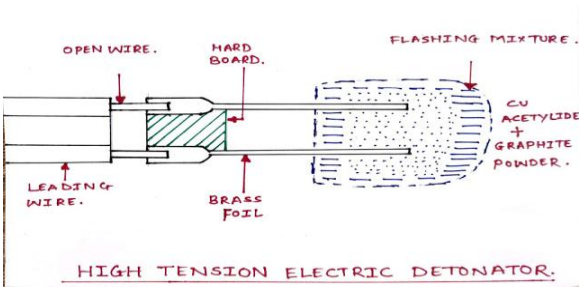
The graphite powder used in the flashing mixture act as a semi-conducting medium or chemical bridge between the ends of the two brass foil in the flashing mixture.

The internal resistance of such detonator is very high, i.e it vary from 1500 ohm to 30,000 ohm and the internal resistance of the detonator is not equal.

The resistance of the shot firing cable is comparatively negligible and the resistance of the blasting cable is ignored.

The high tension electric detonator required 0.025 amp current but voltage required is 50 volt.

The HT detonator cannot be tested for continuity because of variable and very high resistance. Moreover when numbers of HT detonator when connected in series the voltage required will be very high which may causes shot circuit in the blasting cable.



3. CONCLUSIONS

According to the study of this project blasting operation in Explosive plays a vital role in the performance characteristics of any surface mines and underground mines. The blasting operations in explosive induces severe ground vibration which may affect the nearby structure Thus, its safe operation is a prime concern for every industry. Therefore, the proper information of any blasting operation in explosives is very much necessary for its safe operation. The explosives are mainly permitted and low and high explosive are used. In this paper the blasting performance under the influence of types of Explosives was studied. This project mainly getting high powder factor by using low explosives. This study showed that when the blasting done by this project when we before project we pre-split and different parameter and patterns based on the explosive used i.e. also based on spacing and burden between the holes are also important thing for high powder factor getting by low explosive.

By this project asper topic computer applications in the project Adapting to change is never easy, but by choosing the technology as well as a plan for adaptation and training have helped many operations to successfully overcome challenges and they have ended up with a hugely successful, more consistent and much safer process for blasting operations. On the site data collection, use of predictors and alter the charging, timing and sequence of initiation can improve outcome. The system for blast design / rock face profiling is face profiler system, which produces bench height as well as depth and burden data right in the field with the ability to make adjustments on PC and export PDF reports. With the combination of the laser rangefinder and Face Profiler, a single operator cans accurately measure and record critical depth vs. burden data from a single location Information gathering of blasting results and feeding the information to designers is an important tool. New methods of delivery of skill development programmers using webcasting, web or mobile application may be used (e-learning, m-learning). When actual fragmentation is measured continuously, the results can be used to determine whether the blasting program is meeting stated goals. An operation using modern technology can develop fragmentation goals that best benefit the entire mining system. Once these goals are being me, or whether the trend is away from these goals.

When the trend is away from stated goals, one can correlate back to bulk truck and drill data. Once the problem is corrected, fragmentation can be monitored to insure that it is trending back to the desired distribution

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