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INFRA PUNE

Friendly Pulse Plasma

Rock Fragmentation

Technology



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ROCK EXCAVATION BY DYNAMITE BLASTING

- Cheapest
- Volume excavation possible ☐ Permission & license is must for usage, storage & transportation
- Not permitted in the city, critical & sensitive areas like airport; Near to Oil & gas pipe line; Heritage structure etc.

ROCK EXCAVATION BY CONTROLLED BLASTING

- Comparative Cheaper than other technique except blasting
- Volume excavation restricted
- Permission & license is must for usage, storage & transportation
- Limited permission available for sage

ROCK EXCAVATION

By Mechanical Excavation using Hydraulic breaker, Chiseling, Jack Hammer etc.

- Reasonable price
- Volume excavation not possible over time consuming in hard rock
- Very High Noise for rock breaking
- Easy to get services as many agencies available

ROCK EXCAVATION BY ROCK SPLITTER

- Expensive Technology
- Volume excavation is not possible
- Easy to use in confined space like trenches
- Easy to get services as many agencies available



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Is Rock Excavation effecting your project?

- Is Dynamite Blasting not allowed /Permitted in your project?
- Is Hydraulic Breaker / Splitter takes longtime?
- Is Breaker / Jack hammer create lots of noise?
- Is your large volume of rock required safe & speedy excavations?
- Is your project getting delayed because of Rock Excavation?

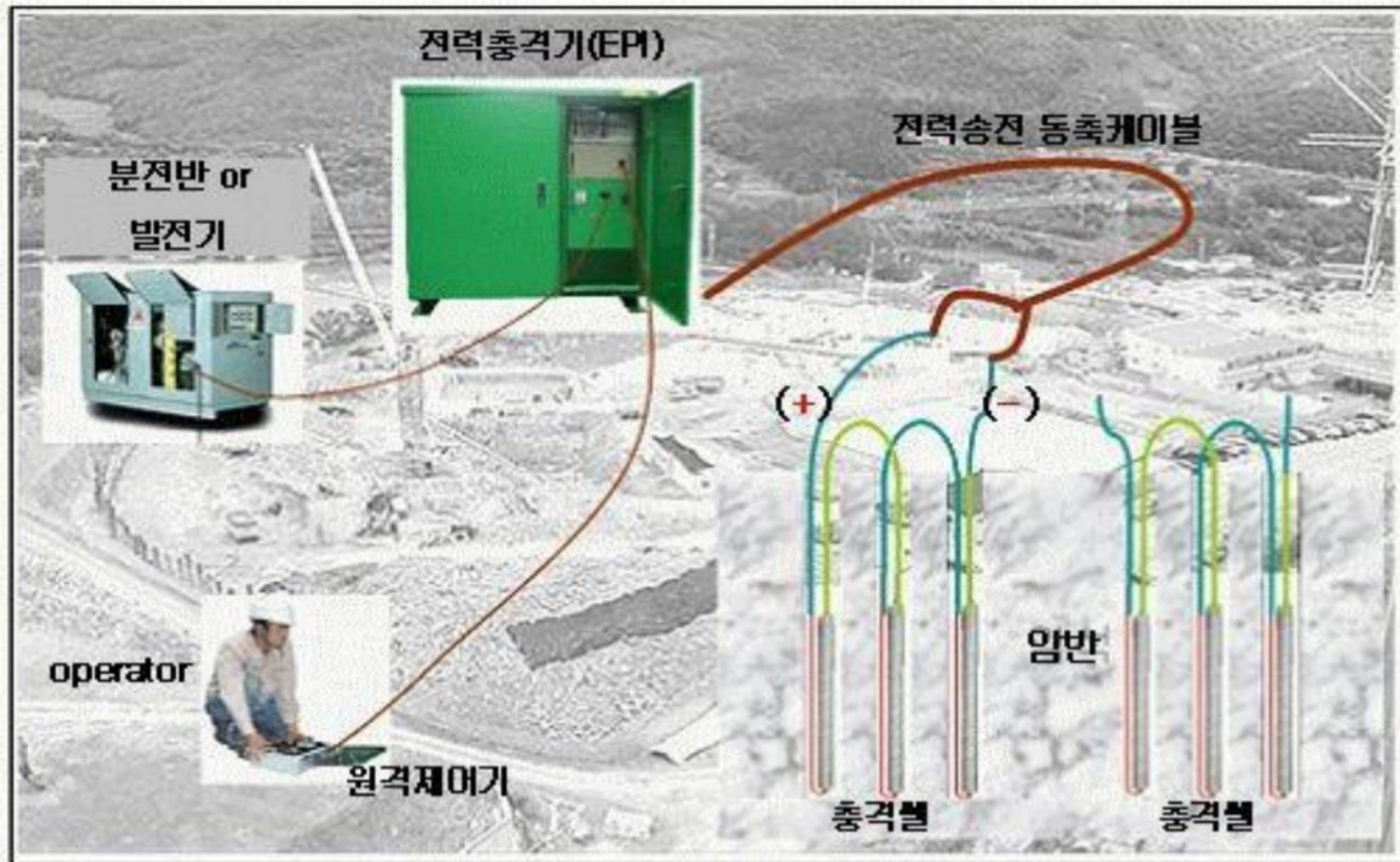
SOLUTIONS

- ECO FRIENDLY
- PULSE PLASMA ROCK FRAGMENTATION
- TECHNOLOGY FROM KAPRA,
- S.KOREA

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PULSE PLASMA CONCEPT



PRINICIPAL

- EPI Plasma is a Thermal Process.
- Aluminum & Copper oxide powder is energized in milliseconds to a Plasma stage using Electro Power Impulse(EPI)Generator.
- Process generates the heat & impact wave to crack & break the rock.

PRODUCT

➤ Electro Power Impact :

➤ Input Power – 30 KVA, 380 V, 3 phase, 50Hz[?]

Storage Energy – 268.92kJ[?]

➤ Output Energy – 1, 34,680Kw[?]

➤ Impact Cells:

➤ $2Al + 3CuO = Al_2O_3 + 3Cu + 1197KJ$ [?]

➤ Plasma Cells & EPI are patented worldwide including
US; Europe; Japan; Australia; Korea etc

ADVANTAGES

- Non-Explosive Product certified by Petroleum & Explosive Safety Organization, Government of India.
- No License & No Permission required for Blasting or Stocking Plasma cells & EPI.
- Low Vibrations; Low noise & Low Dust.
- No Flying of Rocks & No Gases/fumes.
- No Resonance Generated & hence safe to use near to any existing structure.

PROCESS

- Drill holes of 51 mm to a depth of 3 meter
- Insert Plasma cells
- Plug the hole using Seal & sandbags
- Energized Electro Power Impact (EPI) using 30KVA
- Generator.
- Provide Pulse to Plasma Cells from EPI
- Remove the Fragmented Rock using normal Excavator .









APPLICATIONS SAFE & SPEEDY ROCK EXCAVATION for

- Building Foundations
- Tunnels
- Next to the Airport; Rail Lines; Roads; Power Plants; Dams; Canals; Industrial Plants; Oil & Gas Pipelines; City Utility Network etc.
- Used for weak to Hard Rock

EPI Plasma Rock Fragmentation

Gunpowder Blasting and EPI plasma Rock Fragmentation System

- (a) Reaction Equation of Ammonium nitrate Explosives : (TNT, ANFO, Military, Coal Mine, Slurry, Emulsion explosives) $2\text{NH}_4\text{NO}_3 \rightarrow 4\text{H}_2\text{O} + 2\text{N}_2 + \text{O}_2$
+238.9kJ(Weight:160g) (Ammonium nitrate) \rightarrow (Water) + (Gas)+ (Gas) +(Energy) •
Gas Generation:980ℓ/kg, Liquefaction Temp.169°C,ExplosionTemp.1,300°C, •
Blastingenergy:Shockwave20%,GasPressure80%,Vibrationband:10~30Hz
- (b) Cell reaction Equation and produced Energy: $2\text{Al} + 3\text{CuO} \rightarrow \text{Al}_2\text{O}_3 + 3\text{Cu} + 1,197\text{kJ}$
(Weight:292.6g) (Solid)+ (Solid) \rightarrow (Solid)+(Solid)+ Shock Energy • Gas Generation:
None, Liquefaction Temp. 약2,850°C, Thermal ReactionTemp.3,000°C • Rock
Fragmentation Energy : Shock wave,Vibrationband:50~120Hz
- (c) Characteristics of Cell compared to Gunpowder • Byproducts : No gas generation.
• Vibration Band: 5 times bigger than gun powder. •
Energycomparingweightratio:2.7Timesbigger. •
LiquefactionTemp.:17timesbigger,sohardtodetonate. • Energy :Most of the energy
is from shock wave.

EPI Plasma Rock Fragmentation Process and Characteristics of Land Vibration

- Resonance A phenomenon of remarkable increase of amplitude in a body when it continuously receives similar frequency to its own intrinsic frequency. The amplitudes become maximum when the frequency of the two bodies are same. When such resonance occurs in buildings or bridges abnormal vibration happens, which may expedite cracks in the buildings or bridges and break down them. The damage of the buildings are quite different according to the outside frequency bands of vibration. Frequency bands of general buildings: 15~30Hz, Gunpowder: 10~30Hz, Shockwave: 50~1250Hz
- Characteristics
- Plasma of Electrolyte → The rmit reaction → Shock wave & High Heat Generation → Rock Fragmentation → Vibration / Noise (Shockwave)
- Gun powder Explosion
- Elastic and vibration through sudden gas expansion is a vibration with periodic and overlapping wave from a point of the mass, √ Slowly attenuate and long distance. √ Bring resonance effect.
- Initial Reaction → Shock Wave / High Heat gen. → Continuous ignition by shock wave → Gas gen. → Explosion of gas by high heat → Pressure expansion → Rock basting (Usable Energy) → Vibration/Noise (Residual energy changed into Elastic wave)

Regulation on Noise and Vibration (※Resident Area)

- 1. Measured Place : OO Apartment , Measured organization: OOEng.Co.Ltd
- 2. Result : Average of the measured numbers for 3 ea blasting at the same time for 3distances.

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Regulation on Noise and Vibration (⊗ Resident Area)

Vibration velocity Comparison

Distance	EPI Avg. Vibration	Vibration Controlled Power Blasting	EPI/Vibration controlled
20M	0.092 kine	1.800 kine	Abt.1/20
30M	0.089 kine	1.150 kine	Abt.1/13
40M	0.047 kine	0.575 kine	Abt.1/12

Sound Level Comparison

Distance	EPI Avg. Vibration	Vibration Controlled Power Blasting	EPI/Vibration controlled
20M	67.6dB	83.2dB	Abt.1/36
30M	65.3dB	78.9dB	Abt.1/23
40M	65.8dB	73.3dB	Abt.1/6

The difference of 10dB means about 10 times difference in real sound. i.e. The difference of 80dB and 70dB is 10 times, and that of 80dB and 60dB is about 100Times louder.

**THANK YOU
FOR YOUR
VALUABLE TIME**

CONTACT DETAILS

vminfrapune@yahoo.com

9922408756