



Mechanisation of Explosive Charging In UG Mines & Civil Tunnelling

**FOR TOUGH JOBS
UNDERGROUND**

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Normet India Private Limited

Equipment | Construction Chemicals |
Rock Reinforcement | Life Time Care

> **NORMET VISION & MISSION**

> **Vision**

The fast growing and innovative technology company with a passion to offer continuous improvement to our underground mining and tunneling partners' processes for increased safety, productivity and sustainability

> **Mission**

Improve underground mining and tunnelling processes with knowledge and technology to benefit our clients and society



Zero Harm Share

> Health

- > Reduced illness of our employees through health and welfare management processes.

> Safety

- > Zero harm by managing safety across all functions and processes.

> Quality

- > Our strength that comes from knowing our customer's work environment, from our products' technical and economic efficiency, and from strong focus on safety, work hygiene and ergonomics.

> Environment

- > Proactive measures for environmental stewardship in design, production, and in use of our technologies and increasing sustainability awareness through education.

> TODAY'S SHARE

- > <SAFTEY FIRST>



Importance of Blasting In UG Mining & Tunneling

- Successful drill and blast excavation in underground mines and tunnels ensures professional, productive and safe charging and blasting.
- While rock and groundwater conditions and local legislation dictate the types of explosives that can be used, all drilling and blasting operations have one thing in common:

**No method of charging will make up for poor drilling,
but**

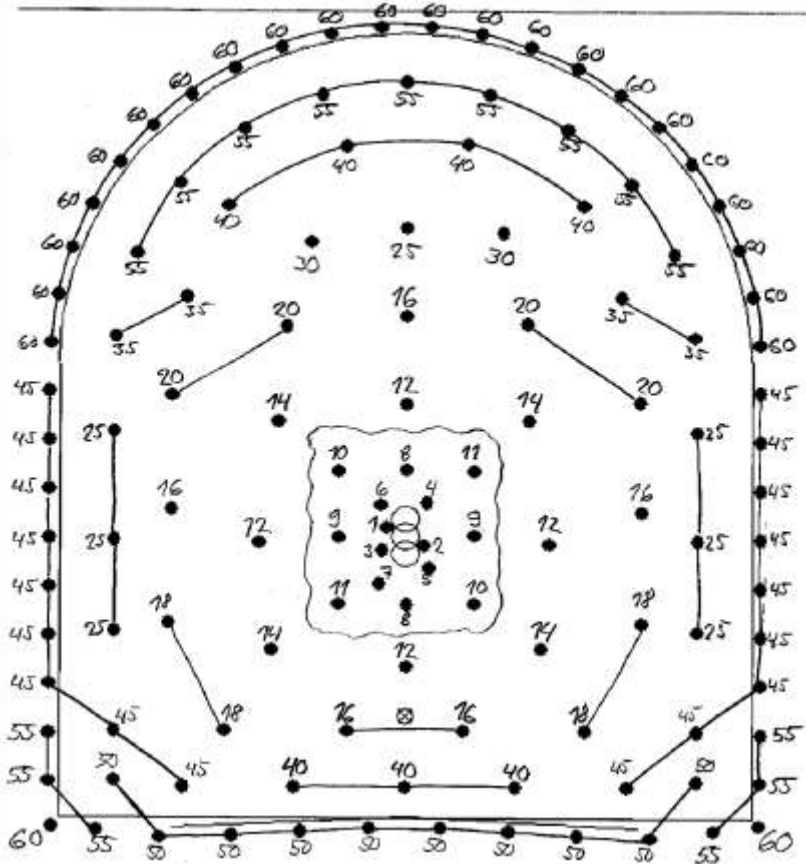
**Good quality drilling can be ruined by inadequate blast design and poor
charging quality.**

Charging Methods Adopted In India

- **Cartridge Charging**
- **Anfo Charging**
- **Emulsion Charging**

Brief Case Study on Various type Of Explosive Charging In a Railway Tunnel a typical example!!

Railway Tunnel : Cartridge/Anfo/Emulsion Charging Example



Cartridge charging

- Total amount of explosive 666 kg
- Specific charging 1,82 kg/m³

ANFO charging

- Total amount of explosive 759 kg
- Total amount of ANFO 530 kg
- Specific charging 2,07 kg/m³

Emulsion Charging

- Total amount of explosive 703 kg
- Total amount of bulk Emulsion 650 kg
- Specific charging 1,92 kg/m³

Railway tunnel, A = 58 m², round 365 m³

Cartridge Charging <> ANFO Charging

Cartridge -charging

Explosive material cost:

Cartridge explosive

666 kg/round x 2,5 €/kg = 1 665 €

Charging time:

111 holes x 4 min/hole = 444 min

ANFO -charging

Explosive material cost:

Cartridge explosive :

229 kg/round x 2,5 €/kg = 573 €

ANFO explosive

530 kg/round x 0,5 €/kg = 265 € Total

573 € + 265 € = 838 €

→ **50 % less**

Charging time:

61 holes x 4 min/hole

= 244 min

50 holes x 1 min/hole

=

= 50 min

Total

= 294 min

→ **35 % less**

Cartridge -charging

Explosive material cost:

Cartridge explosive

666 kg/round x 2,5 €/kg = 1 665 €

Charging time:

111 holes x 4 min/hole = 444 min

Emulsion -charging

Explosive material cost: Cartridge explosive 53

kg/round x 2,5 €/kg = 133 €

Bulk emulsion explosive: 650 kg/round x 0,9

€/kg = 585 € Total 133 € + 585 € = 718 €

➤ **60 % Less !**

Charging time: 111 holes x 1 min/hole = 111 min

➤ **75 % less !**

Outcome of Case Study

Bulk explosive charging , Anfo or Emulsion both have distinct advantage over traditional Cartridge Charging resulting in ;

- **Cost Savings.** (Cheaper by 50-60%)
- **Higher Productivity.**(Time saving by 35-70%)
- **Quality Explosive Charging.**(Better Specific Charging)

Challenges Ahead in Explosive Charging

- Increase in Demand due to Special Focus on Infrastructure Development(large number of Rail/Road Tunnel Projects) .
- Mining sector moving to Underground Mining from Open Cast.
- Supply of Explosive in Bulk Anfo/Emulsion.(Ease in handling & Cost Effective)
- How to maximize the benefits of Explosives like Anfo & Emulsion
- Lack of availability of manpower.
- Human Health & safety.
- Governments tight regulations on distribution and supply of Explosives due to National Security Concerns.

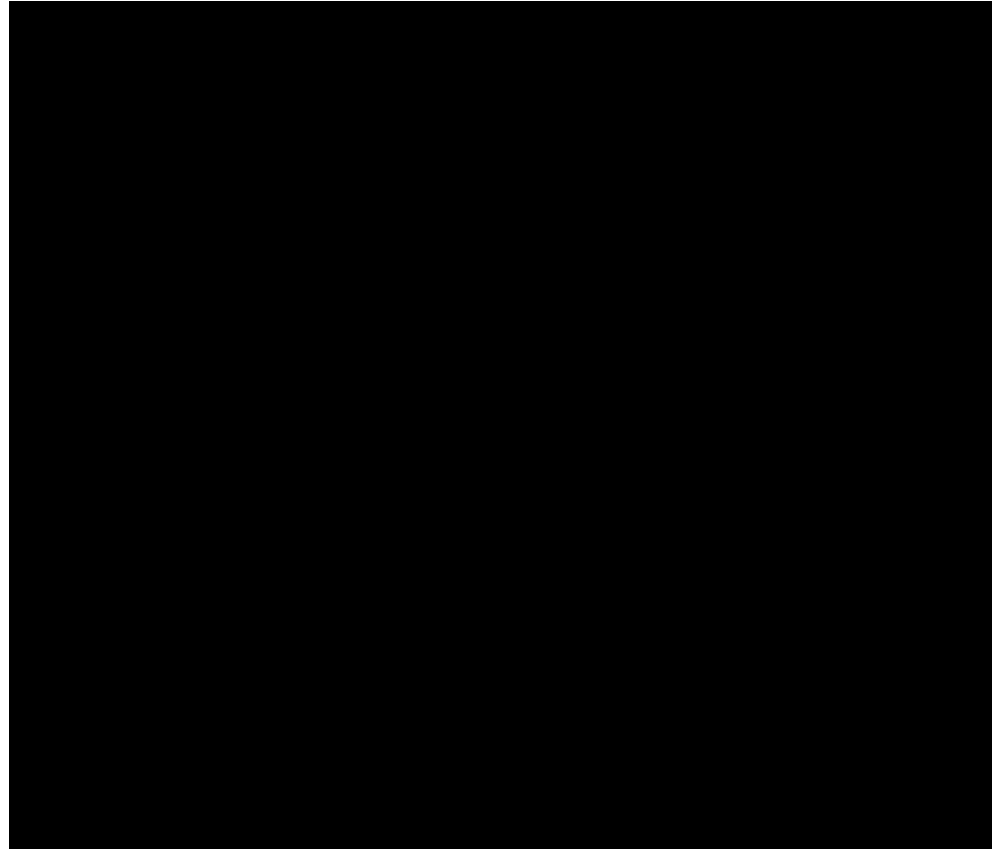
Need of Mechanization , Why??

- Today, all high-production underground operations use bulk explosives: ANFO, emulsions or water gels.
- To maximise the benefits of bulk materials, the charging processes must be properly mechanised.
- The equipment used for face charging with horizontal holes or for production charging with up-hand and/or down hand holes they have to:
 - Be safe and reliable
 - Meet highest productivity and quality requirements of the industry
 - Cost Effective



Advantages Of Mechanized Charging

- High Productivity
- Quality Charging
- Better control on Blasts.
- Cost Advantage .
- Environment Friendly less fumes.
- Ease in handling/storage.
- Time cycle savings resulting into increase in blasts per Shift cycle
- Control and Accurate calibration of Consumption of Explosive & its Tracking.
- **Highly Important for National Safety & Security.**



Contribution of Normet In Mechanized Bulk Explosive Charging Technology

- Normet's Charmec systems are built to improve safety and productivity in underground blasting and contribute to high quality and cost-effective bulk explosive charging.
- They also offer a consistently high resale value with low lifetime costs.
- Hundreds of mobile Charmec's have already been delivered to hard rock mines and civil tunnelling projects worldwide.



Overview of Normet Charmecs Anfo / Emulsion Charging



Charmec 6000 -series



Charmec 1000 -series



Charmec 9000 -series



Charmec MF -series



Charmec MC -series



Charmec LC -series

Overview of Normet Charmecs

- > **6000 -series**
 - > **Charmec 6605 B** Anfo charger
 - > **Charmec 6405 B(E)** carrier for ext. emu kit
- > **1000 -series**
 - > **1610 B** Anfo charger
 - > **1610 B(E)** carrier for ext. emu kit
 - > **1610 B(E)** "robot" carrier for ext. emu kit
- > **9000 -series**
 - > **9905 BC ANT** Anfo charger
 - > **9910 BC ANX** Anfo charger
 - > **9125 BT(E)** carrier for ext. emu kit
- > **MF -series**
 - > **MF605 DA** Anfo charger
 - > **MF605 D** carrier for ext. emu kit
 - > **MF605 D LE** carrier for ext. emu kit
 - > **MF405 D** carrier for ext. emu kit
- > **MC -series**
 - > **MC605 DA SE** Anfo charger
 - > **MC605 DA(V) LE** Anfo charger
 - > **MC605 D(V)** carrier for ext. emu kit
- > **LC -series**
 - > **LC605 DA SE** Anfo charger
 - > **LC605 DA(V) LE** Anfo charger
 - > **LC605 D(V)** carrier for ext. emu kit
 - > **LC605 VE(C)** integrated emulsion charger

Features of Charmec (Anfo Charging)

- Diesel hydraulic or electro-hydraulic drive
- ANFO vessels options of 2 x 360 / 500 / 720
- Compressor option eliminates the need for external pressure air line.
- ANFO filling system allows filling of ANFO tanks from ground level during operation
- Mechanical hose feeding system allows 33.5 mm, 38 mm or 44 mm charging hoses to be used for up- and down holes
- Water adding system allows 1-2 % of water to be added into ANFO
- Optional genuine electro-hydraulic process allows to charge without diesel fumes

Features of Charmec (Emulsion Charging)

- Diesel hydraulic or electro-hydraulic drive
- Normet NBB 3S man lifting boom
- Rear deck for external emulsion charging kit
- Max gross weight of the kit 2500 kg
- Hydraulically driven rotary vane-type compressor
- High voltage operated hydraulics and compressor
- Different sizes available to suite different requirements.

Thank You

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