

FOR **EXPLOSIVES** THINK



# Underground Emulsion Technology





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## About BME:

BME, together with Protea Mining Chemicals forms the mining division within the Omnia Group. The Omnia Group is a Johannesburg Stock Exchange (JSE) listed diversified provider of specialized chemical products and services used in the mining, agriculture and chemicals sectors.

With over 30 years of experience, BME supplies explosives and related technical services to over 23 countries.

### BME Provides:

- A full range of bulk and packaged explosives
- Initiating systems
- Electronic blasting systems
- Surface & underground explosives delivery equipment
- Mobile emulsion plants
- Blasting science services

We pride ourselves in providing **world class blasting solutions** to ensure every blast brings **value** to our customers.

**FOR EXPLOSIVES, THINK BME**

## BME's Bulk Emulsions:

Bulk emulsion explosives have come a long way since BME introduced double-salt – ammonium nitrate and calcium nitrate (AN/CN) – cold emulsion products into South Africa over 30 years ago.

Factors like safety, stability and performance are vital for the mining sectors that rely on emulsions for their blasting activities, but the technology is constantly being developed to meet and exceed customers' expectations.



## Benefits of Emulsions:

- Pumpable emulsions have made daily blasting practices safer because they are not classified as an explosive until sensitised as emulsion is pumped into the blasthole; up to that point, their status as a 5.1 oxidiser makes them safe to transport and handle, simplifying logistics.
- The long shelf-life of BME emulsions makes them easier to store – allowing mines to reduce supply chain risk where distances and accessibility make transportation difficult; as they do not require dedicated magazine facilities, saving on cost and administration.
- BME's double-salt formulations have a lower 'fudge' point than single-salt emulsions, which means that they are more stable and can be repumped numerous times without deteriorating.
- BME has developed a specialised range of underground emulsions, Megapump™ Lateral and Megapump™ Uphole which are combined with in-house developed explosive delivery equipment and technologies for mechanised, uphole and narrow reef operations.



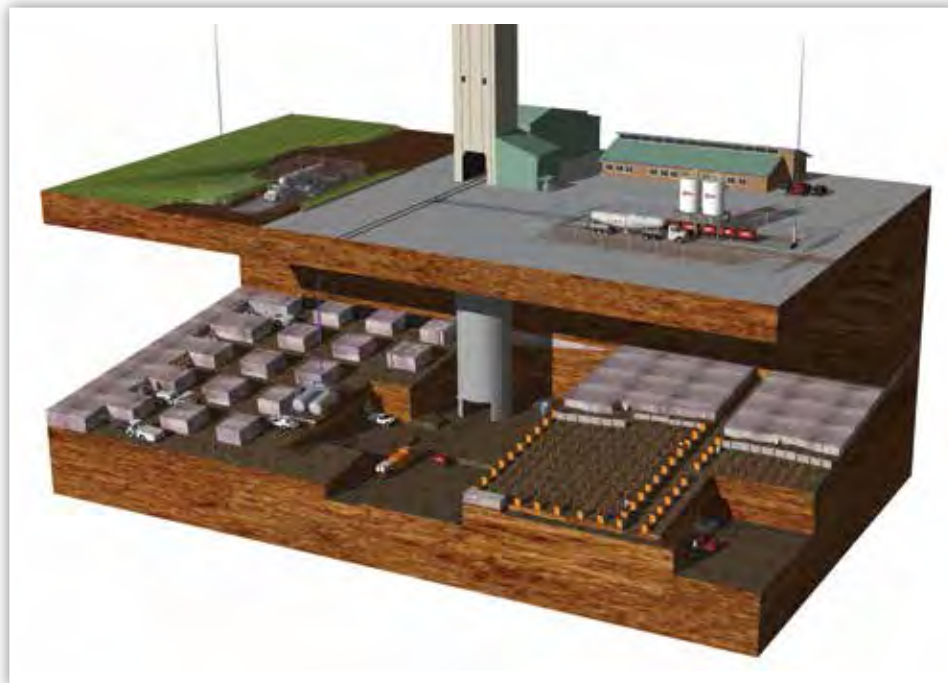
## BME Emulsion Pump Technology

In order to make emulsion systems available throughout all underground mining operations, BME has developed an in-house range of emulsion pump technology.

Benefits available through these technologies include increased safety, reduced down time, reduced capital requirements and improved operational efficiency.

Optional power sources for the pumps include hydraulic, pneumatic and hydropower and are available in a range of pump sizes for different operational requirements.

- BME's Minicharger (PCU) for narrow reef operations and its Mobile Pump (MP2) for mechanised operations have been designed with a simple user interface and deliver emulsion at predetermined densities for optimum blast efficiency.
- Systems can be set to deliver high and low density emulsion depending on blasting requirements
- The low energy requirements for the system allow it be used through a wide range of mining environments with multiple power sources.



## Rapid Emulsion Delivery System

BME's Rapid Emulsion Delivery System was designed to improve UG logistical efficiencies in the transportation of explosives throughout underground operations.

### - Vertical Emulsion Pipeline

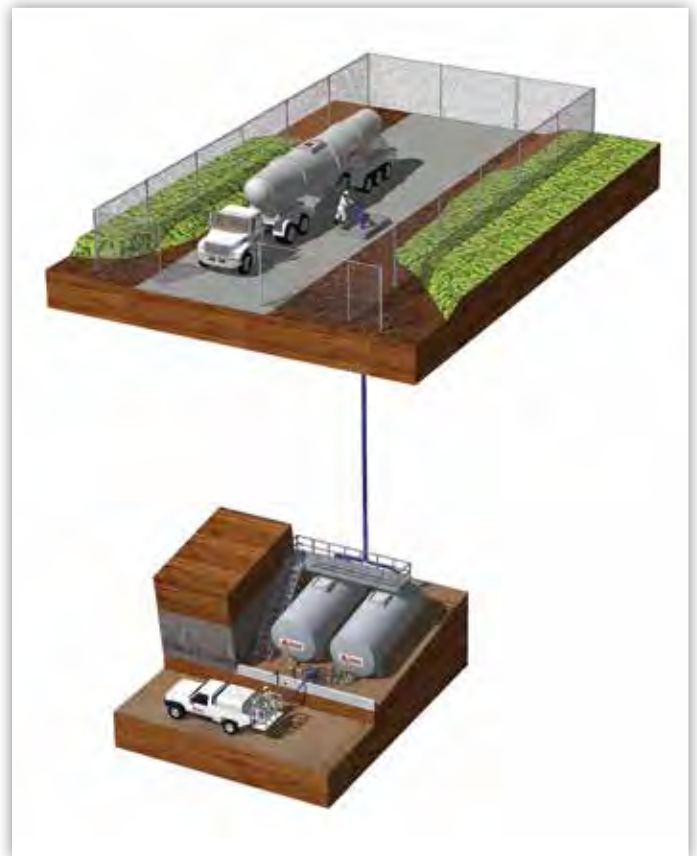
BME has successfully implemented a 318 m vertical emulsion pipeline, the longest pipeline in the world. Pumping of emulsion from surface to underground storage tanks improves logistical efficiencies and has numerous benefits for underground operations:

- Increased shaft availability;
- Reduced explosives car requirements;
- Reduced congestion in shaft;
- Reduced labour requirements & operational expenses;
- Streamlined delivery to operating sections;
- Accurate recording of explosives distribution from surface to underground;

### - Mobile Emulsion Transfer Unit

Equipment for the transport of emulsion from central storage facilitates to remote charging units and emulsion distribution tanks and filling stations UG.

- Reduce traveling and downtime for charging units
- Reduced operating expenses for charging units
- Increased utilisation and efficiency of charging units



## - Underground Filling Stations and Mobile Transfer Cassettes

Tanks for the storage and distribution of emulsions throughout mechanised and railbound underground mining operations

- Bulk distribution of emulsion to working ends
- Streamlined logistical efficiencies





## Mechanised Operations

- **Emulsion Charging Units (ECU)**
  - LP1500 - 1.5 ton capacity
  - HP3000 - 3 ton capacity
  - HP2000 - 2 ton capacity

BME Emulsion Charging Units are designed and manufactured in-house and can be fitted to a wide range of underground mine carriers.

- Double pump systems on ECUs for reduced down time;
- Dual density functionality for high and low energy emulsion;
- Increased reliability and reduced operational expense;
- BME Blastlog Pump Control System with data recording and reporting system to improve operational efficiencies;



- **Megacharger**  
**HP1500 - (High Profile – 2.1m high, 1.5 ton capacity)**  
**LP1500 - (Low Profile – 1.5m high, 1.5 ton capacity)**

Collaboration with leaders in underground mechanised technology has allowed BME to develop a 2.5 ton emulsion unit for use in mechanised underground mining operations.

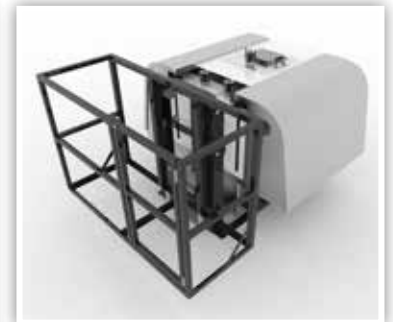
- Purpose built charging unit designed for reduced capital outlay in high mobility and high capacity charging fleets;
- Double pump systems on ECUs for reduced down time;
- Dual density functionality for high and low energy emulsion;
- Increased reliability and reduced operational expenditure;
- BME Blastlog Pump Control System with data recording and reporting system to improve operational efficiencies.



- **Cruiser Charging Unit (CCU)**

Due to the prevalence of Land Cruisers in African underground mining operations BME has developed a purpose built cruiser charging unit for maintenance compatibility in African operations. Vehicles are modified for improved safety and carrying capacity for underground use. Readily available for use in surface mining operations.

- Reduced capital outlay and increased flexibility
- Optional double pump systems on CCUs for reduced down time
- Dual density functionality for high and low energy emulsion
- Increased reliability and reduced operational costs
- BME Blastlog Pump Control System with data recording and reporting system to improve operational efficiencies.





## Uphole Mining Operations

### - Uphole Charging Unit (ECU) HP3000 with Long reach robotic arm

BME's new range of Uphole Charging Units have been designed for use in underground massive mining operations using uphole blasting practices. BME's industry leading technology has been designed to improve safety in uphole operations while simultaneously increasing both blasting and operational efficiencies.



- Double pump system to reduce downtime and increase reliability;
- BME Advanced Pump Control System with data recording and reporting system;
- Wireless remote - robotic arm and charging unit control;
- Compact robotic arm with reach of 6 metres/20 feet;
- BME Advanced Pump Control System with data recording and reporting system for operational efficiencies;
- NEW – Remote video feed of charging operation from robotic arm.

### - MegaCharger (Uphole) HP1500 with standard reach robotic arm

In line with BME's new range of emulsion pump technologies, the MegaCharger has been designed to reduce the capital outlay required for the implementation of emulsions in uphole mining operations. Combining BME's industry leading technology, the MegaCharger has been designed to improve safety in uphole operations while simultaneously increasing both blasting and operational efficiencies.

- Reduced capital outlay required for the start-up of uphole mining operations;
- Double pump system to reduce downtime and increase reliability;
- BME Blastlog Pump Control System with data recording and reporting system to improve operational efficiencies;
- Blastlog wireless remote to control robotic arm and charging unit control;
- Standard reach robotic arm with reach of 6 metres/20 feet;
- Automatically adjusting light weight hose pusher for increased;



## Portable Charging Equipment

### - Minicharger (PCU) - Compressed Air/Hydropower/Hydraulic

Through BME's Portable Charging Unit the advantages of emulsions can now be harnesses within confined underground mining operations. With a mass of only 14kg/31lb, the unit can be effortlessly carried through confined access tunnels and underground stopes. The PCU is designed for use with BME's closed emulsion system allowing two emulsion bags to be connected to the pump when required for use.

- Mass of 14kg/31lb's;
- Simple user interface with predetermined emulsion density;
- Closed emulsion system to prevent contamination, pump wear and maintenance requirements.



## - **Closed Emulsion System™**

BME's Closed Emulsion System allows for optimal logistical efficiencies while maintaining flexibility. Through the bulk delivery system mines are able to pump emulsion between supply vessels and through pipelines, reducing handling and labour requirements. Once emulsion has reached the working place it is pumped into automatically sealing emulsion bags for transportation into confined operating environments. Through the closed emulsion system, contact and contamination of the emulsion is prevented, increasing downstream pump life.

- Emulsion bag – refilled at the entrance to the working place;
- As emulsion bags are reused no emulsion is wasted through the disposal of bags; Emulsion bags mass 20kg/44 lbs when full;
- Automatically sealing emulsion bags prevent contamination of the emulsion;

- **Sensitizer Canister**

Sensitizer is the key to the system as emulsion cannot be sensitised to form an explosive without it. Sensitizer is issued to responsible personnel on a daily basis or as required for the manufacture of explosive.

- **Maxicharger - P120**

BME's Maxicharger has been designed for rapid loading in large development and stoping faces. The high strength pump allows the pump to pump over longer hose lengths and can connect up to six emulsion bags at a time for reduced standing time. The Maxicharger utilises BME's closed emulsion system to increase flexibility and prevent contamination. The unit is made up of a quick connecting pump and power pack that can be driven through air, hydropower or electricity.



- High loading rate within confined charging operations;
- Up to 30 meter charging lance;
- High emulsion capacity – up to six emulsion bags at once;
- BME Blastlog pump control system with data recording and reporting system for operational efficiencies;

- **Maxicharger – T3000 (3 ton capacity)**

Emulsion charging unit designed for development in track bound development operations.

- Double pump system for increased reliability and reduced down time;
- Air or electrical power packs for operation of the unit;
- BME Advanced Pump Control System with data recording and reporting system for operational efficiencies;





Using a portable decontamination unit, and a range of storage systems, the equipment is pre-positioned around the perimeter.



**Megacharger.**  
 Custom made vehicles are developed to deliver charging solutions. Fully equipped 2000 litre capacity, 2.5 MPa infrastructure for gas & compressed working applications.



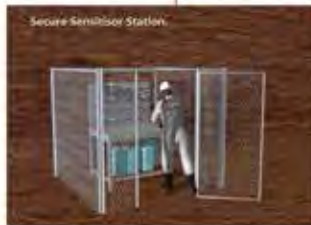
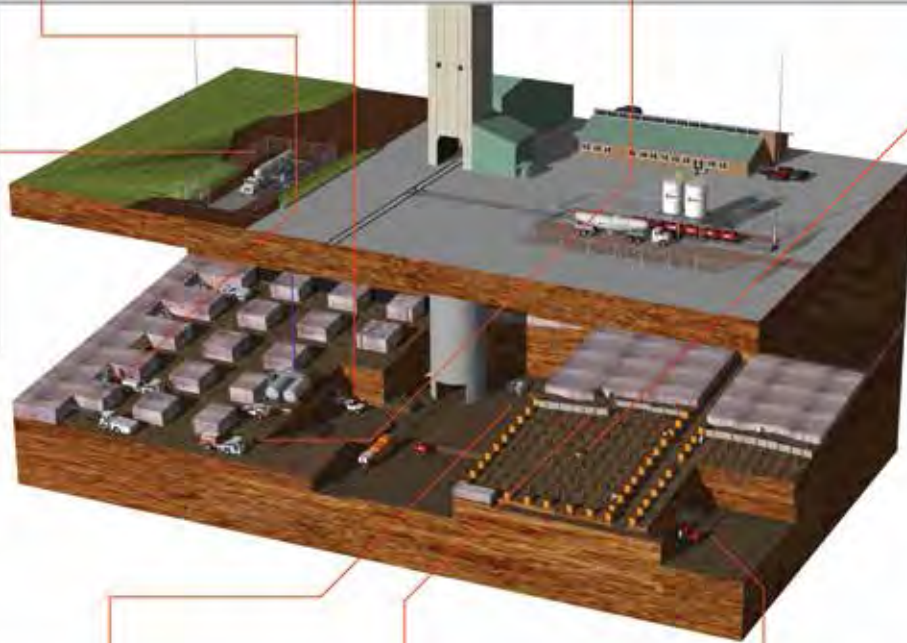
**Mobile Emulsion Transfer Unit.**  
 A system for the transport of emulsion from the surface to the underground. It is a fully equipped 2000 litre capacity, 2.5 MPa infrastructure for gas & compressed working applications.



**MainCharger.**  
 2000 litre capacity, 2.5 MPa infrastructure for gas & compressed working applications. The high pressure pump allows the pump to transfer liquid from the surface to the underground. It is a fully equipped 2000 litre capacity, 2.5 MPa infrastructure for gas & compressed working applications.

**Vertical Pipeline**  
**Megapump Vertical Feed.**  
 From a 2000 litre surface emulsion tanker, Megapump is delivered to the underground tanks via a pipe system.

**Cruiser Charging Unit (CCU)**  
 A double cell emulsion and separator are fitted to the charging lance before entering the blast hole. The 700g capacity and lifting platform possess distinct advantages.



**Secure Sensitiser Station.**



**Minicharger (PCU) Air.**  
 High pressure, high flow compressed air system for the underground. It is a fully equipped 2000 litre capacity, 2.5 MPa infrastructure for gas & compressed working applications.



**Underground Filling Stations and Mobile Cassette transfer.**  
 Transfer Cassette Unit for the Emulsion Filling Station. The cassette tray is filled with Megapump and transferred to the tank.



## Electronic Pump Control and Information Systems

In order to improve transparency within underground operations BME's new information system records information through the underground pump controller for analysis of daily blasting practices underground. Through automated reporting of blasting efficiencies on BME's underground app. Blasting efficiency can be compared and individuals identified for training and improvement.

### - **BlastLog Pump Control System**

- Adjustable mass of explosives per hole;
- Onscreen display of pump operating conditions;
- Automated recording and reporting of explosives pumped per face as well as operating conditions during the charging cycle;
- Transfer of information through central network or mobile devices for reporting through underground efficiency app.

### - **BlastLog Wireless Remote Control**

- Rugged lightweight wireless remote for pump;
- control and activation;
- Information transfer from underground charging units to central reporting system;
- Performance monitoring system for blast audit recording and reporting;



## - BlastLog Tablet

- Rugged lightweight wireless tablet for pump control and activation;
- Information transfer from underground charging units to central reporting system;
- Custom built application for the monitoring of daily blasting practices and the automated calculation of blasting efficiencies;
- Maintenance management system with reporting.



## - BlastLog Mobile Application & Automated Reporting

- BlastLog Mobile application for the real time reporting of blasting practices and efficiencies on the operation.

## AXXIS Centralised Blasting System



BME has developed a CBS using the AXXIS Electronic Delay Detonator system. An electronic initiator is used to set off shock tube units in stoping and development working areas while the normal AXXIS electronic detonator system is used in Long Hole blasting.

### - **Centralised Control Box**

- All blasting is controlled from the Centralized Control Box (on surface);
- System initiation is through a Key Switch;
- When the system is armed, a RED flashing light will be activated; Power is sent via the system from the CCB;
- Intrinsically safe;
- SABS approved.

### - **Centralised Section Box**

- All blasting is controlled through the Centralized Section Box;
- System initiation is through a Key Switch;
- When the system is armed, a RED flashing light will be activated; Intrinsically safe;
- SABS approved.

## - **Centralised Blasting Box**

- All blasting is controlled through the Centralized Blasting Box which is situated at a point of safety;
- System initiation is through a Key Switch;
- When the system is armed, a RED flashing light will be activated;
- When the blast command is received a second flashing strobe light will be activated; Intrinsically safe;
- SABS approved.

## - **Initiation**

- Either the AXXIS detonator or Shock Tube initiator will receive the coded blast command signal and start the process.
- The system can be safely halted at any stage prior to the blast command being received
- The AXXIS shocktube initiator is a single unit designed to accept two lead-in wires and up to three shock tube tubes
- The AXXIS shocktube initiator is not reusable

## - **System Monitoring**

- The UI is designed to keep the responsible person informed on all activities on the CBS;
- Additional functions could be incorporated into the CBS (e.g. start-up of fans).

## - **User Interface**

- The UI is designed to keep the responsible person informed on all activities on the CBS;
- Additional functions could be incorporated into the CBS (e.g. start-up of fans).



# For Explosives, contact **BME**

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