SURFACE

OFFERING

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AECI®
MINING EXPLOSIVES

CONTENTS

GLOSSARY OF ABREVIATIONS

AN	ammonium nitrate
Anfo	ammonium nitrate fuel oil
CBEP	central bulk emulsion plant
CN	calcium nitrate
cP	centi Poise (a measure of viscosity)
Eco	formulation of emulsion containing waste oil
Hot holes	blast holes at temperatures above 40°C
IDE	ideal delivered energy
MJ	Mega Joule (measure of explosives energy)
MMN	mixed metal nitrates (such as calcium or sodium)
MMU	mobile manufacturing unit
RRS	rapid reloading system
RBS	relative bulk strength (% relative to Anfo, indexed to 100)
RWS	relative weight strength (% relative to Anfo, indexed to 100)
TGAN	technical grade ammonium nitrate prill, Anfo grade
VOD	velocity of detonation (measured in meters per second)

INTRODUCTION

Whether it be open-cast mining in Botswana, quarrying in Brazil, or massive mining in Australia, AECI Mining Explosives' range of bulk explosives has an energy solution for every mining application.

Supported by over a century's worth of expertise, AECI's product range and delivery systems offer a complete solution for optimised blasting. With a keen focus on sustainability and performance, AECI drives innovation to ensure the mining explosive value chain delivers quality product safely, efficiently and effectively.

Our highly skilled team, vast range of products, equipment and technical resources guarantee that AECI will remain a trusted partner in the global mining industry.

SAFETY BENEFITS

- Our range of surface bulk emulsions is developed in a safe, non-explosive form and is only sensitised upon loading into the blast holes.

STORAGE

- We guarantee unsensitised emulsion in storage silos for a period of 12 weeks.
- Good shelf life can be expected if specific storage conditions are met.
- It is important to abide by the legal storage requirements for the region.
- Sleep time should not exceed 3 weeks in blast holes after sensitising.

APPLICATIONS

- Our emulsions can be used across quarrying, trenching, civils, mining, forestry and pre-split applications.
- The emulsions need to be initiated with primers that are suitable for the respective hole diameter.
- The use of detonating cord and/or packaged explosives as primers is not recommended (please
- consult with our Blast Consult team).

FEATURES

- Water resistant
- Flexible solutions with scalable energies
- Use of recycled oil in our environmentally-friendly Eco range of emulsions
- Cost-efficient delivery in bulk
- Security – non-explosive transport of emulsions
- Emulsion manufactured on site or delivered via a reliable logistics network

BENEFITS

- Scalable energy – optimisation of blast performance partitioning, as well as clearing (hauling) and downstream processing requirements
- On-site manufacturing with the installation of modular plants for heavy duty, continuous operations
- Widest range of services available including down-the-hole (DTH), prime-load-tie-and-shoot (PLTS) and rock-on-ground (ROG)
- Ability to take used oil at the customer sites for recycling and further use in emulsion explosives
- Our Surface Blends use technical grade ammonium nitrate (TGAN) to achieve an optimal oxygen-balance in the emulsion for efficient delivery of heave energy during blasting.

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SUSTAINABLE BLASTING

100 MILLION TREES

Eco-friendly explosives, for greener blasting.

In just a little more than a decade since the introduction of used oils into its various Eco bulk emulsion formulations, AECI Mining Explosives has consumed more than 80 000 000 liters of used oil. This initiative has prevented approximately 55 000 tons CO_2e into the atmosphere, which equates to having to plant roughly 100 million trees. Thank you for partnering with us in our quest to drive more sustainable blasting.

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MINING EXPLOSIVES

PRODUCT RANGES

S100 AND S100 ECO SERIES

The S100 and the S100 Eco base emulsions are typically used in standard surface mining applications. Both the S100 products have excellent water resistance, sufficient energy for a variety of ground conditions, good shelf life for base emulsion and up to 21 days in-hole sleep times. The Eco range has the added benefit of providing a more environmentally friendly manner of consuming used oils. The S100 products can be doped/blended with TGAN to form various blends as outlined in the product comparison table. Sensitised S100 products have a velocity of detonation (VOD) in excess of 4500 m/s (subject to confinement and ground conditions).

POWERGEL ECO SERIES

Powergel Eco emulsion is used in surface mining applications. Powergel Eco has excellent water resistance with a grey to black appearance. It can be doped with TGAN, as outlined in the product comparison table. The sensitised Powergel Eco product has a VOD in excess of 4500m/s (subject to confinement and ground conditions).

POWERGEL X² SERIES *(HOT AND REACTIVE GROUND)*

Powergel X² emulsion is used in surface mining applications, where hot blast holes, reactive ground, or a combination of both conditions, exist. Powergel X² has excellent water resistance with a yellow to white appearance. It can be doped, depending on reactivity, with TGAN as outlined in the product comparison table. The sensitised Powergel X² product has a VOD in excess of 4500m/s (subject to confinement and ground conditions). This product has been tested at temperatures in excess of 190°C, under controlled conditions.

S300 AND S300 ECO SERIES *(REACTIVE GROUND)*

The S300 and S300 Eco base emulsion is used in surface mining applications and was specifically developed for applications where reactive ground is prevalent. The inhibiting properties of the S300 formulation allows for usage in reactive ground as it delays the exothermic reaction when pyrites come into contact with nitrates. S300 can be doped/blended with TGAN to form various blends as outlined in the product comparison table. The sensitised S300 products has a VOD in excess of 4500 m/s (subject to confinement and ground conditions).

PRODUCT APPLICATION

AECI's range of surface emulsions is designed to meet the energy requirements of surface mining applications across the spectrum. Coupled with the ability to create oxygen balanced dopes with TGAN, our bulk explosives are adaptable to suit most operating environments.

AECI has further developed niche formulations specifically designed for use in hot holes, reactive ground, or both.

All our bulk emulsions are used with our mobile manufacturing unit (MMU) delivery systems, and are either pumped or augured down the blast hole.

PRODUCT APPLICATION

SURFACE BULK EXPLOSIVES

QUARRIES
S100, S100 Eco and Powergel Eco

OPEN CAST
S100, S100 Eco and Powergel Eco

OPEN PIT
S100, S100 Eco and Powergel Eco

REACTIVE GROUND
Powergel X^2, S300 and S300 Eco

HOT HOLES
Powergel X^2

REACTIVE GROUND AND HOT HOLES
Powergel X^2

PRODUCT COMPARISON

PRODUCT	APPLICATION	SLEEP TIME (DAYS)	RBS @ 100MPA	RWS @ 100MPA	IDE @ 100MPA (MJ/KG)	MINIMUM HOLE DIAMETER
S100	Surface - Quarrying (softer rock)	21 Days	149-154	95-100	2.05-2.20	75mm
S120	Surface - Coal, Open Pit (harder rock) - 20% TGAN	21 Days	162-167	103-107	2.10-2.35	75mm
S135	Surface - Coal, Open Pit (hard rock) - 35% TGAN	21 Days	173-178	111-115	2.30-2.55	100mm
S100 Eco	Surface - Quarrying (softer rock)	21 Days	149-154	95-100	2.05-2.20	75mm
S120 Eco	Surface - Coal, Open Pit (harder rock) - 20% TGAN	21 Days	162-167	103-107	2.10-2.35	75mm
S135 Eco	Surface - Coal, Open Pit (hard rock) - 35% TGAN	21 Days	173-179	111-115	2.30-2.55	100mm
Powergel X^2	Surface - Coal, Open Pit (softer rock) - Hot and Reactive	Not recommended in hot holes and/or reactive ground	135-145	90-93	2.00-2.15	75mm
Powergel X^2 35	Surface - Coal, Open Pit (hard rock) - Hot and Reactive 35% TGAN	Not recommended in hot holes and/or reactive ground	160-173	107-111	2.40-2.55	100mm
Powergel Eco	Surface - Quarrying (softer rock)-	21 Days	128-150	89-96	2.00-2.20	75mm
Powergel Eco 20	Surface - Coal, Open Pit (harder rock) - 20% TGAN	21 Days	141-164	98-105	2.20-2.40	75mm
Powergel Eco 35	Surface - Coal, Open Pit (hard rock) - 35% TGAN	21 Days	151-175	105-112	2.30-2.60	100mm
S300	Surface - Quarrying (softer rock) - Reactive	Not recommended in reactive ground	145-149	91-95	2.10-2.30	75mm
S320	Surface - Coal, Open Pit (harder rock) - 20% TGAN - Reactive	Not recommended in reactive ground	159-163	100-104	2.30-2.50	75mm
S335	Surface - Coal, Open Pit (hard rock) - 35% TGAN - Reactive	Not recommended in reactive ground	170-174	108-112	2.50-2.70	100mm
S300 Eco	Surface - Quarrying (softer rock) - Reactive	21 Days	145-149	91-95	2.10-2.30	75mm
S320 Eco	Surface - Coal, Open Pit (harder rock) - 20% TGAN - Reactive	21 Days	159-163	100-104	2.30-2.50	75mm
S335 Eco	Surface - Coal, Open Pit (hard rock) - 35% TGAN - Reactive	21 Days	170-174	108-112	2.50-2.70	100mm

VOD (m/s)
Maximum Hole Depth

All products have a VOD in the range of 3500 – 5500. This is subject to confinement/ground conditions.
Maximum reccomended hole depth is 40m. For deeper holes please contact your specialist for assistance.

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YOUR EXTREME BLASTING CONDITIONS.

OUR EMULSION.

A significant development in AECI Mining Explosives' product offering is the development of its Powergel X² range, designed for surface mining applications where extreme blasting conditions such as hot blast holes and reactive ground, or a combination of both, exist.

**Only available in certain regions.*

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MINING EXPLOSIVES

VALUE OFFERING

PRODUCT DELIVERY

In order for us to supply our customers with surface bulk emulsion, we have developed a quality engineered delivery system comprising of manufacturing plants, tankers and rapid re-loaders as well as state-of-the-art MMUs.

ON-BENCH

The actual explosives are only manufactured on-bench by means of MMUs. Our 20 ton capacity MMUs translate to better utilisation of equipment due to not having to refill as often as the older generation MMUs. These 20 ton MMUs also have superior pumping rates, which means more holes can be charged with less equipment. MMU utilisation on the bench is further optimised by our rapid re-loader system (RRS).

With the rapid re-loader, the MMU can be refilled on the bench and does not waste time travelling to the silos to get refilled. The benefit to the customer is that there is a greater utilisation of the MMU dedicated for a blast, resulting in blasting sooner, thereby shortening the mining cycle. MMUs can be refilled on the bench either by a rapid re-loader (for prill), by a re-pump truck or by tankers for emulsion.

Currently we have an optimised fleet of tankers and MMUs to meet market demand for TGAN prill and emulsions.

Central Bulk emulsion plant in South Africa

PLANTS

AECI Mining Explosives has 23 bulk emulsion plants located across three continents. The Central Bulk Emulsion plant in Johannesburg South Africa is the company's flagship site. This high-volume, permanent operation supplies bulk emulsion across the SADC region. AECI also has modular fit-for-purpose plants at the customer site. These site-specific plants are configured to meet the mine's demand for emulsion product. Our extensive network of plants located either on, or close to customer sites, coupled with an adaptable logistics network, ensures AECI has sufficient ability to reliably and consistently deliver quality product to the bench.

Additionally, AECI Mining Explosives has their own range of explosive surfactants manufactured by AECI Mining Chemicals at their Ummbogintwini site in South Africa. The AECI Mining Chemicals team is supported by a world class research team that ensures the emulsion surfactants are designed to meet the stability and performance requirements of the AECI Mining Explosives' bulk emulsion product range.

Modular Plant in Indonesia

PRODUCT TESTING

Our product is tested according to a strict quality control regime at the point of manufacture – at the bulk plants as well as at MMU level.

This ensures our customers are supplied with quality and reliable product. Daily bulk plant tests include pH, viscosity and density tests. Prior to, and during charging, MMU operators also test for sensitised product densities to ensure that the product loaded into the blast holes is within specification.

Furthermore, all the raw materials supplied to AECI Mining Explosives are checked in batches according to the raw material specifications. We have a dedicated team of quality assurance personnel that ensures each batch conforms to the required specification before releasing the raw material to the manufacturing plant.

TRANSPORT UN CLASSIFICATION

Base Emulsion: Class 5.1, UN No. 3375, AMMONIUM NITRATE EMULSION
Ammonium Nitrate Porous Prill: Class 5.1, UN No. 1942, AMMONIUM NITRATE
Emulsion Product: Class 1.1D, UN No. 0241, EXPLOSIVE, BLASTING, TYPE E

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BETTER BLASTING

WITH DIGITAL TECHNOLOGY

AECI Mining Explosives' new, high-accuracy (sub-1m) Differential Global Positioning System (*d*GPS) brings autonomy to the blast hole tagging process, thus maximising efficiency by eliminating potential human error on the bench and ensuring integrity of drill and blast operations.

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