Development of a Low Density Product
For Reactive Ground Applications

**Project Summary**

**TITAN® BLASTLITE HAS BEEN DEVELOPED AS A SOLUTION FOR BLASTING RELATIVELY WEAK REACTIVE GROUND THAT SAVES THE CUSTOMER OVER 40% IN EXPLOSIVES CONSUMPTION AND 45% IN EXPLOSIVES COST**

Reactive ground conditions require special, approved explosives that inhibit the reaction between the pyritic ground and ammonium nitrate. Traditional reactive ground solutions are based on high ratios of emulsion to ammonium nitrate prill, that promote a physical barrier between the prill and the reactive ground, in addition to the inhibiting chemical qualities of the specialized emulsion.

TITAN BlastLite™ is based on a standard inhibited explosive formulation. However, the density of the product is reduced through the addition of a bulking agent. Testing in the field and the laboratory has proven that the product is resistant to reaction with pyritic material.

**Project Goals/ Summary**

**A NEW PRODUCT IS DEVELOPED TO MEET THE CUSTOMER’S NEEDS OF BLASTING REACTIVE GROUND SAFELY**

The goals of the project were as follows:

- Produce a product that can maintain the safety of working with reactive ground conditions through the development of explosive formulations that are suited to the most reactive ground.
- Produce an explosive for soft ground conditions with low shock energy.
- Produce an explosive at a competitive price.

BHPB IO required a low density alternative to pumped 60:40 blends for use in soft (low competence) shales that needed to be resistant to reactive ground conditions.

The R&D section in collaboration with DynoConsult, determined the energy requirements of the new products. Potential low density blend formulations were processed through a thermodynamic software calculation package called Prodet.

**Background**

**TO REDUCE COSTS, BHPB IO REQUESTED A LOW DENSITY EXPLOSIVE PRODUCT THAT IS RESISTANT TO REACTIVE GROUND CONDITIONS FOR USE IN THESE AREAS**

BHPB IO have areas of the Mt Whaleback operation that are classified as “Reactive Ground”. Until recently, a pumped blend of TITAN® 5060 was the only product approved for blasting of the most reactive shales. TITAN 5060 has a density of over 1.3 g/cm and consequently results in high powder factors (and high cost) in what is actually relatively weak rock. The challenge has been to produce a low density product using bulking agents and inhibited emulsion explosive that has a low density, but still exhibits resistance to reactive ground.

Dyno Nobel has built on its previous experience with emulsion blends suitable for reactive ground conditions, and low density products for dry conditions, to develop a new low density reactive ground product.
A number of blend compositions, which fit the energy requirements of this product, were then tested at the Redgrove test site in 200mm cardboard tubes, buried in 3m deep holes. The low density mixes were initiated using a 400g pentolite booster. Velocity of Density (VoD) cable was attached to the exterior of the tube in order to measure the detonation characteristics of the low density product in ‘unconfined’ conditions.

Segregation can be an issue with this type low density product, particularly where the bulking agent has a significantly different density or particle size to the explosive prill. The particular bulk filler used in the low density product has overcome this issue. The bulk filler (unlike rice hulls or sawdust) has ‘hairs’ on the surfaces that stick to the prills, and prevent segregation of the components.

From this work, a blend was formulated that will be presented to BHPBIO as “Titan BlastLite”.

Trials at BHPBIO to date have shown that the product performs very well and is suited to the weak ground conditions in which it has been trialed. The blast results have been excellent, particularly with the 40% reduction in explosive consumption.

**Value Added**

**IMPROVEMENTS IN COST AND BLAST EFFICIENCY WERE AMONG THE VALUE ADDED BENEFITS OF THIS PROJECT**

- Substantial reductions in the cost of blasting reactive ground.
- Maintaining safe blasting practices in reactive ground conditions.
- Improvements in the efficiency of blasting in terms of the total explosive energy required to move less competent rock masses.

**Technology Applied**

**DYNO NOBEL’S RESEARCH AND TECHNOLOGY DEPARTMENT USED THE FOLLOWING TOOLS DURING THIS PROJECT:**

- Isothermal tests for measuring low temperature reactivity of mixtures of reactive ground and low density ammonium nitrate based explosives.
- DTA tests for measuring high temperature reactivity of mixtures of reactive ground and low density ammonium nitrate based explosives.

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