

Differential Energy Technology Applied in Iron Ore Mining



Project Summary

BENEFITS OF DIFFERENTIAL ENERGY

The use of Dyno Nobel's new Differential Energy Bulk Delivery Systems provides large iron ore mining companies with a unique and innovative bulk emulsion loading approach, that will allow drilling pattern expansion while reducing or maintaining powder factors and explosives costs.

Background

HEAVY ANFO ALUMINIZED TOE LOAD AND PATTERN EXPANSION

For many years, Dyno Nobel has supplied large iron ore mines using the unique Site Mixed Slurry (SMS) technology developed in the 1950s. This made-on-the-bench emulsion manufacturing and sensitizing process offered the opportunity and the flexibility to vary the charge weight from hole to hole, based on geology and burden conditions.

In order to increase the detonation pressure and reaction time, explosives suppliers doped their heavy ANFO blends with various amounts of fine grade aluminum (1 to 5%). This was expensive to break heavy burden or very hard rock zones successfully. Today, the supply of this raw ingredient has become difficult to source and expensive, to the point where manufacturers have investigated alternative approaches to break areas that require more energy.

Project Goals

REPLACE EXPENSIVE ALUMINIZED HEAVY ANFO WITH HIGHER DENSITY BULK EMULSION FOR SEVERE GEOLOGY AND BURDEN CONDITIONS. PROVIDE PATTERN EXPANSION WITH CONSTANT POWDER FACTOR

The trained bulk emulsion delivery truck operator can program up to four different loading charges in the blast hole and customize the bulk emulsion explosive to the desired energy requirements within that hole.



TITAN[®] Bulk Emulsion

1.10 gr/cc density

0.95 gr/cc density

This approach provides a more effective distribution of the available explosives energy relative to the geologic and burden conditions.

Technology Applied

DYNO NOBEL'S UNIQUE DIFFERENTIAL ENERGY TECHNOLOGY GENERATES TRULY INNOVATIVE RESULTS

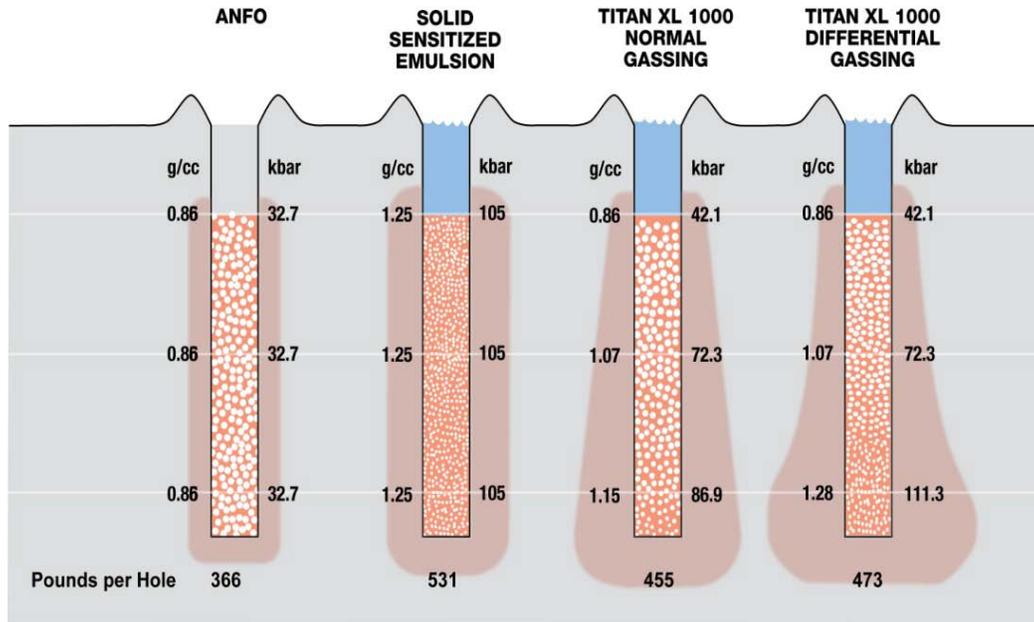
The use of the new Dyno Nobel jumbo bulk emulsion delivery trucks load blast holes very rapidly and productively by pumping at the industry's highest rate: up to 900 kg/min in large boreholes diameter!

The pure TITAN bulk explosives emulsion can be thickened to a high viscosity which will prevent product migration into cracks (often times the source of NO_x fume generation) and is an excellent technique for loading in extreme hydro-dynamic water conditions. With superior product shelf life, it is truly a practical innovation.

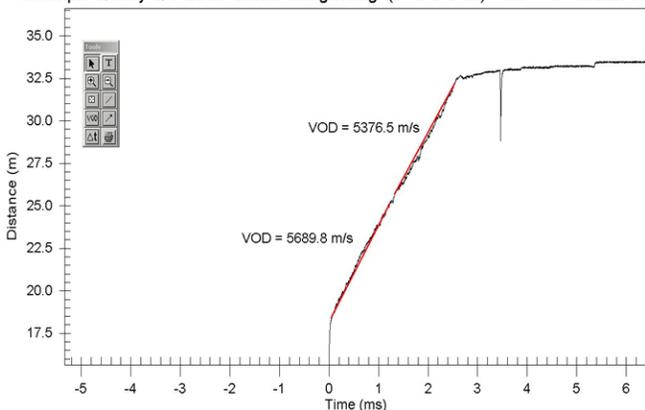
DYNO
Dyno Nobel

Groundbreaking Performance

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Municipal Quarry Q-9-2009 Differential gassing (1.10 & 0.95) Hole 1 TITAN XL1000



Value Added

1. Maintain powder factors and reduce total drill & blast costs while optimizing energy distribution within the borehole.
2. Increase bulk explosives density at the bottom of the borehole only (kg/m)
3. From 7.6% to 9.2% more kg/m at the floor level where it's needed
4. Economy of explosives weight in the upper part of the explosives columns. Major potential drill pattern expansion (lowering drilling costs) by using heavier density in the bottom / toe of the boreholes only while maintaining constant average powder factors
5. Same truck, same product: all with differentially loaded, chemically sensitized bulk emulsion.



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