Underground Bulk Blasting Agent Loading Improvement for Aggregate Producer

Project Summary

EVALUATING CURRENT LOADING PRACTICES

Our evaluations of ANFO and Titan 7000 loading practices helped blaster's visualize the inside of a horizontal development hole during loading and demonstrated best loading practices. When compared, these evaluations also demonstrated Titan 7000's higher loading density and superior water resistance compared to ANFO.

Background

VISUALIZING BLAST HOLE LOADING

It can be difficult to visualize what is happening inside a borehole as it is being loaded with explosives. A Mine Superintendent in West Virginia requested that Dyno Nobel evaluate the ANFO loading practices of his underground blast crew. In addition, Dyno Nobel performed a separate, but identical, evaluation of Titan 7000 loading practices. We compared the results of these evaluations to assist in understanding the differences between ANFO and Titan 7000.

Project Goals

DEMONSTRATING CUSTOMER VALUE-IN-USE

1. Demonstrate density variations in ANFO and Titan 7000.
2. Demonstrate best practices for loading ANFO and Titan 7000.
3. Demonstrate product advantages.

Standard ANFO is a booster sensitive, ammonium nitrate and fuel oil mixture suited for use in dry holes. In this testing, ANFO was loaded using a pneumatic loader.

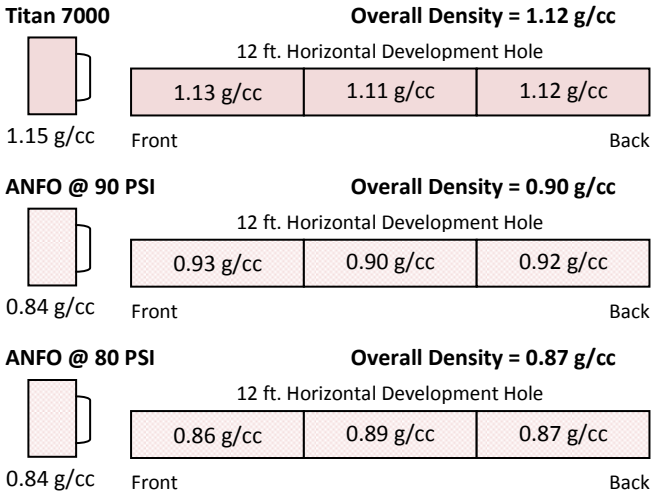
Titan 7000 is a booster sensitive bulk emulsion designed for use in underground construction, quarry, and mining applications. In this testing, Titan 7000 was loaded using one of Dyno Nobel's portable DynoMiner.

Horizontal development holes were simulated using 12 feet long, 2.25 inch and 2.5 inch I.D. clear plastic pipes. The pipes were broken into four foot sections to allow for density measurements at the back, middle, and front of the pipe.

Technology Applied

TITAN 7000 INCREASES POUNDS PER HOLE

Titan 7000 provides a higher density powder column than ANFO in horizontal development holes.



Value Added

IT IS ALL ABOUT THE HOSE!

With both ANFO and Titan 7000, always start with the hose at the back of the hole. This reduces the chances of bridging or light loading the back of the hole.

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Groundbreaking Performance

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Figure 1: Bridging at the toe (top) and fully loaded toe (Bottom)

As the operator loads the holes, they must be aware of the rate at which the hose is retracted. Removing the loading hose too quickly will result in gaps and voids in the powder column. Removing the hose too slowly will cause powder to flow up around the hose, reducing the density of the powder column as the hose is removed.

Figure 2: ANFO hose (Top) and Titan 7000 hose (bottom)

With Titan 7000, appropriately sizing the diameter of the hose according to the diameter of the hole helped produce a uniform powder column. In our evaluation, we found a hose-to-hole ratio (hose diameter / hole diameter) of 0.7 to be effective.

ANFO is Lower Cost

ANFO is a lower cost bulk explosive, primarily for use in dry holes. It is easy to handle, and the loading density of standard ANFO can be varied under 1.00 g/cc when loaded using a pneumatic loader at varying pressures.

Titan 7000 is Higher Performance

Titan 7000 increases the density of the powder column. This allows underground miners to increase the distance between holes and reduce the amount of drilling that must be done.

Titan 7000 also proved to have excellent water resistance. When the hose was properly placed at the back of the hole, Titan 7000 pushed the water out of the hole.

Titan 7000's high velocity of detonation and increased density produces higher borehole pressures than ANFO.

Demonstrate, Evaluate & Visualize

These evaluations provided an opportunity to demonstrate, experiment with, and evaluate loading practices, ultimately identifying some of the best practices that should be used during loading. The blasting crews that were involved are now better able to visualize what is happening inside the hole and make adjustments as needed.

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