Sun Mining Services

Low Density WALA

Dynamic Water

Case study - November 2013

Introduction

WALA was proposed to be used at a coal mine in Bowen Basin QLD with the potential to replace Emulsion heavy ANFOs being used for blasting at the time of trial.

Brief Description

Heavy blends of WALA (60/40) were augered in 30m deep blast holes at IPCM. The overburden comprised of competent sand stone with average 20 meters of dynamic water. Previous blast conducted on adjacent bench using pumped Emulsion heavy ANFO (70/30) generated poor quality blasting and difficulty in digging. Due to the presence of dynamic water, the sleep time was limited to 4 days. For the trial purpose, half the shot was loaded with WALA 60/40 at 0.8 g/cc density and the remaining was loaded with Emulsion Heavy ANFO (70/30). The section loaded with pumped Emulsion Heavy ANFO expressed up to 2 meters of lifting. The area loaded with WALA expressed up to 9.0 meters of ground lifting with 140% improvement in dig rates comparing to the other section of the blast.

Detail description

The allocated bench for the trial comprised of competent sand stone. It was the bottom half of a deep overburden (58 meters) which was blasted previously. The remaining overburden was competent sandstone filled with dynamic water. The returning rate of water after de-watering was 3m per 5 minutes. The general loading practice of the mine was to use pumped Emulsion heavy blends (70/30) and sleep it no more than 4 days and fire it in day 5. Due to the slower nature of pumping process (comparing to Augering), only smaller shots could be done at any time. WALA was considered to be tested at such condition and compare the performance with the incumbent Emulsion heavy ANFO.

It was decided to pour (Auger) WALA heavy blend (60/40) into de-watered blast holes immediately after de-watering is conducted. The MPU and the de-watering truck where following each other in two separate rows to minimise the return time for the return of dynamic water back in to the blast hole. The blast holes where 270mm in diameter and average 30meters deep.

WALA heavy blend was loaded with cup density of 0.8 g/cc. it was loaded for 3 days and slept for average 9.5 days. Emulsion heavy blend (70/30) was pumped towards the end of the loading process (the last 3 days before the shot was fired). The average cup density for Emulsion blend was 1.15 g/cc. The shot was fired after WALA blend was sleeping for 9.5 days.

There was no post blast fume event. The section loaded with WALA was lifted by up to 9 meters (average 7 meters). The section loaded with Emulsion was lifted by up to 2 meters (average 1.0 m). the section loaded with Emulsion produced large size cap rocks (as large as the shot ute). The area loaded with WALA resulted in exceptional fragmentation (sugar like) with no observable cap rock formation. The review of the dig rates from the excavator showed 140% increase in dig rates for the section loaded with WALA comparing to the area loaded with pumped Emulsion heavy blend.

Conclusion

. WALA is far more resilient to dynamic water condition comparing to conventional emulsion heavy blends.

. Lower powder factor can be achieved using WALA in wet condition comparing to Emulsion heavy blends. The initial high density of WALA displaces the water present in the blast hole and the consequent drop in density reduces the powder factor without affecting its water resistance or the blast performance.

. Longer sleep time can be achieved using WALA in wet condition. This would reduce the blasting operational cost by increasing the size of the blasted area and reducing the down time on the mine site.

. Tailored (adjustable) VOD can be achieved using WALA in blasting operation to suit the rock formation. In this case by lowering the VOD, the pressure rise time in the blast hole was increased and extended for longer period of time. The result was better fragmentation and greater heave effect.

. Shallower stem height was achieved using WALA (1.0m less) comparing to pumped Emulsion heavy blend thanks to the lower density WALA adjacent to the stemming material. This resulted in better fragmentation (more uniform distribution of energy throughout the column). In comparison, the section loaded with pumped Emulsion heavy blend created cap rocks due to several reasons including deeper stem height.

. WALA proved to be the ideal explosive choice for the mine.

. Lower VOD of WALA delivered better blasting performance in comparison with higher VOD Emulsion blends.