Site Profile

The Iron Ore Mine face a number of particular blast related problems. Firstly the need to blast near Archaeological significant sites in one of their pits and secondly the ongoing generation of oversize in the cap rock region of the bench.

The Situation

On the boundary of one of the pits there was a rock shelter that has ashes dated to around 35,000yrs old. Being of both scientific and cultural interest, a limit of 20mm/s has been imposed on the rock shelter. Before the trial the engineers used an empirical site law. Further one of the major issues at the operation was the generation of oversize in the cap rock. Various models were run using the current designs and they found that the shockwaves were being reflected off the cap rock. This resulted in the cap rock being 'heaved' instead of fragmented.

Technical Solutions

To solve both problems required to use of Orica’s advanced modelling capability combined with the i-kon Electronic Blasting system to deliver the required blast and initiation design.

Initially, training was undertaken for the two shotfirers from each of the three crews in the use of the i-kon™ system. Training consisted of a two day theory course and on bench mentoring until the crew was assessed as being competent. During this time the engineers/designers also received instruction in the use of the SHOTPlus®-i software for use with the i-kon™ loggers and blasters.

The Result

In order to improve vibration management near the archaeological site, a series of seed wave holes were fired to gather data to setup the Monte Carlo vibration prediction model. Then a series of calibration shots were fired and the data used to enhance the model. The Monte Carlo model was setup and the results were applied the next shots fired.

The initial predictions for these shots varied from what was actually measured. To investigate this discrepancy the results were sent back to the OMS Technical Centre at Kurri Kurri for analysis. It was found that there were four different geological areas around the cave shelter that did not show up in the initial seed wave and calibration data. Once these ‘zones’ were defined, the Monte Carlo model predicted reliably within 1-2mm/s of actual measured results.

To counter the cap rock heave affect a pocket charge and double primed design was implemented based on advanced modelling. The double primed design was chosen as the easiest to implement by the blast crews. The shot was timed using the LAT timing rules. Below are two photos showing the original blasts and the results of the Orica trial blast.
The implementation of pocket charges combined with specific timing between the two charges to maximise the interaction of explosive energy, delivered significant improvements in the fragmentation in the cap rock region of the mining benches.