Site Profile

Hap Seng Building Materials Holdings Sdn. Bhd. is one of the largest aggregate producers in Malaysia. Hapseng has three large sandstone quarries in Sabah, Kota Kinabalu; Papar, Lian Seng & Telipok quarries. All three quarries have a unique geology of folded sandstone and shale bands.

The Situation

Blasting at the quarry was producing oversize rock that needed to undergo secondary breaking with the use of a breaker, which resulted in increased production costs.

Hap Seng asked Orica for assistance to improve fragmentation, reduce operating costs and streamline detonator stock management.

Technical Solutions

To understand the benefits that could be delivered to Hap Seng, a series of four demonstration blasts were arranged using Orica’s Uni tronic™ Electronic Blasting System at Hap Seng’s Lian Seng Quarry.

Uni tronic™ detonators are more accurate and provide practically unlimited blast initiation design options, compared to non-electric detonators.

The benefits to quarry operators above those achievable with Exel™ non-electric detonators include,

- Vibration and over pressure control; Uni tronic™ detonators provide flexibility in the design process helping ensure the lowest maximum instantaneous charge is achieved in blasts.
- Improving quarry planning; as each detonator fires independently, larger, more complicated blasts can be achieved while still complying with vibration and overpressure limits.
- Safe operations; the status of each detonator can be checked prior to firing. This reduces the likelihood of unknown misfires.
- Stock Management; Uni tronic™ detonators are assigned a delay number once they are loaded into the blast hole. Different delays are not required making magazine management easier.
- Improved crusher throughput; Greater detonator accuracy achieves better fragmentation.
- In preparation for the demonstration blasts, Hap Seng’s drill and blast engineers undertook a one day Uni tronic™ theory course.

Hap Seng’s drill and blast team submitted the surveyed drill pattern to Orica. The initiation sequence was designed using Orica’s SHOTPlus®-i initiation design software to maximize fragmentation using the Uni tronic™ Electronic Blasting System.

Two demonstration shots were fired. The first blast was a matched pairs shot. This means that half the blast was fired using conventional firing design with non-electric detonators and the other half of the blast was fired with Uni tronic™ detonators at the same powder factor and design parameters.

Orica Mining Services Technical Services designed the specific initiation timing that was used in the Uni tronic™ half of the blast. This type of initiation sequence is known to improve fragmentation and is not possible using non-electric detonators.
The second shot was designed by Orica Technical Services using Uni tronic™ detonators with a blast pattern that was expanded by 17%.

The Result

In Blast No. 1, the Uni tronic™ side of the blast showed a significant visual improvement in the fragmentation as well as with the throw of the muckpile. Powersieve™ analysis showed 49% improvement on the 80% passing size of the muckpile.

For Blast No. 2 there were significant production improvements and cost reductions observed, despite the 17% pattern expansion.

Compared to Blast No. 1 (using non-electronic detonators) the second blast, was far more effective, achieving the following improved results:

- Oversize reduced by 49%,
- Crusher throughput increased by 20%,
- Quarry waste was reduced from 18% to 13.4%, and
- Powder factor was reduced by 28%

This in turn resulted in significant cost reductions (per tonne) including:

- Drill and blast costs reduced by 7%
- Secondary breakage costs reduced by 21%; and,
- Crushing costs reduced by 17%

With the benefits realized after only two demonstration blasts, Hap Seng decided to commence conversion to the Uni tronic™ Electronic Blasting System.

Acknowledgements

The Uni tronic™ demonstration blasts were made possible with the support of Hap Seng Management, especially Mr. Alasdair Dunwoodie, Drill & Blast Development Manager.
Case Study
Improving Crusher Throughput by 20% in Sandstone Quarries
Hap Seng Building Materials Holdings

Figure 4: Orica Technical service with Hap Seng management and quarry team