Case Study
Managing Risk in Blasting near Sensitive Infrastructure
Meandu Mine, Tarong Coal, Australia

Site Profile
Meandu mine is situated 250km north west of Brisbane in Queensland. The mine currently produces approximately 5 million tonnes of coal per annum for supply to Tarong power station. The power station and the mine are owned by Tarong Energy and have the capacity to supply one quarter of Queensland’s electricity. Thiess is the mine operator and is responsible for all mining and CHPP operations at the open cut operation.

The Situation
The mining operation uncovered an inclusion of hard basalt in predominantly clay geology on the eastern extremities of the King 2 East pit at Meandu mine. The volume of basalt to be removed within the pit shell design was approximately 75,000 m³. The basalt was unable to be dug freely, nor was it economically viable to rock break or rip.

A 275kV transmission line supplying electricity to Ipswich ran within 40m of the blast area with the nearest transmission towers 120m away. This power transmission corridor is owned by Powerlink, who specified special requirements if blasting was to occur near the lines and towers.

Thiess contacted Orica Technical Services for an evaluation of the potential for blasting in close proximity to the transmission towers. Due to the geometry and volume of rock the job was referred to the Quarry Services arm of the Orica business. Orica Quarry Services specialize in hard rock blasting, technology application and vibration and flyrock control.

Technical Solutions
Following an extensive risk assessment in conjunction with Thiess and Powerlink, a number of control measures were agreed upon prior to blasting. These were developed to reduce vibration, and eliminate flyrock and air-blast, whilst striving to obtain the best fragmentation.

Orica’s technical services personnel worked closely with Thiess during the design phase to research the maximum tolerable vibration levels at the transmission towers, the vibration transmission characteristics of the ground, and the potential travel distance of flyrock.
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and the designed firing sequence. Uni tronic™ is one of two electronic initiation systems offered by Orica Mining Services. It is one of the most affordable electronic systems on the market. Uni tronic™ offers fully programmable detonator delays between 0 and 10,000 milliseconds.

- Programmable delays enable the user to assign delays to meet maximum instantaneous charge limits.
- Programmable delays allow the user to avoid generating frequencies that match the natural frequencies of nearby structures.
- The delay sequence can be customized to achieve good fragmentation and control muck pile shape and movement.
- Electronic delay accuracy ensures no out of sequence firing. Target vibration frequencies can be achieved.
- Affordability – Uni tronic™ is a cost effective alternative to conventional initiation systems.
- Elimination of risk of down line cut offs (by maintaining a total burning front).
- Safety – The detonator is unaffected by static, direct current, radio waves and induced currents. This was a major concern due to the proximity of the 275kv Transmission lines.

- Misfire awareness – Potential misfires can be identified and rectified before the blast.

Fig 3: Shotfirer Rob Shaw with the Blast and Towers in the background.

The Uni tronic™ Electronic Blasting System was chosen for this blast due to the following reasons:

The blast was fired on time at 3:11pm Friday the 11th December 2009, and caused no delay to other mining operations at the site. With 1029 detonators, it was the largest single Uni tronic™ blast fired in the world at the time.

The blast behaved as expected with controlled surface expression. The basalt moved out from the free face along the majority of the length of the face, and the rest of the shot “stood up” in accordance with the initiation design. Visual inspection of the muck pile showed good surface expression and fragmentation of the bench surface.

The Result

The closest monitor recorded a peak particle velocity of 15 mm/s. The other two monitors did not experience enough vibration to trigger.

This is considered an exceptional result given that the limit imposed by Tarong Energy was 100mm/s. To put this result in perspective, 35 tonnes of bulk explosive was fired over a five second duration, 120m from the Towers, yet the vibration level recorded was well within
safety limits for most types of structures, including houses.

The vibration trace was strongly dominated by a frequency of 16 Hz. This corresponds directly with the 64 ms control row delay. This result is proof of the ability to channel vibration frequency with accurate blasthole delays.

**Uni tronic™ Performance**

It is important to note that firing a single blast of this size, while maintaining vibration control, frequency channelling and burden relief would have been almost impossible with a non-electric initiation system.

**Acknowledgements**

The success of ABT™\(^1\) blasting at Tarong is a reflection of the partnership between Orica and Thiess personnel.

Orica Quarry Services would like to thank Colin Pidgeon, Rob Thompson, and all those involved from Thiess operations and technical services departments for their continual focus and support.

\(^{1}\)ABT™ (Advanced Blasting Technologies) is one of Orica’s Blast Based Services offerings. It brings together Orica blasting technologies to deliver innovative solutions. ABT™ employs the expertise and experience of Orica’s technical services personnel, combined with the exclusive range of products including SHOTPlus®-I blast design software and the use of Uni tronic™ detonator.