The Situation
The Commodore open cut coalmine is adjacent to the Millmerran Power Station, approximately 200 kilometres west of Brisbane in the Surat Basin in southeast Queensland. The mine is operated by Downer Edi Mining and produces around 3.5 million tonnes of raw coal per annum, which is fed directly to the power station.

The coal is uncovered by free digging the soft pre-strip material with excavators and removing it with trucks then cast blasting the harder material. Dozers are used to push a percentage of the blasted material and the excavators and trucks are used to uncover the coal.

There are three pits at the Commodore mine, A, B and C pit. In B pit there is a thin coal seam that is targeted due to its high energy rating using through-seam blasting (Figure 1). The ability to blast this area only once, targeting both upper and lower coal seams has financial benefits and significant scheduling advantages.

Technical Solution
ABT™ (Advanced Blasting Technologies) is one of Orica’s Blast Based Services offerings. It brings together the best in 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, SABREX™ blast modelling software and the i-kon™ digital energy system.

The objective is to design a shot that will blast the material effectively while maximizing coal recovery and still maintain good dozer and excavator productivity. In the last 2 years there have been approximately 10 through-seam blasts fired at the Commodore Mine. This case study will concentrate on the two most recent blasts, #60 and #62.

Due to the changing quality of the G seam it is selectively mined in B pit. Orica worked very closely with Downer Edi Mining personnel to ensure that the blast design targeted the different strata layers and the coal seams in the most cost effective and productive way possible.

Laser profiling of the blast face was used to accurately record the location of the coal seams, material types and any faulting. This data was utilised in the SABREX™ software to model the potential outcome of different pattern designs (Figure 2). Once chosen, the final drill pattern was designed using the SHOTPlus™-i program.

Figure 1: B Pit coal seams

Figure 2: SABREX™ model of through-seam design
During the drilling of the blastholes, the drillers record the top and bottom of the G seam. This information is fed back into the SHOTPlus™-i design so that hole loading specific to the seam location and thickness could be completed (Figure 3). The software allows the standoff to be designed specifically for each hole so that the coal seam receives maximum protection while providing adequate energy to effectively fracture the rock either side of it.

Figure 3: Through-seam loading

The application of the specific loading is the responsibility of the Orica blast crew. They must maintain a high level of quality control to ensure the success of a through-seam blast. The use of i-kon™ detonators is essential for providing millisecond accuracy. The two decks were fired separately to minimise cast and interactive timing was used to aid fragmentation.

Results

Two through-seam blasts were fired in July and August of 2007. Shot#60 targeted the G seam for the full length of the shot. Dozer push rates down to the G seam were excellent. Recovery of the top coal seam was very good, with the seam remaining intact after blasting (Figure 4). The interburden material was removed using an excavator and trucks. Production rates for this portion of the shot were also very good.

The lower seam was also recovered with no damage or dilution.

Shot#62 targeted the G seam for approximately two thirds of the shot. Where the coal was of low quality the holes were not loaded as part of the through-seam blast. The productivity of the dozer push was very good down to the top seam. Minimal damage was reported while recovering the G seam coal. Likewise the excavator productivity was excellent during the removal of the interburden material. The lower seam was recovered fully with no damage reported.

Figure 4: Intact G seam from Shot#60

Figure 5: Blast result, Shot#62

Separate shots to target the two seams in B Pit would not be economical and would mean a series of delays while the area is prepared, drilled and blasted between mining the coal seams. With the use of ABT™ at Commodore, the thin coal seams can be targeted efficiently in one blast and mined ahead of schedule.
Acknowledgements
The success of ABT™ blasting at the Commodore Coal Mine is a reflection of the partnership between Orica and Downer Edi Mining personnel. Orica would like to thank all those involved from the management and technical services departments at the Commodore Mine for their continual focus and support.

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