CASE STUDY

ELECTRONIC INITIATION SPARKS A SURGE IN SAFETY AND EFFICIENCY AT GEORGE FISHER MINE

PROJECT SUMMARY

IMPROVED SAFETY, BLAST EFFICIENCY AND PRODUCTION

In 2009, George Fisher Mine began to seriously consider moving from pyrotechnic to electronic initiation systems. Initially, the new system was used for complex crown shots or areas where ground conditions had the potential for excessive overbreak.

After evaluating the potential safety benefits, production increases and ability to redesign stopes to better manage a thinly bedded hanging wall, the mine fully embraced the technology. To improve personnel safety, in November 2009 George Fisher became Australia's first mine to fire the SmartShot® initiation system underground using its leaky feeder radio system as the communication medium from surface.

The safety benefits, which came as the mine planned to expand its operations, included reduced exposure of personnel to vertical edges, less overbreak and improved post-blast ground conditions. The main production benefits were a more flexible stope design process, larger blasts resulting in more conventional dirt for the mucking units, fewer re-drills and quicker stope cycle times.

BACKGROUND

AN UNDERGROUND ZINC-LEAD-SILVER MINE

George Fisher Mine (previously Hilton mine) is an underground zinc-lead-silver mine about 25 kilometres north of Mt Isa in Queensland. It is wholly owned and operated by Xstrata Zinc, a subsidiary of Xstrata PLC, and has two separate mining areas. The older Hilton mine is now known as George Fisher South and the newer mining area is George Fisher North (previously Hilton North).

The George Fisher orebody is an economic sulphide mineralisation. It is distinct from the nearby Mount Isa deposit due to its lack of breccia-hosted copper

mineralisation. The deposit is composed of a series of 11 stratiform orebodies striking near N-S and dipping west between 30°-90°. George Fisher South uses a combination of modified retreat benching and continuous fill benching methods, while George Fisher North uses retreat benching and transverse open stoping. Until 2009 George Fisher Mine relied on traditional pyrotechnic blasting methods.

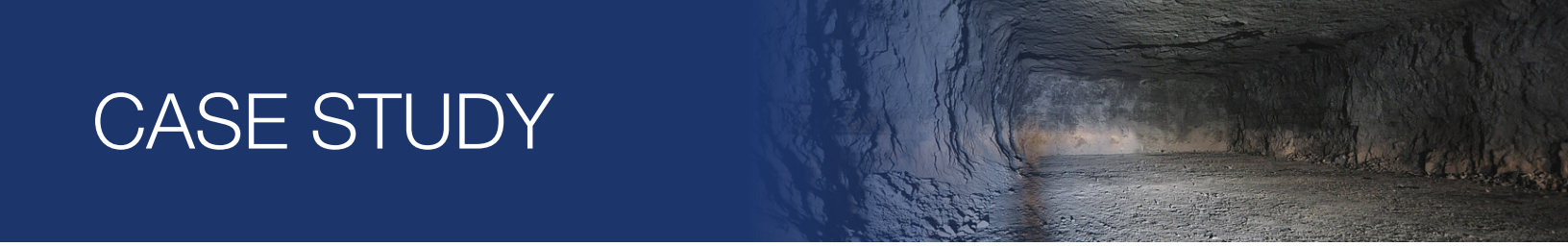
PROJECT GOALS

BETTER SAFETY, EFFICIENCY AND PRODUCTIVITY

Over the past 10 years there have been intensified efforts to bring underground mining standards into line with those on the surface. One such initiative was to remove personnel from high risk situations, for example, vertical edges. Radical changes in blast design were required and could only be achieved using electronic initiation, which has revolutionised employee safety, efficiency, visibility and control in mines world-wide.

Another major goal was to improve productivity. This could be achieved through flexible timing allowing bigger, more complex blasts and designs to increase conventional mucking and reduce stope cycle times.

CASE STUDY



When implementing the SmartShot system, a final goal was to remove the shotfirers from underground whilst blasting takes place. Initially, the shotfirer had to fire the stope from a safe location in the orebody, as there was no remote system to fire underground. This was overcome using an electronic initiation option developed in Canada which communicated via a leaky feed radio system.

TECHNOLOGY APPLIED

LATEST ADVANCES IN ELECTRONIC INITIATION

The SmartShot system facilitates advanced blast design and implementation by providing 20,000 timing options in 1ms increments, coupled with a total burning front. This provides timing flexibility not possible with pyrotechnic delays. Flexible timing and longer available delays mean larger and more complex blasts can be fired.

The SmartShot system ensures that detonators cannot fire unless they receive the correct instructions via a secure, digitally coded signal, as well as the correct blasting voltage. With the SmartShot system unknown misfires and the risk of unintended initiation are effectively eliminated.

VALUE ADDED

A BLASTING REVOLUTION

The transition from pyrotechnic to electronic initiation has revolutionised George Fisher Mine. With plans to expand from 3.5 to 4.5 Mt/a by 2014, the need to improve practices, efficiencies and production systems was crucial in reaching these goals safely.

Electronic initiation, especially the increase in delay times and complete flexibility in allocation, allowed for a total stope redesign for the transverse stoping in George Fisher North and for the benches in George Fisher South. For George Fisher North, design changes almost completely eliminated exposure to vertical edges. Additionally, at George Fisher South, the stope design was reversed, with the rings firing toward the drawpoint instead of the back of the stopes, increasing conventional mucking and almost eliminating the need for personnel to work at the edge of a bench.

At George Fisher Mine, these changes allowed larger blasts resulting in more broken ore on the ground and a less disrupted production mucking cycle with more conventionally mucked tonnes. Stope cycle times fell from an average of 29 days to 22 at George Fisher North and 23 to 11 at George Fisher South.

Firing larger blasts has resulted in fewer blasts and an associated reduction in redrills. Since the transition from pyrotechnic to electronic detonators, redrills at George Fisher mine have fallen from over 3000 m per month to less than 500 m per month on average. This has improved the utilisation of these assets in regards to primary drill metres, as opposed to time consuming rework.

In a very short period of time, the mine was able to alter designs that had been stagnant for years, improving safety, ground conditions and blasting results, boosting conventional production and reducing stope cycle times.

To top it off, in November 2009 George Fisher became Australia's first mine to fire SmartShot™ underground using its leaky feeder radio system as the communication medium from surface. Removing personnel from underground during blasting is a significant step forward in safety.

Results:

- Removal of personnel from underground when blasting.
- Reduced exposure of personnel to vertical edges.
- More flexible stope design process; ability to redesign stopes to better manage a thinly bedded hanging wall.
- Larger blasts resulting in more conventional dirt for the mucking units and reducing line of sight and teleremote mucking operations.
- Reduced ore dilution with ore fired into ore rather than waste.
- Faster stope cycle times with reductions of 24 per cent and 52 per cent for George Fisher North and South respectively.
- Improved drilling performance, with redrills falling by about 85 per cent on average.
- Improved post-blast ground conditions with fewer overbreak and underbreak issues.