

Surface Teleremote Operation

BHP Billiton – Cannington Mine

The Initiative

Teleremote operation of vehicles is not new in mining. Cannington Mine has used Teleremote capabilities for five years. While an Underground Teleremote Operation reduces operator exposure to certain risks by removing the individual from the cabin of the vehicle, existing practice is that the operator is still present in the underground environment. Typically the operator is around 200 – 300 metres from the machine being operated, and therefore still exposed to various hazards including noise, dust, diesel particulate, rock falls and vehicle interactions.

The 'Surface Teleremote' project evolved from experience at similar mines where comparable technologies were used to relocate control of Teleremote loaders to an underground area considered safe to occupy during shotfiring. Embracing technology to reduce risks to operators by removing them from potentially hazardous areas is considered by Cannington to be a major step in both productivity and employee health and safety. It's a practice that is easily implemented therefore of benefit to all underground hard-rock mines.

In February 2010, the Projects Team—made up of personnel from Cannington's Engineering and Mining Departments—began discussing the possibility of building on Cannington's underground Teleremote capabilities, creating a safer work environment and delivering more efficient mining practices.

The Solution

Control from the surface offered the most compelling risk reduction and production enabling option. Initial investigations revealed that Teleremote surface operation would significantly reduce exposure, encouraging the team to search for in-house solutions. Due to some technical requirements, internal development of a system proved non-viable and external interests were engaged.

The vendor was provided with a list of key priorities, goals and other health and safety-based concerns as a foundation for development of a Surface Teleremote Operation. A customised system was then developed and the appropriate risk assessments and risk management systems were put in place before a trial. Implementation was conducted in two phases:

- Phase 1- underground loaders were operated from the surface mining administration building (see figure 1).
- Phase II – Guidance systems were trialled in an effort to provide surface Teleremote operators with even more tools to reduce harm to people and equipment. This stage involved introduction of a guidance system that would reduce reliance on the operator to perform certain machine movements, reducing risk of equipment damage due to impact with walls.

In August 2010, ore from a stope was successfully collected (or 'mucked') using a loader remotely operated from the surface. Since then, an additional Surface Teleremote Operation has been brought online with Surface Teleremote Operators working back-to-back shifts.

The Surface Teleremote Operator was developed with the use of a wireless control system and a distributed antenna infrastructure that is built at each production stope. Control signals from the surface are sent to the production level via the fibre optic cable and then are converted to a mode that can be transmitted to the Teleremote loader via the distributed antenna system. Video from the loader is transmitted to the distributed antenna system and is converted to a mode that can be transmitted to the surface via the fibre optic network. At the surface control station, the video is then converted to a form that can be displayed on monitors.

The system includes a power supply health monitoring circuit with a battery backup. In the event of power failure, a message informing the operator of power failure is displayed on the operators display and the operator has fifteen minutes of backup power to relocate the machine to safe position. Four loader operators are now totally removed from the underground environment, and therefore have nil exposure to occupational hazards (see figure 2). Eliminating the hazard, the first principal of risk management, has proved to be the most effective control, while increasing the safety and productivity of operators.

This innovation demonstrates Cannington's commitment to finding a solution using advanced technology, with the support and assistance of available advanced technology to improve and implement a revolutionary way of underground machinery operation. The initial system and console were developed and installed for approximately \$227,000 and the additional console cost approximately \$167,000.

Additional Surface Teleremote Control Stations can be purchased and installed at a reduced rate, as engineering and development costs have already been absorbed in the initial unit outlay.

Benefits/Effects

The benefits from the system are beyond any monetary value where lives have been removed from potentially hazardous work environments. The Surface Teleremote Operation has also delivered invaluable improvements to health and safety:

- Less people underground reduces risk and Loader operators are now completely removed from the underground (see figure 3) and now have the same reduced exposure levels as a surface administrator.
- The operation eliminates the exposure to risks with serious, potentially fatal severity such as rock falls and vehicle collisions.
- Health-related occupational exposures (such as diesel particulate matter, dust, heat, full-body vibrations, and fatigue) are reduced.

Anecdotal evidence from operators indicates that the guidance system has had a positive impact on operator fatigue by providing a support mechanism that helps with managing their concentration levels.

In addition to the health and safety benefits, the system has delivered impressive productivity increases. With two consoles in place, there is potential for an additional four hours of production capacity per day for a relatively low outlay as the loader is able to continue operating during twice-daily blasting. Previously loaders were idle as operators returned to surface during blasting.

A varied age group of operators on site have responded positively to the new Surface Teleremote Operation and have adapted easily to the new working environment. Having faced exposure on a daily basis these operators now embrace the technology and the system for providing them a workplace with risks as low as reasonably practicable.

The core control functions of the system are identical to the existing Teleremote control system at Cannington Mine. This meant that the operators were already familiar with the control of the machine. Minimal training was required to explain a new barricade system that the surface control system used and how to switch the system over from underground control to surface control. This allowed for minimal training time and rapid operator acceptance.

The issues that the Surface Teleremote Operation faces are typically legacy issues from the existing Teleremote system i.e. the introduction of the equipment required to operate the LHDs from the surface does not introduce additional issues, it may however highlight existing issues with the Teleremote system due to the increased awareness of its operations on site.

Transferability

The system was custom designed in consultation with Cannington's external contract partner—Remote Control Technologies (RCT). The success of the system has seen RCT look to expand the system into mines around the world. This has wider implications for the mining industry as a whole, with potential to continue to revolutionise an inherently dangerous work environment.

The remote operation of equipment can and has already been adopted in surface mine operations for dozer and haul truck operations.

Innovation

Cannington's Engineering and Mining Departments worked determinedly to build on the site's existing Teleremote capabilities and develop the site's Surface Teleremote Operation; setting a leading and innovative example of beneficial partnerships both internally and between Cannington and contract partners.

At the point of development and implementation, this system was unique to Cannington and not utilised anywhere else in the world. The Surface Teleremote Operation is a custom designed system and a leading example of best practice remote technology in the industry.



Figure 1:
Surface Teleremote
control system



Figure 2:
Cannington worker using system.

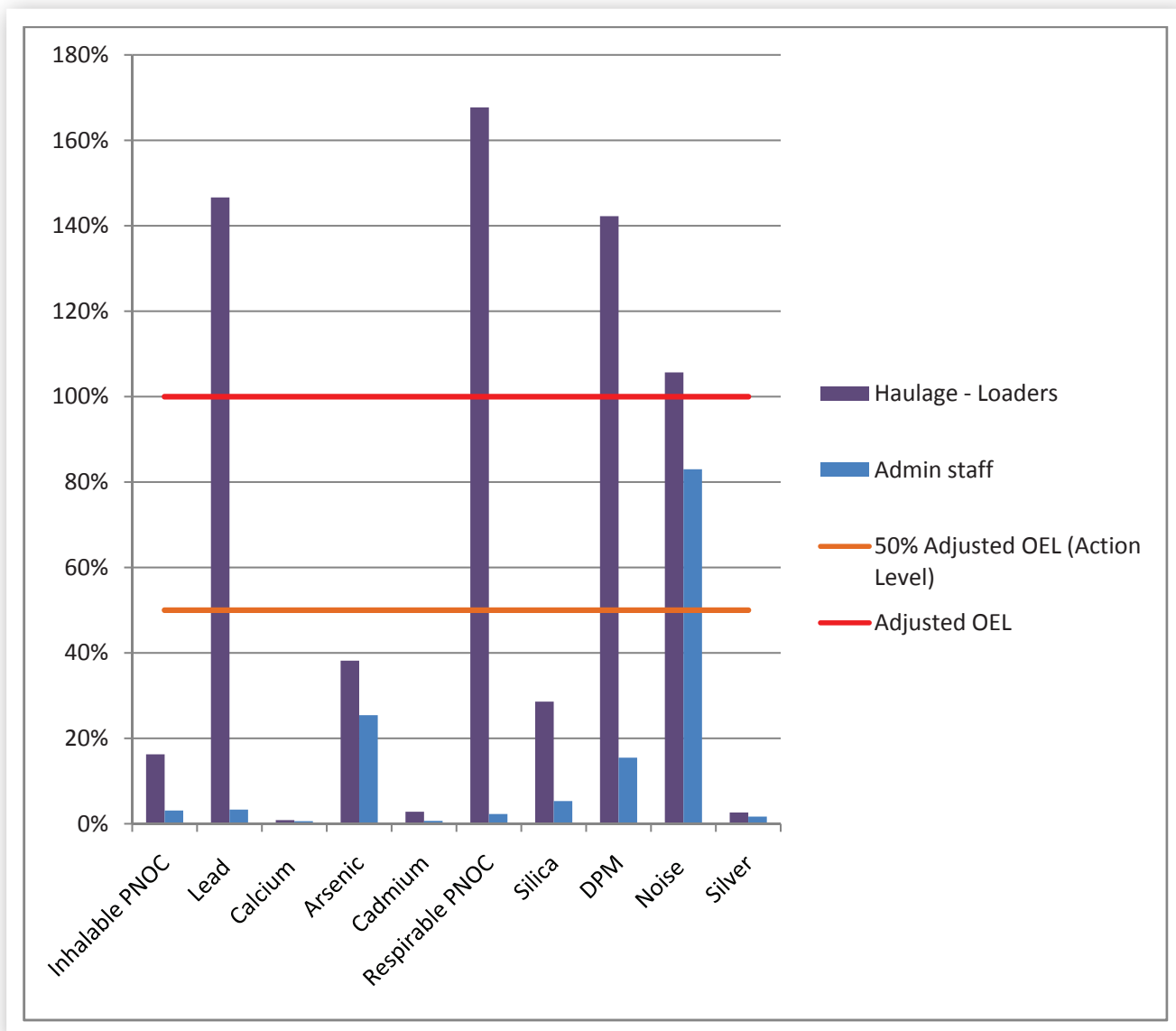


Figure 3:
 Chart outlining occupational exposure results.

Occupational Exposure Results – Comparison of Haulage Loaders to Surface Administration Staff (FY10 Qtr 4)