

Working at the Coal Mine—With RFID

The BHP Billiton Mitsubishi Alliance breaks new ground by using RFID to track and manage miners and their equipment.

By John Edwards

April 14, 2008—Until last year, the [BHP Billiton Mitsubishi Alliance](#) (BMA) coal mine in Norwich Park, located in a desolate section of Queensland, Australia, tracked its miners and gear the old-fashioned way: "It was done manually by our employees," says Shane Hellwege, the supply coordinator in charge of the mine's warehouse operations. The process was both time-consuming and prone to errors—the management equivalent of mining coal with hand shovels. Now, more than 300 miners with RFID chips embedded in their helmets head into the earth each day knowing they, as well as the more than 17,000 pieces of equipment they use, are being tracked and managed by RFID technology.

For BMA, RFID's automatic data capturing and tracking capabilities provide an accurate and efficient method of controlling costs and making sure miners and equipment are available as soon as they are needed. RFID was selected over other competing technologies, Hellwege says, due to its ability to track people and equipment quickly and unobtrusively at a competitive cost. "Quite frankly," he says, "the business case of a successful deployment was compelling."



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First Steps

BMA's managers were fully aware of RFID's power to automate and streamline employee and inventory oversight. The company had its eye on the technology for several years, Hellwege says, watching for developments that would make it practical for use in its remote and hazardous setting. A little more than three years ago, Norwich Park began testing an RFID system, based on 125 MHz tags, to record equipment transactions in its [SAP](#) database. The system used tags provided by [Sokymat Identification](#) (now [Cyntag RFID Systems](#)) and LiveTrack handheld readers from [Syscan International](#).

The simple inventory tracking installation, which provided a Bluetooth connection to the SAP application, impressed the mine's managers, Hellwege says, and built enthusiasm for a full-scale deployment. "It was proven it could be done," he says, "so we took it to the next level."

Taking the mine's RFID deployment to the next stage called for a process review. "We completed a full business scope [on] all of our requirements," Hellwege says. While the pilot proved RFID's ability to capture and transfer data at Norwich Park, the process had rough edges that limited its range and performance in a mining environment, where large numbers of miners need to grab different types of equipment during shift changes and report to their work sites as quickly as possible. "The technology was not where I needed it to be," he says. "We had to wait for it to catch up with our requirements."

In 2006, managers turned to [Sunshine Technologies](#), an Australian RFID system design and integration company (since acquired by Syscan), to create a system that would live up to BMA's expectations. "BMA wanted a system that could track the movement of personnel, inventory and work orders going into and leaving their warehouse," says Scott Austin, managing director of Syscan International Australasia, located in South Brisbane, Queensland.

BMA selected the vendor on the basis of its track record helping a number of businesses—ranging from a livestock shipper to a television production company—create and deploy RFID environments. "They had demonstrated a capability in previous RFID deployments," Hellwege says, "and, at the time, it made sense for BMA to use their capabilities."

Working with BMA and [Computer Sciences Corp.](#) (CSC)—BMA's IT services provider and the company that created the RFID test platform—Syscan developed an RFID system that included tags, interrogators, support equipment and a custom middleware solution, the Suncat Inventory Management System. "The middleware's basic job is to retrieve unique RFID data and then associate it with pre-existing records in the SAP database," Austin says.

To solve the test system's shortcomings, Syscan suggested either switching to Gen 2 ultrahigh-frequency (UHF) technology or revamping the existing design. "We put two alternatives forward," Austin says, "and the UHF solution was selected." Going with UHF provided BMA with a wide range of benefits, including improved coverage and the ability to select from a variety of paper and metal label tags. The technology also enabled BMA to pick from numerous handheld readers, fixed long-range interrogators and other hardware devices. "At that time, the EPC standards were coming into their own," Austin says, "and it made sense for BMA to go with them."

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Tag flexibility was a particularly important design criterion, Hellwege says, noting, "We developed a special process for encoding metal tags based on a printed paper label tag." The process allows the fast and efficient creation of easy-to-apply, stick-to-metal tags for use on motors, pumps and other heavy-duty mining equipment. Miners' helmets are tagged with less expensive, yet highly reliable, paper-based smart labels. The labels are interrogated to associate miners with the tools they have been issued. According to Austin, the design work "took a lot of fine tuning and benchmarking [of] other applications [from] around the world."

Syscan began working on the project in April 2006, and the full system was installed and completed with final software testing in December. The site went live in February 2007.

The real-time system is designed to ensure that Norwich Park's tool inventory is kept accurate and up-to-date, and that employees can quickly locate a specific item in the exact place where it's supposed to be. The system, which tracks both the item and the person who took it, is intended to ensure that expensive equipment doesn't mysteriously

"walk away" from the site, and sounds an alert if an item is removed without prior authorization.

"The specification was fairly tight when it came to developing Suncat [middleware]," Austin says. The middleware automates the equipment issuance process by establishing chain-of-custody records associating SAP-generated work orders with inventory removed from the warehouse. "The software was custom-made to our requirements from the job scope," Hellwege says. "It was developed from scratch, and to the specification upon which all the stakeholders signed off."

Austin believes Syscan's proposal was essentially a textbook lesson on how an RFID solution should be approached. "Really weighing-up the requirements of the application and fitting a product to it," he says, "rather than just approaching every project with the same bag of tricks—which, in RFID, won't work."

Pioneering Effort

BMA deployed the RFID system inside a central warehouse, measuring 40 by 50 meters (131 to 164 feet). Miners enter the facility at the start of their shift to pick up work documents and their equipment. Some 2,500 items are stored in the warehouse, Hellwege says, ranging from handheld tools to motorized machinery. To date, he adds, BMA has used more than 100,000 tags.

The warehouse has two personnel entry points, each about a meter (3.3 feet) wide. There's also a roller door for truck deliveries measuring 3 meters (9.8 feet) wide. RFID portals are installed at all of the entrances, logging entering and departing employees and the items they carry. System hardware consists of four [Alien 9780 Readers](#) and 10 [Zebra R110xi Printers](#), with two used for backup. The system's tags include Zebra Technologies' UHF Gen 2 label tags and [Omni-ID Gen 2](#) metal tags.

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An industrial-grade plasma display screen provides feedback to the miners as they walk out of the facility with their work orders and inventory in hand. "This visual recognition of what they have taken, and against which work order, makes the entire system simple and transparent to all who use it," Austin says.

Skilled labor on mine sites is expensive in Australia, Austin notes, as a soaring global commodities market has sent the nation's resource sector into a boom, and the industry is currently enjoying almost full employment. "So an automated self-regulated honor system made a lot of sense," he says. "RFID could help maintain the openness of the warehouse, yet provide great transparency to the supply management who ensure items are available when required."

The deployment created only a handful of technical and operational glitches. "Probably the biggest issues were faced after the installation and the code was finalized," Austin says. "We did a lot of testing, and the site actually ran in pilot mode for three months before going live. This enabled any bugs to be ironed out, whether they be software- or hardware-related."

Syscan also took pains to ensure the network environment wouldn't be subject to any external or internal interference. "This was overcome by the development of a strong methodology for eliminating potential issues that could cause problems," Austin says. Searching for RF-generating noise sources and isolating key network components became an integral part of the project's mission. "Subsequently," he says, "this methodology became part of the service and maintenance agreement going forward."

In addition, BMA wanted the system to be essentially self-reliant. "It was critical, due to the remoteness of the location, that site technicians would be in a position to pinpoint any issues themselves before calling for assistance," Austin says. Syscan created a virtual private network (VPN) connection to the SAP application supporting over-the-

air diagnostics. "But this has rarely been used in the 13 months of operation," he notes.

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With its new system, Norwich Park is pioneering RFID tracking and management for BMA, which operates mines worldwide. "We are the only site using the RFID system," Hellwege says. "We are the pilot site." BMA plans to use results generated by the Norwich Park deployment for planning similar RFID systems at other company mines.

The development of an RFID system for a mining operation involved exploring uncharted territory. "Everything was custom," Austin says. "The concept belongs to BMA and CSC. They had the vision and the drive to get it to where it is today. We just helped their vision come to reality, which is really what technology is about."

Final Thoughts

With a year of RFID experience behind it, BMA is now beginning to realize some of the technology's benefits. While it's still too early to calculate a definitive return on investment, Hellwege says, the system is already starting to prove its worth by getting miners to their jobs faster, improving database accuracy, and pinpointing lost or stolen equipment.

Austin says the feedback from BMA has been "extremely positive," noting that the system has actually exceeded the company's specifications. "The solution has provided transparency in many areas that weren't even part of the business case," he says. If repair parts are needed urgently, for instance, those parts can now be grabbed out of the warehouse without a work order, yet still automatically recorded in the SAP database.

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Looking back on his experience, Hellwege says most of the standard advice he's heard over the years about planning and deploying an RFID system has turned out to be true. "Set realistic business goals, benefits and key performance indicators," he says. "Complete a good scope of your business requirements, before going out to tender, because if you don't have a good understanding of your needs, you'll waste a lot of money."

What's more, Hellwege considers it important to partner with a good integrator, and to judge that business on the basis of its skill set and track record rather than its size. "Sometimes, bigger is not better," he states. Hellwege warns that companies shouldn't underestimate the effect a powerful new technology such as RFID can have on a business, as new procedures are designed and deployed, and fresh processes replace traditional tasks. "By the introduction of new technology into your business," he says, "there's always going to be some impact."

Besides finding a good partner, Hellwege believes it's crucial for a new adopter to generate internal support. "For your RFID solution to be successful, you'll need the full support of all levels of management," he says. Without a complete buy-in, an enterprise may find internal forces—for personal or petty reasons—conspiring to delay or derail an RFID project.

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Down the road, Hellwege expects RFID to become more capable and useful as technologies mature and businesses gain additional experience using the technology in industrial settings. "[Since] I first started looking into RFID about four years ago, the leap has been very significant," he says. "I'm very excited, because I know that in five years' time, the leap again will be huge."

Hellwege admits he's an RFID enthusiast, and says he believes companies need to begin planning for RFID today, before their competitors beat them to the punch. "Businesses that don't look at this new technology," he states, "will give their opposition the competitive edge."



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