Rio Tinto's drive to the future

With Rio Tinto doubling its fleet of driverless haul trucks at its iron ore operations in the Pilbara, the future is now, *Australian Mining*'s WA correspondent Jamie Wade writes.

Autonomous Haulage System (AHS) technology: if you haven't heard of it – and you work at mine with a fleet of haul trucks – you soon will.

The technology is part of a new paradigm in mining where next-generation technologies aim to reduce costs, increase efficiency and improve health, safety and environmental performance.

Under an ambitious program launched in 2008 and aptly named Mine-of-the-Future, Rio Tinto is advancing a suite of technologies to better explore, exploit and recover deposits in surface and underground operations.

At the heart of the program is mine automation technology and Rio Tinto has been clocking up the kilometres in advancing the AHS technology with driverless haul trucks in the Pilbara. The AHS project has been underway at West Angelas since 2008, operating around the clock for more than two years with the trucks delivering loads supervised by remote operators.

The trucks are programmed to run daily tests to highlight operational issues so maintenance can be conducted early.

Rio Tinto's Head of Innovation John McGagh said the AHS technology had the potential to unlock massive efficiency in surface bulk mining while improving safety.

"Our experience has been positive; vehicle utilization is higher and the safety aspects have been excellent," he said.

In addition new skills and new job types have been developed to support the technology platform.

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Rio Tinto will double its fleet of driverless haul trucks at its iron ore operations in Western Australia and deploy them at Yandicoogina, its largest mine in the Pilbara. Photo Courtesy of Christian Sprogoe Photography.

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The automated haul trucks at West Angelas have moved more than 42 million tonnes of material in approximately 145,000 cycles, travelling more than 450,000km.

"This is more than we had planned for the initial trial," McGagh told *Australian Mining*.

Buoyed by the success of trials at West Angelas, Rio Tinto will double its fleet of driverless haul trucks at its iron ore operations in Western Australia and deploy them at Yandicoogina, its largest mine in the Pilbara.

The existing five Komatsu 930E trucks fitted with Komatsu's 'Frontrunner' AHS system, will be moved from West Angelas to the Yandicoogina mine, where they will combine with five new 930E trucks, and operate the JSE pit.

The trucks are expected to be fully deployed by April 2012.

The trucks will dump ore for the first time, marking a major step in the evolution of the project towards full operational deployment. Previously the trucks only dumped waste product.

"It will be the first operational deployment of this technology in Australia, or anywhere on this scale," McGagh said.

Rio Tinto Iron Ore Pilbara operations manager Greg Lilleyman stated that "this is an exciting step in achieving our Mine of the Future vision, and a critical one in our drive for outstanding safety and production efficiency as we grow our business towards a 333 million tonnes per annum capacity".

The trucks will be used for all haulage requirements in the Junction South East (JSE) pit, moving high grade, low grade and waste material from multiple loading units.

"The trials at West Angelas have demonstrated the value of the autonomous haulage systems and given us a great deal of information about how we can use the system going forward," McGagh said.

"We will be using our learning from West Angelas as we expand the program and use the trucks for all haulage requirements in the JSE pit at the Yandicoogina mine.

"The intention is then to assess this next stage with the aim of looking at the role autonomous haulage can play as we continue to expand our Pilbara operations towards an annual production level of 333 million tonnes per year."

Rio Tinto Iron Ore has now assumed the lead for the deployment of the AHS technology across all of its Australian operations taking captured learning from the trial and embedding them in their operating procedures.

The autonomated haul trucks at West Angelas have moved more than 42Mt of material in approximately 145,000 cycles, travelling more than 450,000km. Photo Courtesy of Christian Sprogoe Photography.

"Rio Tinto innovation continues in a technical support role but, as planned, we have transferred deployment accountability from our central technology division over to production operations," he said.

Rio Tinto innovation is now translating the outcomes of the trial experience and assessing the suitability of the AHS technology in other product groups.

Although positive about the technology, McGagh said there were some limitations.

"Driverless trucks won't work for every mine or for every pit, but can add significant value as part of our expansion," he said.

Rio Tinto is also trialling autonomous drills designed to provide a reliable and repeatable process in blast-hole drilling.

The aim of the integrated system is that automated the drill rigs will precisely position the blast holes, conduct live rock analysis, dictate to the explosives delivery vehicle the correct charge for each hole and provide data supporting three dimensional mapping systems to allow for detailed imaging of each deposit.

"Autonomous technology requires changes in working practices and may require modifications in mine design and layout if one is to achieve maximum productivity and deliver enhanced safety," McGagh explained.

Rio Tinto's Pilbara iron ore mining and infrastructure has been controlled remotely the Operations Centre in Perth for the past 12 months.

The Centre has more than 400 employees overseeing and ensuring the synchronisation of the mine, rail and port systems in the Pilbara region.

However, the AHS and remote operations program is just one aspect of Rio Tinto's iron ore growth in the Pilbara.

The miner recently announced that it is accelerating its expansion program in the region with US$676 million in funding for early works and procurement.

As a result of this, capacity expansion towards Lilleyman's forecast 333 million tonnes will now be reached in the first half of 2015, a full six months earlier than planned, Rio Tinto Australia's head of iron ore, Sam Walsh explained.

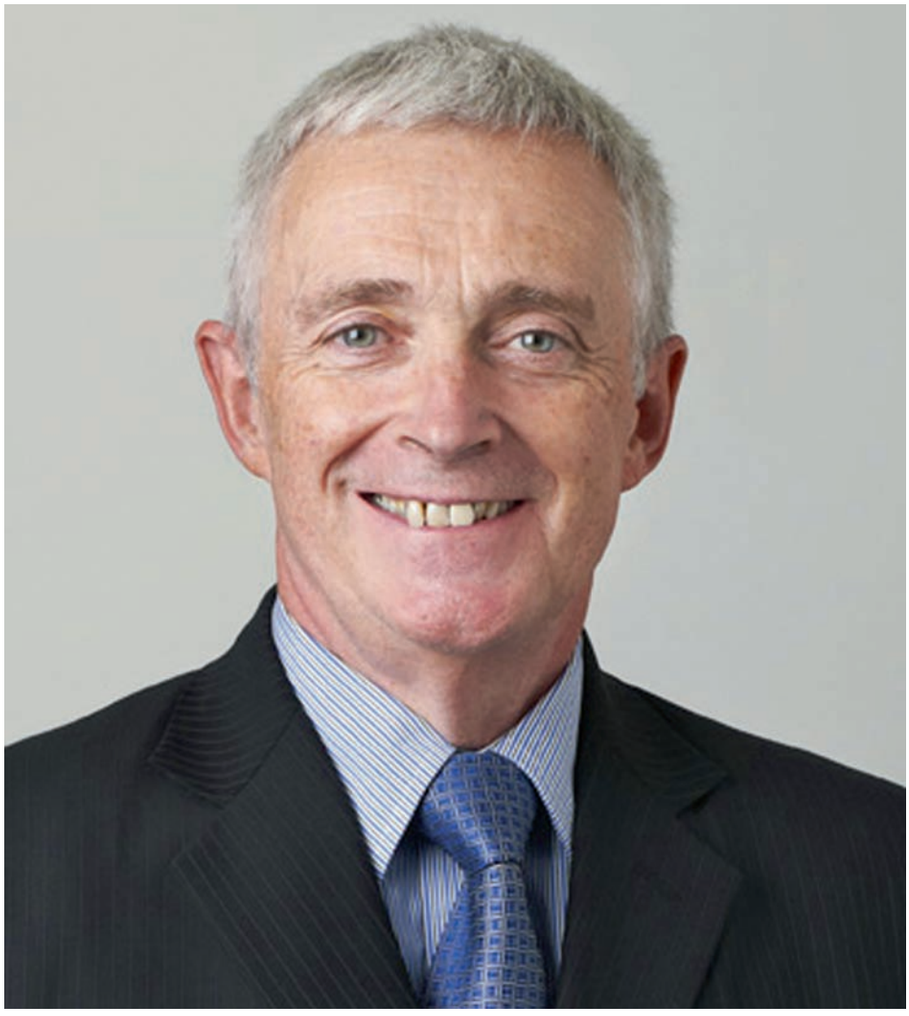
The mines of the future are likely to rely on remote monitoring and control, with employees undertaking tasks from cities thousands of kilometres away. Photo Courtesy of Christian Sprogoe Photography.

The man from OZ

In a career beginning as a metallurgist forty years ago, to the head of OZ Minerals today and its flagship Prominent Hill copper-gold mine near Coober Pedy, Terry Burgess has enjoyed a diverse career and has seen changes in the industry for the better. Jamie Wade reports.

Speaking recently before members and guests of the WA Mining Club, Terry reflected on five key changes he said had defined the industry today: safety, workplace culture, community relationships, technology and the growth of China.

The following is an abridged version of his speech edited by *Australian Mining*'s WA correspondent Jamie Wade.



Terry Burgess has been a part of the Australian mining industry for four decades.

Safety

The mining industry has been a leader in the area of safety and has assisted in safety improvements across many industries. It's likely that innovations and practices developed in the mining industry have been responsible for saving lives across many different workplaces.

For example, mining has supported the high visibility clothing that's seen throughout the community.

Another example is from the medical industry where mining industry practices such as an active reporting culture has often been cited as a valuable learning tool to improve patient safety.

For our industry, safety continues to be our major challenge. In our own company I still feel that we have a long way to go, and safety statistics indicate that there's still work to do, but overall as an industry we really do care about safety.

Workplace culture

The second area which I think has improved significantly in our business is the workplace culture.

The focus has now shifted to include more people in the decision-making.

Another big change in the workplace culture has come from women moving into the industry which has been very positive.

Women have brought new ways of thinking and problem solving to the business which has benefited from it. Women represent about 20 per cent of the OZ Minerals workforce which is above average – especially for a fly-in fly-out operation.

Relationships with communities

When I started in the industry communities were the people you tended to keep away from your operation with fences and guards.

As we all know, companies now require a social licence to operate and the way to get that is to be a wanted guest in the host community.

In 2010 over 20 local businesses were employed at Prominent Hill and we give preferential treatment to purchase goods and services locally wherever feasible.

Our operation has made significant contributions to local and regional economies through payments to suppliers and contractors during 2010 with over $12 million spent locally, $7.5 million spent regionally and approximately $80 million spent within South Australia.

Now 82 per cent of our workforce at Prominent Hill is from South Australia and we spend $30 million on salary in South Australia – not including our contractors – and last year we paid $16 million in State Government royalties.

The other thing that's changed dramatically is our relationship with Indigenous communities.

We're working at Prominent Hill to increase the number of Indigenous employees, which is currently about 60 in total, for OZ Minerals and its contractors.

One of our targets now is to increase the number of Indigenous people we have at the supervisory level.

We have a pre-employment training program which enables local and Indigenous people with no previous mining experience to gain the skills required to get a job at Prominent Hill. This is something we're proud of and we continue to invest in.

The program in short is a 60-day program which includes three weeks of work experience onsite at the Prominent Hill mine and after that if they're successful they will be offered permanent employment at our operations

Since the program was launched in 2006 we've had six groups of trainees including 51 successful graduates that have taken up roles at Prominent Hill.

One of the key success factors in making this work has been to create a culture where the Indigenous people enjoy the work; where their colleagues are understanding and supportive; where there is mentoring by other Indigenous people; and where specific attention is paid to training and to safety.

The success of the program to date has been largely because of the accepting nature of the existing workforce at Prominent Hill who help people who've been long term unemployed and not use to the challenges and responsibilities of working on a mine.

Technology

The other area that I see the major change in is changes of technology and these have been staggering.

At Prominent Hill today we actually have an expert system for the flotation circuit which uses multi-variable speed forward control to reduce disturbances to the plant along with concentrate flow optimisation to maximise the recovery of the metal.

We've also installed some flow force mechanisms to all

OZ Minerals Prominent Hill copper mine is one of Australia's most recognisable operations.

our flotation cells in the rougher circuit, and also some flow boosters which promotes maximum contact between the valuable metals and the reagent which has also added between one and two per cent recovery. Two per cent recovery is significant; this high tech tweaking has delivered extra revenues of about $10 million per year for each per cent gained.

An area that has benefited hugely from the advances in computing power in the last 30 years or so is geophysics.

China

Perhaps the most fundamental change of all to our industry has come from the economic development of China in recent years.

Thirty years ago China was not an important copper importer. Today it's the biggest importer in the world, counting for 40 per cent of consumption and demand in China continues to grow.

In 2011 refined copper demand from China is expected to grow to about six per cent year on year.

China's demand has been due to its rapidly urbanising population which requires heavy investment in copper intensive sectors such as power, infrastructure and construction. The major downstream uses for copper are power generation and transmission, electrical appliances, building construction and vehicle production and these are all required in the country's urbanising populations.

The proportion of urban to rural populations in China is currently 47 to 53 per cent. There has been a big shift that the urbanisation is far from over. By 2015, China will have 106 cities with more than one million people compared with only 35 cities which have more than one million people in Europe today.

About OZ Minerals

OZ minerals is an Australian-based mining company with a focus on copper.
Its primary asset is the Prominent Hill copper gold Mine in northern South Australia.
OZ Minerals recently finalised the purchase of the Carrapateena copper gold project, and an advanced project also in South Australia about 250km south of Olympic Dam.
Prominent Hill is a fly-in fly-out operation with a workforce of about 900 people including contractors.
It is an open cut mine with a new underground mine currently in development.
According to OZ minerals managing director Terry Burgess, Prominent Hill has a plant consistently performing at 20 to 25 per cent above its nameplate capacity.
Guidance production for 2011 is 100,000 to 110,000 tonnes of copper and more than 185,000 ounces of gold.

More than 80% of the Prominent Hill mine's workforce comes from South Australia.

Reaching new heights in safety

Improved contractor management, a unique escape ladderway and a clever solution to working at height have been recognised for creativity and ingenuity. Jamie Wade reports.

Rio Tinto Argyle Diamonds, underground safety solutions provider Safescape and Sinclair Knight Merz (SKM) were just a few of the shining lights at the Chamber of Minerals and Energy of Western Australia's (CME) seventh annual Safety and Health Innovation Awards.

Rio Tinto's Argyle Diamond operation earned recognition for two separate initiatives including improvements to a contractor management system and a program to assess health and wellness.

The mine took honours in the Systems category for improvements to a Contractor Management System (CMS) that saw the contractor All Injury Frequency Rate (AIFR) fall to zero for the first time.

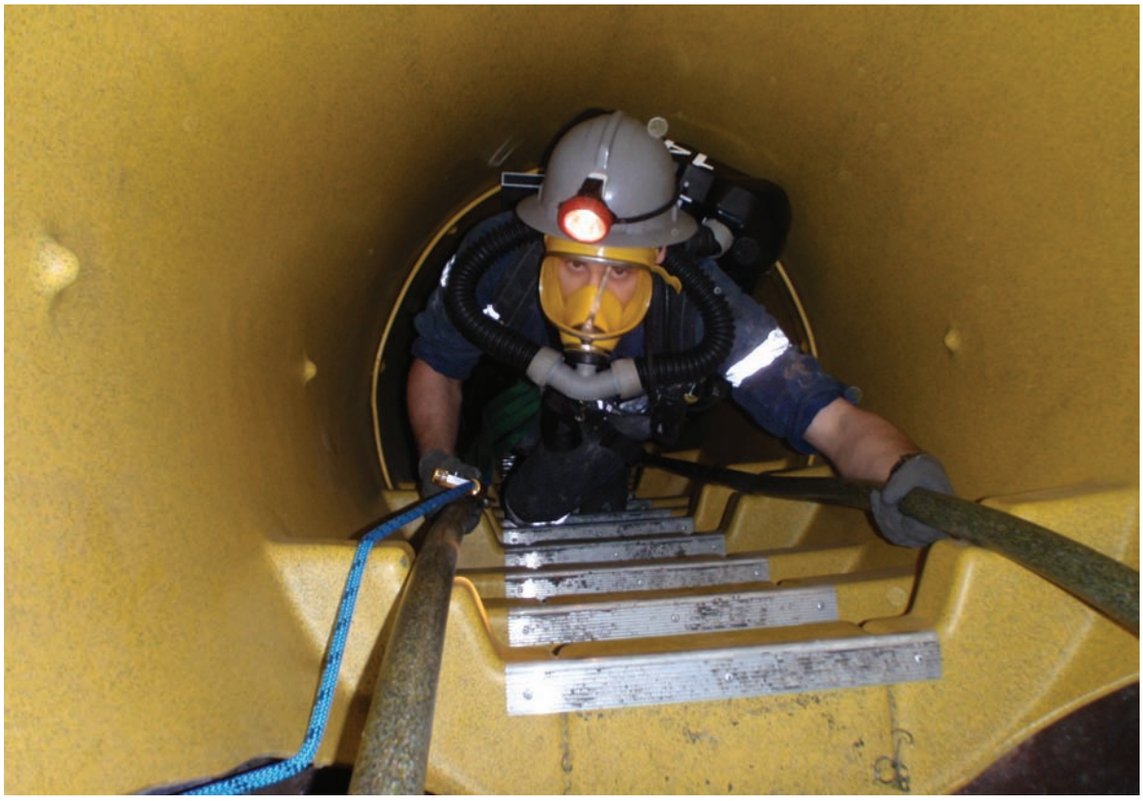
Over 25 years of surface mining operation, Argyle Diamonds' contractor AIFR exceeded that of employees. Worldwide, Rio Tinto has seen significantly higher rates of fatality, serious injury and significant injury cases among contractors than its full time employees.

In response, Argyle Diamonds established a dedicated team to revise and improve the CMS.

Based on the team's findings, in 2009 Argyle Diamonds implemented a range of improvements. These included company representatives for training and audits, quarterly contractor meetings, principal meetings, comprehensive monthly reporting on contract company KPIs, and consolidation of its pre-qualification process.

Contractors were also included in all Health Safety & Environment (HSE) initiatives including wellness assessments, hydration testing and HSE awards.

Argyle Diamonds is setting the challenge to its employee workforce to achieve the same results.



Safety solutions provider Safescape took honours in the Engineering category in the Chamber of Minerals and Energy of Western Australia's (CME) seventh annual Safety and Health Innovation Awards.

Better ladderway

Safety solutions provider Safescape took honours in the Engineering category in the CME's Innovation Awards for a safer and more flexible emergency escape ladderway system for underground operations.

Traditional escape ladderways have been manufactured from wood or galvanised materials with wire cages to provide protection against large rock fall. However, they are exposed to finer materials. In addition, ladders are subject to constant water and often salt exposure, leaving them slippery, scaled and susceptible to corrosion

The Safescape 'Ladder tube' comprises ladder sections that can be joined to provide a straight line of ladderway at any practical length.

Manufactured from resilient plastics, the Ladder tube is lighter than traditional galvanised options, flexible and non-corrosive.

Rest platforms are installed at 6m intervals. A static line has also been included allowing people to attach a harness and rope shunt that locks in the case of a fall.

Although the Ladder tube can be manufactured in any colour, the standard offering is safety yellow, providing an easily visible entry to ladderways. As an enclosed structure, users are protected from falling debris in the event of emergencies that require evacuation.

Ventilation is also made simpler and more cost effective, as a vent curtain can be fitted at the bottom of the ladderway. Being enclosed, the need to install multiple ventilation walls and the risk of lost ventilation is significantly reduced.

Other advantages include less maintenance due to the ladderway being enclosed, no risk from many corrosive materials, and greater ease of installation.

Managing director Steve Durkin developed the Ladder tube while working as an underground mining engineer in Kalgoorlie.

After researching the cost and installation techniques of the various options on the market, he believed that the industry was paying too much for a product which was not optimally designed for underground mining, both in terms of durability and the safety of users.

New heights in safety

SKM took honours in the Engineering category in the CME's Innovation Awards for a collaborative approach to safely and efficiently repairing beams on the Sinter Fines building at Rio Tinto's Cape Lambert facility.

The facility houses surge bins for the storage of fines iron ore.

These bins are fed by a tripper conveyer, which runs on trusses supported by transverse beams across the top of the bins.

During a structural integrity inspection undertaken by SKM engineers, five of these beams were found to be damaged due to corrosion and in need of urgent replacement.

Traditional repair methods of installing compensation plates on the existing beams could only occur during planned shutdown periods to limit the impact on the critical nature of the fines iron ore operations. This was not an option, so contract repairer Monadelphous proposed to insert the beams with the use of a cantilever lifting apparatus through holes cut in the bin walls.

Through a collaborative approach involving SKM, Rio Tinto and Monadelphous, the entire repair process was completed within three weeks. As the bulk of work was conducted from the ground, safety risks were significantly reduced and the work was completed without interruption to the fines operations.