



Rio Tinto driverless train cabin view

Mining industry automation panel

by Peter Diekmeyer

With human and financial capital in short supply these days, companies are increasingly expected to generate better results using fewer resources. For many, increased use of automation seems like a natural fit. To learn more about this trend and to get a feel for where things are and where they are going, *CIM Magazine* spoke with some of the industry's top thinkers.

Automation, brought on by increasingly sophisticated technologies and shifting industry economics, is steadily gaining prominence at many operations. These productivity-enhancing initiatives range from new advances in information technology to remotely operated mining equipment.

Increased efficiency and flexibility

"When looking at automation opportunities within the mining industry, it is crucial to distinguish between the short and the long term," said Greg Baiden, whose credentials certainly put him in a position to know. Baiden is Canadian Research Chair in robotics and mine automation at Laurentian University and is CTO of Penguin Automated Systems Inc. Prior to holding those posts, he worked in Inco's Mines Research Division. In short, he has watched developments in the sector closely for many years.

"Right now with motor vehicle production in a freefall, financing tight and the overall economy slowing, mining companies are hesitant regarding new capital investments," Baiden continued. "But over the medium and longer terms, we are going to see an explosion in the use of devices and machinery that can improve quality and replace human labour."

Charles Jackson, CEO of Quadrem International Ltd., agrees. "Because many minerals and resources are commodities that have determinant prices that are established daily by global exchanges, the more efficiently you extract and move them to market, the more profitable your company will be," said Jackson. "Furthermore, over the longer term, demand is projected to grow so quickly that innovation on an advanced level will be needed to help meet it"

Jackson has a point. As a ravenous world marketplace consumes the output of more accessible ore bodies, miners will need to look for resources in increasingly inaccessible places. The trouble, explained Baiden, is that you can't easily send people to a lot of those places.

"One example is the bottom of the Creighton nickel mine in Sudbury," said Baiden. "The mine extends almost 8,500 feet [2,591 metres] underground. Down there, the temperature is extremely hot, maybe 140 degrees

Fahrenheit [60 degrees Celsius] and the humidity level is close to 100 per cent. When conditions get that rough, the temptations to find automated solutions, in which personnel can operate equipment from remote locations, are quite high.”

Of course, such challenges pale when compared with those on the horizon. Among the more promising ore bodies that companies will eventually want to develop, many are located in even deeper mines and others lie under the ocean floor, a huge, undeveloped area thought to contain massive potential. “Don’t forget that 71 per cent of our planet is basically unexplored,” said Baiden. “There is one company [Nautilus] that is thinking about mining copper and gold a few miles under the ocean. But to do that, you have to automate.”

Automation and labour accessibility challenges

One big argument for the increased use of automation, according to John McGagh, head of innovation at Rio Tinto,



Photo courtesy of Penguin Automated Systems Inc.

Virtual machine operation environment to allow multiple real time tele-robotic machine control

is that it helps deal with a recurring industry challenge: labour accessibility. Given recent rising unemployment in both Canada and the United States this may seem unusual, but many commodity extraction players report having a hard time finding the right people at the right price, with the correct skill sets to fill certain posts.

“The increased urbanization of a good chunk of the world’s population, particularly in the developing world, has been driving demand growth for our three products: copper, iron ore and aluminium,” said McGagh.

The biggest labour deficit is projected to be in the trades and semi-skilled workers categories: a shortfall similarly faced in Canada and elsewhere on the globe. So Rio Tinto will have to compete hard for those workers.

“It is hard to attract and keep the right people,” admitted McGagh.

“That’s particularly true in the highly technical functions, a problem that is expected to worsen when the economy starts to pick up again. In normal circumstances, when good jobs are available in the city,

COMMITTED TO YOUR SUCCESS.



At Kal Tire we are committed to exceeding your expectations in the tire supply and service industry. From haulage and medium OTR tires to transport and light truck tires and our partnership with you the customer is all about helping you succeed.

A true service partnership.

www.kaltire.com

KAL TIRE

True Service.

people increasingly don't want to work for extended periods in the bush, or in other remote areas where many mines are located."

However, McGagh is adamant about one thing: though mining sector automation does compensate somewhat for tough labour accessibility, that is not its main benefit. "You cannot justify this just from a manpower standpoint," he insisted. "You have to look at all of the combined benefits, such as quality of output, lower waste, higher levels of machine operability, lower levels of maintenance and the fact that machines run 24/7,

before you can do an effective cost-benefit assessment of automation investments."

Boosting mine safety through increased automation

Christopher Curfman, president of Caterpillar Global Mining, has a slightly different take on the situation. While conceding that automation has a great future, he is a fervent advocate of speeding the process by starting right now. Worker safety is one of his primary concerns. "It is our customers' number one priority," said Curfman. "As a result, safety is also the number one priority of our autonomy program."

In fact, according to Curfman, automation often solves labour accessibility and safety concerns simultaneously. "The more that our customers are able to implement automation solutions, the more the safety performance of mine sites will be enhanced," explained Curfman. "Not only will we be reducing the number of humans operating machinery, but those who will be engaged in the operations will be working from much safer environments."

As part of his overall responsibilities, Curfman oversees the worldwide engineering and development of large mining trucks, tractors, underground loaders and trucks, and other mining equipment. In this capacity, he has increasingly been seeing the writing on the wall: if extraction companies are going to automate, they are going to need new or upgraded equipment.

"Caterpillar is striving to be a leader in automation at mine sites," said the seasoned executive. "We are currently in the middle of our largest ever research and development program on autonomous trucks, dozers, drills and underground machinery, and are collaborating with key customers around the world on both surface and underground autonomy projects."

While worker safety is Caterpillar's primary concern when addressing automation issues, increased efficiency and productivity are also major factors. "All autonomous machines will operate precisely as they were designed and will not be subject to inappropriate manoeuvres such as over-speed, operating against warnings, overloads and so on," explained Curfman. "This will drive lower operat-

North American Construction Group
 North American Construction Group is the premier provider of mining, heavy construction, industrial, piling and pipeline services in Canada.

WE'RE MORE THAN JUST BIG EQUIPMENT.
 The difference is in our unique talent and knowledge, combined with an unmatched history of over 50 years as an industry leader.

WE BUILD

MOA
 LISTED
 NYSE

NCA
 LISTED
 TSX

MINING & HEAVY CONSTRUCTION
 INDUSTRIAL - PILING - PIPELINE

WWW.NACG.CA
 1-888-862-8182



Photo courtesy of Caterpillar

The C175 engine is the result of a huge research and development program by Caterpillar, and it will be the power plant for most of the large mining equipment.

ing costs and reduced costs per tonne, as well as increase the life expectancy of machinery.”

Furthermore, machines don't take coffee breaks. “An additional expectation of autonomy is greater machine availability,” admitted Curfman. “Autonomous machines will be operating without the inefficiencies and interruptions associated with human operators.”

Still, Curfman combines his sense of immediacy regarding automation with a decidedly longer-term view. “Without question, 2009 will be tighter,” he said. “However, research and development, innovation and automation are at the top of our list at Caterpillar Global Mining. Our new electric drive truck models, upgraded mechanical trucks, automation programs, the new C175 engine family and the research and development to support these initiatives are still in place and progressing along our projected timelines.”

Rio Tinto's mine of the future

One of the most innovative automation initiatives underway is Rio Tinto's “mine of the future,” which was announced by the company's CEO, Tom Albanese, early last year. The move, which will help alleviate some of the company's worker availability challenges, is a bid to maintain what it describes as “its position as Australia's leading iron ore producer.”


Several building blocks for Rio Tinto's automated mine-to-port iron ore operations have been commissioned and will be phased in as they become ready. For example, mine operations at the Pilbara site will be controlled from a new Remote

Operations Centre (ROC) servicing Rio Tinto Iron Ore Operations 1,300 kilometres away in Perth. Many of the components for the mine of the future have now been assembled in the test mine, called A Pit, which lies within the West Angeles mine located in the Pilbara. Autonomous truck and drill commissioning of A Pit commenced in December 2008 with full capability expected to be reached in the first half of 2009, with ROC support coming later in the year.

According to McGagh, when Rio Tinto Iron Ore ROC is completed, it will house at least 320 employees who will work hand-in-hand with their Pilbara-based colleagues, to oversee, operate and optimize the use of key assets and processes, including all mines, processing plants, the rail network, ports and power plants.

Operational planning and scheduling functions are also slated to be based in Perth.

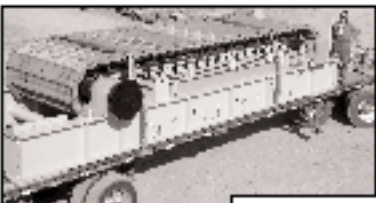

Still, according to McGagh, the Pilbara/Perth operations represent only the tip of the iceberg as far as innovation at Rio Tinto is concerned. “Many of the world's best ore bodies are maturing and fewer Tier 1 surface deposits are being discovered,” explained McGagh. “As a result, we will almost certainly see continued migration from surface to underground operations. This, combined with the fact that many of the new developments will encompass lower grade minerals that need to be hauled





INDUSTRIAL EQUIPMENT MANUFACTURING LTD.

With over 40 years of engineering and manufacturing experience, IEM offers a complete range of bulk materials handling equipment for mining.

Apron Feeders - Belt Conveyors - Bulk Feeders - High Lift Conveyors

ISO 9001:2000 Certified

**15/11 Projects: PT (The Westport, Indonesia) - Philip Dodge, Suffolk and
Mozambique - David, Pradeo Viljo - Brazil, Mongolia**

107-11422 94th Avenue, Surrey, BC V4E 4G8, Canada

Telephone: 604-573-9928 Fax: 604-573-9929 conveyors@iem.ca www.iem.ca



Photo courtesy of Rio Tinto

Lineup of autonomous trucks at Rio Tinto's A Pit test mine at the Pilbara site in Australia.

longer distances, at a time when carbon constraints will deepen, means that the demand for increased productivity will be almost relentless."

Automation within the office

According to Jackson, surprising efficiencies for companies in the mining industries can be generated through automating their supply management processes. One obvious solution: "replacing manual paper-driven processes

with automated paperless ones is simply smart business," said Jackson.

Jackson should know. His company, Quadrem, operates a transaction delivery network that includes more than 55,000 suppliers and 1,100 buyers, among them many mining and metals sector players such as BHP Billiton, Alcoa and Rio Tinto. According to Jackson, companies that join its eMarketplace benefit from an enhanced database and tools that allow mining sector professionals to source items and suppliers more efficiently. Even better – they get paid faster because their paperwork is processed faster.

On the transaction side, increased automation means fewer errors and increased accuracy. Furthermore, processing times tend to be shorter.

"As mining companies look towards the increased productivity demands of the future, they will need to increase the accuracy and speed of information exchange all through their supply chains," said Jackson. "The combination of precision coordinates between processes, functions and companies create an environment that can produce more tonnage, with less resource requirements."

A solid future

As you might expect from someone charged with looking into the future, given the rapid technology advances of recent years, Baiden is optimistic. The professor/entrepreneur is currently working on a mandate with the Canadian Space Agency that involves planning how one would construct and operate a lunar mining facility remotely from a location here on earth.

That's good news for Baiden, because among his pet projects at Penguin Automated Systems, are the communications systems that his company sells, which enable remote operators to exchange information with off-site machinery. "If you think it's hard to find people willing to go to northern Canada to do mining work, just imagine how hard it would be to find volunteers to go work on the moon," said Baiden with a laugh. "Seriously though, automation is the future. Better get ready for it." **CIM**

IT TAKES GUTS.

Labels in diagram: FLEXIBLE SHIELD, POLYURETHANE, TRIPLE LAYER WITH SHIELD, PATENTED POLYURETHANE ROLLER COVER, OFFERED SHIELD FOR 300000-500000 HOURS, DRIVE SHAFT, 4000 DUMP TRUCK ROLLER SHIELD.

LUFF

INCREASE YOUR CONVEYOR PERFORMANCE

Luff Industries Ltd. produces the most durable line of conveyor products available on the market today.

EXIBIT 2013

SME AGG CIM

IDLERS • PULLEYS • IMPACT RIDS • ACCESSORIES

28501 0 Whangle Road SE (W.D. of R.V.) Calgary, Alberta, Canada T1X 0K3
TOLL-FREE 1-888-340-LUFF (5333) | www.luffindustries.com