

THE AUSTRALIAN MINING REVIEW

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NEW CENTURY
AIMS FOR TOP
TEN LISTING

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EXCAVATOR IS
LEGO'S BIGGEST
REPLICA MODEL

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THE PIONEERS
OF HEAT-SEEKING
TECHNOLOGY

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Comprehensive condition monitoring
with Schaeffler Australia p82

THE AGONY AND THE IRONY

Members of various climate change and anti-mining groups have been slammed for disrupting proceedings at the three-day International Mining and Resources Conference in Melbourne, an event which attracted more than 7000 delegates from around the globe. Ironically, here a protestor uses a mobile phone, probably unaware that the components of the device are made from rare earths mined from the ground.

FULL IMARC REPORTS
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Image: Adam Calaitzis.

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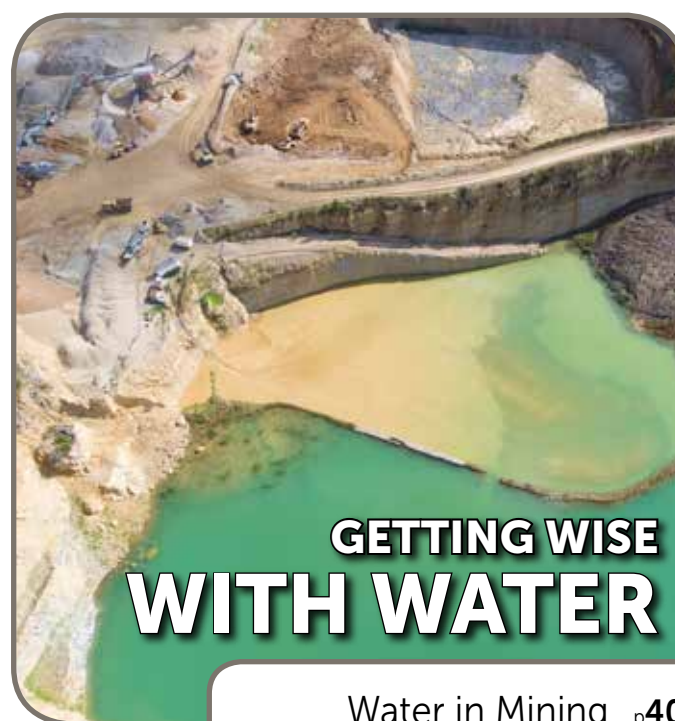
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GETTING WISE
WITH WATER

Water in Mining p40

DANAKALI CEO
NIELS WAGE

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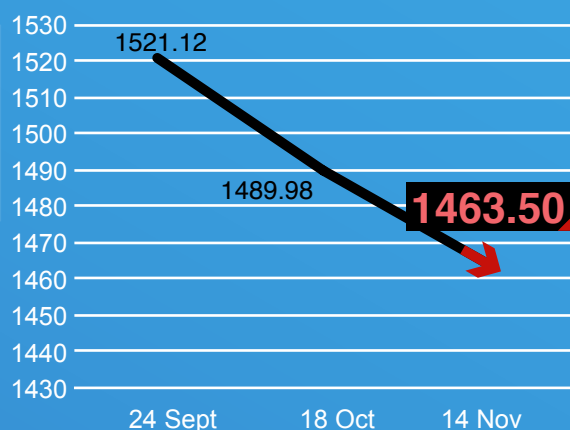
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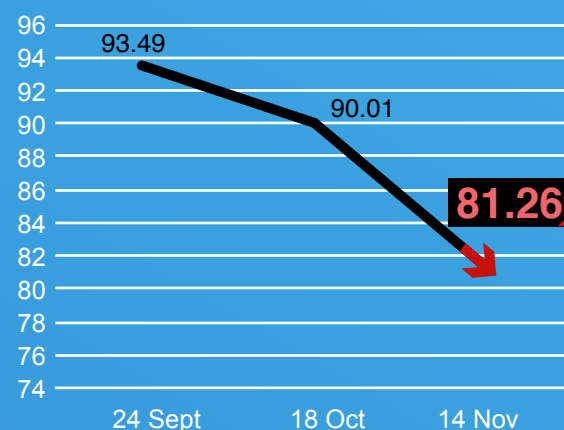
Gold prices have declined again but remain strong amid global tensions.



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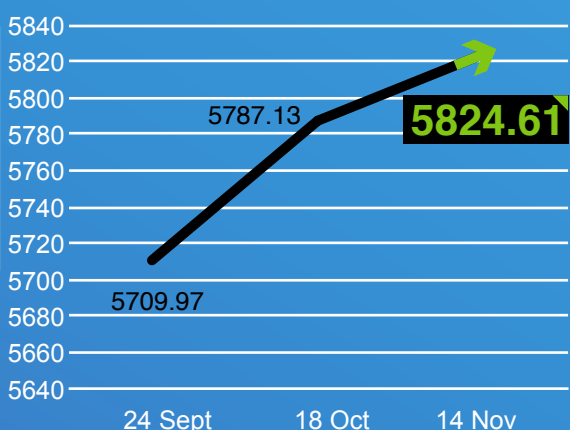
With the iron ore supply squeeze all but alleviated, and China's tepid steel-making demand over winter, iron ore prices continued to fall.



COPPER

\$US/t
LME Price

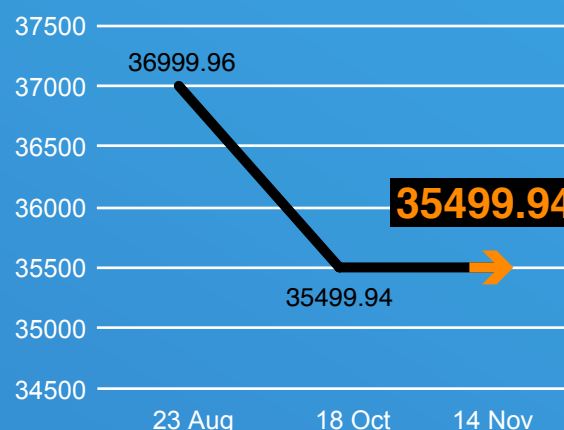
Copper has continued to rally as growing anticipation around the EV market sparks interest.



COBALT

\$US/t
LME Price

Cobalt prices have levelled out since Glencore closed the Mutanda mine in the DRC and is expected to stall as restocking of inventories completes.



ALUMINIUM

\$US/t
LME Price

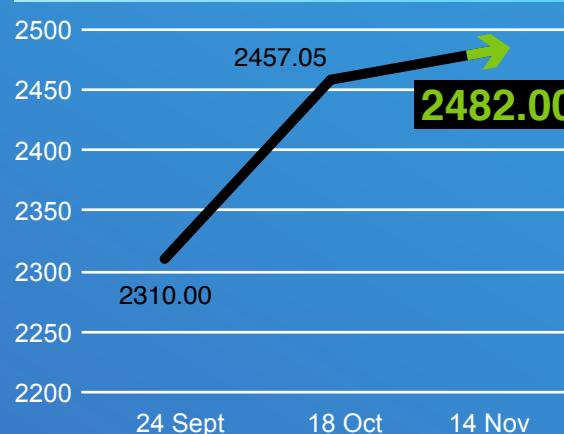
Aluminium prices bounced back this month as global production slows down while stockpiles are being depleted.



ZINC

\$US/t
LME Price

Prices rose this month with trade war rumours China would restrict the metal supply in retaliation against US tariffs.



LEAD

\$US/t
LME Price

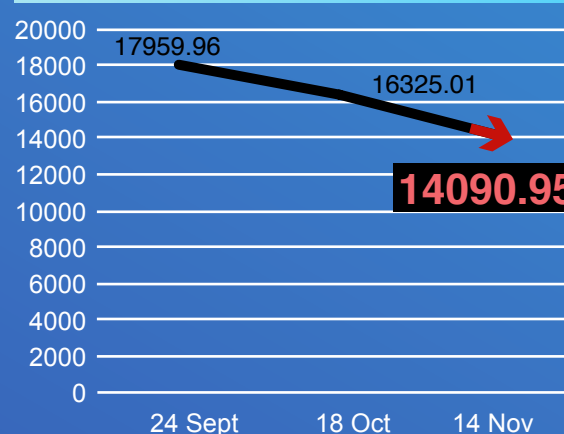
The lead price dipped this month, with declining Chinese use and declining production meaning that existing stockpiles have been adequately meeting supply deficits.



NICKEL

\$US/t
LME Price

Prices have plateaued but remain strong as the Philippines suspended four mining operations which, along with Indonesia's looming ban, has fuelled fresh supply concerns.



A man wearing a blue cap, a high-visibility orange and yellow vest over a black shirt, and dark trousers is smiling while operating a high-pressure pump. He is holding a blue high-pressure spray gun. The pump is a silver-colored machine with a black fuel tank, a red fire extinguisher mounted on the side, and a stainless steel frame. The pump has 'Aussie Pumps' written on its side and a sticker with the Australian flag and the text 'Aussie Pumps WE'RE FOR AUSTRALIA'. The background shows a corrugated metal wall and some greenery.

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IN BRIEF



Mike Henry.

Henry to head mining giant

NATIONAL

MIKE Henry will replace Andrew Mackenzie as chief executive of BHP on January 1, 2020.

Mr Henry joined BHP in 2003 to work on a range of marketing roles, and in trading a range of mineral and petroleum commodities while based in The Hague.

He brings more than 30 years experience, and has been on BHP's executive leadership team since 2011.

He was appointed to his current role as president operational minerals Australia in 2016, covering iron ore, coal, copper and nickel assets.

Mr Henry delivered major projects such as South Flank iron ore in the Pilbara, implemented BHP's first full-scale autonomous haulage system at Jimblebar, and has overseen the turnaround of the Nickel West business which BHP took off the market this year.

China vital for Pilbara

WA

SECURING continued investment from China is vital to future projects in the Pilbara region, according to the Australia China Business Council.

Speaking at a Pilbara Summit in Perth, ACBC WA investment committee chair and iron ore research director Philip Kirchlechner acknowledged global trade tensions but said the onus is on the mining industry to explain to Australians why trade with China is so important to our economy.

"There are so many nationalistic tendencies around the world – we need to re-engage our stakeholders," he said.

With China contributing billions to the Pilbara economy, Mr Kirchlechner said better relationships need to be made to secure ongoing investment.

"Foreign investment in our mining industry actually makes our trade, and the industry, more sustainable," he said.

"Australia has very strong legal protections, and if you're a Chinese investor in Australia your money is safe – unlike other countries.

"It's really important to keep policy stability – that's our key selling point."

Green light for Samarco



Image: BHP.

Reconstruction efforts at the mine in January 2017.

RAY CHAN BRAZIL

BHP has approved \$63.9 million as its share of funding for the restart of the Samarco iron ore venture in Brazil.

The money will enable the construction of a filtration plant over the next 12 months, which will improve safety by using dry stacking technology to dispose of minings waste, replacing the previous tailings dam-based system.

The joint venture between Vale SA and BHP Group was given approval to resume operations at the Germano iron ore plant, four years after a fatal dam collapse there.

It is understood that 10 of the 12 members of Minas Gerais state environmental council, known as Copam,

voted in favour of an operational corrective licence for the mine.

Samarco has had its operations halted since the 2015 Fundão waste dam collapse that killed 19 people and resulted in flooding across more than 600km in one of the worst environmental disasters in the country's mining history.

The mining dam failure had affected the downstream Santarem dam, causing a "significant release" of mine tailings to flood the nearby community of Bento Rodrigues and surrounds.

The owners have been working to get all permissions to restart, with the aim of reaching 8mt of production in the second half of 2020 and full capacity of about 26mt of pellet production by around 2030.

As soon as Samarco's business plan is approved by its owners, the company

is expected to resume paused talks with creditors.

The JV has \$2.9b in defaulted debt, and restructuring talks were put on hold in January when Vale suffered an even worse disaster at a mine in Brumadinho, also in the state of Minas Gerais.

The mine, which once produced nearly 25mt of iron ore a year, will restart at an annual rate of less than a third of that, with a potential increase to 14-16mt within another six years.

The Samarco joint venture signed a deal with state and local authorities in March 2016 to create a foundation to oversee the clean-up after the disaster.

It has spent more than \$1.5b so far but some victims have complained about the slow pace of rebuilding efforts.

Climate protest violence slammed

RAY CHAN NATIONAL

ORGANISERS of the International Mining and Resources Conference have condemned protest violence outside the conference venue.

More than 7000 delegates from about 100 countries attended the three-day event in Melbourne in late October, and were greeted by climate change activists aiming to shut down the event.

From 6am on the first day, members of 11 different groups began blocking entry to the conference amid a heavy police presence.

Clashes erupted between police and the protesters who held up signs calling for mining to be "shut down" as they tried to push back the police line.

An IMARC spokesman said while the right of people to protest peacefully and lawfully was supported, the level of violence that occurred could not be condoned.

"Safety of our delegates and attendees will always be our first priority," he said.

"We feel for the thousands of people in Melbourne who have been caught up in the protests.

"We also want to extend our appreciation to the delegates, some of whom were exposed to unnecessary anti-social behaviour and taunts as they entered the building.



Protestors taunted conference delegates as they entered the building.

"Our delegates have responded with respect, professionalism and restraint, under particularly trying circumstances.

"We thank them for upholding the integrity of the mining industry."

The organisers also said there was a misconception that as an industry, mining did not operate with sustainable principles in mind.

"Mining was vital for the production of electricity, solar panels, electric car batteries, pacemakers and medical apparatus and public transport," they said.

"This year the conference will consider the importance of battery minerals, used

in the emerging electric car market, and the growing importance of ethical investment for resource companies."

Deputy Prime Minister Michael McCormack described the protests as "disgraceful, absolutely disgraceful".

Victoria Police made a number of arrests, with Acting Commander Tim Tully saying that the majority of protest offences related to failing to obey police direction or intentionally obstructing an emergency service worker.

Two people were arrested in relation to cruelty to animals after they allegedly struck a police horse.

• IMARC reports: pages 10-14

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Vanadium plan for Mid West

RAY CHAN

WA

AUSTRALIAN Vanadium has signed an option agreement over a potential site near Geraldton for its proposed vanadium processing plant.

AVL's pre-feasibility study included a series of trade-off studies, one of which highlighted the potential to locate the facility closer to existing gas infrastructure.

In total, 11 alternate locations were considered, including coastal WA and locations between Meekatharra and Geraldton.

The final site selection process narrowed the preferred location to land which is inland from Geraldton and west of Mullewa, to take full advantage of the available workforce, industry support and existing road, rail, water and gas infrastructure.

AVL has started a detailed engineering study for the processing plant relocation, which will define the associated costs related to the move.

Trade-offs between operating expenses, logistics and transport costs, plant capex and associated infrastructure costs will inform AVL's final decision to relocate.

Managing director Vincent Algar said locating the processing plant near Geraldton, rather than at the minesite, presented a number of opportunities for AVL and local communities.



A 3D model of the processing plant.

"Our goal is to safeguard the business through all vanadium price cycles, by achieving lowest quartile costs of production," he said. "Moving the processing plant component could be an important step to achieve that."

"We have already started to engage with local stakeholders in the Geraldton region and we are finding great enthusiasm for the processing plant project and the jobs it will bring to this important strategic regional centre. Support from all levels of government has been very encouraging."

The company will now analyse the selected option in more detail, including working with the local community, completing technical and commercial reviews and commencing the environmental and regulatory approval processes, to allow a final decision about

the best location for the processing plant to be made.

The relocation of the processing plant would also reduce AVL's capital and operating expenditure for gas supply for the Project, as it would be unnecessary to build a new gas pipeline from the nearest existing infrastructure – either the Mid-West Gas Pipeline in Mount Magnet or from the Dampier- Bunbury Natural Gas Pipeline – to the minesite location.

Without the need for large volumes of natural gas for the roast component of processing, the electrical energy requirement onsite can be provided by reliable hybrid power systems, which will include a significant component of renewable energy, combined with trucked natural gas or diesel.

Energy storage as part of the hybrid power system is highly suited to the use of a megawatt-scale vanadium redox flow battery.

Relocating the processing plant would also significantly reduce the minesite water requirement by about one third of total water used.

Other benefits to relocating the processing plant include a camp not being required at the Geraldton location due to workers living at home; reduced construction costs; and cheaper transportation costs for reagents.

An open pit mining operation and concentrator with associated workforce will be required on-site at Meekatharra, irrespective of the location of the processing plant.

Gold ticket at Myhree

RAY CHAN

WA

BLACK Cat Syndicate's Myhree deposit near Kalgoorlie has uncovered a large gold interval grading 1130g/t.

The find was 0.5m and within a broader intercept of 1.7m grading 335.96g/t gold.

Infill drilling is underway at the deposit to update the resource and provide further information on the geological, geotechnical and metallurgical characteristics of the mineralisation.

Other assays received to-date included 1.7m at 335.96g/t from 52.2m, 7m at 9.84g/t gold from 59.5m, 4.74m at 5.99g/t gold 166.3m, and 3.04m at 3.07g/t gold from 140.6m.

Part of the Bulong gold project, the Myhree and Trump deposits are undergoing open pit feasibility studies by Black Cat, due for completion in the June 2020 quarter with extensional RC drilling kicking off in the current period.

The project covers 128sqkm of tenements about 25km east of Kalgoorlie, and has access to infrastructure, regional mills, support services and a nearby workforce to draw from.

Black Cat managing director Gareth Solly said the first diamond holes into Myhree show the deposit's "outstanding potential".

"We are also about to commence reverse circulation drilling to test the Myhree Southern Offset," he said

"Confirmation of the offset will have important implications for the current feasibility study."

Rio eyes the iron prize



Image: Rio Tinto.

A reclaimer in the Pilbara.

GERARD MCARTNEY

WA

RIO Tinto looks set to take top spot as 2019's largest iron ore exporter.

Its Q3 results show that, after bouncing back from the June blow-out which saw the company lower its iron ore guidance for the second time in the year, the miner shipped 86.1mt of iron ore, up 5pc on Q3 2018, with 87.3mt coming from its Pilbara operations – 6pc higher than Q3 2018, and 10pc higher

than Q2 2019 as the company bounced back from Q2.

The company has not changed its iron ore guidance, indicating it would ship between 320-330mt in Q4, and said that its unit cost guidance remained between \$14-\$15/t.

Rio has traditionally lagged behind Brazil's Vale as the second largest iron ore producer, but in the wake of the Brumadinho disaster, Vale said it would resume about mid-point guidance of about 307-332mt, leaving Rio to take first place.

This comes somewhat ironically as the company will record its first downgraded iron ore exports for the first time in more than two decades.

Rio's alumina and bauxite operations have not performed as strongly in Q3, as maintenance issues and high energy costs hit output.

The company has lowered its bauxite production to 54mt from 56-59mt, and alumina to 7.7mt from 8.1-8.4mt.

Rio said it was mainly due to maintenance activities at its Australian refineries.



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Consistent regulatory framework

RAY CHAN
WA

IF they weren't already aware, IMARC attendees were reminded that WA remains a mining and energy powerhouse.

WA Department of Mines, Industry Regulation and Safety director general David Smith said a clear and consistent regulatory framework has helped provide the industry with the certainty required to make investment decisions.

"A transparent approvals process accounts for the environment, health and safety and other land users, is critical for ensuring sustainable development," he said.

"WA's regulatory framework has transitioned from prescriptive regulation towards objective-based and risk-based regulation."

Mr Smith while there was talk the mining boom in WA has passed, "the picture we have is that the mining sector is alive and well".

He said the facts and figures inspired confidence.

Mr Smith said WA also had the world's first code of practice for safe autonomous mining.

"We have launched Australia's first code of practice to help promote mentally healthy workplaces for FIFO workers and completed world-class research projects on diesel emissions safety in underground mining," he said.

Land released for exploration

RAY CHAN
VICTORIA

MINING companies that can demonstrate a commitment to engaging with traditional owners and boosting local jobs will be favoured in a major release of ground-for-gold exploration by the Victorian Government.

Resources Minister Jaclyn Symes made the announcement at the opening of the three-day International Mining and Resources Conference in Melbourne, which drew thousands of delegates from across the globe.

The North Central Victorian Goldfields Ground Release will be open to a competitive international tender, with strong interest expected thanks to the success of Kirkland Lake Gold's Fosterville Mine, which is set to produce four times as much high-grade gold this year as it did in 2016.

For the first time, engagement with traditional owners will be part of the evaluation process and selection criteria for prospective companies, so indigenous communities can assess the miners' ability to develop relationships with traditional owners and work with consideration of cultural heritage.

Victoria's wealth was built on gold and the state continues to punch above its weight, with growth in minerals exploration spending over recent years outpacing other states and increasing year on year, bringing benefit to a range of regional businesses and jobs for country Victorians.

"Gold helped build Victoria's wealth and the industry remains integral to creating regional jobs," Ms Symes said.



Victorian Resources Minister Jaclyn Symes speaking at IMARC.

"The North Central ground release will be a huge boost for this sector – attracting companies who are determined to work closely with regional communities and the traditional owners of the land they will explore."

Geoscience Victoria, the state's mapping agency, estimates that only half the gold that may exist in Victoria has been found over the past 169 years, putting the state in prime position for a second gold rush.

Victoria is Australia's largest exporter of mining equipment, technology and services and Victorian METS companies are at IMARC connecting to the global industry, thanks to the Labor

Government's support of the event.

Dja Dja Wurrung Clans Aboriginal Corporation group CEO Rodney Carter said the mining industry and its investors now understood the value of social licence.

"We support the government's commitment to deliver industry best practice for the benefit of all Victorians," he said.

Now in its sixth year, IMARC brings together over decision-makers, mining leaders, policy makers, investors, commodity buyers, technical experts, innovators and educators from more than 100 countries for learning, deal-making and unparalleled networking.

China woes challenging, but short-term

RAY CHAN
VICTORIA

AUSTRALIAN mining faces short-term challenges caused by China's slowing economic growth and rising trade protectionism, IMARC delegates were told.

Office of the Chief Scientist Manager of Resource Economics David Thurtell said current market conditions were challenging and were expected to remain so in the short term, but there was no need to be overly pessimistic.

Critical and battery commodities, hydrogen and gas were bright spots and Australia was positioned to take advantage of growing demand for battery commodities, he said.

In his address on challenges and opportunities for Australian mining, he said while commodity demand from China will slow down, it would do so from a very large base, and remain a major source of import demand for years to come.

"Growth from China is expected to plateau or decline moderately over the medium term, rather than fall sharply," he said.

"Urbanisation and industrialisation in emerging economies will be the next source of growth in commodity consumption.

"While they are unlikely to replicate the scale of growth in consumption from China, there is a large potential for them to contribute to a large increase in commodity demand.



Part of the Sandvik display at IMARC.

"The key risk is the pace and scale of China's slowing economic growth, and the extent to which this will be offset by growth in developing countries which have their own financial risks from growing private debt."

Mr Thurtell said that in absolute terms, urbanisation in China would remain significant in the next year or so,

but the rate of growth was set to slow noticeably.

Between 2015 and 2020, the urban population was estimated to have grown by almost 20 million a year, and in the five years following, was projected to grow by 16 million per year.

The slowing rate of urbanisation in China underpinned the projected

slowdown in commodities demand growth.

But growth in Indian and South East Asian urban populations would drive demand for resource and energy commodities.

"As urban populations grow, materials and energy are needed to develop/expand and power cities," Mr Thurtell said.

Africa had the potential to play a major role in resource and energy commodity consumption in the long term.

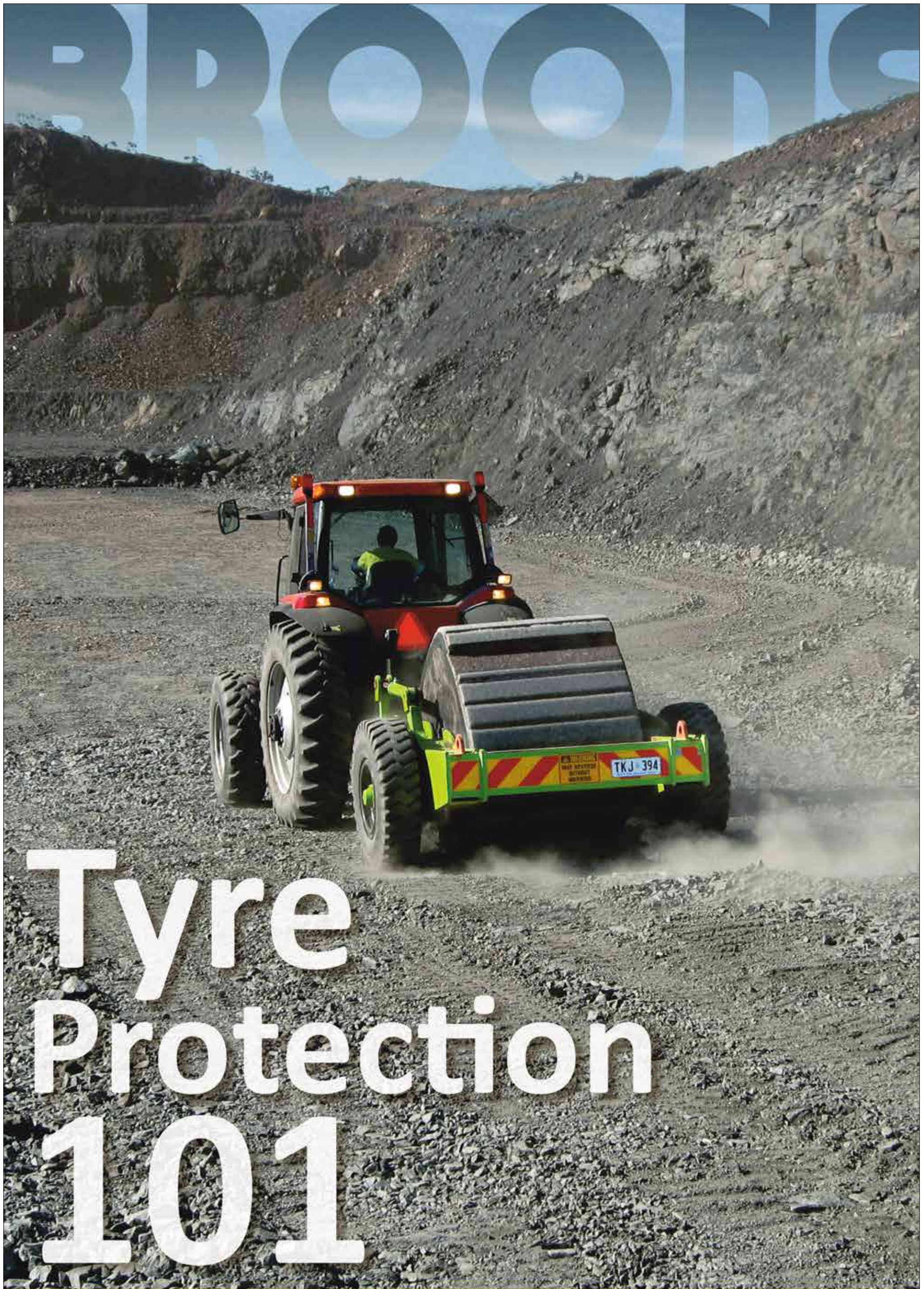
"Rising trade protectionism is a major concern for the world economy and Australia," Mr Thurtell said.

"Changing government policies in a carbon and pollution constrained world will also affect demand for energy commodities.

"Overall, there are both opportunities and challenges for the mining sector in Australia. The country has vast mineral wealth and sits on the doorstep of a rapidly growing Asia.

"Australian producers have generally adapted well to challenging market conditions in the past. The investment boom has translated into a substantial increase in Australia's productive capacity, particularly for iron ore and LNG."

Mr Thurtell said the long-term growth of Australian commodity earnings depended largely on developing Asia and on shifts towards the new commodity uses: LNG, battery commodities, and other emerging opportunities.



Tyre Protection 101

Sustainability and safety at the core

RAY CHAN
VICTORIA

OPERATIONAL outcomes are driven by safety and sustainability, according to Newcrest chief development officer Michael Nossal.

In a keynote address to IMARC, he told delegates they only had to “look at the conference program or stop and talk to some of the people demonstrating outside to understand how the sustainability message is really affecting everything we do”.

“It is more and more common that each new project is undergoing higher and higher levels of scrutiny,” Mr Nossal said.

“What that means is that it is more challenging to get a new project up and in particular we have to think about time frames.

“People talk about a licence to operate; we like to think that if we get this right, we have a licence to grow.

“We have to walk into new communities, sit with new governments and set out how we operate and basically pass that test every time we look at moving into a new country.

“But we actually have to deliver on these promises from the very beginning. We have all probably, in this room, been associated with projects that have gone wrong from that first interaction; the first time a geologist walks over a piece of ground.”

Mr Nossal said he believed Newcrest had made significant strides in the past few years, and in particular about being more explicit on the gold miner’s commitments.

“From a business point of view, it is straightforward; if we get this right, we will



Newcrest's Michael Nossal speaking at IMARC.

have the licence to grow,” he said.

Mr Nossal said the company was also proud of its achievements around safety.

The goal was to be achieve zero fatalities and be an industry leader for total recordable injuries frequency rate by the end calendar year 2020.

“There has been significant progress in our lagging indicators, however in safety

I like to say we are only as good as our last five minutes,” Mr Nossal said. “It’s a continual struggle and you never give up on something.”

In August the company announced sustainability commitments, include greenhouse gas emissions targets for the first time, pricing carbon emissions into its investment decisions, a catchment-based approach to water management and a

commitment to no net loss of biodiversity values for new projects.

“In addition, as part of our commitment to a sustainable gold mining industry we are proud to assist in the development of and to support the World Gold Council’s recently launched Responsible Gold Mining Principles,” Mr Nossal said.

“These are an overarching framework that sets out clear expectations from consumers, investors and the downstream gold supply chain to what constitutes responsible gold mining.”

Mr Nossal said the company’s asset mix – Cadia Valley, NSW; Telfer, WA; Lihir, PNG; Gosowong, Indonesia; Red Chris, Canada; and Golpu, PNG – gave it several attributes that made Newcrest unique.

“Cadia and Lihir have two of the largest operating gold reserves base in our pier group. This large gold endowment...enables us to be patient and gives us time to make decisions that are aligned to our focus on cash generation and shareholder value,” he said.

“We don’t believe that reserve size or gold production for the sake of it is a proxy for value creation. Instead, we are about safely generating the most cash we can from our existing asset base and sensibly growing our business profitably with a focus on that value creation.

“Being low cost is a key part of that. Our industry is cyclical. It is quite good now but being low cost gives as the best chance of generating cash throughout the cycle.

“Technology and innovation is at the heart of who we are as a company. We will see a lot more technological breakthroughs in the industry and we hope Newcrest is a key part of that.”

People are the priority

RAY CHAN
NATIONAL

FEDERAL Resources Minister Matt Canavan has reinforced Australia’s commitment to global carbon emission reduction and the role Australia’s resource sector plays in working towards meeting UN targets.

And he said there was a broader reason why those who truly want action on climate change should support the development of Australian resources.

“Other countries are not going to prioritise reducing carbon emissions before providing nutrition or housing to their people,” he said.

“If we truly want all countries to reduce emissions we must work towards making all countries rich enough to afford to do so first.

“If we restrict the use of Australian coal and gas that will make it harder for other countries to grow and develop. That will defer the time at which other countries will take emissions reductions seriously.

“That means to get more action on climate change we need to increase people’s incomes.

“The development of our resources is part of the way to do that. We have a moral, economic and environmental duty to responsibly develop our resources to help deliver better outcomes for all people in the world.”

Good ethics key to success

RAY CHAN
VICTORIA

ETHICAL sourcing, meeting climate change goals and creating a diverse and inclusive workforce is not only right, it’s good for shareholders and good for business.

According to BHP’s Group Procurement Officer, Sundeep Singh, prioritising these principles across the company’s entire supply chain was critical for the mining giant’s business operations.

The company set itself a goal in 2016 to be gender-balanced by 2025.

Three years ago, women made up 17.6pc of its workforce. Today, that number has climbed to 24.5pc.

Mr Singh says BHP is working hard with like-minded employment agencies to meet their targets and the shift is paying substantial dividends.

Data collected by BHP shows that more inclusive and diverse teams outperform other teams on safety, productivity and culture. Highlighted this is an injury rate that’s down up to 67pc, 11pc better adherence to schedule and unplanned absence down up to 28pc.

On the issue of climate change, Mr Singh talked up the company’s progress, highlighting the company’s world-first tender earlier this year for LNG-powered vessels for its maritime transport operations as it works towards a goal of net-zero operational emissions by 2050.



BHP's Group Procurement Officer Sundeep Singh.

“If shipping were a country it would be the sixth-largest emitter of CO2 in the world, with more emissions than Germany or Canada,” said Mr Singh.

When it comes to ethical sourcing, Mr Singh said that BHP is continually reviewing and assessing its supply chain, applying the framework established through its own Human Rights Centre of Excellence and Global Contract Management System.

“No-one wants to work with unethical suppliers. Having high-risk partners is ultimately expensive for everyone and represents significant exposures. Human Rights violations are the furthest anyone could possibly be from shared value,” he said.

“Through the system, we know that 96pc of our direct suppliers are concentrated in 10 countries.”

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China knowledge lacking

RAY CHAN
WA

AUSTRALIA'S miners are lacking in "China intelligence", according to Global Mining Association of China (GMAC) chairman Peter Arkell.

In a presentation at IMARC, he said the Australian economy depended on both China and mining.

"Australia supplies 30pc of China's ore and metal import requirements, far outweighing the contribution from other resource nations including Brazil, Chile, Peru and South Africa," he said.

"China was mostly self-sufficient in minerals up until the early 2000s, and

it too has a rich endowment of iron ore, manganese, zinc, rare earths and more."

Mr Arkell said what happened thereafter could only be described as an "infrastructure boom," and the demand for resources skyrocketed.

While miners across the world were busy selling their wares to China, others took a different approach – with more than 400 exploration projects taking off in the early 2000s.

ASX-listed Sino Gold sold three of its Chinese operating mines for more than US\$1b, and TSX-listed Continental Minerals sold its undeveloped Tibet copper project for US\$432m.

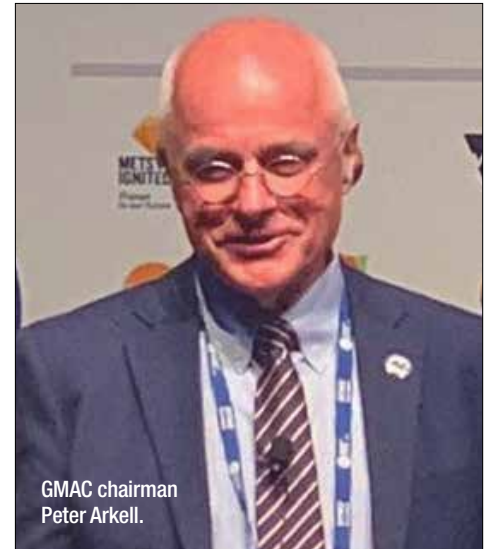
While international mining projects in China have tailed off, Mr Arkell sees no

signs of an economic slowdown.

Urbanisation in China continues at a rapid pace, benefiting not only minerals companies in Australia, but also in China with many domestic companies ranked in the top 50 largest miners list, including China Shenhua (number four ahead of Brazil's Vale), China Moly (11) and Tianqi Lithium (33).

While miners in Australia are some of the best in the world, Mr Arkell believes that they are deficient in what he calls CQ or Chinese Intelligence.

"If you look at the boards of companies in Australia, they are sadly lacking in CQ. We would like to see companies far more knowledgeable of what is happening in China," Mr Arkell said.



GMAC chairman
Peter Arkell.



GlassTerra chief customer
officer Sophia Li.

Monitoring of tailings facilities

RAY CHAN
MELBOURNE

QUEENSLAND-BASED GlassTerra impressed visitors to its IMARC stand, where its range of monitors and sensors.

GlassTerra installed its Internet of Things (IoT) and Light Detection and Ranging (LiDAR) sensors at Mount Morgan, an abandoned mine managed by the Queensland Government's Department of Natural Resources, Mines and Energy, to demonstrate the safety benefits of real-time tailings embankments monitoring.

The initiative is a collaboration with a global satellite connectivity company and showcases integrated technology using GlassTerra's geospatial platform, together with global satellite connectivity to achieve highly reliable real-time monitoring of tailings embankments.

GlassTerra chief customer officer, Sophia Li, said that the combined solution demonstrated the ability to conduct real-time monitoring of unplanned movements of earth and other parameters, on embankments such as tailings facilities.

"Real-time monitoring of embankments enables prompt reporting, investigation and mitigation of any changes, which can enhance safety, improve the protection of our environment and advance the social performance of the mining industry," Ms Li said.

It can potentially be applied to the 3500 tailings storage facilities in the global mining sector.

GlassTerra also announced the technology will be applied to real-time tailings embankments monitoring in Africa.

Wilkes the latest Legend

RAY CHAN
MELBOURNE

OCEANAGOLD president and CEO Michael Wilkes proved himself to be a legend at IMARC's Gala Dinner.

Mr Wilkes received the prestigious Mines and Money Legend in Mining Award, presented annually to individuals who have made notable contributions to the resources sector, and joins industry luminaries such as Andrew Forrest, Robert Champion de Crespigny, Jake Klein and last year's winner Bill Beament in receiving the prized legend jacket.

Mr Wilkes is a mining engineer with 35 years of broad international experience, predominantly in precious and base metals across Asia and Australia, and has been in his OceanaGold Corporation role since 2011.

While at the helm of the Melbourne-based company, Mr Wilkes has successfully opened operations in the Philippines and penned strategic deals in New Zealand, South Carolina, Nevada and Argentina.

The night featured some star power with Wimbledon winner and tennis legend Pat Cash headlining.

The coveted METS Ignited Collaboration Award went to ProcessIQ and Perseus Mining, recognised for their successful collaboration in the Australian METS and mining industry.



Michael Wilkes shows off the jacket after being presented it by Resources Minister Matt Canavan.

The award celebrates collaborative partnerships between METS companies and mining firms who demonstrate a commitment to approaching industry or business opportunities collectively.

ProcessIQ, a metallurgy and process engineering business, partnered with two other Australian METS companies – Orway Mineral Consultants and Mintek – to implement sensing, data acquisition and expert input improving grinding circuit operations for Perseus Mining, operators of the Edikan Gold Mine in

Ghana.

Together they implemented a cloud-based data collection and transmission platform, that enables the relevant data to be delivered to Australian offices and then processed using real-time data analytics.

This world-first solution guarantees remote mine sites are operating at their most productive levels, and since implementation has significantly increased material distribution onsite.

\$6m boost for new investments

RAY CHAN
NSW

EXPLORERS have been encouraged to search new areas of the state for both traditional and high-tech metal deposits, thanks to \$6m in grants from the NSW Government to attract new investment into regional NSW.

Deputy Premier and Resources Minister John Barilaro said the third funding round

of the New Frontiers Cooperative Drilling program will reimburse successful applicants for up to 50pc of their per metre drilling costs up to a maximum of \$200,000.

Mr Barilaro announced a \$2m funding boost at IMARC, on top of \$4m allocated under two previous rounds of the program.

"We've already seen the benefits from previous rounds of this fund, with the first Cooperative Drilling hole in a project near Broken Hill striking high-grade platinum group metals and leading to a \$5m joint venture investment," Mr Barilaro said.

"Our goal is to make NSW the number one state for new mineral exploration and resources investment across the nation, and we're doing that by providing greater support for explorers and investors, and providing greater certainty for the mining sector."

The NSW Government has just completed the largest-ever aerial electromagnetic

(AEM) survey by area in NSW history, with researchers looking for clues for new copper, gold and zinc deposits, and groundwater, over more than 19,000sqkm in the Greater Cobar region.

"A vast array of metals are used worldwide to manufacture high-tech products such as smartphones, satellite components and pacemakers, as well as renewable energy technologies including wind turbines and the batteries in hybrid and electric cars," Mr Barilaro said.

"Global demand for metals is growing strongly and we want to ensure that the people of NSW, especially the NSW Central West, have every chance to capitalise on that demand, with the exploration for new mineral deposits and groundwater sources generating jobs, attracting investment and bringing economic and social benefits to local communities."



Deepcore CEO Don MacDonald greeted visitors to the company's IMARC display

The sound of silence

RAY CHAN
VICTORIA

A BENDIGO-BASED firm has developed an innovative way of reducing the visual and acoustic impact of drilling operations within rural communities.

Developed by Deepcore Drilling, the Deepcore Acoustic Shed dramatically reduces the noise emitted from a drill rig during exploration activity by up to 20pc.

The shed is flat-packed, easily transported and assembled quickly in both rural and urban areas - even on sloping terrain.

The shed can be installed and fully functional in less than day, with minimal impact to the local environment.

Over the past 12 months, Deepcore Drilling has dramatically expanded its operations along Australia's east coast, with the shed dampening the sounds of rigs in rural Victoria.

Engineering shortfall concern

RAY CHAN
VICTORIA

MONASH University Dean of Engineering Professor Elizabeth Croft has issued a rallying call to the mining industry to push the Federal Government for more engineering places at universities – describing the shortage as a matter of national economic security.

Professor Croft told the conference that there was a shortfall of 6100 engineers a year.

“Mining companies are screaming out for engineering talent and they can’t find it,” she said.

“They are recruiting all around the world and they are competing with other nations for talent those nations want to keep at home.

“The thing I worry about is that with all of these opportunities, more and more as a country we are going to have to outsource the work to foreign engineering companies.

“Instead of having our engineering companies and our kids being able to take the opportunity to do those jobs, we are going to have people from all over the world eating our lunch.

“It’s a matter of national economic security to increase the number of engineers that are being domestically produced.”

Professor Croft said that over the past 10 to 15 years, the number of women entering universities had increased, but universities had failed to lure those students into engineering.



Professor Elizabeth Croft.

“We did not do a good enough job of explaining the value proposition and the opportunities to women to study engineering,” she said.

Then, in 2017, the Federal Government capped the funding for engineering students at universities nationally.

Monash, the highest ranked engineering faculty in Australia, was turning away prospective engineering students, who were taking their second and third options.

“We are at risk with international engineers coming over and the number of places declining for domestic students, so we have hit a perfect storm where we can’t produce any more domestic engineers because the Government has capped funding for domestic places; we are at risk of not having enough people coming from overseas and the growth in the opportunities is exponential,” Professor Croft said.

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Liam Twigger.

Retail investors come to party

NATIONAL

NEW analysis shows that nickel's price surge over 2019 has favoured the 'big end of town' of Australia's major producers, with junior explorers caught in the crossfire.

Chairing the opening session of the Paydirt Nickel Conference in Perth, PCF Capital principal Liam Twigger said that finally, after years of forecasting a recovery in the nickel market, the metal had outperformed every other commodity over the past 12 months.

"The nickel price is up 75pc so far this year on the back of increasing demand from strong electric vehicle (EV) growth and a bigger than expected kick in stainless steel production," Mr Twigger said.

"Nickel stockpiles at London Metals Exchange warehouses are falling, with the market further tightened with Indonesia's September announcement that it will start the ban on nickel ore exports on January 1, 2020, two years earlier than expected.

"This move will take about 350,000t of nickel off global supply markets."

These factors, however, had not led to uniformity in share price gains of listed nickel entities.

"The prices of nickel producers are up 37pc - but nickel explorers on average are down 11pc," Mr Twigger said.

"So the majority of gains over the past 12 months has been at the bigger end of the market.

"Junior nickel players have been caught in the rush from retail investors into ETFs and the global push to keep interest rates down, not to mention the impact on industrial growth from the trade war."



Black Swan mine is expected to be back in operation within nine months.

Black Swan to spread wings

RAY CHAN
WA

A FINAL investment decision can be expected in the current quarter on the proposed \$30m restart of Black Swan nickel mine, located northeast of Kalgoorlie in WA.

The updated timeframe was announced last month at the Paydirt 2019 Australian Nickel Conference in Perth by Black Swan's 100pc owner, Poseidon Nickel, which also owns the shuttered Lake Johnston and Windarra regional nickel mining operations, giving it a combined resource portfolio of 395,530 contained nickel tonnes.

Poseidon's interim chief executive officer David Riekie told delegates the company's near-term value driver lay in the restart of Black Swan's nickel mining operations.

"We are currently undertaking a range of pre-restart safety activities and are eying an intended processing capability at restart of 1.1mtpa over three to four years," he said.

"Our modelling shows we can be in



Poseidon's interim chief executive officer David Riekie.

production at Black Swan within six to nine months from Final Investment Decision (FID).

"We are working towards that decision and expect to be in a position this quarter to consider a restart.

"Considerations include pending updates to Black Swan's July 2018 pre-feasibility study and other contingent factors such as the prevailing nickel price."

Poseidon is currently spending \$2.9m on time-critical precursor works ahead of the FID, which includes mine escape ladderway rehabilitation, plant accessway and pit dewatering.

Mr Riekie said the restart metrics included the ability for Black Swan to deliver around 7500tpa of nickel concentrate, an AISC not exceeding US\$5.10, and positive results from the current PFS update work.

The project also includes additional exploration upside of its tenement areas.

"Strategically, Black Swan's restart campaign will be a catalyst for cashflow and operating opportunities for Poseidon," Mr Riekie said.

"This is before we seek to maximise the other two assets - Lake Johnston which has compelling exploration targets and processing potential and the significant underlying resource base at Windarra."

Potential shines at Goongarrie

RAY CHAN
WA

THE developer of one of Australia's richest nickel-cobalt ore bodies - the Goongarrie project north of Kalgoorlie - has adopted a conservative staged development under a strategy to evolve a long mining life over multiple mines within the tenements.

Goongarrie is part of the broader Kalgoorlie Nickel Cobalt Project (KNCP), which itself is the largest and only Australian nickel project of any type among the world's top 10 (by contained metal).

The base case mine start-up CAPEX of US\$588m could stretch to US\$918m if 100pc owner, Ardea Resources Limited, elects to adopt the outcomes of an expansion study which concluded



Ardea's board of directors visit the Goongarrie Nickel Cobalt Project.

the project could manage a 2.25mtpa 25-year mine life compared to the initial 1.5mtpa base case over 10 years.

Addressing the Paydirt Nickel

Conference, Ardea chief executive officer Andrew Penkethman said strategic partner interest in the project was high.

"This is partly being driven by rising concerns and urgency to lock down secure and long-term ethical supply of battery-grade nickel and cobalt - and Goongarrie delivers on those credentials," Mr Penkethman said.

"The full 100pc of the project's potential offtake is currently available and attracting the early market interest.

"Both the KNP and Goongarrie are world-class and the largest in Australia and the more recent studies are pointing to the potential for multiple processing hubs and multi-decade mine life.

"Strategically, Goongarrie is a low

technical risk project for the growing battery markets. For the potential partners looking over the numbers, they are buoyed by the fact the expanded mining case of 2.25mtpa is based on only 26pc of Goongarrie's resource, so there is considerable upside.

"Goongarrie offers an ethical, secure, long-life source of nickel and cobalt and that is what equity markets and social pressures are demanding.

"There is no shortage of graphite and lithium but nickel supplies are most critical with global reserves declining."

Ardea is currently completing definitive feasibility studies on Goongarrie which hosts 1.5mt of contained nickel and 130,700t of contained cobalt.

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TURNING THE CORNER

With certainty returning to the mining industry in Tasmania, the state's Resources Minister Guy Barnett spoke with the *Australian Mining Review* about the importance of mining to the Tasmanian economy, the state of the industry, his government's response to Green demands to ban coal mining, government action toward greenfield exploration in the island state, and the restart of the Hellyer gold mine in Beaconsfield.

Grange Resources' historic Savage River magnetite mine.

Image: Tasmanian Minerals and Energy Council.

GERARD MCARTNEY

AFTER uncertainty in recent years, Tasmania's mining industry is seeing something of a renaissance with new mines opening, an aggressive Mining for the Future policy that would make illegal protesting an indictable offence, and greenfields exploration seeking out the next big find.

The industry has the backing of the Hodgman Liberal Government, which is promising to provide stability and certainty, and to assist miners moving forward.

Mr Barnett said that the Liberal Government was determined that there would be no more land-lockups, likening the current movement to the anti-forestry movement.

"More than half of Tasmania is already in reserves," he said.

"And yet the Greens call for more."

The resources industry employs about 5600 people in Tasmania, many of them from regional areas, and exported about \$2.1b in FY19, making up more than half of Tasmania's exports.

Mr Barnett said that mining contributes about \$35m to the treasury each through royalties.

"And the flow on effects are significant," he said.

"Rail and port services are utilised by the industry to transport the products.

"The need for stable and affordable energy provides the manufacturers with a significant advantage over the mainland states, and with the added benefit of our green renewable hydro and wind energy resources the attraction of our State for manufacturing and mineral processing is becoming more and more relevant.

"The industry helps to strengthen regional Tasmanian communities with valuable employment opportunities and skills and training programs, as well as hundreds of small businesses which benefit from the broader supply chain."

The Green challenge and greenfields

On October 16, the Tasmanian Greens called for a prohibition on new thermal

coal mines in Tasmania.

MP for Franklin, Rosalie Woodruff, said that the government's announcement of a \$50,000 enticement toward Midlands Energy had brought together a "breathtaking collaboration" of opposition to coal mining in the state.

"It has tapped into a depth of concern about what is happening in the global climate, a recognition of the urgent need for action and a real eye-watering sort of outrage, I suppose, at the ludicrous prospect of handing out thermal coalmining leases in this time, in this place," she said.

"None of us in this room can say that we no longer understand that emissions from mining and burning thermal coal will add to the already dangerous level of global heating that is occurring."

The Liberal Government pulled no punches when it came to Green intervention in mining.

In its Mining for the Future policy, it states that "the Liberals believe that the best way to stop unlawful market attacks by Green groups is not to appease them; it's to toughen the law to deter them".

The policy aims to make protesting in a way that impedes access to a workplace an indictable offence with on-the-spot fines of up to \$10,000 for individuals, and up to \$100,000 for corporations that incite or encourage illegal behaviour.

Mr Barnett echoed this sentiment, calling the Greens' demands a stunt.

"It was the Greens again ignoring the facts, scaremongering and wanting to ban any of our job creating industries, first forestry now mining," he said.

"Coal mining is an important industry in Tasmania, and currently supports the production and export of over one million tonnes of cement by Cement Australia from its Railton cement manufacturing site.

"Coal has been continuously mined in Tasmania's Fingal Valley since 1886."

And on supporting new greenfield development, the government appears to be putting its money where its mouth is.

The Mining for the Future policy has put forth three initiatives that support the industry, and exploration in the state.

Firstly, it is pouring \$1.4m over four years

into a geoscience program that would provide new data and ideas to underpin and de-risk the next generation of mineral exploration activities.

Secondly, the Mining Sector Innovation Initiative will invest \$1m over four years to address environmental, geoscience and natural hazard issues.

Thirdly, the Exploration Drilling Grant Initiative (EDGI) will invest \$2m over four years, which is aimed at encouraging drilling of greenfields targets that could lead to new discoveries.

To date, 21 successful applicants have been awarded grants.

If the designated projects are completed as planned, the grants totalling \$960,000 will have contributed to 10.5km of drilling, and the total exploration investment would be about \$2.9m with co-funding, assaying, mobilisation and de-mobilisation, and site rehab.

Tin and new projects

Tin mining has been a stalwart of the Tasmanian economy since the discovery of Mt Bischoff in 1871 by James Philosopher Smith.

There are a number of tin projects ready to go: Venture Minerals' has called its Mt Lindsay project one of the biggest undeveloped tin deposits in the world, with a current JORC resource of 13mt at 0.7pc Sn equivalent, while also identifying a tungsten mineralisation.

Stellar Resources' Heemskirk tin project is a high-grade resource across three deposits around Zeehan near Tasmania's west coast.

The combined mineral resource is estimated at 6.35mt at 1.13pc Sn, and a further open-pit deposit is located nearby at St Dizer.

Mr Barnett said that although tin had been consistently declining since the beginning of the year, at \$24,000/t the price was robust.

"Tasmania has some of the world's best unexplored tin resources," he said.

"Tin remains an important commodity for the development of electronics, including electric cars, and technology going into the future.

"I see a great deal of investment upside and potential in Tasmania for the discovery and utilisation of our abundant tin resources."

Aside from tin, there are other new mines coming on board in Tasmania, including the re-start of the Mt Lyell copper mine, the commencement of operations at the Rogetta iron ore mine, Venture Minerals starting production at the Riley iron ore mine, and Dundas Mining's announcement of its intention to resume mining at the Avebury nickel mine.

The Bluestone Mines Joint Venture is moving towards a major investment in the recovery of tin and copper tailings at the Renison tin mine via the Rentails project.

The company intends to recover minerals from tailings storages that have accumulated over more than 100 years.

And Grange Resources has recently announced a 45pc increase in resources, and are developing an exploration decline at its Savage River magnetite mine as part of a feasibility study into taking mining underground.

Hellyer

In January, NQ Minerals commissioned its processing plant at its flagship Hellyer gold mine.

In May, the company reached the milestone of the first bulk shipment of precious metal pyrite concentrate which had a higher than forecast grade for both gold and silver.

Throughout 2019, the mine has consistently improved on production with Q3 increasing metallurgical recoveries from 36.5pc to 45.35pc in the lead circuit, and from 33.7pc to 42pc in the zinc circuit, these recoveries comparing with life of mine projections of 47pc for lead and 38pc for zinc.

Mr Barnett said that the company was doing a fantastic job of extracting minerals from the tailings facility at the Hellyer site.

"This project demonstrates the level of returns that can be generated from waste products, and also provides a valuable environmental benefit with the removal of potentially acid-forming materials from the local environment," he said.

"We wish the company all the best in their ongoing endeavours at Hellyer, and look forward to other such opportunities being taken up in the future."



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The ore sorting specialists

NATIONAL

TOMRA is the leading ore sorting provider in the country, offering the only full-scale, indoor test centre for prospective customers to get hands-on with ore sorting and learn about TOMRA's unique technology and sensors.

In the last few years TOMRA's XRT technology has evolved from being able to just scan rocks down to an incredibly small detail of just 0.8mm, when just a few years ago 4mm was considered an impressive feat for the technology.

Ore sorting is an increasingly prominent way for mine sites to maximise recovery and improve their processes.

In recent years a wide array of sensor technologies has emerged, each tailored to a different mineral or sorting application.

TOMRA has a range of highly advanced and automated sorting machines that utilise a number of different sensor technologies such as LASER, x-ray,



TOMRA offers the only full-scale, indoor centre for prospective consumers in Australia.

infra-red, electromagnetic and colour that are able to sort ore before entering a processing stream.

TOMRA's LASER and XRT technologies are able to achieve higher and higher resolutions of material as it goes through the machine at higher and higher speeds.

These and other technologies are at the forefront of mineral separation technology.

XRT scanning, possibly the most common type of ore scanning technology in mining applications, scans the internal mineralogy of the rock in minute detail, with X-ray penetration with the unique ability to show the makeup of particles within the rock.

LASER scanning is another popular method, particularly for the identification and subsequent grading of quartz or gold-bearing quartz via the diffusion, dispersion and diffraction of the LASER

light through the material.

When implemented and operated correctly, ore sorting machines can greatly improve plant efficiency, reducing downstream crushing requirements and costs, and resulting in much improved grades.

It can even benefit the operator's carbon footprint since waste is rejected at an early stage, which in turn reduces the need to tailings treatment.

Experts in high quality silica sand

TASMANIA

SCOTTSDALE, Tasmania, is a town with a population of 2400 in the north-east of Australia's island state.

It lies on the Tasman Highway, about 63km north-east of Launceston and 22 km south-east of the coastal town of Bridport.

Scottsdale is part of the Dorset Council, and the town and its surrounding area has traditionally supported potato farming, dairy farming, pine plantations, poppy cultivation and mining.

While hops were previously an important crop, large hop farms have over the last few years been sold and/or turned into dairy farms and eucalypt and pine plantations.

It is also home to Island Resources, a wholly owned subsidiary of The Baker Group.

Located 14km from the Scottsdale town centre is Tasmania's biggest sand mine.

The mining tenements have a combined estimated reserve of over 80mt and offers long-term viability to produce high purity silica sand – with the SiO₂ purity grade being greater than 99.7pc.

Island Resources provides sand products ranging from high grade silica sands, varying grades of concrete and construction sands, dried foundry sands, filter sands as well as top dressing/growing mediums.

According to The Baker Group general manager Nigel Baker, due to the global shortage of construction sands, the company has seen a dramatic increase in the enquires for sand to be exported both nationally and internationally.



Island Resources is Tasmania's largest sand mine specialising in premium grade silica sand, concrete sands, dried foundry sands through to various grades of construction sand with the ability to export cost effectively.

"With the closet deep-sea port being only 50km from our closest tenement, the group is in a great position to bulk ship directly into cities all around the globe very cost effectively," he said.

"We expect to see a significant increase in exports over the next two

years, especially as the Australian concrete sector starts shipping directly into major capital cities."

In addition to its extensive sand mining operations, The Baker Group also operates its own transport division, hauling all of its own sand products

utilising its fleet of Kenworth tipper combinations.

Island Resources was established in 1983 and has been wholly owned by the Baker Group since 2007.

More information can be found at: www.thebakergroup.com.au.



INCREASED MINING PRODUCTIVITY — REDUCED COSTS

IMPACT OF SENSOR-BASED SORTING IN THE MINE

- + Increased mine productivity
- + Increased life-of-mine
- + Bulk mining instead of selective mining
- + Reduced transportation cost of waste



TYPICAL APPLICATIONS

- + Industrial minerals
- + Gemstones
- + Ferrous metals
- + Non-ferrous metals
- + Coal & other fuels
- + Slag metals

Transtegic the people people

NATIONAL

TRANSTEGIC has been in the business of people development since 2006, when founder and managing director Luke Miller decided to build his company around providing workforce and business development solutions to a broad range of industries.

The company develops and delivers practical and effective programs and training that enhances workforce capabilities.

Its consultants are highly qualified and experienced, and regularly travel to any required location providing clients with a professional and friendly service.

Reflecting on the growth of the company, Mr Miller said that the head office, located in Launceston, now has branches in Queensland and NSW.

"We are in our 14th year of operation servicing Australia and the South-East Asia region," he said.

"Our client sectors include mining, forestry, manufacturing, energy, rail, construction and education."

All of the company's nationally recognised qualifications and statements of attainment are issued



Transtegic's consultants Keith Hackett, Peter Green, Glen Cheffers and managing director Luke Miller.

by its owned subsidiary registered training organisation, Triple 0 Solutions (RTO#70217).

Mr Miller said that people were at the heart of any business in the resources industry.

"People are the most important resource in any business, good people become exceptional people if they are upskilled and managed correctly," he said.

"From my experience, it doesn't matter where you live or work, whether it's the jungles of PNG, the mines bordering the Ho Chi Minh Trail or the rugged west coast of Tasmania, it's essential to have good leaders.

"A recent ongoing project we are proud to be involved in is the Tasmanian Minerals, Manufacturing and Energy Council Industry Leadership Program.

"As a fully customised Certificate

IV in Leadership and Management course, the aim is to provide its members organisations frontline workforce with targeted high impact leadership and management skills.

"The key to the success of this program is the customised delivery focusing on the businesses objectives and equipping leaders with the necessary tools and confidence to contribute and lead others effectively".

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ALL BODES WELL FOR BODDINGTON

Boddington continues to be Newmont Goldcorp's biggest Australian producing mine, and as the company works through its stripping campaign, the site is gearing up across the board to reach full capacity.

The South pit at the Boddington mine.

RAY CHAN

IT'S a new era for Newmont Goldcorp, with Tom Palmer taking up the reins as the company's chief executive officer in October 1.

And while it's business as usual for the world's leading gold company, Mr Palmer said he planned on building on Newmont's proven growth strategy.

"Newmont remains focussed on keeping our people safe, while growing our profit margins through operating, technical and financial discipline," he said.

To do so, Mr Palmer plans to advance the company's most profitable projects while investing in exploration across cycles.

Newmont Goldcorp has strong and sustainable portfolio of operations, projects and exploration prospects in the gold sector, with about 90pc of the miner's reserves located in the Americas and Australia, and other projects in Africa.

These include Newmont's Boddington mine, in WA's south east, Australia's second largest and the world's fourth largest gold mine.

These assets allow Newmont Goldcorp to sequence its projects to sustain six to seven million ounces of steady gold production annually.

Since 2016, Newmont – which also produces copper, silver, zinc and lead – has generated more than \$2.9b in free cash flow and commissioned two new mines and six expansions on four continents, on or ahead of schedule and at or below budget.

Boddington

The original Boddington operation began in 1987 after a 15mt (at 2.7g/t) gold resource was identified in 1980.

The mine continued until the

oxide-laterite resource was exhausted in 2001, during which time it produced about 4.6moz of gold and 6.5kt of copper.

Between 1989 and 1991, the mine was the largest producing gold mine in Australia, operating at around 400koz per year.

Newmont bought the operations from Normandy in 2002, taking over the gold stable which included Bronzewing, Jundee, Golden Grove, Wiluna, as well as the Kalgoorlie Consolidated Gold Mines (KCGM) Super Pit, which it operates but owns in a joint venture with Barrick Gold.

At this time Newmont shared the ownership of the Boddington mine with AngloGold Ashanti and Newcrest through the Boddington Gold Mine Management Company, which began investigating the feasibility of mining a 600mt basement rock operation with a 15-to-20-year mine life.

The numbers added up, approvals were sought, and in March 2006 the expansion of the operation was officially announced.

At this time, Newmont bought out Newcrest and became the major owner of the Boddington mine in a 67:33pc split with AngloGold Ashanti.

By early 2009 Newmont was the sole owner of the site, which consisted of the North and South pits which supplied gold and copper hard rock ores, which was produced into a copper-gold concentrate and doré bars.

Boddington was Australia's second largest producer of gold in the March quarter, yielding 155,000oz.

Current production and expansion

In Australia, the Newmont team has been busy launching its first centralised process control hub, which allows experts at each site to collaborate in resolving problems and raising performance.

Newmont said this year it aimed to produce between 1.5 and 1.7moz from its Australian division, and between 1.4 and 1.6moz in 2019 and 2020, equating to roughly 17pc of the country's total production.

The slight slump in the coming years can be attributed to a stripping campaign at Boddington to access higher grade ore, which will be completed in 2020.

The mine is set to reach full capacity in 2021 and add another 100,000oz of gold to the Australian production guidance.

Boddington operates two pits utilising three electric rope shovels as its prime ex-pit material movers, with a fleet of 40 production haul trucks, and a fleet of ancillary equipment.

In April this year, Mr Palmer said the company was currently optimising Boddington's mill maintenance strategy to reduce the number of plant shutdowns per year from four to three.

"This change delayed some production in the first quarter but we expect to recover those ounces over the course of the year," Mr Palmer said.

"Mine sequencing at Boddington resulted in higher copper and lower gold production."

Mr Palmer said the company remained on track to achieve its full year targets and take advantage of the resurgent gold prices.

Boddington operations general manager Jim Cooper told *Australian Mining Review* in March this year that the mine was on track to meet its production target for 2019.

He said the company had also reduced the number of shutdowns from four to three, which has allowed it to significantly reduce downtime and sustain production.

"We are now working to build in more rotatable components and more modular equipment so that we make the most of the shutdowns," he said.

"This also allows us to do the repair work in a controlled work environment that is not part of a process plant."

The Boddington results could offset any under-performance by the Super Pit, with Barrick already announcing plans to sell its share of the asset as it was not satisfied with current output.

The Canadian company's share of production from the Super Pit during the June quarter was 57,000oz, up 4pc on the 55,000oz recorded in the previous quarter. But in the June 2018 quarter, Barrick's share was 96,000oz, 41pc higher than the same period this year.

Technology

The mine recently received approval for a new hydraulic shovel that would give it greater operational flexibility.

"We see continued investment and technology innovation as critical to ensuring ongoing production excellence at Boddington," Mr Cooper said.

Newmont Goldcorp is also advancing an autonomous haulage study at Boddington that could lead to a fleet of trucks being converted using the CAT command system.

The project is expected to improve costs and mining productivity at the mine, with a full investment decision anticipated later this year.

Newmont expects to reach higher grades at Boddington in the fourth quarter this year, as it progresses its stripping campaign in the South pit.

Though Boddington faced port congestion and subsequently delayed shipments near the end of the June quarter, Mr Palmer said its "little backlog" of concentrate sales from the second quarter flowed into the third quarter.

(CONTINUED OVER)

Expect more with XMOR

WA

G&G Mining designs and manufactures the XMOR range of off-highway dump truck trays and buckets.

XMOR is a revolution in attachment design – offering lighter weight and improved productivity.

The unique high-strength steel formula delivers the lightest, hardest working dump bodies and buckets in the mining and earth moving industry.

Offering increased volumes and reduced weight, XMOR can handle larger payloads than its counterparts, increasing the productivity of the asset and reducing cost per tonne while extending asset life.

Over several years G&G has been working on developing stronger, lighter, more productive earthmoving attachments.

Proven through operation, XMOR buckets are the result of many years of materials and bucket design knowledge, plus extensive field development.

This has resulted in an exceptional combination of wear resistance and strength.

Wear parts are minimised, and on-site maintenance reduced with the bucket structure designed to combat wear.



XMOR is the result from years of addressing industry challenges.

G&G has also designed, developed and commercialised a new generation of dump truck body that offers a paradigm shift in the offering for off-highway rigid rear dump trucks.

While the market has been seeking “lighter” offerings in order to increase payload and productivity, many times these offerings are focussed primarily on weight reduction at the cost of other essential features.

The G&G XMOR body changes this – utilising the new advanced high strength,

high wear steel, Hardox 500 Tuf in order to offer an ultra-lightweight body that also offers a wide range of productivity, maintenance, safety and cost of ownership benefits.

XMOR dump bodies were the first ever large structure to be manufactured from Hardox 500 Tuf steel.

The XMOR body utilises the inherent strength of the steel (using Hardox as a high strength structural material) and makes the structure flexible rather than stiff, while the flexible side wall design,

strength from overlaps and pressings rather than box beams, and omega joints, including thickness only where it is needed (panels), enable stresses to dissipate rather than build up in welded joints or box beams.

G&G offers the XMOR dump body for OEM off-highway rigid dump trucks of all sizes and makes, and XMOR buckets are currently available for backhoes and wheel loaders.

More information: www.ggmining.com.

(CONTINUED FROM PAGE 23)

“We have been able to move concentrate to market very effectively,” he said.

Mr Cooper said that Newmont Goldcorp would continue to invest in new technology at Boddington.

The company has continued to refine the mill, and has utilised the latest technology to further improve its capabilities and maximise the efficiency of the operation, for example in upgrading the screens in the leach tanks in 2018.

Workforce

Boddington has about 1000 direct employees and 800 business partners working on site on any given day.

Some of these employees are local residents, from the towns of Boddington, Williams, Dwellingup and Quindanning. The remainder live in the Peel region or greater metropolitan area and are employed on a drive-in, drive-out basis and stay onsite at the accommodation village.

About 20pc of employees are females (higher than the industry standard) and 5pc are indigenous.

Boddington has been seeking to improve diversity numbers on-site with targets set for both women and indigenous employees, supported by numerous programs such as cross-cultural awareness training, flexible work arrangements, the set-up of a diversity steering committee, and the onsite women’s professional network.

It has deep ties in the community through initiatives such as the Moorditj Booja Community Partnership Agreement and its Kalyagool Kadadjiny Scholarship – worth \$120,000 – to



The employee camp at Boddington.

Murdoch indigenous students who want to pursue a career in mining.

Performance

Though Barrick has historically reported much higher revenues compared to Newmont, the trend has reversed in recent years with the latter taking over in 2018.

Barrick’s revenue dropped by US\$1.8b from 2015 to 2018, mainly due to faster exhaustion of its reserve base which led to lower production and shipments of gold and copper, while Newmont gained US\$1.2b during the same period, thanks to higher gold revenues, partially offset by lower copper sales.

In 2018, Newmont’s revenues were

US\$0.1b higher than Barrick.

This lead is expected to widen to US\$0.6 billion in 2019, with both companies forecast to see a rise in revenue benefiting from the 2019 mergers of Newmont and Goldcorp, and Barrick and Randgold Resources.

Newmont’s US\$10b acquisition of Goldcorp enabled it to assume the mantle of the world’s leading gold business.

Leading pumping solutions provider

WA

RBH Mechanical Services has provided labour services and pump infrastructure to the Newmont Boddington gold mine for many years.

The team is well-known for its expertise in how to achieve efficiencies and improvements in pumps and water recovery, and successfully designed, engineered and built many dewatering solutions.

Its latest product is a remote-controlled, track-driven, mobile platform with a large dewatering pump unit fitted to reduce the need for machines to mobilise/demobilise pumps from mining water bodies.

The machine leads to improved safety conditions, and in an emergency it can be operated remotely up to 1km away and removed from a dewatering body or pond.

In addition, RBH has successfully designed and manufactured floating water intake ‘Turrets’ that connect to the end of any pump suction line and float on the top of a water body.

Implementing Turrets on various water bodies at Boddington gold mine has directly improved operational efficiency on pump installation, as well as effected safer methods of deployment.

The Turret solves vortexing and cavitation issues, drawing from shallow water with its patented radial design.



RBH’s innovative shallow dewatering solution, the Turret.

The system is not only beneficial for mining, it is also used in agriculture and firefighting.

With a long history at Newmont’s

Boddington site, RBH has been able to develop and carry out testing innovative products.

The company looks forward to many

successful years working with the Boddington team.

More information on RBH can be found at www.rbhmechanical.com.au.



MINE DEWATERING MADE EASY

RBH Mechanical Services is a long-term provider of labour services and pump infrastructure to Newmont’s Boddington gold mine.

INTRODUCING OUR TRACK PLATFORM

We’ve designed a remote-controlled, track driven mobile platform and mounted a large dewatering pump to reduce the need for machines to mobilise/demobilise pumps from mining water bodies.

SHALLOW WATER?

No Problem.

Our Turret™ is a floating water intake device for pumping from shallow water bodies, solving the problems of vortexing and cavitation with its patented radial design.

THE RESULT:

Safety improvements and cost reductions.



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Image: Port of Abbot Point.

NEW KID ON THE BLOCK

After officially opening in September, the Byerwen coal mine will be ramping up to 10mtpa nameplate capacity, and with a 50-year minelife it is expected to provide coking coal to Southeast Asia, and jobs to regional Queensland for two generations of workers.

Byerwen will be exporting from the Abbot Point coal terminal.

GERARD MCARTNEY

AUSTRALIA'S newest coking coal mine, the \$1.76b Byerwen coalmine, officially opened on September 17.

Currently operating at 3mtpa, it will ramp up to its nameplate capacity of 10mtpa coking coal after a significant site expansion.

The open cut mine in the Northern Bowen Basin, about 20km west of Glenden, has employed about 1000 people during construction and the mine will have a permanent workforce of more than 500 people during operations.

The mine comprises four mining areas with a total of 18 open-cut pits, two coal handling and preparation plants, two train loading facilities, including rail loop and spur lines, connected to the existing line to Abbot Point, and an augmented power supply.

It is a JV between QCoal and JFE Steel 80:20 respectively, and has been five years in the making, with first approval from the Queensland Coordinator General granted in July 2014, and Federal approval granted in October 2014.

The first mine lease was granted to the company in April 2015, and it has an expected mine life of more than 50 years.

Queensland Resources Council (QRC) Chief executive Ian Macfarlane said that the opening of the Byerwen coal mine in North Queensland was testament to the strength and diversity of the state's mining sector.

"This is a milestone not only for QCoal Group, but for all Queenslanders," he said.

"Every new mining job in Queensland leads to at least another four jobs in associated industries and adds to the budget bottom line.

"Mines are part of the local community and during both construction and operations QCoal Group has kept track of its local spending and employment.

"Almost half of the spend during construction was in Queensland and in operations more than three quarters of the spend is in our state.



Image: Hastings Deeing – Facebook.

A haul truck at Byerwen.

"More than half of the workers currently at the mine are from the Isaac, Whitsunday and Mackay regions."

Coal mined at Byerwen will be exported to Japan, Europe, India and South East Asia.

"Queensland's resources industry benefits all of us, from the workers at the mine site, to regional communities and down to the South East corner."

The opening day

Resources and Northern Australia Minister Matt Canavan said the official opening of the mine was symbolic of the resilience of Queensland's coal industry, and that it would deliver more than \$3b in direct wages, and \$3.8b in royalties.

"This mine has already contributed significantly to the region's job numbers and will continue to do so over its potential 50-year lifespan," he said.

"It also enhances our trade relationships with other nations which rely on our high-quality coking coal to produce the steel they need to grow and prosper."

Speaking to attendants at the opening ceremony, in a somewhat bizarre rant, Mr Canavan launched into an anti-protester tirade.

"The history of the Australian mining industry is a reminder that dreams still come true," he said.

"And today's opening shows that we should still dream about a bigger and brighter future for the Australian mining industry.

"Today those dreamers have the modern problem of fighting a bunch of hypocritical, self-indulgent activists who like to enjoy all of the conveniences of modern life powered by our mining sector while campaigning against the very industry that makes this happen.

"The modern protest movement has become some kind of perverted take on the medieval purchase of indulgences."

Outlook

JFE Steel is one of Australia's biggest trading partners, according to Queensland premier Annastacia Palaszczuk.

As the world's largest producer of coking coal, Australia has seen a sharp decline in the price of coking coal.

The Resources and Energy Quarterly September 2019 said that rising supply, combined with falling demand, is expected to drive an easing of the average price from US\$186/t in 2019 to US\$158/t in 2021, while Australia's exports are predicted to grow from 183mt over 2018-2019 to 198mt by 2020-21.

"The price has declined more sharply than previously anticipated, driven by a combination of factors," it said.

"Demand growth has been relatively muted against a background of a deteriorating global economic outlook and weak global steel production outside of China.

"While Chinese imports of metallurgical coal have been strong, there has been growing negative sentiment impacting on buying from Chinese steel mills, due to multiple drivers.

"These include slowing demand, declining steel margins and an expected tightening in coal imports."

Built for Australian conditions

NATIONAL

AS a leading global manufacturer of branded mining and construction equipment, Hitachi Construction Machinery Australia (HCA) is at the forefront of delivering quality product and service to customers around the country.

As part of an extensive global network, and with 26 locations throughout Australia, HCA is in a strong position to support customers — 24 hours a day, seven days a week.

In particular, Hitachi’s consolidated position in the mining landscape in central Queensland has resulted in many major players relying on its equipment for key projects.

With a HCA branch located in Mackay, mining companies such as QCoal Group are guaranteed full access to service and support to assist their operations around the clock.

Operating out of the Bowen Basin, QCoal has been supported by Hitachi’s range of mining equipment for several years now and will continue to strengthen into the future.

Its current Hitachi fleet is made up of a number of EX3600 and EX5600 large mining excavators as well as fleets of EH3500AC3, EH4000AC3 rigid dump trucks and with a fleet of EH5000AC3 trucks soon to arrive.

HCA general manager of mining, Eric Green, said that the Hitachi Rigid Dump Trucks (RTDs) are a major focus for



Hitachi invest in the future of mining in central Queensland.

Hitachi and its customers this year, with increased fleet numbers in Australia.

“Our latest AC3 models continue to perform strongly,” he said.

“The Hitachi RDTs are recognised for their outstanding reliability, productivity, fuel efficiency and overall

reduced costs per tonne .

“Our brand-new Hitachi ultra-lightweight dump bodies have recently been made available in Australia.

“It’s great to see that there are now a number of these bodies in the field and clocking up production hours.”

Hitachi Construction Machinery will continue to re-invest into the technology and advancement of its products whilst strengthening the service and support to customers locally.

For more information about Hitachi’s products and services, please visit www.hcma.com.au or phone 1300 HITACHI.

QUALITY, RELIABILITY,
PERFORMANCE.

Our range of large excavators and dump trucks are backed by Global e-Service, ConSite and machine monitoring technology with Wenco.
Monitor machine health and productivity in real time.



HITACHI

Reliable solutions



OLD KING COAL

Coal is the king commodity in North Queensland, with a range of new developments in the works that are set to bring economic benefits to the region for decades to come.

EMMA DAVIES

ACCORDING to the Queensland Resources Council (QRC), the resources sector added \$74.3b to the State's economy in 2018-2019 – and with new mining developments underway, the economy is set to grow even further in 2020 and beyond.

QRC Chief Executive Ian Macfarlane said the sector already supports more than 316,000 jobs across the state, earns 80pc of Queensland's exports and generates more than \$5b in royalties for the State Government.

"Queensland's resources sector is now supporting one in every seven jobs, and one in every five dollars for Queensland's economy," Mr Macfarlane said.

"That means from Burleigh Heads to Brisbane and from Mackay to Mount Isa, the resources sector is powering local economies and employing local people.

"This year's figures are up substantially on last year, with both overall jobs and total value added growing by 18pc."

Mr Macfarlane said that almost every family in the State has a connection to the mining and resources sector, either through employment or the economic windfall mining operations provide to regional areas.

"We proudly support regional communities, including by providing extra economic value for farmers during drought, and earlier this year the resources sector answered the call for help as floods hit North Queensland," he said.

"The economic data shows the resources sector supported almost 14,500 businesses and 1395 community organisations over the past year.

"While the resurgent coal price has delivered a budget benefit for Queenslanders, there is significant growth in the metals category, such as copper, zinc and bauxite, which is up 26pc this year and is now worth \$11.7 billion to the state's economy."

There are strong prospects for even greater

returns and more jobs as Queensland's world-class North West Minerals Province is developed.

"The resources sector will continue to be a long-term partner for both rural and regional Queensland to deliver ongoing investment and jobs in the decades ahead," he said.

Winchester South

The State Government is now progressing approvals on the \$1b Winchester South coal project near Moranbah that will support another \$1b of investment and 950 jobs.

The project's environmental impact statement (EIS) was released during September and Whitehaven can now work towards a draft EIS for public consultation as part of the approvals process.

State Development Minister Cameron Dick said the project could extract up to eight million tonnes of product coal each year for about 30 years.

"That type of production would contribute significantly to both the local and state economy, boosting our exports and supporting communities in the region," Mr Dick said.

"These terms of reference follow public consultation and will ensure potential impacts on the natural, social and economic environment are appropriately considered.

In Queensland, coal is worth around a billion dollars a week or \$52.5b annually, directly employs 34,667 people and supports 226,887 indirect jobs.

Assistant State Development Minister and Member for Mackay, Julieanne Gilbert, said the goal would be to employ staff from local towns in the region, including Moranbah, Dysart and Coppabella.

"The Queensland Government's Strong and Sustainable Resource Communities Act bans large resource projects like this from employing 100 per cent fly-in-fly-out workforces," Ms Gilbert said.

If approved, it's estimated construction of the project would commence in 2021, with the

first extraction of coal proposed for 2023.

Olive Downs

Pembroke Resources' \$1b Olive Downs metallurgical coal mine 40km south east of Moranbah is also progressing towards approval, and will support 500 jobs during construction and 1000 once operational.

Mr Macfarlane said Pembroke Resources' announcement that the project had received its Environmental Authority (EA) for the project was good news for Central Queenslanders.

"The finalisation of the EA is an important next step to bring this project closer to a reality," he said.

"This is more good news for Queensland's coal industry."

The project is close to ports, and Mr Macfarlane said the high-quality coal it will produce highlights the wealth of opportunities Queensland can generate from the Bowen Basin.

"The Isaac region is a heartland for our resources sector, creating so much of the wealth that benefits our state," he said.

This project will be another valuable addition to Queensland's world-leading resources sector."

Byerwen coal mine

A \$1.76b joint venture between QCoal Group and JFE Steel, the Byerwen coal mine in the Bowen Basin is expected to produce 10mt of coking coal each year, 1000 jobs during construction and 500 operational roles - and it has already contributed to the local community.

"Mines are part of the local community and during both construction and operations QCoal Group has kept track of its local spending and employment," Mr Macfarlane said.

"Almost half of the spend during construction was in Queensland and in operations more than three quarters of the

spend is in our state."

More than half of the workers currently at the mine are from the Isaac, Whitsunday and Mackay regions.

"Each tonne of coal exported also delivers returns for all Queenslanders through royalty taxes that pay for schools, roads, hospitals and public transport," Mr Macfarlane said.

"The Byerwen coal mine has a potential life of more than 50 years, which means a long-term pipeline of jobs and investment in North and Central Queensland."

Exploration in Far North Queensland

QRC is pushing for more investment in exploration in the State, stating it is the key to long term growth.

"Investment in minerals exploration in Queensland shows there is huge potential for our great resources state," Mr Macfarlane said.

"The most recent exploration data shows a 12pc increase in mineral expenditure compared to the same time last year."

Since the same period last year, investment in gold exploration has increased from 62pc (\$8.81m) to 80pc (\$9.4m) while coal is up from 28pc (\$8.4m) to 55pc (\$13.5m).

Copper and selected base metals also experienced a rise in exploration investment in Queensland in the past year.

"Queensland is in the sweet spot to deliver more economic returns from resources, given our substantial mineral prospectively and a skilled workforce based in key regional centres alongside a network of supporting service industries," Mr Macfarlane said.

"The QRC is keen to work with the Queensland Government on new incentives for exploration and resources development to make the most of our opportunities.

"Ongoing investment in exploration is the first step in reaping returns through more jobs, more investment in regional communities and more royalties in the years ahead."

The underground mining specialists

NATIONAL

COALROC offers a complete range of services to the underground coal mining industry.

Strategically located in Mackay in Queensland and Mudgee in New South Wales, the company has serviced the industry for almost 20 years.

Its team of experts specialise in installing ground support, ventilation devices, water management systems and general outbye works for the underground coal industry.

In conjunction with Australian Conveyor Technologies (ACT), the company is also a specialist in turnkey conveyor installations for underground mines.

Coalroc's staff have installed systems from 1050mm wide to 2000mm wide, and work closely with clients to ensure minimum downtime is required for each installation so the mine continues to function at optimum production levels.

The team works in conjunction with various specialist companies to provide a complete material handling solution.

This includes design, manufacture, installation and maintenance to any industry.

Coalroc also supplies an extensive range of ventilation devices including overcasts, machine doors, regulators, stoppings, seals and hatches and a full design service ensuring current mines are department compliance.



Coalroc owns a wide range of specialised underground mining machinery available for long or short-term hire.

In addition to providing excellent workshop facilities from its 2800sqm premises, Coalroc owns a wide range of specialised underground mining machinery available for long or short-term hire.

The large quantity and wide range of machinery means that Coalroc can supply specific equipment that suits an individual

project, in both a timely and cost-efficient manner.

This fleet is maintained in its Mackay workshop, which is licenced to carry out repairs, services and Code D inspections on underground diesel engine systems.

Coalroc is a Recognised Service Facility (RSF) by the NSW Mines Department

and holds NATA technical inspection accreditation ISO/IEC 17020.

The company doesn't offer a one-product solution, and instead will work with clients to ensure they get what they want and need to be as efficient as their budget permits.

More information can be found at: www.coalroc.com.au.



YOUR TRUSTED UNDERGROUND CONVEYOR INSTALLATION PROVIDER

At Coalroc, we work in conjunction with Australian Conveyor Technologies to offer turnkey conveyor installs at underground coal mines across QLD and NSW.

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Image: New Century Resources.

RAMPING UP

Australian base metal producer New Century Resources is aiming high, with the goal for its Century Zinc Mine in North West Queensland to become one of the world's top 10 zinc producers.

Production at the Century Zinc mine is set to ramp up to 12mtpa by March 2020.

EMMA DAVIES

SINCE acquiring the Century Zinc mine from MMG in 2016, New Century Resources has brought the site back into production and is set to ramp up to 12mtpa by March 2020.

The focus has been on the existing ore reserves to produce zinc in the lowest cost quartile globally – with substantial mineral resources on the mining leases (including more than 2,200,000t of JORC compliant zinc metal equivalent resources located within mineralised tailings, and around 1,000,000t of JORC compliant zinc and lead resources in the Silver King, South Block and East Fault Block base metal deposits) offering a the potential for mine life extension and metal production increases from the mine's operations.

The mine concentrate continues to achieve relatively low impurity penalty rates.

This is despite spot treatment charges rising over 200pc since the start of operations and representing more than 30pc of New Century's C1 costs, which are continuing to reduce in line with increasing metal production.

Treatment charges received for Century concentrate remain in line with standard market pricing and are also competitive with other global zinc miners.

In the medium term, treatment charges are expected to fall in line with increasing smelter utilisation rates – especially in China.

To date, 100pc of New Century's concentrate has been sold with all forecast production for the remainder of the year contracted and scheduled for delivery.

Operational performance

Looking back over the course of the year, the mine has also delivered strong zinc recovery improvement and continued to report record metal production rates, with more than a 30pc increase in average daily metal production and decreased C1 costs of around 24pc from May through August.

As part of the ramp up to 12Mtpa operations, New Century initiated slurry

commissioning and optimisation of cleaners 2B, 3B and 4B in August, which has allowed the full cleaner circuit of the processing plant to be incorporated into operations for the first time.

The upgraded cleaner circuit has also contributed to improving Century zinc concentrate product quality, with operations now regularly achieving average zinc grades of 49-50pc zinc and to a seven-day moving average of 55pc (up from 52pc) during September.

For the month of September, the company reported record performance across all production parameters, with operations delivering around 50pc recoveries for 30 days straight.

Essentially, the upgrade removed bottlenecks for continued recovery improvement and increasing metal production, which was evident in an overall zinc metal output increase of 28pc, with 26,171t of zinc metal produced in 53,500t of concentrate grading 49pc zinc (compared to 20,450t zinc metal in 42,500t of concentrate at 48.1pc zinc during the March quarter).

Silver content of 150g/t in concentrate remained in line with previous quarter.

From a mining perspective, the overall average mining rate increased 17pc quarter-on-quarter (1.87mt in September vs 1.6mt in March).

The average mined grade during the quarter was 2.96pc Zn, which continues to reconcile strongly with the Ore Reserve model and mine plan.

Stable operation has been achieved in hydraulic mining, at a rate above 8mpta during the month of September.

This stability has continued into October and the mining rate is now being progressively increased to 9mtpa over the course of the December quarter.

For the December quarter the company expects guidance of 27,000t – 33,000t zinc metal at C1 costs of US\$0.87/lb-US\$0.98/lb (payable metal basis including treatment charges).

With improved production throughput,

company's C1 costs could potentially reduce by approximately a further US\$0.15/lb outside of any production increase or cost savings, should treatment charges revert to a 10-year average.

Expansion upgrades

New Century anticipates further improvements to metallurgical recoveries and metal production rates during FY20, through the expansion to 12Mtpa plant capacity.

Improvements during the December 2019 quarter are set to be achieved from the continued optimisation of the upgraded cleaner circuit and the implementation of the new scavenger circuit upgrade.

On October 24, New Century announced the initiating of slurry commissioning of the upgraded scavenger circuit to allow the full capacity of that section of the processing plant to be incorporated into operations for the first time.

The circuit upgrade was the second stage in optimising throughput, recoveries and concentrate quality and recent operational rates are sitting at around 9mtpa, meaning only around an additional 25pc increase in throughput is required to meet New Century Resources goals for the site of 12mtpa in FY20.

The company reports that capital expenditure program for the expansion is on schedule and budget, at 55pc complete with \$18m ramp up expenditure remaining of a total \$40m.

New Century also expects to incur a further \$9m in sustaining capital expenditure in FY20, predominantly associated with the five-yearly survey of the company's transshipment vessel, the MV Wunma, and the annual dredging of the Norman River.

The third and final stage – upgrading the rougher circuit – is on track for completion in March 2020.

Ramp up royalties

The mine expansion will also be supercharged by the Queensland Government agreeing to a royalty deferral agreement, supporting more than 260

construction and 240 operation roles on site.

Premier Anastacia Palaszczuk said the royalty agreement was an important step in her government's commitment to open up the North West Minerals Province.

"We know the North West Minerals Province is rich in minerals like copper, cobalt, zinc and gold, as well as potential deposits of rare earth minerals that will play an increasing role in renewable electricity generation and battery technology," Ms Palaszczuk said.

"We want to see new projects in the North West Minerals Province, but also new technologies that can extract more value from former projects like this."

The agreement is the first Royalty Deferral and Repayment Agreement to be negotiated under the Resources Regional Development Framework (RRDF) and will provide a precedent for similar arrangements in the future.

Deputy Premier, Treasurer and Minister for Aboriginal and Torres Strait Island Partnerships, Jackie Trad, said New Century was a great example of what the RRDF can achieve.

"We said when royalties were deferred, they would have to be repaid in full, with interest and with security of payment in place," Ms Trad said.

"We said investors would have to meet a financial assurance model to ensure compliance with environmental conditions to cover rehabilitation costs.

"New Century has satisfied all these conditions through an exhaustive process and has also committed to employ a significant proportion of local indigenous workers through the additional jobs being created by the project.

"The company has set a great benchmark for future proponents wishing to engage in a Royalty Deferral and Repayment Agreement."

The reinvigoration of the Century Mine has the additional benefit of continuing the operation of a 304km slurry pipeline between the mine site and Karumba, and the continued dredging of the port of Karumba, making the site available for other commercial users.

Champions of far north Queensland

QLD

MANAGING nine ports across Far North Queensland, Ports North plays an important role in the development and growth of regional economies and connecting communities in some of the most remote parts of Northern Australia.

According to Ports North chairman Russell Beer, the company champions the case for the development of Far North Queensland as a supply hub and source of goods and services to other areas of Australia as well as to neighbouring Asian and Pacific regions.

“To do this, we work with companies like New Century Resources to improve our ports’ capabilities, and thus broaden opportunities for port users and new investors,” he said.

In this case, Ports North worked with NCR to negotiate re-opening the Century zinc mine, which was serviced by the Port of Karumba, after operations closed in 2015.

On behalf of NCR, Ports North manages the annual dredging of the transshipment channel to maintain its depth of 3.2 metres.

“This arrangement has bolstered current activities at the Port of Karumba in terms of the general cargo, live cattle export and minerals export,” Mr Beer said.

“And importantly, it is also triggering exciting new opportunities for other port users and investors in this mineral-rich region.”

More information can be found at: www.portsnorth.com.au.



Ports North worked with NCR to negotiate re-opening the Century zinc mine, which was serviced by the Port of Karumba.

Port of Karumba

Located at the mouth of the Norman River in the south-east corner of the Gulf of Carpentaria, the Port of Karumba has serviced remote Gulf communities since the late 1800s.

It provides for general cargo, live cattle export, minerals exports, fuel and fisheries products.

Road access is via the Gulf Development Road from Cairns and the Matilda Highway from Cloncurry.

The Port of Karumba is used regularly for the transshipment of oversize project freight and heavy machinery for mining operations in the Gulf of Carpentaria including Weipa, Gove and Groote Eylandt.

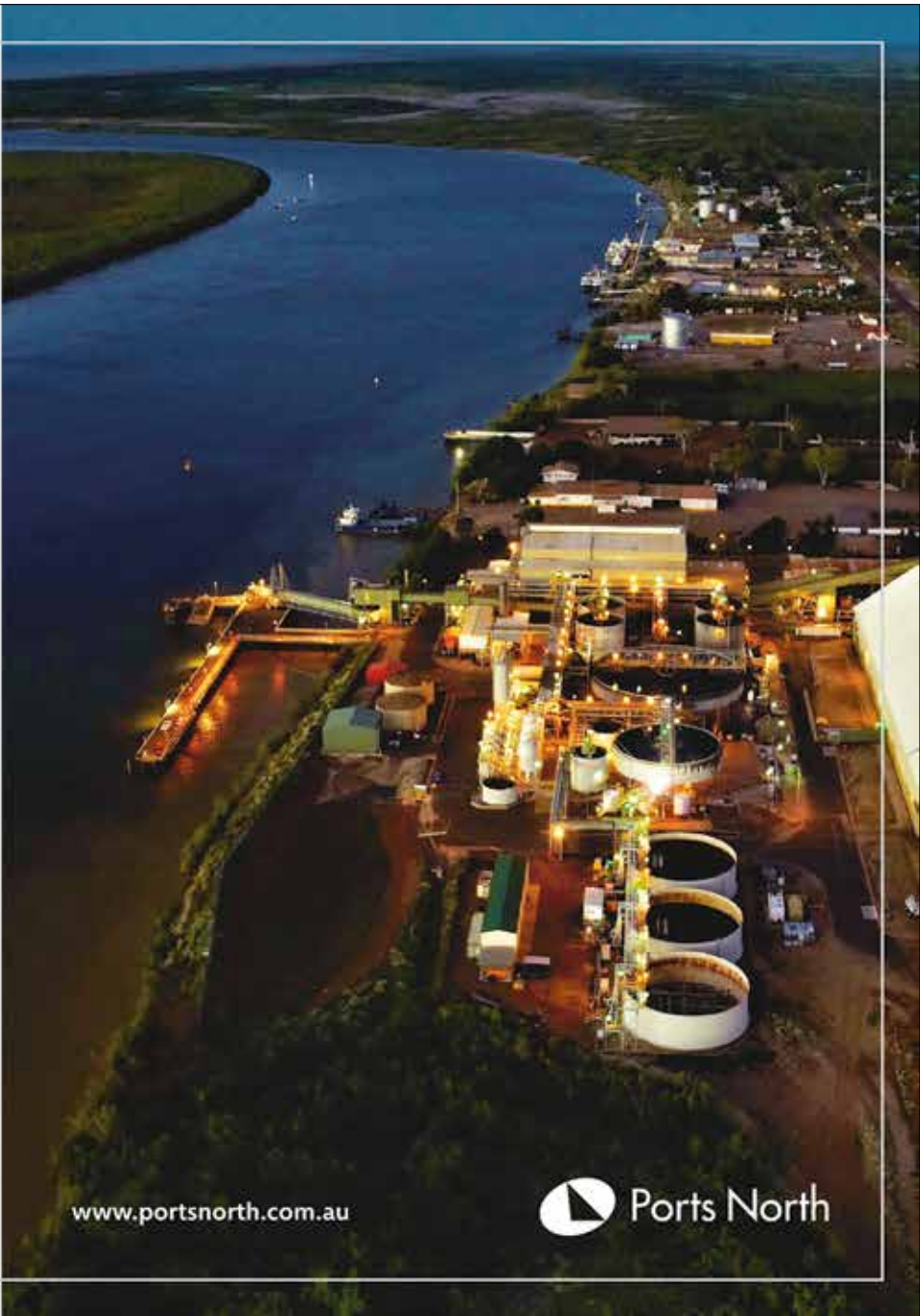
The development of Northern Australia, as earmarked by the Federal and State Governments, will provide further opportunities for the port to become a major transshipment port for agricultural commodities such as sugar and cotton as well as minerals.

The port comprises:

- De-watering and storage facility for New Century Resources.
- Significant areas of land directly adjacent to port facilities for storage of project freight.
- A number of sheds available for covered storage of equipment.



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DEMAND DRIVING GROWTH

The increased demand for nickel has seen prices soar, with BHP gone from mothballing its Nickel West operations to transitioning to new mines and improving existing infrastructure on site.

BHP has greenfield and brownfield expansion plans and its Nickel West operation.

EMMA DAVIES

DEMAND for nickel has increased on the back of the growing electric vehicle (EV) industry, and BHP is now pushing forward at its Nickel West operations in Western Australia.

Nickel West has made significant progress in FY2019 on its transition to become a leading supplier to the battery materials market – from selling zero nickel to the battery market in 2015 to selling more than 75pc of its production to global battery material suppliers this year.

BHP's operational review for the September quarter showed production on site increased by one per cent to 22kt, reflecting higher volumes at the Kalgoorlie smelter following the fire in September last year.

The company has commenced construction of a nickel sulphate plant at the Kwinana Nickel Refinery, with first production expected in the first half of 2020.

While major maintenance shutdowns of the refinery and smelter are scheduled during the December 2019 quarter, stage one of the refinery project is expected to produce up to 100ktpa of nickel sulphate, just in time for the expected jump in demand in mid-2020.

The company has its sights on reducing bottlenecks at its Mt Keith concentrator and Kalgoorlie smelter as well as the Kwinana refinery.

Green and brownfield exploration

The company is investing in new greenfield exploration programs in WA and continuing nickel mine development in the northern Goldfields.

BHP has secured a new tenement package called Seahorse, which consists of 26 tenements along a strike length of 350km over an area of about 13,000sqkm



The company aims to reduce the bottlenecks at its Kalgoorlie smelter and Kwinana refinery.

– approximately 10 times larger than its current tenement holding at Agnew Wiluna Belt.

The Seahorse belt has direct access to rail and road routes to Nickel West, is around 450km from the Kalgoorlie smelter and is near the Transline Railway corridor.

Brownfields exploration projects are underway around the Leinster nickel operation, which could develop untapped potential and provide feed to fill spare capacity in the mill.

Work has also commenced at the underground Venus Mine near Leinster on the new main ventilation shaft and pastefill plant, where Nickel West will operate the underground infrastructure for the mine.

BHP is also developing the undercut for Leinster B11 (block cave) with first ore production expected in the second half of 2020, pending external approvals.

Work has begun on the Mt Keith satellite mine development with excavation

of the northern pit (Six Mile Well), while construction of the haul road and additional capacity from the project will be matched to meet the Mt Keith mill requirements.

BHP expects production to grow by de-bottlenecking the milling circuit and leveraging the significant spare capacity in the flotation circuit of the concentrator to increase feed from 10.5mtpa to 12mtpa.

Over time progressive and incremental investment in new flotation technology could further expand capacity to 15mtpa and overall, expanding the milling capacity could improve processing of harder ores, reduce grind size and provide a recovery benefit – increasing equity production and supporting plans to fill the smelter.

Native title agreement

In August, Nickel West signed an agreement with the traditional owners of the land surrounding used by Nickel West's operations in the northern Goldfields, the

Tjiwarl people.

The Comprehensive Agreement with the Tjiwarl Aboriginal Corporation will provide native title compensation, financial and other support to assist the Tjiwarl people to deliver their community plans in areas such as health, education, training, employment and contracting.

The agreement also supports the ongoing development and operation of Nickel West, including a framework to work together on cultural heritage management and the protection of areas of special significance.

Tjiwarl Aboriginal Corporation director and Tjiwarl native title holder Brett Lewis said the agreement was a milestone for his people.

"It gives Tjiwarl a seat at the table," Mr Lewis said.

"It means the respect of our fathers and mothers who didn't have a say and will now get a say in their country."

BHP Nickel West president Eddy Haegel said the agreement demonstrated a joint commitment to a long-term mutually beneficial partnership.

"This landmark agreement for the region has been built on trust, transparency and strong leadership from both parties," Mr Haegel said.

"It reflects BHP's commitment to making positive economic and social contributions in our communities, including employment and engagement of Tjiwarl people across our diverse operations in WA."

The agreement will also provide support for the Mt Keith Satellite mine development, which will supply additional ore to the Mt Keith concentrator with first ore expected by the end of this year.

A Nickel West Tjiwarl Work Readiness Program is also underway in Kalgoorlie for Tjiwarl graduates to work on country at BHP's northern operations in the Goldfields with 15 members of the Tjiwarl currently employed at Nickel West.

Fit-for-purpose mining services

WA

WHEN choosing an engineering, manufacturing or maintenance provider it is important to find a company that will take the time to understand your problem and work with you on cost-effective long-term solutions.

It also helps when that company has the experience, know-how and reputation for delivering high-quality work.

WA-based services provider, Orontide, delivers just this (and more) for its wide range of clients across the mining and resources sector.

BHP Nickel West are one example, choosing Orontide to refurbish their production shaft at Leinster.

“We understood the unique challenges required for the shaft refurbishment and have worked closely with the BHP Nickel West project team to deliver a cost-effective solution,” Orontide Leinster Project Manager Peter Truscott said.

Refurbishing the shaft steelwork and concrete safely while continuing to operate transport of personnel underground in conjunction with integrated skip production presented the biggest challenge.

“This project required a close working team approach, with flexibility and adaptability on both our parts, as we trialled and executed the works,” Mr Truscott said.

Orontide brought together a diverse workforce, integrating BHP Nickel West



More information on Orontide's services can be found at www.orontide.com.au.

team members, to deliver the work scope.

This included statutory supervision and upskilling the work team to provide cage and materials handling operation.

The construction of a full-scale cross-section of the Leinster shaft at Orontide's Henderson facility has proven to be invaluable for testing out repair methods, training new workers and developing a manufacturing approach for the works.

Orontide's expansion beyond traditional engineering work now includes rope access, scaffold and electrical work in both the underground and surface mining environments.

Underground infrastructure projects (pass lining, vent doors, pump stations), along with labour supply (including management and supervision) for various maintenance shutdowns such as rope crops, water, air and pumping services, and concentrator shutdown works are

also available from the company.

Orontide were recently awarded the lining and refurbishment of an underground waste pass at Leinster which will be along similar lines to an ore pass that Orontide lined on site previously.

Since commencing operations in 1979, Orontide has made its mark in WA with a large pool of skilled employees and extensive workshop spaces located in Henderson, Leinster, Port Hedland and Bunbury.



INNOVATIVE UNDERGROUND MINING SOLUTIONS

We've been in business in WA for 40 years helping mining companies get the most out of their assets through **manufacturing, installation, maintenance** and **repair**.

ENGINEERING SERVICES

— Design, Fabricate and Install

- Pump stations
- Ventilation doors and fans
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- Skip and cage conveyances
- Work platforms/man cages
- Drop board regulators

MAINTENANCE SERVICES

- Underground pump systems
- Ventilation fans
- Air water reticulation/services
- Rope access/scaffolding
- Shaft maintenance (rope crops, conveyance change outs, refurbishments)
- Shutdown labour
- Electrical services



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ORONTIDE

40
YEARS

All images: Western Areas.

READY FOR THE FUTURE

Western Areas will be closing out the year on a high on the back of strong nickel prices throughout 2019. The Odysseus project has continued to move steadily toward production in 2022, exploration targets are showing positive results, and the company has begun the process of negotiations for offtake agreements, and re-negotiations of existing agreements due to expire, early in 2020.

The Odysseus pit.

GERARD MCARTNEY

WA nickel miner, Western Areas, has had a strong start to FY20 as it continues ramping up toward production at Odysseus, hitting all major guidance targets across its Forrestania operations, while reporting some exciting results from its extensive exploration portfolio.

For the September quarter, Western Areas reported mill production at 5259t (FY20 guidance between 21,000 and 22,000t), at a cost of \$3.06 (FY guidance oat \$2.90/lb to \$3.30).

Its net cash flow was up \$21.6m to \$165.9m, receiving a \$33.1m boost from the sale of Kidman Resources to Wesfarmers.

Nickel prices have surged to a five-year high, jumping almost 70pc since the start of the year, peaking at \$US18,153/t off the back of increased interest in nickel for the EV market.

Currently, only 3pc of the world's nickel is used for EVs with the remainder used in the production of stainless steel, but that figure is expected to skyrocket while a global shortfall looms over the market.

Indonesia has banned the export from 2020 as it aims to develop a domestic battery industry with the backing of Chinese stainless-steel giant, Tsingshan Group.

The bullish sentiment toward the metal has even seen BHP hold on to its Nickel West mine and smelter operations, an area of the business it was unable to sell over the two years.

Managing director Dan Lougher told the *Australian Mining Review* that the price increase could not come at a better time for Western Areas.

"It's been very welcome in terms of where we're sitting at the moment," he said.

"We're keeping on with our operations at Forrestania, mining safely and producing good cash flow.

"We're putting a big effort into developing Odysseus, we still have a bit to go yet.

"We're looking forward to starting our new

contracts with whoever wins the offtake.

"It's really quite exciting how nickel sulphate concentrates are being looked at in the market, obviously the electric vehicle hype is getting stronger and, going toward 2020, there will be some significant changes in terms of nickel sulphate volumes out of Asia – we will be a part of that.

"Keeping our two operations going, developing our third and getting involved in strategic downstream processing of nickel sulphate for the EV market will keep plenty of work on the plate, I think."

Forrestania

Production from Western Areas' two operating mines, Flying Fox and Spotted Quoll, were both consistent with the forecast FY20 guidance.

Flying Fox produced 6414t of ore at about 3.7pc nickel which translated into 2280t nickel.

Ore was mined predominantly with long-hole stoping (75pc), and the remainder from ore development.

No additional resource extension was completed during the quarter, and the massive sulphide resource currently stands at 1.65mt of ore at 4.7pc nickel for 76,597t nickel.

Spotted Quoll produced 85,942t of ore at about 4.1pc nickel, translating into 3525t, predominantly mined from ore drive development (53pc) with the remainder from long hole stoping.

No underground drilling took place, but Stage 3 surface drilling to test a thicker north-east trending plunge commenced early in November.

The mineral resource, including depletion to the end of September 2019, currently stands at 1.43mt of ore at 5.3pc nickel for 75,469t nickel.

The Cosmic Boy concentrator processed 149,729t of ore at an average grade of 3pc, which produced 35,606t nickel concentrate at 14.8pc.

Western Areas delivered 35,737t of concentrate for sale.



Western Areas chief executive Dan Lougher (left).

Odysseus

The massive deposit at Cosmos, north of Leinster in WA, will underpin Western Areas' operations as the company moves into the new decade and onto the next.

With a 10-year minelife identified in the feasibility study, Mr Lougher said that it was by far the largest operation in the portfolio.

"We have some upsides that we will pass down early next year, which are the EM5 and EM6 deposits, which we didn't actually have in the feasibility study," he said.

"This will be over and above the 10-year minelife, and it will boost it significantly so we're very excited about that.

"The area is being fully manned up, we're putting in a haulage shaft system purchased from South Africa, and the equipment will be arriving on the shores of Australia in March/April next year.

"It will be one of, if not the only or at least very few shaft hauling systems installed in Australia in recent times.

"It will have a significant impact on the costs associated with bringing material and ore and waste to the surface, rather than using trucks – it's much cheaper so all of that is a part of the pre-production CAPEX."

In the September quarter, the company continued with infrastructure developments such as a pumping reticulation system and an underground ventilation shaft, while contracts were awarded to commence civil earthworks around the shaft collar.

With key offtake agreements set to expire early in 2020, Western Areas is also looking to re-negotiate contracts and, on return from the LME week in London, Mr Lougher said it was an exciting time for the company.

"Our contracts are due to expire at the end of January 2020, so February 1st is when we start our new contracts, we're currently in shortlisting mode," he said.

"We're very, very encouraged by the market responses that should add more value to those contracts."

Exploration

The company has continued to invest heavily in both greenfields and brownfields exploration, and Mr Lougher said that exploration was vital to the long-term prosperity of the company.

"The way we deal with exploration is that we always have a greenfields area, which is a bit more long-term, and that's Western Gauller in South Australia," he said.

"In terms of potentially a new discovery the Western Gauller is literally the mirror image of the Fraser Range which holds the last best discovery, the Nova deposit, in recent times. That's always quite exciting looking.

"And we've got two brownfields sites, one at Forrestania and one at Cosmos – the money's basically spent equally between the three projects.

"The Cosmos project is looking good, the nickel we're seeing might not be in the highest grade at the moment, but it does show that there is a lot of nickel in the system.

"Historically, Cosmos' tenements has basically held the highest grade pretty much across the planet, the old Jubilee pit was running 9pc."



GRES is proud to have assisted Western Areas in the delivery of the Cosmic Boy MREP project.

Engineering solutions for miners

NATIONAL

GR Engineering Services Limited (GRES) is an ASX-listed process design and engineering company providing fixed price EPC and EPCM project delivery services to the mining and minerals processing industries internationally.

After initially being engaged by Western Areas Limited to assist with feasibility studies, GRES was appointed on an EPC basis to undertake the engineering design,

procurement and construction of the MREP bio-leach plant and infrastructure at the Cosmic Boy operation in Forrestania.

The MREP is the first nickel bio-leach project in Australia and is a marked achievement for both Western Areas and GRES.

GRES has also been assisting Western Areas with study and development works at the Cosmos Nickel Project.

GRES has successfully completed feasibility studies, process and engineering

designs and construction for projects of various scale covering a diverse range of metalliferous and mineral commodities.

The company has delivered mineral processing or hydrometallurgical facilities and infrastructure for precious metals, base metals, mineral sands, industrial minerals, tin, tungsten and iron ore projects for a range of clients, both in Australia and internationally.


The innovative engineering solutions developed by GRES has enabled its clients

to confidently move into development with the knowledge that the outcomes from study work will be reproduced in the operation of their projects.

GRES also has a presence in the hydrocarbons industry via its wholly owned subsidiary, Upstream Production Solutions.

Upstream is a leading provider of operations, maintenance and well management services to the oil and gas industry in Australia and South East Asia.





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ALL SYSTEMS GO

The last thing a mining operation can afford is a fire. Not only will it threaten the safety of operators and destroy vital equipment, a devastating fire most certainly will be catastrophic to production and profits. This is why it is so important to ensure that all these mission-critical equipment are protected by appropriate fire protection systems.

All mine owners, facility managers, and operators understand the potential environmental impacts of scheduled extinguishing agents if released into the atmosphere.

GARRY KWOK

MINE sites across Australia are both broad and varied in how they operate as well as the critical natural resources that they search for. However, all have in common the highly expensive and mission-critical equipment that typically operate day and night under extreme hostile conditions, in vast, remote and difficult to access environments, especially on underground equipment.

On a mine site, fire hazards may occur in and around process plants, underground conveyors, static and mobile plants, draglines, workshops, substations, monitored controls rooms and switch rooms.

In many cases non-gaseous and gaseous fire suppression systems are the preferred systems installed to protect the high value assets, safeguard operators and processes so as to guarantee business continuity.

Systems and equipment used

Non-gaseous systems are primarily used on mobile plant and are usually not scheduled extinguishing agents under the Commonwealth Ozone Protection and Synthetic Greenhouse Gas Management Act 1989.

Gaseous fire suppression systems typically encompass extinguishing agent stored in pressurised cylinders that are connected to a network of discharge pipework and nozzles that deliver the extinguishing agent to an enclosure to be protected.

Typically they also include dedicated fire detection and control systems which provide an automatic discharge if a fire starts.

These systems are best used to primarily protect delicate electronic and electrical equipment against fire due to their quick detection of a fire event, and rapid suppression and extinguishment capabilities.

An additional benefit is the extinguishing agents used do not leave any residue after discharge, and hence sometimes are referred to as 'clean agents'.

There are two broad groups of extinguishing agents:

- Inert gases are naturally occurring gases such as nitrogen, argon, carbon dioxide or combinations of these (e.g. IG541, IG55).

They extinguish fires by reducing the available oxygen to a level below that which a fire needs to burn (typically less than 15%).

- Synthetic gases are man-made manufactured gases and they extinguish fires by reducing heat and using chemicals to interfere with the fire chain reaction.

Both types of extinguishing agents have their own advantages and disadvantages.

This means that choosing the most suitable fire extinguishing agent for a specific application will depend on a range of factors including their impact on the environment.

Scheduled extinguishing agents

A number of synthetic extinguishing agents are ozone-depleting substances (ODS), which when released into the atmosphere will deplete the stratospheric ozone; and/or synthetic greenhouse gases (SGG), which, when released into the atmosphere, will contribute to global warming.

As such, these are defined as scheduled agents under the Act and the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995 (the Regulations).

The regulations stipulate certain obligations in how they are to be acquired, stored, used, handled, disposed of and maintained safely to minimise their impact on the environment.

Under the Act, a scheduled extinguishing

agent can only be discharged where the product containing the extinguishing agent is being used for its designed purpose, in other words in response to an actual fire.

Discharge for testing or training purposes is not permitted unless the person meets the requirements in the regulations, and has been granted a fire protection industry permit to do so by the Fire Protection Industry (ODS and SGG) Board.

It is very important that all mine owners, facility managers, and operators understand the potential environmental impacts of scheduled extinguishing agents if released into the atmosphere.

To learn more about the effects of scheduled extinguishing agents, please visit the Department of the Environment and Energy website.

The types of scheduled extinguishing agents in the mining industry

Scheduled extinguishing agents that are most typically used on mine sites are heptafluoropropane HFC-227ea, HCFC Blend C and HCFC Blend A.

Typically they will be contained in fixed fire suppression systems located in or around the fire risk areas such as control rooms, data centres, electrical switch rooms, and process control rooms.

Large mobile plants including large excavators, shovels, draglines, haul trucks and wheeled loaders may also have fire suppression systems installed that may contain such agents.

The primary scheduled extinguishing agent used on mine sites is FM-200/ FE-227 (with some minimal use of NAF S-III and NAF P-III).

Identifying a gaseous fire suppression system

Rooms or enclosures protected by gaseous fire suppression systems typically have

warning signs installed on or above doorways into the room/enclosure.

Most of these systems will operate automatically if fire or smoke is detected.

Any activity which may cause the detection system to go into alarm (such as soldering or other activities which create clouds of dust or smoke) must not occur unless the gaseous fire suppression system has been isolated.

Correct servicing and installation

All fire equipment and systems including gaseous fire suppression systems need to be regularly tested, serviced and maintained to help ensure that they will be ready to operate as intended at the event of a fire.

Australian Standard, AS 1851-2012 routine service of fire protection systems and equipment sets out these requirements.

The objective of AS 1851 is to maximise the reliability of fire protection systems and equipment such that the systems and equipment meet the requirements of the relevant design, installation and commissioning standards and are likely to continue to do so until the next scheduled activity.

Section 7 of the standard contains the inspection and testing requirements for gaseous fire suppression systems.

Under the regulations, to minimise the environmental impact for accidental discharge of scheduled extinguishing agents it mandates that work on such systems (including the installation, decommissioning and servicing) must be performed by an appropriate licensed technician.

This article was republished with permission from the Fire Protection Industry (ODS & SGG) Board.



Scavenger can assist in fire disaster prevention with 100pc reliable, 100pc dependable, and 100pc consistency in fire safety supply and services.

The fire safety specialists

NATIONAL

SCAVENGER Fire and Safety has the knowledge and equipment to support landholders, whether they be bush firefighting foam and nozzles, rakehoes, drip torches, fire extinguishers or first aid/snake bite kits.

The company also offers extinguisher servicing and repairs, safety supplies (including respiratory equipment), fire protective and personal safety equipment and vehicle batteries for heavy equipment or marine environments.

Scavenger Fire and Safety's fully trained service technicians have operated for the past 10 years both within WA and in the Eastern States, with an office recently being opened in Sydney.

It is a quality assured business to ISO

9001 through AAA, with 20 full-time employees — incorporating sales, accounting and administration — who are all fully trained and experienced in their chosen fields.

The quality assurance processes ensure the provision of high quality services and products with full traceability.

Its WA arm is based at Unit 4, 33 Thornborough Road in Mandurah, and operating hours are Monday-Friday from 8am-4.30pm.

This WA family-owned business provides a professional ethical option for all fire and safety needs.

For information on other products and services available, phone 9584 2500, email admin@scavengersupplies.com.au or go to www.scavengersupplies.com.au.

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Ventilation control system experts

NATIONAL

UNDERGROUND coal mining has historically been recognised as a hazardous occupation.

It is a universally recognised principle of underground coal mine safety that there must be proper ventilation of the mine.

Indeed, it is the most fundamentally important aspect of safety in the coal mine.

Failure of the ventilation system or failure of underground seals can lead to multiple fatalities and closure of a mine.

Examples include Moura No.2 (Qld, 1994) and Sago (USA, 2006).

It is critical to maintain an effective, safe and efficient ventilation system in an underground coal mine, and ventilation control devices (VCDs) play an essential role in mine operations and safety.

The effectiveness of VCDs to safely resist explosions during their intended life is important.

This functionality depends on the ability of the VCDs and particular seals to withstand changes in the behaviour of the strata, particularly where longwall abutments influence the stress regime in and around the chain pillars.

During the normal course of underground coal mining, it sometimes becomes necessary to install permanent

seals to isolate abandoned or worked out areas of the mine.

This practice eliminates the need to ventilate those areas.

Seals may also be used to isolate mine fires or areas liable to spontaneous combustion.

To effectively isolate areas within a mine, a seal should prevent toxic and/or flammable gases from entering active workings and oxygen from entering the sealed areas.

They should also be capable of preventing an explosion initiated on one side from propagating to the other side and continue its intended function when subjected to heat (AS 1530.4 - 1990) time-temperature heat input.

For more than 20 years, Minova has manufactured a range of cementitious and steel fabricated systems that are used in the design and construction of underground mine ventilation structures and bulkheads.

The company offers vast experience and capability in engineering, design, product manufacture, fabrication and contract installation of VCDs, and has successfully developed and implemented many specific devices for individual customer requirements.

Visit <https://www.minovaglobal.com/apac/products/ventilation-control-devices/> to learn more.



It is critical to maintain an effective, safe and efficient ventilation system in an underground coal mine.

VENTILATION CONTROL DEVICES.

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With over 20 years of experience in the design, construction and installation of underground mine ventilation structures and bulkheads, we have successfully implemented many mine specific solutions.

Key features include:

- **Enhanced air quality in underground mines**
- **Trusted designs and engineering certification offering the largest range of live tested, explosion rated ventilation control devices**
- **Complete service by one supplier for design, construction and installation of ventilation structures**
- **Improved cost efficiency with mine ventilation systems**
- **Customised products to suit any roadway dimension and mine layout**



All images: Port Waratah Coal Service.

PORT Waratah Coal Services, which has been receiving, stockpiling, blending and loading coal for export in the Port of Newcastle for more than 40 years, and is setting new standards in the provision of healthy and safe workplaces.

Port Waratah Coal Service has consistently outperformed its 2018 production.

GERARD MCARTNEY

PORT Waratah Coal Services owns and manages both the Kooragang and Carrington Coal Terminals, which have a combined capacity of 145mtpa, and employs about 350 people across the 24/7 business.

At October 31, exported 92,021,793t of coal from both the Carrington and Kooragang terminals, up from 90,454,527t at 2018, with Carrington contributing 12,190,816t. and Kooragang contributing 79,878,238t.

Fires temporarily closed the rail network that supplied both the port of on November 12, and the Australian Rail Track Corporation (ARTC) said that there was no damage to assets and services gradually began to resume operation from 7:45pm until the morning of November 13.

“ARTC continues to monitor conditions regarding train operations on its network in NSW and is working with operators and emergency services regarding train movements and access to the rail corridor,” it said.

In 2019, the company won the prestigious SafeWork award alongside Sydney Metro, CareSouth and John Harris from Liberty Industrial.

Minister for Better Regulation and Innovation, Kevin Anderson, said that the award recognised the hard work of employees and businesses that had outstanding health and safety standards.

“The winners are setting new standards for providing safe and healthy workplaces across NSW,” he said.

“Every worker has the right to work in a safe environment, so they can return to their homes and loved ones at the end of the day.

“These awards acknowledge the commendable work we see in categories including Leadership in Workplace health



and safety culture’, ‘Best Solution to High Risk Work Health and Safety Issue’, as well as acknowledging ‘Excellence in Recovery at Work’ for both businesses and individuals.

Port Waratah Coal Services chief executive Henry Du Plooy said that it was a credit to the company’s attitude to safety.

“Continuously improving the way we work is integral to our safety performance, with the aim of working free from injury, illness and harm,” he said.

“Whilst we as a business are responsible for providing a safe site for employees, contractors and visitors, we are also committed to empowering our employees to make safer choices and encourage a shared responsibility for health and safety.”

Terminal illness

At the end of 2018, throughput fell short of both

budgeted and contracted volumes, although it did exceed the 2017 throughput due to high demand.

The controversial \$5b Terminal 4 was scrapped after “extensive consultation with stakeholders”.

Mr Du Plooy said that market conditions for Hunter Valley coal were still strong.

“At Port Waratah’s terminals, 105mt were loaded in 2017 and incremental growth is expected this year,” he said

“With significant growth capacity available in the existing terminals, we do not expect that the conditions to support an investment of the large and long-term nature of Terminal 4 will be in place before the development approval lapses in September 2020.”

“We are proud of the role our Carrington and Kooragang terminals play in connecting Hunter Valley coal with the world.

“We are confident that with ongoing investment in the reliability and performance of these terminals, we will be well positioned and flexible enough to adjust quickly to changes in demand.”

“We are committed to understanding and meeting the expectations of our stakeholders, particularly in limiting noise, reducing dust and water usage, and creating the smallest environmental footprint that we can.

We continue to make significant investments in our terminals, to improve both operational and environmental performance.”

The company said that it was focused on being responsive and flexible to better service customers during periods of high demand and Port restrictions due to weather impacts so that the full capacity of the terminals was available when required.

During the year Port Waratah diversified its funding base by successfully refinancing \$232m in the Japanese debt capital market through a new seven-year “samurai” syndicated loan.

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GETTING WISE WITH WATER

The exponential growth in mining has seen the rise of water challenges which the Australian industry has met through the early adoption of technologies and innovation.

AUSTRALIA is a global leader in water management and innovation across the mining life cycle.

The country has a mature mining industry built on nearly 200 years of experience spanning coal, iron ore, nickel, copper, bauxite, zinc, gold, silver, uranium and rare earths.

Ensuring continuous water supplies during mine operations is a baseline requirement.

Today, the Australian mining industry is at the forefront of sustainable water management recognising that environmental accountability, social responsibility and commercial success are now inseparable goals.

The protection or enhancement of water resources for the environment and for communities – before, during and after mining – has become an established part of Australian practice.

Increasing stress on water resources means that mining, in Australia and globally, will continue to rely on expertise and innovation in effective and sustainable water management.

Water must be managed at all stages of the mine life cycle including: exploration, project planning and design, mining and minerals processing, rehabilitation, closure and post-closure.

Water management decisions made at any stage of the life cycle may have effects on the subsequent stages.

For example, mine planning dictates volumes and quality of surplus water generated by the mine, which may affect water treatment requirements during mining, rehabilitation and post-closure. Australia has mines at all stages of the life cycle: from mines in current planning to operational mature mines more than 90 years old, to closed and abandoned mines that are still being actively managed to protect the environment.

Australia's long history of overcoming the challenges associated with mining in a difficult geographical and social context has led to the development of specific water-related expertise.

The mining industry is one of the most efficient and productive water users in Australia.

The contribution of the mining industry to the Australian economy, per gigalitre of water consumed, is around 50 times that of agriculture.

This is largely due to the high water efficiency of Australian mines, which in total consume about 760GL of water per year, only 4.4pc of Australia's total.

Along with its low national water footprint, Australia's mining industry has

adapted to more regulatory requirements around water than most other economic activities.

Australian water capabilities across the mine life cycle

Australia is seen as a global leader in water stewardship and integrated water resources management related to mining resources, including building resilience of mining value chains to climate and weather disruptions.

The country's economic reliance on groundwater requires high standards and innovation in groundwater management.

It has developed technologies to suit specific water and wastewater treatment needs of individual mines, with the drive for environmental performance leading to Australian leadership in alternative mine water sources, such as recycled water and the development of water recovery technology ensuring long-term safety of tailings dams.

Australia is also a leader in education and training programs for improved mine environmental performance and social responsibilities.

Climate change and climate variability

Circulation systems such as the El

Niño-Southern Oscillation have varying, often strong effects across Australia, contributing to swings between extreme droughts and floods.

Most mines in Australia need to predict the nature of the oscillations and implement adaptable and robust water management systems to mitigate the risks associated with extreme weather.

Australian companies have developed and apply the monitoring and forecasting technologies that permit effective decision-making and planning.

CSIRO has also developed an innovative climate adaption tool called CRATER (Climate Related Adaptation from Terrain Evaluation Results) for the mining industry, which identifies flood-potential hot-spots around a mine and helps to select suitable adaptation options.

Australian companies similarly provide infrastructure and operational management solutions that ensure a mine can respond in a timely manner to changes in weather with minimal loss of production and within regulatory parameters.

Mining in sensitive environments

Most mines in Australia are located in sensitive environments with shared water resources.

Sensitivity arises when cultural and economic water assets, such as the Great Artesian Basin and the Murray Darling Basin, are accessed by multiple users, including traditional land owners.

Mines must adopt water solutions that respect the sensitivity of the water environment and community values, and where possible contribute positively.

This has led to particular capability in all aspects of water stewardship, including water efficiency, contributing to urban and pastoral water supplies, ecological restoration schemes, water monitoring, prediction and reporting systems and development of governance and engagement frameworks.

Groundwater management and monitoring

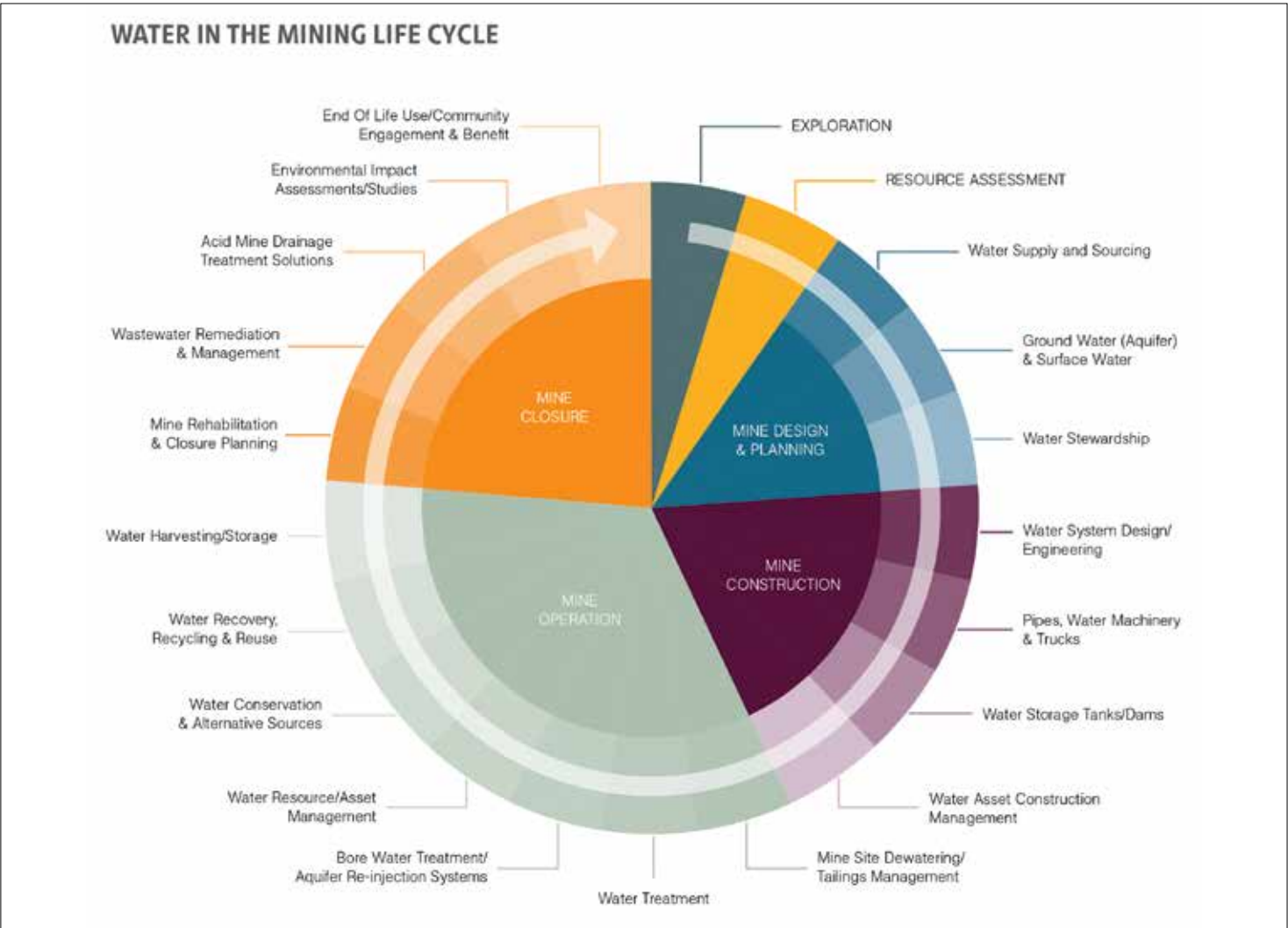
Australia is not only economically dependent on the preservation of aquifer resources but also deeply tied to the environmental and cultural values of groundwater.

Mines avoid groundwater impacts through minimising the depressuration of aquifers caused by the dewatering of mine pits and limiting mine-affected water seepage into groundwater.

The intersection of mining activities and groundwater resources has required the Australian mining sector to achieve excellence in predicting dewatering volumes; designing mines to minimise dewatering requirements; designing groundwater pumping; and re-use or disposal systems.

Water and wastewater treatment

The Australian water industry is highly skilled in the development and delivery of



water treatment strategies for each stage of mine life.

This includes the mine ramp-up through to peak production, post-closure and remediation of abandoned sites.

Treatment strategies are tailored for each mine site to ensure the provision of fit-for-purpose water treatment in an environmentally and financially viable

manner.

Australia's expert practitioners ensure that water treatment solutions meet high safety and quality standards, maintain regulatory and process compliance, ensure robust and reliable technical performance and support optimal productivity throughout the mine life.

Remote working environments, harsh

operational settings, variable climatic conditions and stringent processing requirements are just a few of the challenges Australian water treatment specialists are adept at managing.

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Sand silica-based water filtration

NATIONAL

ALL natural waters contain varying amounts of suspended and dissolved matter as well as dissolved gases and heavy metals.

These impurities in water become an important consideration when water is to be used for steam generation.

With the trend toward higher-pressure boilers, pre-treatment has become the key to successful operation of industrial power plants. Feed water must be pre-treated to remove impurities to control deposition, carryover, and corrosion in the boiler system.

Water evaporating in the boiler causes impurities to concentrate, iron deposits cause tube failure from overheating because they act as an insulator, preventing efficient heat transfer through the tubes to the water.

Over time the metal fails, and these deposits can also cause plugging or partial obstruction of boiler tubes, leading to starvation and subsequent overheating of the tubes.

Deposits cause unscheduled outages, increased cleaning time and expenses, reducing overall operating efficiency resulting in higher fuel consumption.

Water filtration systems

Filtration reduces the need for frequent tower cleaning and blow-down and



DMI-65 is infused technology and not just a surface coating technology, unlike other catalytic water filtration media, which removes the chance of any chemical leaching into the water stream.

increases heat transfer efficiency.

The DMI-65 is an extremely powerful silica sand-based catalytic action water filtration media that is designed for the removal of Iron and manganese without the use of potassium permanganate through an advanced oxidation process.

Incorporation of a DMI-65 filter will materially reduce the symptoms as well as benefitting the total system by performing disinfection and mechanical filtration of un-dissolved solids.

Case study

The Kuala Langat Municipal Power Plant is a 760 MWe natural gas-fired power plant, 45 miles south of Kuala Lumpur, Malaysia.

Electricity generated from the gas and steam turbines at the site rely on available clean water from the rivers and privately-owned deep wells.

During the wet monsoonal season, turbidity levels and suspended solids increase in concentrations, and as a result

block the existing rapid sand filters filled with traditional silica sand media.

To overcome the influx in turbidity and suspended solids, bore well water is blended in lagoons to lower levels of turbidity and suspended solids.

While doing so provides a short solution, it also introduces the risk of heavy metal bio-fouling developing in the system from traces of colloidal iron and manganese from the well water sources.

In 2016 Australian company Quantum Filtration Medium provided consultation to KLPP engineers and board of directors, on how the total system could be improved, starting with the upgrade of chemical process to accommodate for effective dry chemical polymer dosing to clarify and treat in the river water harvested in the lagoons, and the upgrade of the traditional rapid sand filters with new technology catalytic filter media: DMI-65.

Quantum Filtration Medium commenced works in 2016 with local Malaysian engineering firm ExPG Engineering Sdn Bhd. and Australian water treatment consultants Aquasol.

By March 2017 the upgrade of the polymer dosing systems in the lagoons and DMI-65 media install in the rapid sand filters was complete.

A report released in March 2017, confirmed that the process waters was of better quality than before - with TSS and TDS values less than 1mg/L, iron and manganese values less than 0.01mg/L.

For more information visit: www.dmi65.com.



ADVANTAGES OF USING DMI-65® FOR POWER GENERATION: PRETREATMENT FOR BOILERS AND COOLING TOWER WATER

IRON AND MANGANESE BUILDUP

Build up of iron and manganese in boilers and cooling towers results in very high maintenance overheads, loss of production and potentially system failure. DMI-65® efficiently removes dissolved iron to the almost undetectable levels as low as 0.005mg/L and manganese to 0.001mg/L as well as particulate, effectively removing this risk.

REDUCED COSTS

The total cost of the iron and manganese removal water filtration system is significantly less than alternative solutions, the effectiveness, but relative simplicity, of DMI-65® based systems reduces the upfront capital expenditure on plant complexity as well as the ongoing operational expenditure in chemicals, power and backwash waste water recovery.

HIGH FLOW RATES

The infused technology of DMI-65® promotes the highest oxidation rate of any catalytic filtration media. This permits a significantly higher water flow rate to achieve the same level of iron and manganese removal. DMI-65 can operate at linear filtration velocities up to twice that of conventional media with a corresponding reduction in capital equipment costs.

HIGH LOAD CAPACITY

DMI-65® also has higher iron and manganese load capacity which can extend the duration of filter runs and the time between backwashing, thereby reducing downtime, operating expense and wastage.

REGENERATION NOT REQUIRED

The media operates with a continuous injection of sodium hypochlorite at low

residual levels (0.1 to 0.3mg/L) which eliminates the need for Potassium Permanganate.

WIDE OPERATING ENVIRONMENT

Stable and satisfactory performance at pH 5.8 to 8.6 and a maximum operating temperature of 113° F (45°C) reduces the need for investment to alter the operating environment.

LONG LIFE

DMI-65® is not consumed in the process giving it an expected operational life of up to 10 years, providing considerable advantages over other processes or media. The media does not display a decaying capacity to do its catalytic work. Over the 5 to 10 year period, through many backwashing operations of the bed to remove retained solids, an attrition loss of the media occurs by contact between particles and mechanical abrasion.

CONTACT US:

☎ 1300 303 281



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www.dmi65.com



Waterless waste disposal

NATIONAL

ROTA-LOO, the premier dry composting toilet system, is still the best way to handle sewage in a waterless, odourless, environmentally friendly and complete safe manner.

It is ideal for homes, parks, remote locations and sensitive environments where septic is not an option.

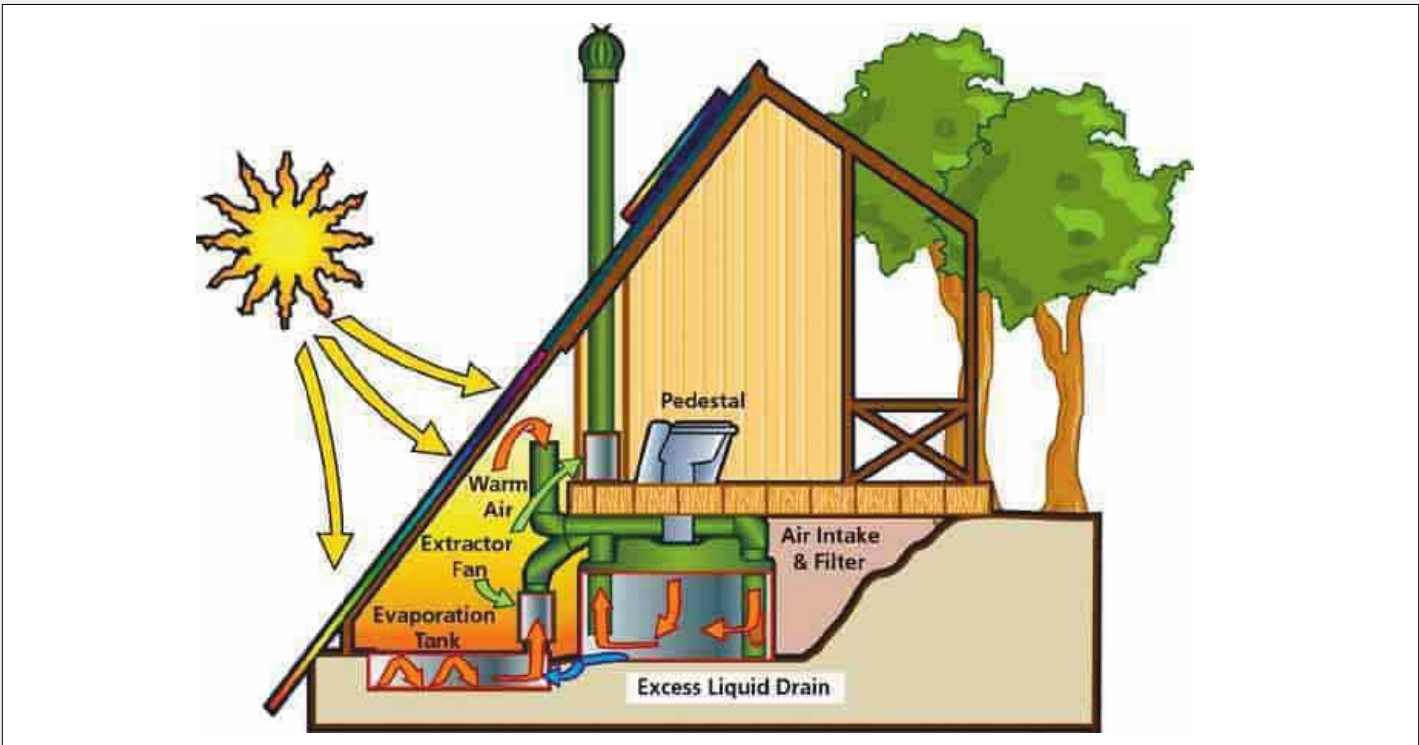
Rota-Loo is certified to AS/NZS 1546.2 and is approved in all states and territories in Australia.

Rota-Loo is a waterless system where natural moisture is drained and evaporated so it is designed to maintain aerobic decomposition and not produce odour.

There are six bins in use in the Rota-Loo loop at any one time, which functions as a big clock.

A bin, on average, should take about two months to fill, meaning that after about one year, the contents of a bin will be fully composted into 'humus' which can be used as fertiliser.

By adding food scraps, cardboard, grass clippings and wood shavings, airflow through the pile can be enhanced.



Rota-Loo is ideal for remote locations where septic is not an option.

ROTA-LOO FAST FACTS

- Number of people frequently using – from 4-20
- Number of bins – 6-8
- Capacity – 180 -1200 litres
- Estimated composting time – 324-480 Days
- Low handling frequency
- No water usage
- No odour – aerobic composting
- Designed and manufactured in Australia
- Available reseller and agents throughout Australia
- Do not require a plumber to install
- Humus produce can be safely used to fertilise plants and trees
- Based on 5 litres per flush for 2 people, 2 visits over 7 days, the user would save 140l per week, or 7280l per year

ROTA-LOO

THE PREMIER DRY COMPOSTING TOILET



- Waterless
- Odourless
- Chemical free
- Easy to install
- Virtually maintenance free

Ideal for remote locations, mines, farms, parks, and sensitive environmental areas where septic is not an option.

CONTACT

- (03) 5135 3900
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- www.rotaloo.com.au

Mine water treatment solutions

NATIONAL

STORAGE and treatment of mining production water, or underground water brought to the surface during dewatering operations, can provide many challenges.

It may often be contaminated with salts, heavy metals, iron and manganese amongst other things, making treatment and disposal problematic.

Sulphide ore bodies can often result in acid sulphate conditions causing water bodies to turn highly acidic on exposure to the atmosphere and becoming toxic to the environment.

Inability to effectively treat this water can curtail or even halt mining operations as safe storage limits are exceeded and provision for future runoff events become compromised.

A strategy for ongoing sustainable water management is essential for any mining business.

Compliance with discharge guidelines is critical to ongoing operations.

Waste water supplies can become an asset with the correct treatment approach.

Modern, technologically advanced treatment processes with log 6 viruses, bacteria and metals removal can effectively take any water source, no matter how contaminated, and convert it to pure drinking water quality.

Treatment systems can now be conveniently supplied in preconfigured, containerised systems.



With a reputation for rugged reliability in the toughest environments, Aqueous' equipment is exported around the world in a variety of applications.

These systems avoid the requirement for expensive and time-consuming processes, buildings and infrastructure.

The containerised systems arrive at site pre-plumbed, prewired and ready to go, providing a fast and convenient route for immediate treatment needs while minimising onsite installation time.

Aqueous has been a specialist manufacturer and supplier of quality Australian-made water treatment equipment for more than 20 years.

With a reputation for rugged reliability in the toughest environments, Aqueous' equipment is exported around the world in a variety of applications.

Aqueous is an engineering-based company with a core staff of design professionals able to assist with each treatment application on an individual basis finding the best fit for the job.

If you have a treatment problem, call Aqueous on: 03 9397 3066.

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- Lake, dam and river water ultrafiltration and disinfection for secure, safe water supply to your operations.
- Aqueous Solutions have been designing and delivering quality water treatment and reverse osmosis equipment for industrial and processing facilities since 1999.
- Short term rental and permanent systems available.

CONTACT US

**RUGGED DESIGN. AUTOMATIC OPERATION.
REMOTE MONITORING. BUILT TO WORK.**

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www.aqueous.com.au

Easy-install amenities and facilities

NATIONAL

WHEN it comes to bathrooms, every home, building, project space or areas where people gather needs one.

They're often seen as one of those necessity buildings that are a 'must have' and therefore only need to be utilitarian, sparse and useful.

This being the case, they're sometimes added almost as a second thought to a project and added after many major elements of a project has been considered.

Many companies are looking for a modular, prefabricated bathroom building that can be put almost anywhere, built quickly and doesn't cost a fortune to install.

With these requirements in mind, Ecoflo has developed a range of prefabricated toilet blocks that will suit a wide range of situations.

They can be installed in campgrounds and caravan parks, road stops, parks, churches, businesses, mining sites or anywhere where an outdoor building is needed for an amenities block.

Ecoflo aims to make the building process easier by providing toilet buildings that are easy to install and maintain, come with a wide range of composting toilet



A twin toilet cubical install at Jubilee.

options, meet Australian standards, won't corrode or rust, and are fire-resistant.

The company make its amenities buildings from fibreglass reinforced plastic building materials, which are strong, lightweight, and won't require any special tools to install.

There are many benefits to installing an amenities building that's prefabricated.

Firstly, there's no waiting around for building materials to arrive as everything is delivered flat packed and ready to go.

The other benefit is that because Ecoflo's buildings are easily combined with its wide range of composting toilets, the buildings don't need to be 'plumbed in'.

If you combine Ecoflo's buildings with a water tank and solar electricity, they quickly become incredibly environmentally-friendly and almost entirely self-sufficient.

Ecoflo's prefabricated amenities buildings can be customised to suit the

specific requirements of the area clients intend to install.

The client also gains access to Australia's largest range of composting toilets and solar accessories to include in the amenities building.

If businesses have specific requirements centred on accessibility, build time, build type, materials or environmental impact, they can call Ecoflo on 1300 138 182 to discuss their project with one of its experts.

PUBLIC TOILETS ANYWHERE, ANYPLACE, ANYHOW



At Ecoflo, we're the experts in remote, waterless composting toilet solutions.

- Proven track record of over 35-years
- Reduce water consumption and environmental footprint
- Fabricated from lightweight, strong fibreglass reinforced plastic
- Odourless and chemical-free

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ecoflo
wastewater management

Amoeba threat in process water

NATIONAL

DURING the past 10 years, mining has started to monitor process water quality to ensure low risk of water borne diseases.

Now that it is being monitored and tests for amoeba are being conducted monthly, some major mining sites have found *Naegleria Fowleri*, an amoeba that can travel up the nasal passages and proliferate into the brain.

This causes brain death by primary amoebic meningoencephalitis, in short brain tissue is destroyed and brain swells causing death slowly.

Of 134 people who contracted the disease in USA since 1962, only three survived.

This organism grows and thrives in warm freshwater water such as present in pipelines or tanks at mine sites.

It feeds on bacteria, slimes, fungi, algae and lives in crevices, cracks and porous substrate.

It is very resistant to chlorine and hard to remove once detected.

Some mine sites have closed sections of mines or suspended operation while they sterilise once detected, posing a major productivity loss, and a major risk.

Aquasol technical director, Paul Savage, said he had advised many mining companies to step up process water filtration systems to remove or disinfect this organism and other bacteria.

"The benefit is also clean water that



Amoeba grows and thrives in warm freshwater water such as present in pipelines or tanks at mine sites.

promotes low maintenance on valves, piping and tanks," he said.

"Most modern mine sites specify process water filtration and sterilisation, but we are still seeing old

mines with issues due to no treatment or poor treatment systems."

Recently a high-profile case in a surf wave lagoon in USA killed a man when he contracted this organism, with death

occurring over almost a week with no cure and limited treatment available from hospital.

For more information visit: www.aquasol.com.

As a fully licensed Water Treatment provider AQUASOL can offer a range of Water Treatment Solutions to cater for all of your mine Water Treatment needs

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- Containerised Mining Process Water Treatment Systems
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AQUASOL
Water Treatment Solutions

RANGELAND REPATRIATION

Located near Onslow on WA's Pilbara coast, Chevron's Wheatstone LNG plant is one of Australia's largest resource developments. As part of the construction of the onshore processing facility, Chevron's principal contractor, Bechtel Australia, engaged environmental consultancy and wildlife research company, Terrestrial Ecosystems, to undertake the fauna management on-site.



An excavator carries out the initial deconstruction of the rock-hard mounds.

RAY CHAN

TERRESTRIAL Ecosystems was the sole provider of terrestrial fauna management services for the construction of the \$35b on and off-shore Wheatstone LNG project.

Working between November 2011 and July 2018, the company had to remove or "deconstruct" more than 100 large termite mounds that were scattered across the landscape.

In doing so, it recorded 34,646 individual vertebrate fauna – including a diverse range of reptiles, an abundance of frogs and a smaller but important number of feral and pest species – that had made the mounds their own micro-habitat.

Terrestrial Ecosystems partner and

principal zoologist Scott Thompson said the work had been highly varied, including catching and relocating fauna during the vegetation clearing programs, removing fauna from the village and newly constructed LNG plant, trapping feral fauna (ie. cats and foxes), removing fauna that were injured or died as a consequence of the works program, and educating the workforce about the importance of fauna on site and in the region.

"The Wheatstone site was a very complex project and we were required to liaise with more than 50 different contractors to gain access to various work areas, work alongside heavy machinery, respond to fauna call outs on a 24/7 basis and provide advice to traditional owners, client staff and contractors with varying levels of knowledge or ability," he said.

More than 10,000 frogs, 444 Stimson's



Zoologists had to finish off the deconstruction with hammers.

pythons, almost 1000 goannas and 60 death adders were recorded.

There were more than 240 species of fauna recorded and more than 100 feral cats were euthanased.

Dr Thompson said 158 termite mounds were deconstructed and more than 4200 fauna salvaged during the process, highlighting the importance of the micro-habitat that the mounds provide in the Pilbara.

"Large above-ground termitaria provide an important food resource for small vertebrates, protection from fires and flooding, a thermal environment that modifies the external extremes and nesting sites for birds and reptiles," he said.

"Due to their size and how hard they were, a small excavator would break up portions of the termite mounds and these

would be carefully broken up by hand or hand-held hammers.

"The process could take up 3hrs per mound with four to five staff."

During all vegetation clearing, staff would monitor the clearing process and collect live and dead fauna.

The fauna were identified and live fauna released into similar habitat in the surrounding region.

Released fauna were spread out so not to overcrowd existing habitats.

Cats and small native mammals were caught in cage traps and aluminium box traps and all reptiles were caught by hand.

Dr Thompson said that at the peak of construction, there were eight full-time FIFO staff on the project, who completed more than 100,000 hours without an loss-time injury (LTI).



All reptiles in the mounds were captured by hand.



A black-headed python emerges from a termite mound.

(CONTINUED OVER)

(CONTINUED FROM PAGE 47)



Among the amphibians collected were this desert spadefoot toad, endemic to Australia.

“The fauna salvage program resulted in a significant number of rescued fauna, some great scientific outcomes, range extension data for a number of fauna species, and new knowledge on invasive species incursions resulting from construction programs, which will influence the regulatory approach for future construction programs, and has

provided employment opportunities for almost 50 new career zoologists on fauna management in real life industry placements,” he said.

“Going forward it is essential that there is a change in government policy with regards to fauna management, so that there is more focus on the way companies approach fauna management during mining and land



An echidna found in a mound.

development programs.

“Currently there is no policy or State Government guidelines for this type of work, and the current focus is on the rare or threatened fauna only – even when this does occur, it is often done poorly.”

Dr Thompson said that State Government guidelines are

essential and would mean a more universal implementation of fauna management programs across WA during vegetation clearing programs, whether it be the mining or land development industries.

“Monitoring the outcomes of any fauna management programs are also important,” he said.

A new digital age for mining

IN a day and age where the internet is as much a part of our daily lives as food, it's crucial for every business to have an on-line presence.

The mining industry is using digital marketing strategies, including social media, to attract community support, talent and media attention, not only to communicate technical aspects of their projects reactively, but pro-actively as well.

Over the past few years, access to information has changed the way the mining business communicates and interacts with their audiences.

Mining companies in Australia are using stories that connect people and businesses to create a positive agenda for their brand.

If you go to Youtube or any other social media platform and browse in any of the channels of the biggest mining companies in Australia, you will notice that in the past five years the companies are showing less of the operations or technical aspects and telling more personal stories.

Topics about the environment, flexible working policies, gender gap and inclusions are some of the issues that have more content about.

Search Engine Optimisation (SEO)

If you are in Australia and search on Google for the word “Adani”, the link in the first position will be the website Stop Adani.

This is the worst SEO scenario that you can imagine from the digital marketing perspective.

But, why is Stop Adani ranking higher than Adani Australia itself? There are many ranking factors that Google takes into consideration, but the one that is making some difference, in this case, is



Public relations and social media are working together to create a positive agenda for the mining industry.

the quality of backlinks of each website connected to, and the organic traffic for, this specific search term.

Because of the media coverage about the protest, the Stop Adani's website received a significant amount of high-quality domain backlinks, which shows Google that this website is relevant for those searching for Adani.

Public relations and social media combined

According to Media Shark online

content head Gabriela Damaceno, governments and communities are undoubtedly changing the mining industry dynamics, and some companies already understand that it is a better way to engage with them.

“With the democratisation of the information seen in the last decades on social media, both governments and communities have the power even to shut down projects if their needs are not adequately assessed,” she said.

Browsing between the recent press releases and digital marketing

campaigns of the most significant mining companies in Australia, it is clear to see that public relations and social media are working together to create a positive agenda.

“They are using these channels to talk about how their actions are impacting the community and employees,” Ms Damaceno said.

“Public relations and social media campaigns are not two totally different communication tools as they used to be a few years ago.”

Lego unveils Liebherr excavator model

LEGO has revealed its biggest ever Technic set, and it's a replica of a Liebherr mining excavator.

Developed in partnership with Liebherr, the 4108-piece model of the 800t, 4000HP Liebherr R 9800 mining excavator comes with an array of true-to-life features and functions, introducing Lego builders to advanced elements of engineering, while the Technic Control+ app puts the builder in complete control of the model.

The replica is not only the new flagship of Lego Technic models, but also the first smart device connected kit, which allows programming.

The feature enables the user to control the model entirely via a smart device, reproducing the operations and applications of its original Liebherr counterpart.

Liebherr-Mining Equipment Marketing Manager Grégory Schuh said it was a great honour for the company to be contacted by Lego Technic for such a project.

"Even more, when it's to develop the flagship of the range for the year to come, this means that the brand is attractive and conveys values of quality and performance," he said.

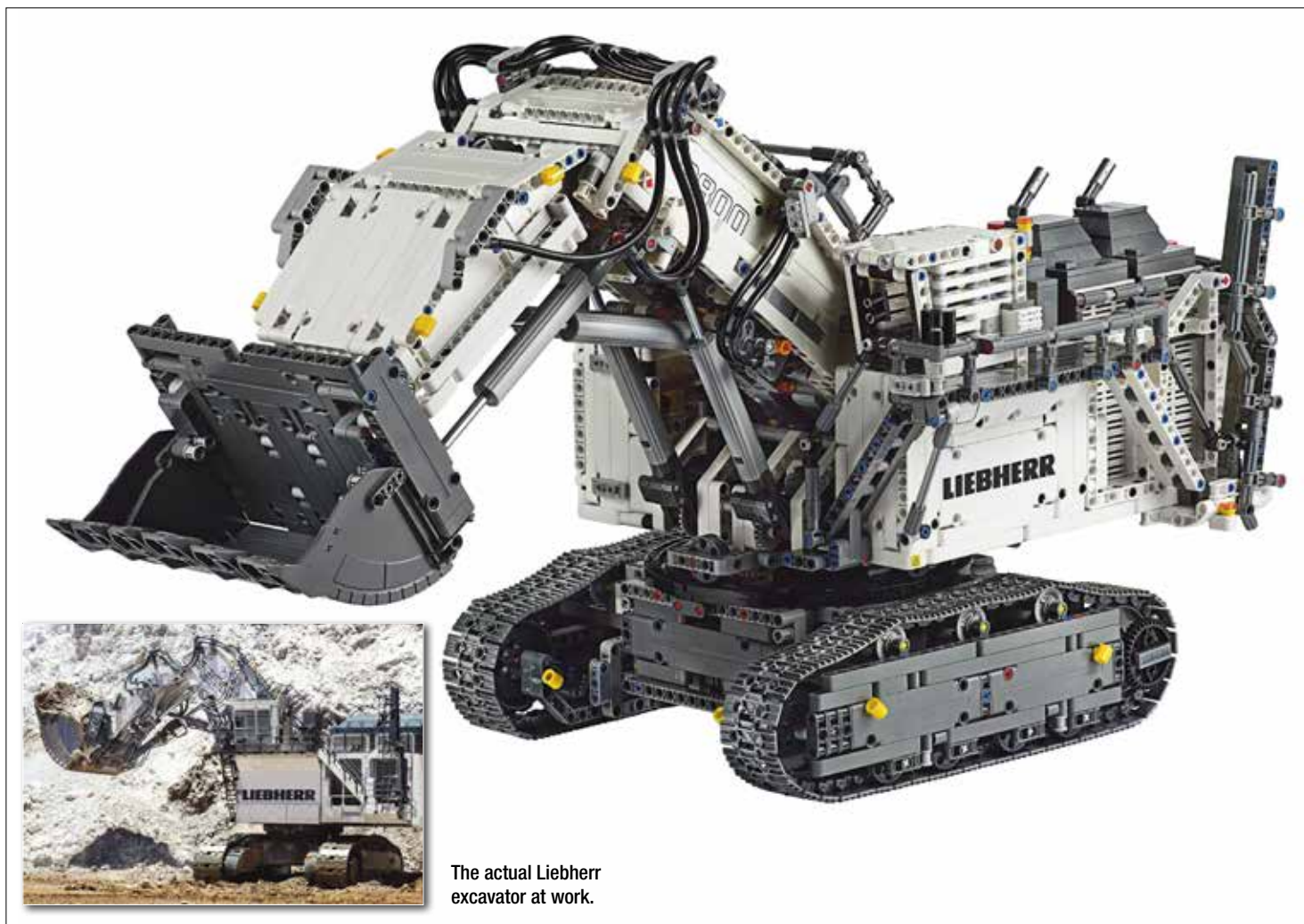
"We experience the fascination for our huge machines and the sophisticated technology behind them – for example with visitors at our trade fairs.

"We believe that the Lego team has done a great job in capturing this fascination and turning it into an impressive model, that can ignite the joy for engineering.

Lego Group marketing director Niels Henrik Horsted said the company wanted to give fans an even more authentic experience when they build for real with Lego Technic elements.

"This new way of controlling your Lego Technic set bridges the physical and digital world and gets you even closer to the real-life model replicas that you build," he said.

In the course of the partnership, Liebherr provided comprehensive support to the Lego project team; not only during the development of the model but also for the development of the marketing campaign revealed in early October on the Lego Technic and



The replica of the Liebherr excavator.

Liebherr social media channels.

The Lego team gained unrestricted access to the machines, logistical support and contact with the customer to make this project possible.

The sophisticated Control+ app technology enables super-precise movement and functionality, while delivering authentic digital play combinations.

The multi-function control screen on the app enables users to drive the excavator in all directions, rotate the superstructure, extend and raise the boom, open and tilt the bucket, play realistic sound effects and get real-time feedback, such as boom position, power usage and drive distance –

authentically mimicking the original.

With the One-touch screen, Lego fans can use drag patterns to control the boom, arm and bucket, while the custom-built movements screen enables users to choose pre-set commands or record the model's actions to create complex movement sequences. Finally, with the challenges and achievements screen, users can complete challenges to unlock reward badges.

The Liebherr machine, on which the Lego model is based, is produced at a Liebherr site in Colmar, France.

The mining excavator is one of the heaviest machines in the Liebherr universe.

With its weight, the Liebherr R 9800

weighs about three times more than a large passenger aircraft.

The bucket size comprises 42m³ and can hold 80t of material in one bucket – as much as filling 300 bathtubs.

Because of its size and heavy parts, 28 trucks are required for the shipment of one R 9800.

For assembling the full size R 9800, 12 weeks are required.

The replica model LEGO® Technic™ Liebherr R 9800 excavator can be put together faster and comes in just one box.

It is now available in stores and in the Liebherr-Shop. Visit: www.liebherr.com/liebherrshop/

Honouring patron saint of mining

DECEMBER 4, commemorated in many countries as Saint Barbara's Day, celebrates Saint Barbara of Nicomedia (Turkey), the patron saint of miners and geosciences in general.

It's commemorated by the British, Australian, and New Zealand armed forces, and by the United States army and marine corps.

Several mining institutions also honour it, such as some branches of the Australian Institute of Mining and Metallurgy, and the WA Mining Club.

Accounts place the early Christian Greek martyr in the third century in Heliopolis Phoenicia (present-day Baalbek, Lebanon), where she was regarded as one of the 14 Holy Helpers – a group of saints venerated together in Roman Catholicism because their intercession was believed to be effective,

especially against various diseases.

Often portrayed with miniature chains and a tower, Barbara continues to be a popular saint in modern times, perhaps best known as the heavenly advocate of armourers, artillerymen, military engineers, miners and others who work with explosives.

As the legend goes, when Barbara decided to be a Christian against her father's wishes, she fled town and hid in a crack in nearby mountain rocks.

Her father found her and killed her, but was then himself struck down by lightning, leading to her association with incendiary devices.

She may also be associated with miners because of her hiding place within rocks.

Among the Australian places which



A giant truck rolls down the main street of Kalgoorlie during St Barbara's Day last year.

observe the day is the mining town of Kalgoorlie, in WA, where colossal mining vehicles rumble down the main street festooned with mascots, Christmas angels and a couple of famous footy sons.

Celebrating the saint, miners, and the mining industry's contribution to the state's heritage, economy and community, the annual festival draws in thousands of visitors.

Tough Tsurumis withstand corrosion

NATIONAL

AUSTRALIAN Pump's partnership with Tsurumi allows the company to augment its Mine Boss pump range with submersible pumps that handle corrosive mine liquids.

Tsurumi claims to be a major player on the US and Canadian markets with a dominant position in copper, gold, lead and zinc mines.

Australia's rapid expansion in copper production, not just at Carrapateena but also in other existing key locations, means demand for 316 stainless-steel submersible pumps is increasing.

Tsurumi, which claims to be the world's biggest manufacturer of electro-submersible pumps for dewatering applications, produces more than 1.4m pumps per year.

Of those, an increasingly large quantity are made from titanium (TM series) or stainless steel (SFQ series).

Tsurumi SFQ series pumps are used in copper mines around Australia and the titanium pumps are used in chemical treatments processes that require absolute resistance to corrosion.

The rise of the titanium pumps

Tsurumi's TM series has been a huge success since launched by Australian Pump Industries.

Available in both single and three-phase, the pumps were originally designed for chemical plants or liquid food waste where cast iron pumps or low-grade stainless-steel pumps fail to go the distance.

TMs are available in both manual and automatic options.

The titanium stator housing and FRP resin wetted parts mean the pumps are not only corrosion-resistant but lightweight and easy to handle.

The maximum power rating is 3.7kW.

Even the heaviest in the series, the model 80TM23.7, weighs only 26kg.

The pumps are relatively inexpensive, free standing and available with 2in or 3in discharge ports.

The vortex impeller delivers maximum flows up to 900lpm and maximum heads to 26m.

Like all Tsurumi pumps, they feature a dual silicon carbide mechanical seal and Tsurumi's unique and patented "oil lifter".

This feature ensures the mechanical seals are constantly lubricated for cooling and longevity.

Series 316 stainless steel pump range

Tsurumi's SFQ series 316 stainless steel pumps have been readily accepted in gold and copper mines where cast iron pumps simply don't last.

Aussie Pumps chief engineer John Hales said the company had heard reports of cast iron submersible pumps failing in only a matter of days, not even weeks.

The SFQ series 316 SS pumps offers flows of up to 2000lpm and heads to 45m.

With a power range of up to 11kW, Tsurumi's corrosion-resistant, heavy-duty pumps feature two pole motors with high grade bearings.

An especially high-carbon grade of 316 SS is used which allows the pump to be fully cast with no welds to corrode.

High heads, big flows

Tsurumi's LH series, high head pumps are popular across Australia.

The unique design with its centre-mounted outlet makes it convenient to install.

The slim line of the product provides the ability to fit in 24in diameter bores.

That's even true of the 110kW version.

Smaller pumps in the range can be used in bores of only 8in diameter.

The pumps are fitted with abrasion-resistant, high chrome, closed impellers, providing heads of up to 200m and flows as high as 6500lpm.

Many of this range are now available in 316 SS all the way up to the big 8in model LH8110.

That 110kw pump has an astonishing performance of 3000lpm at over 100m head.

The big news is that these pumps are now available in cast 316 SS.

That's been a huge hit in the US mining market.

Many mining companies in Australia are already eyeing this product and waiting for it to be readily available.

Pumps will be wound in 415 volt and 1000-volt configurations, as well as optional 690V versions.

Stainless surface pumps

Aussie Pumps' commitment to solving the corrosive liquid problems on mine sites is ongoing.

That extends to the understanding of the need for self-priming centrifugal pumps that are surface mounted.

Recently the company announced that its

Aussie GMP range is now available in 316 SS configurations.

That allows flows from a self-priming 4in pump to reach as high as 2000 lpm and produce heads of 31m.

Mr Hales said that the higher performance pumps are also available with the G3TMK series of 3in pumps providing heads of up to 54m.

"The good news about this product is that it is available in 316 cast stainless steel either as an electric motor close-couple drive motor pump configuration, or as a bare shaft or even hydraulic drive version," he said.

"Working with mines directly has given us opportunities to learn how to adapt our product line to suit the growing requirement for pumps capable of handling corrosive liquids with ease."

The company is eyeing off the huge expansion of copper mining in South Australia, where Olympic Dam, Carrapateena and Kamantoo are all set to become major producers as the world's demand for copper grows.

"Future demands for the electrification of motor vehicles, ships and machinery will drive copper production for the next 25 years," Mr Hales said.

"Third world countries are set to stimulate further growth as demand for power increases."

For more information of the complete Aussie corrosive liquid mining package, contact Australian Pump Industries on 02 8865 3500.

A free copy of its mining capability document is readily available and online, entitled "Mining and Quarry Solutions".



A seven-year-old stainless-steel model SFQ came out of one of the most corrosive liquid copper mines in the country. Here the Tsurumi SFQ gets a new set of bearings and is back to work for another year or two – cast iron pumps simply do not last in such applications.



Aussie's big 3" G3TMK-A high pressure self-priming stainless-steel pumps can be electric drive, bare shaft or hydraulically driven.

GRI group partners with Titan

NATIONAL

TITAN Australia always endeavours to provide the very best quality products and service to its loyal customers, from the very best Australian-made steel for wheel manufacturing to the biggest and best brands of tyres for your farm or industrial machinery.

Therefore, it is with excitement and pride that Titan Australia announces its new partnership with a great specialty tyre supplier, GRI from Sri Lanka.

Over one and a half decades since establishment, GRI has experienced rapid growth, solid success and won many awards for business excellence.

With a team of dedicated professionals who strive to achieve the highest levels in innovation, engineering and operations that have powered GRI to become a leading specialty tyre producer, the company has seen momentous success via global expansion and transference of best practices.

With diversification in its industrial tyre product range and the launch of a new product portfolio in agriculture, construction and material handling tyres, GRI has earned a reputation of a company



GRI specialty tyres perform brilliantly in the most severe operating environments.

that advances towards the future with passion and determination.

GRI has established its trademark in pioneering initiatives, sound innovation and high-performance specialty tyres that perform brilliantly in the most severe operating environments.

Titan Australia national agricultural product manager Daryl Hynoski said GRI's agricultural tyre range and quality really hit the mark at Titan Australia.

"The state-of-the-art production facility

and advanced equipment in Sri Lanka are impressive," he said.

"This new-found relationship in supplying an alternative tyre brand on our wheels to tractor OEM's and aftermarket in Australia is exciting for both parties.

"The partnership between GRI and Titan is built on a strong foundation of assured performance and exceptional value to our customers in Australia.

"Farmers, construction workers and forklift operators all rely on the tyres

and wheels of their machines." GRI chief executive officer Mahesha Ranasoma said with the company's new solution, it would "more efficiently be able to nourish, build and move the world around them".

Together with GRI, Titan Australia will continue to provide the very best products to the agricultural, industrial and construction sectors across Australia.

If you would like to learn more about this great new range visit www.gritires.com or contact Titan Australia on 1300 791 672 or sales@titanaustralia.com.

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The basics of abrasive blasting

NATIONAL

ABRASIVE blasting is the use of abrasive material to clean or texturise a material such as metal or masonry.

Sand is the most widely used blasting abrasive, with other abrasive materials including coal slag, smelter slags, mineral abrasives, metallic abrasives, and synthetic abrasives.

Abrasive blasting systems typically include three essential components: an abrasive container (i.e. blasting pot); a propelling device; and a blasting nozzle or nozzles.

The exact equipment used depends to a large extent on the specific application and type(s) of abrasive.

Three basic methods can be used to project the abrasive towards the surface being cleaned: air pressure; centrifugal wheels; or water pressure.

Air blast (or dry) systems use compressed air to propel the

abrasive using either a suction-type or pressure-type process. Centrifugal wheel systems use a rotating impeller to mechanically propel the abrasive by a combination of centrifugal and inertial forces.

Finally, the water (or wet) blast method uses either air pressure or water pressure to propel an abrasive slurry towards the

cleaned surface.

Abrasive materials used in blasting can generally be classified as sand, slag,



Sand is the most widely used blasting abrasive.

metallic shot or grit, synthetic, or other.

The cost and properties associated with the abrasive material dictate its application.

Silica sand is commonly used for abrasive blasting where reclaiming is not feasible, such as in unconfined abrasive blasting operations.

Sand has a rather high breakdown rate, which can result in

substantial dust generation, and worker exposure to free crystalline silica is of concern when silica sand is used for abrasive blasting.

Metallic abrasives include cast iron shot, cast iron grit, and steel shot. Cast

iron shot is hard and brittle and is produced by spraying molten cast iron into a water bath.

Cast iron grit is produced by crushing versized and irregular particles formed during the manufacture of cast iron shot.

Steel shot, which is not as hard as cast iron shot, but is much more durable, is produced by blowing molten steel.

Synthetic abrasives, such as silicon carbide and aluminum oxide, are becoming popular substitutes for sand.

These abrasives, typically reclaimed and reused, are more durable and create less dust than sand.

Other abrasives include mineral abrasives (such as garnet, olivine, and staurolite), cut plastic, glass beads, crushed glass, and nutshells. As with metallic and synthetic abrasives, these other abrasives are

generally used in operations where the material is reclaimed. Mineral abrasives are reported to create significantly less dust than sand and slag abrasives.

The type of abrasive used in a particular application is usually specific to the blasting method.

Dry blasting is usually done with sand, metallic grit or shot, aluminum oxide (alumina), or silicon carbide.

Wet blasters are operated with either sand, glass beads, or other materials that remain suspended in water.

Industry-leading protective coatings

NATIONAL

HEAVY duty abrasive blasting to remove years of thick corrosion is just one of the specialty services Cormac Metal Spray offers its clients across Australasia.

For more than 23 years, the company has been actively involved in the application and development of Thermal Metal Spray (hot metal spray) which is used for 'long term corrosion protection' in the mining, petrochemical, oil and gas, marine, subsea, power generation, waste water and a variety of construction industries.

The application of a variety of metals can be used such as zinc, aluminium (TSA), zinc aluminium alloys and nickel, stainless steel, hastalloys, monel and bronze.

Cormac has developed unique mobile equipment and plant for all onsite thermal metal spray and protective coatings.

The process also provides various non-skid textured coatings for pedestrian and vehicular use on walkways, stairs, ladders, Helo decks and bridge expansion joints.

The company boasts more than a dozen high deposition thermal metal spray systems, a unique 'Internal pipe blast and thermal spray system', and numerous abrasive blasting systems, including two fully self-contained 4x4 mobile blast/metal spray trucks that can mobilise throughout Australia.



More information on Cormac Metal Spray can be found at www.cormacmetalspray.com.au.

Cormac Metal Spray also strives to provide clients with safe work practices, quality work ethics and product satisfaction.

This is evident by the calibre of clients Cormac has attracted over the

years, which include heavyweights such as BHP, BSL, SHELL; Rio Tinto; Aurelia Metals, OneSteel; Caltex; ExxonMobil; BP; the Australian Navy; Chevron; Woodside Energy, Port Kembla Coal Terminal; INPEX, NOV

and McDermott.

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OUR SERVICES:

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Revolution in discharge management

NATIONAL

PARTIAL discharge management is a crucial procedure for assessing the condition of electrical systems, but it doesn't have to be a timely and costly exercise.

Leading technology provider, Prysmian, has launched a revolutionary new partial discharge measurement solution that measures a whole cabling system to prevent failures and services interruptions.

The Pry-Cam product is a portable device that harnesses the extraordinary possibilities of the Internet of Things.

By using this device, partial discharge (PD) measurement and condition assessment data can be collected and stored via the Cloud to be accessed and shared remotely anywhere across the globe.

The portable device performs online PD measurement without service interruption covering all the joints and terminations within range of 500 metres either side of system, and PD testing at a distance, without the need for a direct connection.

This has enabled operators to keep track of PD testing with greater safety, and enables a test to be carried out without the requirement of onsite calibration.

Time completing a PD check is also significantly lower when using this device, as due to its 500m either side range, it doesn't have to be completed at every check point.

"Prysmian believes in developing new products and solutions through which our



The Pry-Cam portable device in action.

clients could increase uptime and safety, enhance asset longevity and significantly reduce maintenance costs and risks," Prysmian stated.

"Pry-Cam's technology allows online, accurate and reliable partial discharge

measurements, diagnosis and defect localisation as well as the monitoring over a certain period of time."

Australian Mining Review readers are invited to participate in a draw to win a free Pry-Cam survey.

Simply email the Prysmian team at albert.majadire@prysmiangroup.com and mention promo code PRY-CAM to be in the running.

More information can be found at: www.prysmiancable.com.au.



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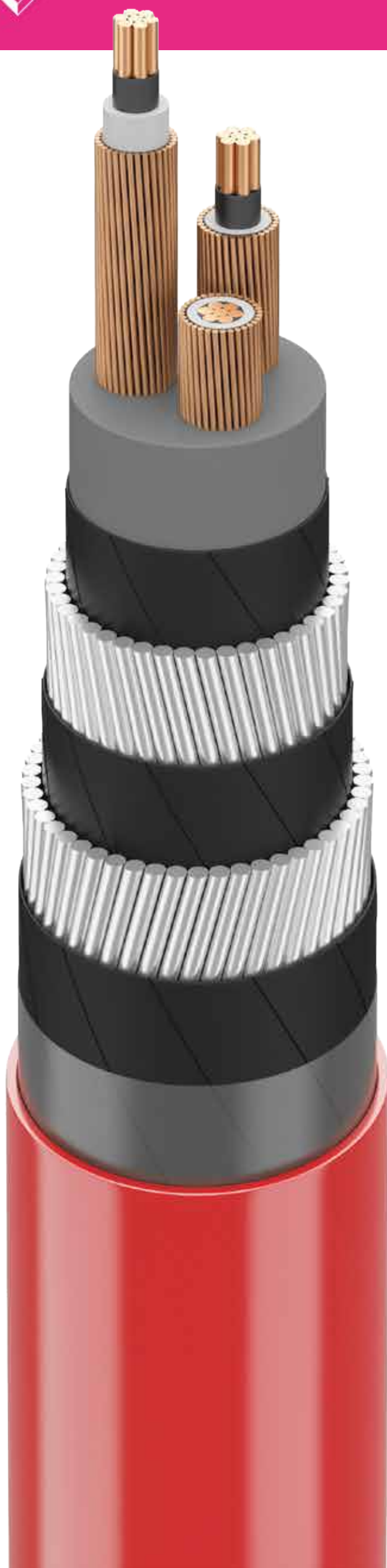
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CONTACT



Reputation set in concrete

NATIONAL

DALLCON has been manufacturing and supplying precast and custom concrete products to the civil, mining and agricultural industries throughout Australia since 2005.

Recently the company completed a large custom precast concrete project for Roy Hill Mining, which marketing manager Manuelito Ofiaza said was a pleasure to be involved in, for such a short lead time project.

"Everything had run very, very smoothly, and the client was extremely happy," he said.

"In conjunction with RCR Mining Technologies Dallcon successfully manufactured and supplied eight custom precast units to be used as a footing/loader bump stop for integral steel loadout hopper.

"The units sizes were 2360mm wide x 600mm thick base x 9000mm deep x 2850mm high, and weighed just under 50t each.

"We are renowned because of our versatility and flexibility in working around with custom products, we are assertive to build no matter how challenging a project can be.

"Dallcon understands the situations that can be occurred onsite, and how important short lead time items are in some situations.

"We have the experience and



Dallcon's established production methods and strict Australian manufacturing standards means the company can offer competitive rates for supply and delivery.

knowledge of how to deliver custom large precast elements in a very timely manner."

Mr Ofiaza said Dallcon's ability to manufacture and deliver difficult-to-handle projects set the

company apart from other precast suppliers.

"Clients come to us with a 10-week lead, time we set ourselves to deliver the promise whatever the weather," he said.

"We are always prepared to face

different sorts of jobs regardless of their complexities.

"The series of projects we've been awarded from industry key-players such as Rio Tinto, FMGL, Woodside, BHP, Mainroads and the major contractor like CPB, Georgiou, BGC, and Primero Group signified that the demand for our precast products is expanding.

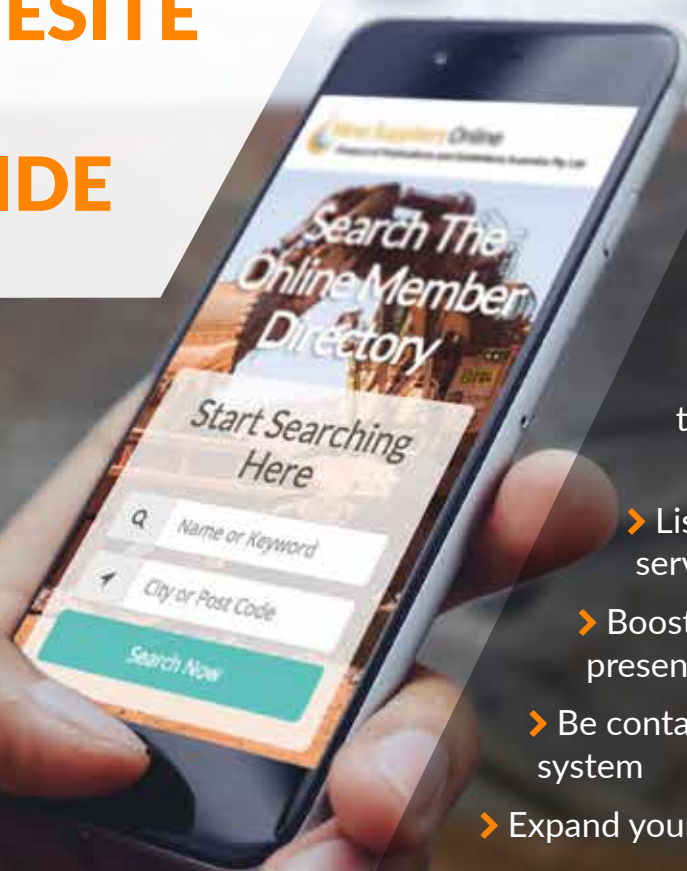
"So, we are investing in hiring more skilled people, new equipment and machineries to organize ourselves for bigger projects yet to come."

The company prides itself on using only the best materials sourced within WA in all products, which are made according to current Australian Standards and Main Road Development of Western Australia (MRDWA) specifications.

"Dallcon's experience in supplying products to a variety of projects, clients and locations throughout the country means we understand your specialised needs and can provide innovative, customised solutions for almost any situation," Mr Ofiaza said.

Dallcon also offers Australia-wide delivery at extremely competitive rates and has developed high standards in quality assurance, with current certification to ISO9001. For more information about Dallcon's high quality engineered precast concrete solutions visit: www.dallcon.com.au, email at sales@dallcon.com, phone at 1300 325 526.

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Dallcon is a West Australian owned and operated concrete manufacturer, supplying quality precast and custom-made concrete products throughout Australia.

Based in Dalwallinu, our manufacturing facility are perfectly located to be able to handle the largest custom precast units you require.



CIVIL & MINING PRODUCTS

Dallcon is the Precaster to engaged when looking for anything precast in your civil and mining project. Our large variety of ISO 9001 accredited precast products is the largest in Australia.

Additional to this, we manufacture any custom-precast product, which can be fully engineer designed and certified in-house, if there is no design at enquiry stage. Whatever your product, our commitment is Dallcon will always have a solution.

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DALLCON
Our Reputation is set in 'Concrete'

At the core of it

INTERNATIONAL

ADEPT is the leading designer, manufacturer and distributor of core sample conveyors both in Australia and abroad.

As the name suggests, Adept has the experience, the knowledge, and is nimble enough to tailor its work to any circumstance.

Speaking to the *Australian Mining Review*, Adept managing director Paul Johnson said that at his most recent project in Ghana, the company was involved in early core shed layout designs with the geologist and team leader.

Mr Johnson said that the job required the adaptation of the design to suit the final design/layout to seamlessly integrate and work to spec.

"We matched out Autocad drawings with the builder's final shed design, which provided system design advice to the customer on product flow and the most ergonomic design to suit their application," he said.

"We were able to undertake the layout of the system design in Australia to suit common products, which ensured the equipment could be supplied in 'kit' form.

"This meant installation could be carried out at a remote site by semi-skilled labourers.

"And it ensured that flow was ensured



Installing a core sample conveyor in Ghana.

that the flow through the core shed was streamlined, without bottlenecks from point of loading to final inspection with processing to out load."

It is this attention to the quality of work from design through to commissioning that has earned the company its formidable reputation not only in core sample conveyors but across other areas such as warehousing, freight housing and logistics and air and courier cargo systems

manufacturing, to name a few.

Mr Johnson said that looking to the future, he would like to see the company have further involvement in the design and layout of the core sheds, as the wealth of knowledge that Adept brings to this process can add tangible value to clients end results.

"In our view, we believe that it is pointless to just quote on a layout put forward to us when we can considerably

value add through our input in system design if given the opportunity," he said.

"If we are involved in the early planning stages, we can advise the user in efficient system design layout and provide effective advice on alternatives to save time and movement, and give considerable advice on safe operation by staff.

"Our advice is always free, it's just a part of the service we provide."

One word...
adept

- Core sample tray conveyors
- Core tray roller racks
- Core roller benches
- Drill core handling systems
- Australian design and manufacture
- Specialist core sample handling systems
- Full CAD system design and engineering in-house
- Special requests for customer applications



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Core sample tray handling systems? One word...



CONTACT

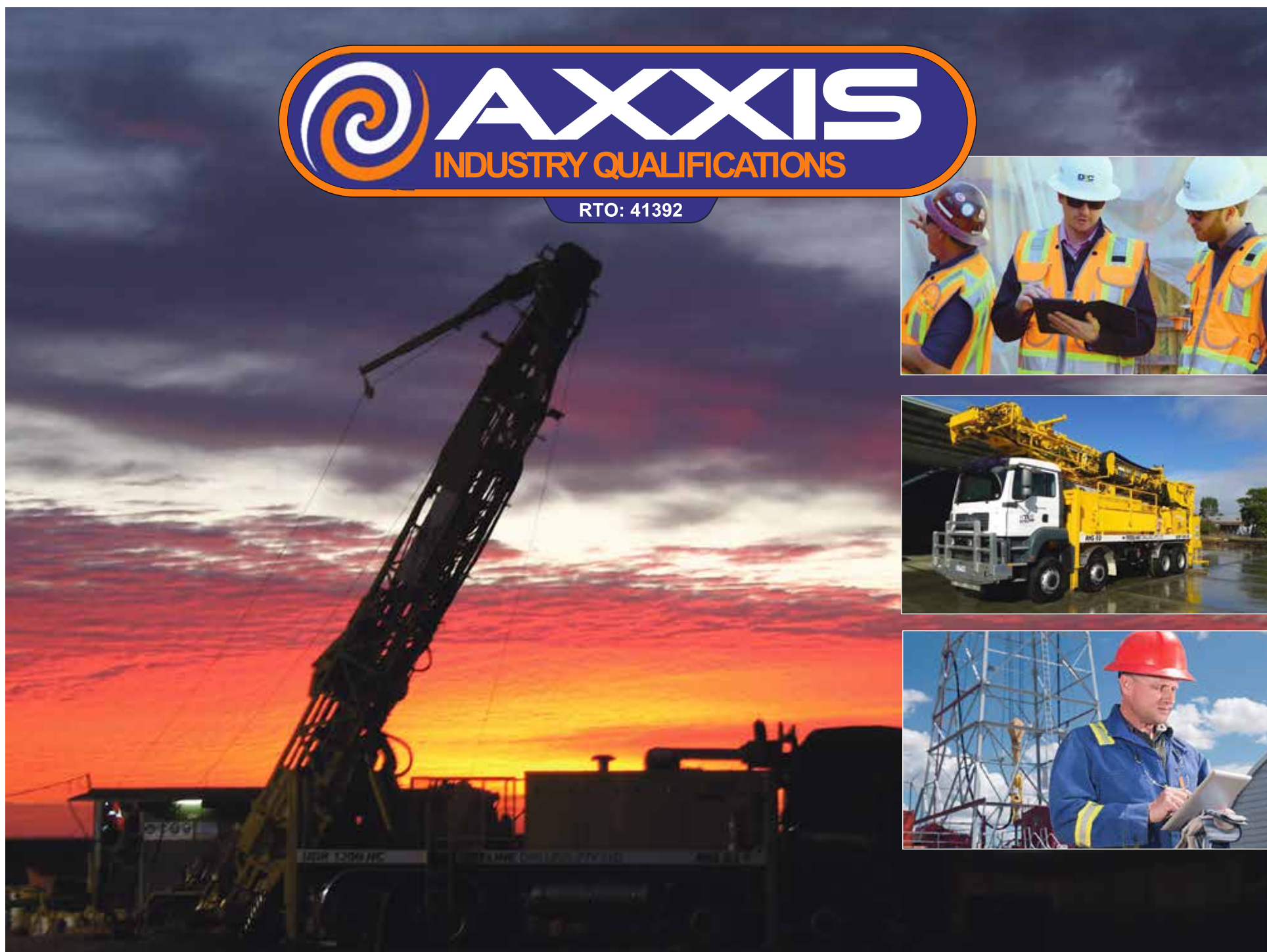
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technologies



RTO: 41392



Every employer knows it costs a small fortune to find and train new personnel . . . then your new star recruit messages, “It’s not for me!” and the recruitment merry-go-round starts again. Recruitment agencies often charge around 15% of annual salary to give you 2 or 3 “possibilities” that will “quite possibly”, not work out. Amazing! Read on, our proven solution is truly a no-brainer. Axxis sorts the wheat from the chaff for you! We run tailored certificate courses, with Drilling, Mining & Civil outcomes that dramatically save on your in-house training and inductions. Every situation is different of course, but for way less cost than traditional recruitment methods, our graduates are pre-trained and know what to expect on the job, BEFORE you even employ them! Our trainers get to know each candidate well enough to make valuable recommendations; it’s like a 3-week interview! Staff turnover is dramatically decreased as workers arrive armed with essential knowledge and qualifications. Put them into a follow-on traineeship pathway and you might even get wage subsidies and Payroll tax benefits as well!

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Axxis provides the following courses to the Resources and Infrastructure Industry (RII).

(Queensland state government funding may be available for eligible Queensland residents or workers)

Why not give one of our programs a go?

Entry level - RII20115 Certificate II in Resource & Infrastructure Work Preparation

Drilling Pathway – Certificate levels II, III, IV & Diploma

Mining Pathway – Certificate levels III and IV

Civil Construction Pathway– Certificate levels III (various types) and IV (Supervision)

Axxis delivers industry qualifications Australia wide, including high-risk licensing & short courses.

CONTACT US

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A reputation for excellence

NATIONAL

FOUNDED in 2006 by brothers Hugo and Gus Lacey, Raglan Drilling started out with one air-core rig and has since expanded to a 12-rig operation.

With dedication and a 'can do' attitude, Raglan has gained a reputation for delivering a high standard of service, sample quality and safety.

Raglan delivers exceptional services and solutions in RAB, air core, reverse circulation, diamond and lake drilling.

In 14 years of operation, Raglan has demonstrated a strong commitment to safety with excellent production rates and high-quality sample over every metre drilled.

The company provides services across multiple locations in Western Australia with a highly skilled and committed crew of 55.

Raglan Drilling is experienced in providing a high-quality service in the delivery of safe drilling.

"We understand no two jobs are the same and approach each one with an agile 'can do attitude' to exceed client expectations and deliver exceptional results," Raglan Drilling founder Gus Lacey said.

"We operate with transparency and integrity, and place high-value on strong client relationships and client satisfaction.

One delighted customer of Raglan Drilling is Horizon Minerals general manager Andrew Pumphrey.

"MacPhersons Resources has used the services of Raglan Drilling since 2013, and during this time they have completed over 140,000m of reverse circulation and aircore drilling, providing a good quality sample at a competitive cost using modern well-maintained drilling rigs," he said.

"They have always had a high standard of OH&S and worked well with MacPhersons staff onsite."

Raglan driller Jarryd Whipps recently drilled a 600m deep RC with a hole deviation of less than two degrees, which is an impressive effort.

"I have no hesitation in recommending Raglan drilling for upcoming work you may be considering," Mr Pumphrey said.



"We strive for effective and clear communication to ensure the best outcome for every drill program.

"We value our people and that's why

Raglan selectively employs, trains and supports committed and capable drill crews who closely follow company values and safety protocols."

More information about Raglan Drilling and its extensive range of services can be found by visiting: www.raglandrilling.com.au.



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www.raglandrilling.com.au



Keeping stock of innovations

NATIONAL

DRILLERS World Australia is a supplier to the drilling and environmental industries, servicing the mining, exploration, geotechnical, waste treatment, water well, tunneling, foundation piling and HDD communications sectors.

A member of the Australian Drilling Industry Association (ADIA), the National Ground Water Association (NGWA), and No-Dig Australasian Society for Trenchless Technology (ASTT), the company has been in operation since 1997 and is a family-owned and operated business.

Drillers World Australia owner and founder Bob Seaborn has been involved in mining and drilling particularly for more than 30 years.

“Our mission is to deliver a professional service to the drilling and environmental industries by providing a fast and efficient delivery service, from a fully stocked warehouse in Sydney, of products that our customers use on a regular basis,” Mr Seaborn said.

“The different drilling disciplines we sell to have enabled the company to have expansive suppliers that mines don’t always consider or aren’t on their current vendor lists. This gives us capabilities to



Drillers World managers Pete Seaborn and Tom Moc.

assist them in obtaining different product ranges”.

Popular products include Baroid drilling fluids and polymers, wireline and conventional core barrel assemblies, DTH hammers and bits, core trays, threaded steel and PVC tubing, Asahi diamond bits and more commonly PDC (Polycrystalline diamond compact) bits.

“PDC technology has led to improvements in penetration rates and a

big reduction in downtime due to less rod tripping and their ability to be used with air drilling or mud rotary,” Mr Seaborn said.

“We pride ourselves on the ability to support our existing customer base at short notice.”

Recently a client using PVC for a water well was unable to fit the PVC casing in the borehole.

This was due to borehole instability

and the end user not allowing drill mud to keep it stable, as they had to do permeability testing.

Drillers World was able to get the PVC threaded instead of bell-ended that night, to reduce the outside diameter of the PVC.

The client and hydrologist were extremely happy to see the product delivered on site the next morning, and allow completion of the well.

www.drillersworld.com.au

Drillers World Australia Pty Ltd has been in operation since 1997 and is a family owned & operated business.



Drillers World Australia Pty Ltd

MEMBERS OF
ADIA
NGWA
No-Dig ASTT

Drillers World Australia is a Supplier to the Drilling, Trenchless and Environmental Industries including Mining, Exploration, Geological, Geotechnical, Waste Treatment, Water Well, Consulting, Communications, Piling and Tunnelling.



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📠 + 61 2 9457 0256
✉ sales@drillersworld.com.au

drillersworld.com.au

World's quietest dust controller

NATIONAL

LOOKING for a super quiet dust suppression system?

The new and improved V12s Dust Control Cannon from Emi Controls is definitely worth considering.

At only 60 dBA within a radius of 20m, the V12s Dust Control Cannon operates at the same noise level as normal speech.

That makes it ideal for use in urban construction or demolition sites where noise emissions are strictly regulated.

But the V12s is also suitable for use in mining, materials handling, recycling and scape metal yards, wood processing, materials warehousing and landfills.

The V12s Dust Control Cannon has been available in Australia for several years, but this latest model showcases some great refinements to the design and function.

It's smaller – making it easier to transport between locations if required.

Rotation speed is faster than ever.

The V12s offers higher water pressure to create an extra fine water mist that will abate dust more efficiently.

The powerful fan and fine water droplets means the V12s has a greater throw range – up to 60m with incredible accuracy.



The V12s is ideal for use in urban construction or demolition sites where noise emissions are strictly regulated.

But the V12s also offers smaller throw rates of 25m when using the lower fan speed - providing versatility across a range of project sizes.

Water consumption can also be adjusted from 16-100 l/min.

All Dust Cannons in the Emi Controls range are designed to withstand

harsh environments and extreme temperatures, making them feel right at home here in Australia.

The unique turbine design includes patented centrally located nozzles to protect the fine spray mist from being blown off course in windy conditions.

This results in a more reliable and

targeted spray to bind dust particles at their source.

Tecpro Australia is the exclusive distributors of the super quiet V12s dust suppression unit.

Located in Castle Hill NSW, Tecpro is a specialist engineering supply company offering advice and products for a vast array of industrial applications.

Founded in 1982, the company specialises in providing reliable technical solutions for a vast range of industrial applications.

Through its technical expertise and comprehensive knowledge, the Tecpro team prides itself on being able to solve the most challenging engineering problems.

Tecpro distributes all types of spray nozzles, tank cleaning equipment, ergonomic guns, stainless steel hose reels, odour control systems, fogging nozzles and fog makers for dust suppression and evaporative cooling.

Tecpro Australia is an award-winning consultant in the area of dust suppression, offering a diverse range of bespoke solutions for mining, construction and any situation where dust is a problem.

For information and guidance on your dust suppression options, call the technical consultants at Tecpro Australia on 02 9634 3370 or visit www.tecpro.com.au.

Dust suppression made easy

NATIONAL

WHEN it comes to dust suppression, there is no such thing as a one-size-fits-all solution.

The market has many choices available, and there are numerous deciding factors that require careful consideration, such as the type of dust, how it is being generated, and the available water supply.

With more than 30 years' experience in the formulation and execution of effective dust suppression and dust control solutions, Tecpro has helped clients to significantly improve their workplace safety, reduce the wear and tear on equipment, and to improve community relations by eliminating or reducing dust in the vicinity of the project.

Apart from the ugraded V12s silent dust controller described above, other products include:

V22 – for very large throwing distances

The new V22 is smaller and more compact than its predecessor.

Due to its ability to throw over 70m, the V22 is well-suited to open cut mines, recycling plants, ship loading facilities, materials storage and quarries.

The nozzle head and the externally mounted nozzle ring produce a fine water mist, which binds the dust particles and



The all new V22 in action.

prevents them from spreading, without causing puddles.

The throwing distance of the inside nozzle head can be extended to a narrower range by switching off the turbine.

The angle of inclination can be adjusted from -18 degrees to + 40 degrees, and it can be set to a swing range of 350 degrees either by the user friendly remote, or it can be set automatically.

The V22 dust controller continues to be the only dust suppression unit that can use salt or saline water and it's exclusively available from Tecpro Australia.

Heavy duty hose reels

Some industries demand tough and durable equipment but for some

industries like mining, durable isn't enough – they need extra heavy duty.

Tecpro is the supplier of a range of Mine Spec hose reels that delivers just this.

The reels are suitable for a ¼ – 1½in diameter hose, and can accommodate hose lengths from 15m to 100m.

The reels are designed and manufactured in Europe and use 50pc thicker stainless steel than most standard hose reels.

Each reel includes a spring rewind mechanism that makes it easy for operators to retract the hose after use, and are designed to withstand the toughest conditions and the roughest operators.

As well as being available in AISI

304 stainless steel, the reels are also available in 316 stainless steel, powder coated steel and cataphoric treated steel.

Spray nozzles

Whether it is flat fan spray nozzles, full or hollow cone nozzles, air atomising nozzles and everything in between, Tecpro has 30 years' experience in spray nozzle engineering, performance, specification and design to help its customers choose the right nozzle for the job.

Tecpro represents PNR, an Italian manufacturer of spray nozzles, and supplies nozzles of the highest quality to ensure the best performance and durability.



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Check out our website for the full scope of what we can offer.

Improved asset management

NATIONAL

RYCO's new asset management system QRAM is set to change the way businesses manage hose assemblies and equipment anywhere around the world.

QRAM streamlines how businesses register, track, order, transfer and maintain hose assemblies and equipment – improving efficiency, preventative maintenance, customer retention and aftermarket sales.

The system provides 100pc accuracy, enabling businesses to easily view the complete bill of materials, manufacturing processes, drawings, photos and test records of each asset fitted on registered equipment on a global platform.

RYCO Hydraulics general manager of marketing Sean Babbage said QRAM allows the freedom to tailor the solution to any business needs.

"We have large clients with multiple locations across an extensive list of countries, and we have small to medium businesses, working in one or two locations," he said.

"Whatever your business structure, improving the way you manage the life of assets and equipment is paramount.

"In addition to the way QRAM streamlines asset management, the customisable features means QRAM fits all scenarios."



Ryco prides itself on the ability to tailor a solution to suit client's requirements.

As a secure cloud-based system, QRAM ensures processing performance and reliability across desktop, tablet and mobile applications – both iOS and Android.

QRAM generates a unique serial number and QR code which is registered in QRAM, and the unique asset label is then printed and placed on the asset or equipment.

The information presented upon scanning the QR code is instant and 100pc accurate and each unique QRAM serial number automates a notification of the first inspection date, making safety and preventative maintenance a priority.

"Scanning the equipment QR code label presents you with the complete installed asset list, service hours, past and future installations, inspections, work orders and the geolocation of the equipment," Mr Babbage said.

"Each hose assembly has its unique identification code.

"When a hose assembly is replaced, simply scan the old out and then scan the replacement asset, and QRAM will do the rest by updating the equipment details.

"Unscheduled downtime is reduced with QRAM because it's a preventative maintenance system that alerts you well ahead of time when hoses or equipment need servicing or replacing."

QRAM is simple to install, easy to use and saves time and money when managing assets.

"To have the full visibility of assets, including location and customers ordering replacement assets with 100pc accuracy at a touch of a button, is unprecedented, and something RYCO's customers have been eager to implement," Mr Babbage said.

To see how RYCO's Asset Management System works visit: www.QRAM.RYCO.com.au.

One Scan. Endless Possibilities.

QRAM
RYCO ASSET MANAGEMENT SYSTEM

Rely on a secure, powerful and safe asset management system.

- ✓ Speed to Market
- ✓ Asset Tracking
- ✓ Easy Identification
- ✓ Aftermarket Sales
- ✓ Email Alerts
- ✓ Customer Retention



QRAM.RYCO.com.au

HTS the hydraulic experts

NATIONAL

ESTABLISHED in 2009, Hydraulic Technical Solutions (HTS) is an independently owned and fully mobile company highly skilled in repair, servicing and fabrication solutions.

No job is to big or small.

From component repairs to machine rebuilds and diagnostic fault diagnosis, HTS is the one-stop shop for your complete solution.

HTS owner Kyle Putland said the company is known for its prompt and reliable work.

“With Hydraulic Technical Solutions, you can always be sure that you will receive a prompt response to your issues,” Mr Putland said.

“Our aim is to have you up and running in no time at all in the hopes that your minor delay doesn’t develop into a major problem.

“Be confident in the knowledge that if anything goes wrong with your hydraulic system, we are just a phone call away.”

Popular products

One of the company’s most popular products



Hydraulic power packs reduce live work and improve safety on site.

is its complete kits of aftermarket valves, and individual valves for Hitachi excavators.

“As an aftermarket valve supplier, we offer the best in reconditioning hydraulic valves,” Mr Putland said.

If there is a component in the valve that bypasses under pressure, it will be changed out for new, along with O-rings rated to 150oC and re-designed make-up seal to ensure the very best of quality.

Each valve is individually set at the specified pressure on a custom-made hydraulic testing bench, eliminating high pressure testing on site.

New replacement valves can be purchased and are currently in stock with service exchange valves available.

Power pack manufacture and refurbishments are also popular with the focus on elimination of live work for safety

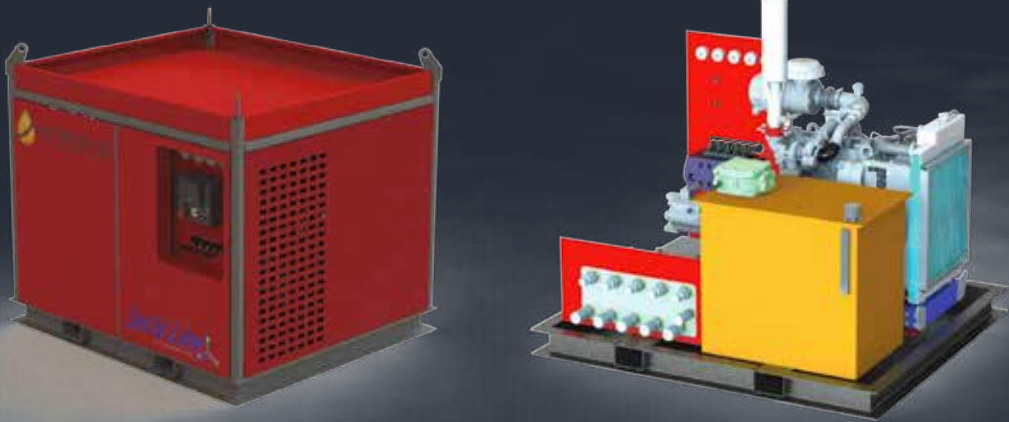
improvements on-site.

“We manufacture hydraulic power packs to remotely operate machinery to change out components,” Mr Putland said.

“Our newest pack has the capacity to help remove buckets from machines and front attachments.”

For more information visit: www.hydraulictechnicalsolutions.com.au.

Hydraulic Power Packs to remotely operate machinery for component change outs



THE EXPERTS ON ALL THINGS HYDRAULIC

- Reduce Costs
- Maintain Greater Availability
- Eliminate Live Work

*Service Exchange Kits Available



HYDRAULIC
TECHNICAL SOLUTIONS

CONTACT US:

0422 982 482 kputland@hydraulictechnicalsolutions.com.au hydraulictechnicalsolutions.com.au



BOSS is built tough

NATIONAL

THE BOSS Hydraulics range has been developed specifically to meet the needs of the industrial sector.

Developed by Australian owned PT Hydraulics, the range can suit almost any application across mining, transport, rescue, rail, agriculture and manufacturing to construction, engineering, marine, defence, waste management and materials handling.

PT Hydraulics has been providing unparalleled customer service in the field of hydraulics for more than 30 years, supporting the Australian and New Zealand markets with hydraulic solutions from its rescue, rail, industrial and hire divisions.

According to PT Hydraulics industrial division director Matt Lloyd, the company's years of experience and technical expertise was channelled into a range that could withstand the rigours of harsh environments.



The BOSS range is built to withstand the rigours of harsh environments.

"We're proud to have developed the BOSS Hydraulics range, to provide high quality hydraulic solutions with exceptional value," Mr Lloyd said.

"As part of the PT Hydraulics team, you can depend on BOSS - just like our customers in the emergency services and rescue industry depend on the lifesaving equipment that we provide, including the Lukas brand 'Jaws of Life'.

"You can be assured of the quality of our BOSS range, that's why we offer a lifetime warranty on so many of our products."

The high-pressure, BOSS Hydraulics Blue range (over 350 BAR), features a wide range of high force products that

are suitable for mining applications, including cylinders, pumps, torque wrenches, and more; from general workshop tooling to high tonnage jacks and synchronised lifting systems.

BOSS products are built from quality parts and are thoroughly tested to ensure they are durable enough to meet ongoing capacity demands required by mining applications.

The BOSS Black range (under 350 BAR) features hydraulic power packs, AG cylinders, mobile valves and piston air motors as well as DC driven hydraulic power packs, which can be custom built and tailored to suit specific requirements.

"Our team is 100pc focused on making it easy for you to do business with us," Mr Lloyd said.

"Whether it's providing technical advice and training to help your team, or getting you the right product, at the right price, where you need it and when you need it.

"At BOSS, we work hard so that you can let your BOSS do the hard work, and you can be sure that you'll get exactly what you need to get the job done, at a good honest price.

"That's our promise to you."

For more information visit: www.bosshydraulics.com.au.

BOSS

HYDRAULICS

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Explosion-protected water jetters

NATIONAL

WOMA (Australia) is a specialist business renowned for its business-to-business provision of quality and dependable pressure and vacuum pumping and explosion protection solutions across key sectors, including the oil, gas, petro-chemical, and mining industries.

The company designs and manufactures high-pressure water jetting systems for a range of applications, setting standards in the construction of high-pressure plunger pumps and ultra-high-pressure units.

Diesel and electrically driven WOMA plunger pumps are used in mobile and fixed units for numerous ultra high-pressure cleaning and jetting applications, in water blasting and also in industrial applications.

The pump series range from 250 bar to 4000 bar and cover almost every requirement in the field of high-pressure water technology.

WOMA also manufactures a range of waterblast tools and accessories, such as high pressure water guns and attachments.

With operating pressures of up to 3000 bar, WOMA high-pressure trigger guns can be used for any application.

Their modular design also means that they can be flexibly extended with various nozzles and nozzle holders.

WOMA continues to invest in new technologies and innovative industrial solutions, evidenced by the explosion protection solutions which have



The much-acclaimed WOMA WaterJet (HotPro) series is an industry leader in quality, simplicity and robust engineering, enabling easy maintenance and longevity.

been completed on special high and ultrahigh-pressure pump systems, vacuum systems and a range of vehicle systems where the conversions have been designed and implemented with the most advanced technologies.

They include the introduction of kits made by Miretti – the global leader in explosion protection solutions – to simplify equipment maintenance, thus reducing intervention downtime.

With engineering, production and training premises in Perth and Sydney and

representation across Australia and New Zealand, WOMA can explosion-proof-protect a wide range of combustion engines, vehicles, pump systems, special trucks and other heavy-duty solutions.

Working worldwide with the most eminent OEMs, together they protect more than 1000 diesel and electric vehicles annually.

The Miretti conversions have been designed and implemented with the most advanced explosion protection technologies and with the emphasis on safety, simple

equipment operation and continued safe maintenance, with the factories utilising solid edge design, computational fluid dynamics and finite elemental analysis software and are certified to ISO 9001.

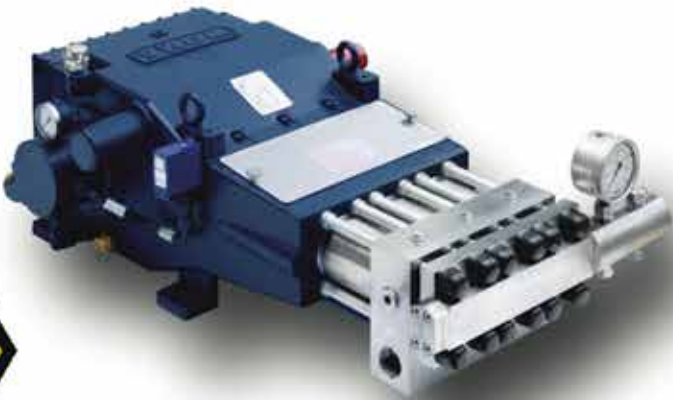
Unprotected diesel engines, in particular, can be dangerous ignition sources, resulting from electrical, mechanical, or static sparks, overspeed or flame from inlet or exhaust, and hot surfaces that could cause an auto-ignition of a flammable gas or vapour.

Flammable gases in the atmosphere can be sucked in through the air intake along with air for ‘super-fuelled’ combustion, which results in backfires in the inlet and exhaust or an engine overspeed situation whereby the engine runs out of control.

The WOMA team works with clients to ensure that the explosion proof conversions are in accordance with specific area classifications to provide the required electrical and mechanical protections to the diesel engine, thus removing the risk of explosive ignition.

WOMA Miretti is approved and certified to manufacture and supply products that comply with world-wide accepted standards in defence (land, air and sea) for equipment operating in hazardous areas, including, but not limited to, material handling assets (forklifts and loaders, etc) to mobility assets (such as troop carriers, refuel and transporter vehicles), through to static combustion engine protection systems powering sea-going support craft and main vessels.

ENGINEERED INDUSTRIAL PUMPING SOLUTIONS UHP • HP • VAC • ACCESSORIES • ROBOTICS • EXPLOSION PROTECTION



www.woma.com.au | hpwater@woma.com.au | +61 8 9434 6622

Aqua Prep the jetting specialists

NATIONAL

ESTABLISHED in 2012, Aqua Prep has become a leading name in the safe, fast and reliable delivery of high-pressure water jetting for mining operations.

By coupling the latest technology in high pressure water with robotic equipment, the company can access difficult locations, minimise operator fatigue, all while achieving a safe working environment and increased productivity.

This continual drive to develop “a better way” led to Aqua Prep being named a finalist in the 2015 WorkSafe Victoria Awards.

As an industry leader, Aqua Prep is regularly engaged by clients across Australia to carry out projects at a variety of industrial and commercial locations.

This includes ports, mines, marinas, jetties, bridges, tunnels, water and wastewater treatment plants, dams and civil construction sites.

Hydro demolition

Aqua Prep uses high pressure water jetting to demolish concrete for structural



Aqua Prep specialises in high pressure water jetting for concrete demolition and repair, surface preparation and industrial coatings.

repairs on new and old structures.

Concrete is selectively removed without vibration preventing damage to rest of the structure.

Scabbling

Concrete scabbling involves the removal of the top surface layer of a concrete area, exposing the aggregate, allowing coatings, mortars and new concrete to bond with existing structures.

Cold cutting

Cold cutting is the process of cutting metal or concrete using ultra high-pressure water with an abrasive material in the water stream.

No heat is produced so cold cutting

can be used in volatile environments.

Industrial services

Industrial and tank services are important for cleaning various surfaces as traditional methods of cleaning aren't always viable for safety and environmental reasons.

Onsite wastewater treatment and dewatering

Aqua Prep has developed a hydro demolition waste management system which includes solid, slurry and water separation followed by pH reduction and clarification with discharge to sewer, storm water or beneficial re-use.

For more information about Aqua Prep's unique water jetting capabilities visit: www.aquaprep.com.au.

COLD CUTTING PROJECT

Aqua Prep prides itself on working with clients, suppliers and industry partners to achieve win-win results.

The focus is always safety first through innovation automation and by challenging the way things have been done in the past.

A major client in Singapore needed to remove steel piles that were part of a temporary access wharf.

The piles had to be cut 2.5m below the seabed to guarantee they did not pose as a hazard to maritime activities.

While Aqua Prep had undertaken similar works in Melbourne, the challenge working overseas was to ensure the correct IP, resources and equipment would be available to meet the client's project timeline.

With a strong Australian supplier network, Aqua Prep was able to use local and overseas support to ensure all pumps and equipment made it to Singapore on time at a low cost and sought local support for supply of consumables and spare parts.

The result was a project delivered on time and on budget through solid collaboration with our client and industry partners.

This project was just another example of how Aqua Prep continues to set itself apart from the opposition in driving safer, faster and more reliable projects.

FAST, SAFE AND RELIABLE

AUTOMATION IS OUR SPECIALTY

Aqua Prep's ability to adapt technology to suit any application and remove the operator from the high pressure water and blast zone is what makes us unique. By coupling pumps that range in pressure from 4,000 to 40,000 psi with robotic cutting and demolition equipment, Aqua Prep has developed innovative solutions for our clients.

WE ARE SERIOUS ABOUT SAFETY

Aqua Prep uses and abides by the latest Australian Standard for High Pressure Water Jetting Systems. Our equipment and parts are all pressure tested and certified for use in Australia. As a member of the Australian High Pressure Water Jetting Association (Ausjet), Aqua Prep has also implemented its own Safety, Environmental and Quality Policies which are supported by Procedures and Forms that conform to **AS4801**.

OUR SERVICES:

- Hydro Demolition
- Scabbling
- Paint Coatings Removal
- Cold Cutting
- Industrial Cleaning
- Industrial Vacuum Loading
- Tank Cleaning
- Onsite Wastewater Treatment



High Pressure Water Jetting Specialists

03 9588 0361 | www.aquaprep.com.au

Effective shutdown planning

NATIONAL

AURORA is a suite of applications that provides market leading project management technology through its fully integrated planning, execution and reporting platform.

Effective shutdown and maintenance planning is an essential component of maximising asset reliability and ensuring predictability of operations.

The Aurora suite – Quantum, Project Tracker and Merlin – has been developed through the lens of the end user.

The technology works on the capture of real data, in real time, housing it in one central location which allows the user to make informed decisions and drive successful outcomes.

Quantum

Quantum has been developed as a planning tool that can be utilised to develop and iterate plans, monitor overall progress, conduct meetings, analyse work remaining, and review completed activities.

Unlike other planning tools, Quantum allows the end-user to access the centralised database from any networked location.

This mobility improves the transfer of information and provides management with transparency in their oversight.

The user interface has been constructed in a way that allows the reviewer to configure the data in a view that is targeted to their specific needs and address questions



Image: Shutterstock.

like “How can we reduce our maintenance and shutdown overruns and react to issues driving the success of the shutdown, before and during the shutdowns?”

Project Tracker

Project Tracker is a mobile application

that is used by infield supervision and leadership to capture key operational data for progress reporting.

The seamless relationship between Project Tracker and Quantum synchronises key operational information to and from a site location (in real time), eliminating

the requirement to physically return to the office location to update progress.

Designed with a simple interface, Project Tracker requires minimal training for effective on-site use and performs well in remote areas requiring a minimum 3G mobile data service.

Merlin

Merlin is an optimisation platform purpose-built for the shutdown and maintenance industry.

Delivering optimised schedules within minutes, it does not require any end-user programming and runs effectively on a laptop/desktop device.

Throughout the planning and optimisation process, Merlin recognises all planning inputs, is spatially aware and handles dynamic limits to resource constraints to enable end-users to rapidly adapt their plan to reflect the dynamic nature of this unique sector.

With more than 800 successfully completed shutdowns using the Aurora suite, Aurora has driven planning efficiencies, allowed the capture of information in real time, facilitated schedule optimisation, generated informed decision making and reduced overall shutdown durations.

For more information about this market leading technology visit: aurorapro.com.au.



Real data, Real decisions.



aurorapro.com.au

Industrial storage tank solutions

NATIONAL

APMS Storage Tank Services was launched by APMS Engineering and Acid Plant Management Services in early 2019 to provide a comprehensive range of storage tank solutions to the resources industry.

The division specialises in technical consultations and a range of services, including inspections, maintenance, repairs, and major and minor alternations to industrial storage tanks and piping.

The company has more than 15 years' experience in inspection, design, construction and project management services covering all types of storage tanks and associated pipe spooling, as well as cleaning, repairs and maintenance to existing facilities.

APMS STS provides innovative solutions for tank remediation projects and can conduct alterations and repairs to tank shell plates, tank shell materials, floor plates, foundations, and correction of settlements.

It can repair tank bottoms, fixed roofs, floating roofs and floating roof perimeter seals.

The division also provides advice regarding tank remediation for floor or sidewall breaches, oxidation or corrosion damage, buckling, dangerous settlement levels, and the removal or relocation of storage tanks.

APMS has in excess of 150 existing weld procedures, can qualify new weld procedures, and provide coded welding to Australian and international standards.



APMS has more than 15 years' experience in inspection, design, construction and project management services covering all types of storage tanks.

The company also delivers a range of tank cleaning services, including tank cleaning and degassing including hydro-blasting and dry ice blasting, hazardous chemical tank cleaning, cleaning and unblocking connecting pipework and drains and heat exchangers.

APMS STS general manager Dave Osman said the company was a leader in the field, with a unique end-to-end service.

"We aim to reduce operational cost, minimise tank downtime and extend the life cycle of tanks, improve tank operations, and

evaluate developments and trends to ensure best practice in order to deliver increased levels of efficiency, safety and tank integrity," Mr Osman said.

More information can be found at: www.apmssts.com.au.



APMS
Storage Tank Services




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✉ info@apmssts.com.au
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- 🔧 Engineering and technical services
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- 🔄 Relocation of tanks and associated infrastructure



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STS had its humble beginnings in the early 90s when Richard Holloway - a licensed plumber with years of experience - recognised a need in the local market for somebody willing to service the water tank industry.

Custom tank maintenance

NATIONAL

SPECIALISED Tank Services (STS) specialises in the construction of new steel lined water tanks — in both the domestic and commercial sectors — as well as rejuvenation of existing concrete and steel tanks, including tank lining, tank roofing, wall re-panelling, inspections and cleaning and identifying issues with tanks.


STS owner and operator Richard Holloway said STS can offer a site inspection, propose a range of options, prepare the site, link other trades, provide project management, build the tank or repair the existing one, and maintain customer satisfaction resulting in a quality solution to their water storage needs.

“Our friendly team is trained, certified, experienced and cares about the finished result for their customers and operate in an efficient and safe manner,” he said.

The company has recently expanded into the provision of quality remotely operated vehicles, high-resolution cameras, lights, surface control and surface video recording equipment for inspection reporting.

“We have confidence in our people, products, systems and ability to provide a quality solution that meets the water storage needs of our customers,” Mr Holloway said.

For more information visit: www.waterstorage.net.au.



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Don't let your water storage tanks and infrastructure stop the production of your business, contact the friendly customer service team at STS for a free quote today.

.....

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Hands-free roller change out here

NATIONAL

TWENTY-five years ago, H & B Mining developed the first drop-down idler (DDI), which revolutionised conveyor roller change-out and became a standard inclusion on just about every mine site in Australia.

Although brilliant in its time, the DDI now looks outdated.

H & B Mining's Easy Maintenance Retractable Idler (EMRI) builds on the original DDI and brings conveyor idler design into the 21st century.

While the DDI allowed for easy access to the conveyor wing rollers without the need to lift the conveyor belt, central roller change-out remained problematic.

The EMRI incorporates a drop-down mechanism to access the wing roller and a retractable capability to access the central roller.

Managing director Eddy Hodgkinson believes that with the advent of the EMRI, an unbelievable giant leap forward in roller maintenance has arrived.

In earlier years, it was deemed dangerous and sometimes impossible to change central impact rollers on drop down and jack down idlers.

H & B's EMRI provides an opportunity to eliminate finger, hand and back injury while changing out idler rollers.

H & B Mining combines three patent pending products to revolutionise roller change-out: EMRI – Easy Maintenance Retractable Idler; Roll Removal Tool



H & B Mining combines three patent pending products to revolutionise roller change-out.

(RRT); "Rack'n'Roll" roller storage rack; and the Trolley extraction tool.

The RRT easily lifts conveyor rollers and the "Rack'n'Roll" safely stores worn or replacement rollers during change out.

Operators' hands and fingers never make contact with any part of the rollers.

Roller change-out is simpler, safer and quicker.

Shut-downs are shorter and safer, and

production is up.

Yet again, H & B has proven that it is a leader when it comes to providing the Australian mining industry with safety-first, easy maintenance solutions.



REVOLUTIONISING CONVEYOR IDLER ROLLER MAINTENANCE

QUICKER, SAFER, SIMPLER –
INTRODUCING OUR EASY MAINTENANCE
RETRACTABLE IDLER (EMRI)

- ➔ Easy access to all idler rollers without the requirement of jacks, come-a-longs or cranes
- ➔ Hands-free roller change out & maintenance
- ➔ Massive savings in shut down time
- ➔ Consistent beltline for the skirts to seal against, reducing spillage
- ➔ Enhances overall productivity of the conveyor

GET IN TOUCH

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✉ info@handbmining.com.au

🌐 www.handbmining.com.au

HODGKINSON PRODUCTS
H & B MINING
**THE EXPERTS
IN CONVEYOR SKIRTS**



Manitowoc is a match for mining

NATIONAL

FOR more than 50 years, US Company Manitowoc Ice has developed and manufactured quality ice machines for use around the world.

The brand of choice for many well-respected Australian companies, Manitowoc is renowned for its technology that enables its ice machines to work in harsh and exposed environments.

The manufacturer has won the Best in Class Award from the US Foodservice Equipment and Supplies magazine for the past 17 years.

AJ Baker and Sons Pty Ltd is the exclusive Australian distributor of Manitowoc ice machines, and has sold them since 1976.

The company is family-owned, based in Perth, with branches and stock in Brisbane, Sydney, Melbourne, Adelaide and Bunbury.

As a market leader, it has been involved in the commercial refrigeration industry in Australia since 1931.

The reliable and durable Manitowoc ice machines feature a strong aesthetic and cutting edge ice-making technology.

The Manitowoc range is uniquely

suited to the mining industry, as its designs take into account stringent on-site health and safety requirements.

Stainless steel and galvanised panels make the machines easy to use and clean, with excellent corrosion resistance.

Manitowoc has a suitable model for every area of Australia's mining industry, with machines capable of producing up to 1300kg of ice per day.

Coupled with the award-winning ice machine, AJ Baker also offers the Kloppenburg automatic ice dispenser range.

The DISP range includes a combined storage bin and ice dispenser that accurately distributes ice into any size drink container or insulated bin.

One model also comes with water dispensing taps, so that drinking containers can be filled with ice and water at the same time, all captured safely within a drip tray to reduce spills and slipping hazards.

The AJ Baker team is committed to providing products that not only satisfy customer needs but also add value to the equipment investment, working to effectively reduce costs and increase energy efficiency.



Manitowoc has a suitable model for every area of Australia's mining industry.

Mining & Manitowoc ice machines. A great match.



Cube, Flake & Nugget Ice Machines,
Ice Storage Bins & Ice Dispensers



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www.ajbaker.com.au



Refrigeration needs for the mining sector

WA

FOR more than 70 years, Arcus has been highly regarded for the design, manufacture and installation of commercial refrigeration, custom stainless steel and food service products to the WA hospitality market.

A second-generation family-owned and operated business, Arcus employs more than 55 staff across design, sales, engineering, manufacturing, project management, installation and service in its purpose-built facility in WA.

During the last boom, Arcus was at the forefront of the market when it came to supplying kitchen equipment, cool rooms, other refrigeration and stainless steel products to the resources sector, and working with the leading transportable and building companies involved in some of the biggest projects in WA's North West.

Today, the company's unique in-house ability to cover the full design, manufacture, installation and service should put it near the top of any call sheet for assistance with the food and drink areas on any site.

When it comes to ice rooms, Arcus sets the standard, offering the best solutions on the market.

There are more than 500 large volume, proven, WA-made Arcus STW660 water coolers in the North West of WA alone.

This robust model holds 520l of water at



A professional mine site ice room with Arcus AFIP450M Ice Dispensers and STW660 Water Coolers. Inset. Ductwork on an Ice Machine allows for more economical ice production and water cooling.

10oC and recovers at 140l per hour, while the built-in pressure pump allows the water to feed other equipment such as ice machines - ensuring maximum production and efficiency within any ice room.

Built with the mines in mind, the biggest revolution in ice dispensing of the last 15 years is the Arcus AFIP450M ice dispenser.

Initially developed for the Gorgon project, its success there, coupled with its compatibility with nearly every ice head on

the market, meant large numbers started to appear on other sites around WA.

A big threat on any mine site is illness and the speed at which a virus or bug can spread throughout a close-knit community.

The AFIP450M locks the ice away to prevent the ingress of human contaminants such as blood, skin, dirt, hair and other unwanted substances.

The unit is automatic so as the worker

places their drinks container under the ice chute, 1kg of ice is automatically dispensed in one second directly into their container.

This again reduces contact with the ice but also greatly lessens the chance of spillage which can create and a huge OHS nightmare.

For more great features on the machines mentioned in this article and for more information about Arcus, visit the website www.arcus.com.au.

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Support a
West Australian
Manufacturer



The procurement experts

NATIONAL

EARTHMACH is an independent used mining equipment dealer that began operations in 2000 with head offices located in Brisbane.

The company specialises in the acquisition, sale and logistics for used mining assets throughout the globe.

EarthMach founder Chris Reeves said the company's main objective is to supply quality used mining equipment and associated services to local, national and international mining and mining contracting companies.

"As well as the procurement and disposal of used mining equipment throughout the world, EarthMach has extensive global experience and expertise in the logistics of moving major mining assets to anywhere in the globe," Mr Reeves said.

"We have extensive knowledge of the international mining and mining contracting industries, having worked as a Civil Engineer and in the mining industries in the Middle East, Africa, South America and extensively in Asia during the rapid expansion of the mining industry there in the 1990s.

"For over 30 years we have developed an extensive global network of contacts for the valuation, procurement and disposal of major mining assets anywhere in the world," he said.



EarthMach specialises in the procurement of mining equipment.

The company has been actively involved in a wide range of international projects, including:

- Winning a contract for the procurement, logistics and support for the supply of heavy mobile equipment and fixed assets for the Goro Nickel Mine in New Caledonia.
- Procuring from the World Bank a large package of major mobile and fixed assets from a dam site in the Philippines and delivering to a gold mine in Uzbekistan.
- Providing technical and procurement advice for the design and construction of large mobile dredges for Wasa Dredging from Finland.

- Being awarded a contract for the supply and support of mobile mining equipment and fixed assets for the African Minerals iron ore mine in Sierra Leone, West Africa.
- Some more recent projects and experience include:
 - > Sale, dismantling and delivery of 2 x P & 4100 shovels from a Hunter Valley coal mine to a client in India
 - > Sale, dismantling and delivery of major drilling and blasting equipment and components from a major nickel mine in Brazil to Mongolia
 - > Sale, dismantling and delivery of Komatsu 830E

- trucks from South America to Australia
- > Sale, dismantling and delivery of two Komatsu PC3000 excavators from Africa to Mongolia
- > Established a Joint Venture mining equipment company in India – Vibgyor Mining

This extensive global experience and knowledge makes EarthMach an invaluable tool to assist any company in their global valuation, procurement, disposal and logistics of any major mining asset.

For more information about EarthMach visit: www.earthmach.com.

MORE INFORMATION: EarthMach | 0418 778 695 | creeves@bigpond.net.au | www.earthmach.com



EarthMach is a globally recognised independent family company specialising in the procurement of major mobile mining and construction equipment.

Current equipment available:

- **Excavators and Shovel** – Cat 6030 and 6040 excavators, Komatsu PC3000 excavators and PC4000 shovels.
- **Mining trucks** – Cat 793D and F, Komatsu 830E AC and 960E AC
- **Dozers** – Cat D10T and D11T, Komatsu D375A-6 and D475A-6
- **Wheel loaders** – Komatsu WA1200-3
- **Components** – Cat MD6640/49HR electric drill – new/unused components



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Earthmoving & Mining
Equipment Solutions



Putting money where your mouth is

Gordons Brothers fully underwrote the sale of the assets at Koolyanobbing after the previous mine operator decided to exit the country.

INTERNATIONAL

GORDON Brothers may have only been operating in Australia for three years, but the firm brings with it more than 115 years' experience passed down through four generations of family leadership.

The US-based, privately owned, family-held business is a global, independent investment and advisory firm that provides customised restructuring, asset remarketing, advisory and capital solutions.

It is a specialist in structuring complex, multi-asset transactions.

Across these platforms, it will buy, sell, operate and value assets on a standalone and integrated basis.

By incorporating its experience in valuing and selling assets, the company is able to extract the maximum value from plant, machinery and equipment, inventory, real estate, receivables and intellectual property.

It works with businesses at all points of the business cycle, whether that means a growth period, transformation, turnaround or strategic consolidation to provide certainty of results.

Gordon Brothers has had an Australian presence for only three years, but in that time, it has demonstrated that it will put its money where its mouth is and take on the principle risk in asset sales.

Gordon Brother's managing director, Fenton Healy, spoke with the *Australian Mining Review* about the fully underwritten sale of the Koolyanobbing machinery fleet.

Mr Healy said that the company's real expertise was rooted in its knowledge of assets, plant equipment inventory, receivables, intellectual property and retail.

"Usually, we take the view that we will try to take the risk," he said.

"Our fundamental point of difference is that we will try and buy the equipment – we buy the risk to re-sell the product.

"We have the means and the balance sheet to do it."



Managing Director,
Fenton Healy.

Koolyanobbing

When the previous operator of the Koolyanobbing mine near Southern Cross in WA decided to exit the Australian market, the mine and everything bolted to the ground was sold to an Australian publicly listed miner, with all mobile equipment needing to be disposed of by another means.

This left the organisation with a serious amount of equipment and in need of a quick, easy, effective solution.

Mr Healy said that it was Gordon Brothers' ability to take on the risk that made them the right choice.

"They were looking for someone to solve the problem of all the equipment – of everything that wasn't bolted to the dirt," he said.

"We weren't the first to look at it, there were plenty of people trying to buy bits and pieces, and there were auctioneers trying to offer their services.

"But the client was looking for the most efficient and streamlined way to wind it all back and leave the country without having people trapped here for nine months overseeing the disposal process, so we were introduced to it relatively late to the process.

"Long story short, we did a deal, cut a check, and once both parties had agreed to the final terms of contracts, the money was approved and out in five days."

As a fully underwritten purchase, Gordon Brothers backed itself on a considerable risk.

The company provided a solution no one else was willing to offer, and the client got what they wanted.

Mr Healy said that while Gordon Brothers may not have been the first option, ultimately it was the right choice.

"We're one of the only companies with the capacity to do this," he said.

"And we demonstrated that we will put our money where our mouth is.

"We have a balance sheet and we're prepared to use it, we're prepared to buy and



After securing a deal with the new mine owner, the company was able to sell almost all of the equipment in-situ and did so through private negotiation over a twelve-month period.

to take risk and this was a big package – the biggest for a long, long time."

After securing a deal, Gordon Brothers was able to sell almost all of the equipment in-situ and did so through private negotiation over a 12-month period.

Not like a traditional lender

The company is also an investment firm, lending under a traditional US-style asset-based lender model.

This means lending principally against the value of assets that are available.

The company aims to provide more flexible term loans for up to three years, as well as short-term bridging loans and sale and lease back options.

Mr Healy said that where the company differs from traditional lenders is that the diligence is in and around the equipment.

"We're very light in terms of covenants," he said.



The company will, where possible, buy the equipment and take on the risk.

"We don't try to restrict, hamper or tie the borrower up.

"We give them the money with the plan being they will use, that capital to go and develop opportunity, and move their business from point A to point B."

As Gordon Brothers is not a credit lender, it is not stuck on typical lending requirements.

Potential clients don't need the pristine, crystal-clear two-year financial history that traditional lenders typically require, because the company focuses on the security it lends against.

Mr Healy said that in a capital-intensive line of work such as contracting, this is important.

"We're more focused on what we are taking as security, and in terms of financial due diligence, we are very comfortable in the here and now – who's running the business, what's in the pipeline, what's the current trading activity – we're not concerned so much with the rear-view mirror because for contractors, sometimes the rear-view mirror doesn't look

good coming out of a fairly ugly downturn," he said.

As contracting is a capital-intensive line of work, it is important that contractors have the ability to mobilise quickly, and access to the capital that requires is paramount to their success.

Mr Healy said that Gordon Brothers won't take personal property as security.

"Guys who've come out of the downturn have probably had to deal with the banks," he said.

"And the banks have, at least up until recently, been sidetracked by the royal commission and had cut back lending against used equipment.

"But we can take a look at someone's circumstances and say, 'well look, you've currently got a \$12.5m facility fully secured but you've got about \$40m worth of plant equipment': we can offer you the ability to refinance the facility and give you working capital over and above your current limit".



A Kenworth prime mover fleet.

"We are more expensive than traditional lenders, but at the end of the day clients walk away with the flexibility of the arrangement and know that their home and personal property is no longer tied into the business because we don't take security over someone's home.

"They pay a bit more, but come away with working capital to buy the new equipment or chase the new contracts, and assuming they achieve their goals they can, relatively shortly, demonstrate improved financial capacity and return to cheaper traditional lenders."

MORE INFORMATION: Gordon Brothers | 02 9220 0000 | australiainfo@gordonbrothers.com | www.australia.gordonbrothers.com



CONTACT US
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Bringing more than a century of experience to every transaction

Mining asset remarketing

- + Gordon Brothers will assume principal risk on equipment and machinery.
- + We will provide advance funds against a pool of assets identified for realisation.
- + We will give structured guarantees, or tailor the solution to a client's specific needs.

Mining investment solutions

- + Gordon Brothers offers asset-backed financing and credit solutions to our clients to help facilitate transition and transformation.
- + Capital is available for financing, asset acquisitions, leasing or special situations.
- + We have more than A\$1bn of capital available through our strategic partnership with Gordon Brothers Finance Company and independently utilising Gordon Brothers' balance sheet.
- + Our options include debt financing, acquisitions of non-core subsidiaries or orphan assets, and asset sale guarantees.

Heat-seeking maintenance

NATIONAL

AS a pioneer of thermography in Australia, Stowe Australia adopted the technology back in 1982, when it purchased the Hughes infra-red scanner.

At the time, it was similar to the thermographic cameras being used by NASA to test the temperatures on space shuttles, and there was only one other company in NSW that had access to the same technology.

Originally, the technology was used to test electrical switchboards in real time and real-life scenarios, without isolating them, in order to identify potential failure points by helping to identify high resistance 'hot joints', within an installation.

Today, it is the go-to method of predictive and preventative maintenance, allowing thermographers to identify component faults long before they become component failures.

Stowe Australia specialises in thermography and ultrasonic scanning within the industrial and high-voltage and high energy, low voltage sectors of the electrical industry.

It uses thermography as just one of its arsenal of preventative maintenance tools that form a part of its electrical maintenance package, covering everything from distribution boards and main switchboards to high-voltage transformers and switchgear as well as reticulation systems such as overhead lines.

Accurate thermography has the ability to identify areas that require extra attention during routine maintenance and shutdowns, as well as being able to greatly improve the efficiency of these shutdowns by scanning to identify trouble hotspots.

How does it work?

By detecting infrared light that is invisible to the human eye and converting it into an image that can be seen, thermographic cameras allow operators to see the infrared heat that all objects emit.

High voltage and industrial account manager and trained thermographer and ultrasonic technician, Paul Collier, said that every object known to man emits this infrared light, as long as those objects are above absolute zero, or 0° Kelvin, or -273.15°C.

"As an object heats up, its level of infrared light emitted increases and objects can start to produce their own visible light once they begin to gain enough heat energy, such as when a piece of metal is heated and begins to glow red hot: this is now a source of visible light which itself has a temperature," he said.

"With this knowledge and understanding of how infrared light behaves, we can adapt the use of thermography to mining in many ways, especially for ongoing live recording of systems in actual use, and their performance, without the need for shutting down plant for monitoring purposes."

Thermography systems are now at a point where they can inspect very widely from the monitoring of rolling stock within conveyors and their motors for bearing conditions to electrical systems, from low voltage switchboards to high-voltage systems and everything in between.

Mr Collier said that thermography can also be used for moisture detection and can even be used to check levels in certain kinds of sealed tanks.



Level 1 trained technician, Leander Chihuri, and his standby/safety observer, Antony Wright.

However, versatile as it may be, there are limitations to this technology due to the nature of infrared light.

"Infrared light will not pass through the majority of objects like that of visible light, and even the cleanest, most clear piece of glass is in fact a mirror for infrared light," Mr Collier said.

"This means that when performing inspections on electrical switchboards, all covers including internal perspex covers need to be removed to thoroughly perform infrared scanning, although there are ways around this and they are by installing perspex that is slotted or by the installation of IR windows, which are made of a special material that allow the infrared light to pass through.

"Another complementing technology that we employ at Stowe Australia is ultrasonic scanning, whereby we are able to use a device that can detect sound outside of the normal human hearing level and convert it into audible sound that a trained technician can interpret, identify, record, analyse and then identify any anomalies.

"This can help to assist condition monitoring and fault identification within electrical systems, both high and low voltage, steam systems, bearings, and can also be used on pneumatic/air systems particularly for leak detection."

A technology in flux

The improvements in camera technology have seen thermography evolve from an ultra-high-tech service with prohibitively expensive equipment designed for NASA, to a stalwart of minesite predictive and preventative maintenance.

The biggest improvements, according to Mr Collier, are the addition of functions such as picture-in-picture overlays, as well as the improved clarity of the infrared images which give the technician a much greater chance of accurately identifying a fault.

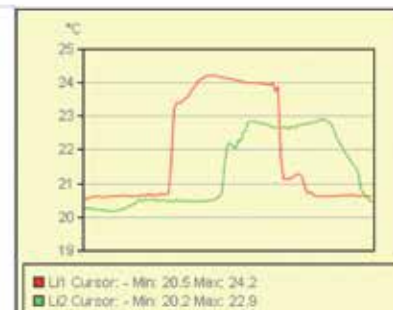
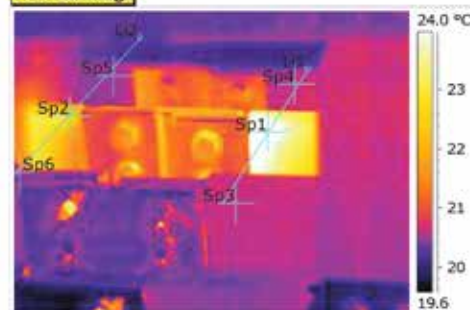
"This is greatly important, as not all faults present as something that is excessively hot, but by way of heat dispersion and image patterns," he said.

So, what does it mean for mining? In short, thermography has become a widely accepted and regularly used technology by industry for diagnostic

THERMOGRAPHIC SCANNING REPORT

EQUIPMENT DETAILS Tower 2 Substation 2 L.V. Switchboard BC4-29-MS804 Busbar Zone Below 2500A Main Switch Blue Phase Connection

Thermal Image



Visual Image



Date	09-08-17
Image Time	11:54:20 AM
File name	FLIR0648.jpg
Max. Temperature	25.4 °C
Min. Temperature	19.7 °C
Emissivity	0.95
Atmospheric Temperature	20.0 °C
Sp1 Spotmeter Temperature	24.2 °C
Sp2 Spotmeter Temperature	22.9 °C
Sp3 Spotmeter Temperature	20.6 °C
Sp4 Spotmeter Temperature	20.6 °C
Sp5 Spotmeter Temperature	20.5 °C
Sp6 Spotmeter Temperature	20.6 °C

	CURRENT
RED	266
WHITE	263
BLUE	282

Analysis & Recommendation

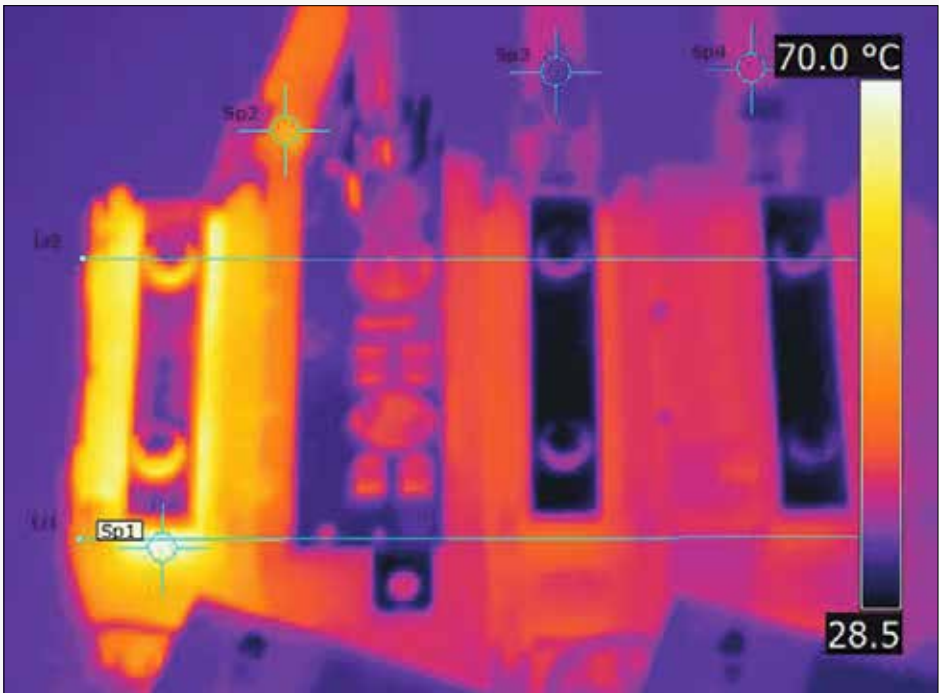
At the time of scanning all temperatures were within equipment rating; however it was found that this connection was displaying abnormal thermal pattern. Thermal patterns and current reading indicate a poor connection.
Suggest checking connection surfaces and retorquing bolts.

Thermographic report page for JLL, International Tower.

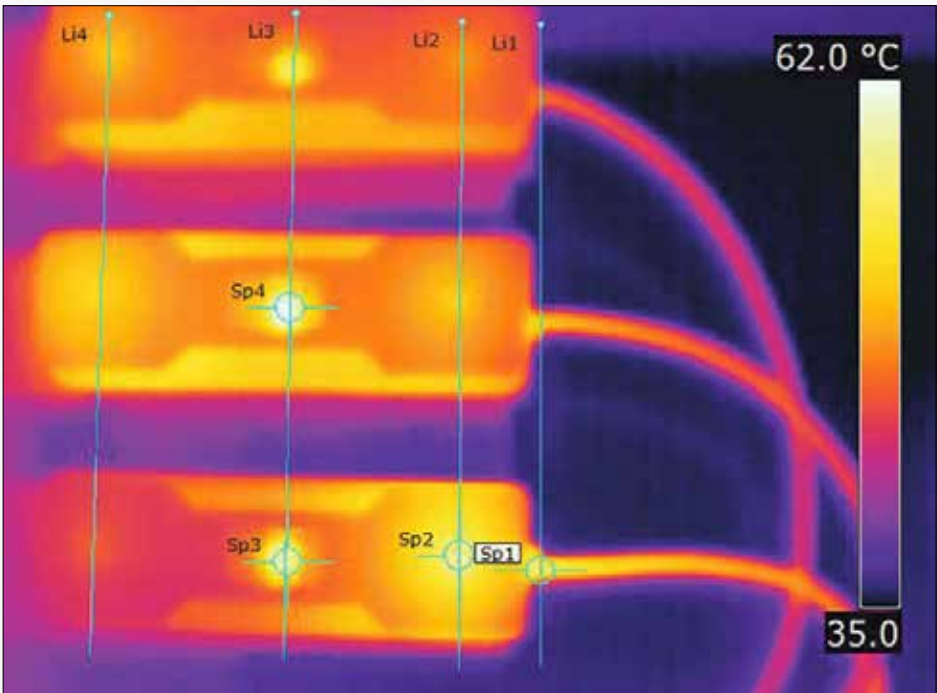
purposes, and for regular preventative maintenance.

More organisations than ever are able to accurately use thermography as a preventative maintenance tool that helps to identify faults that can be dealt with during planned maintenance periods before they become expensive failures.

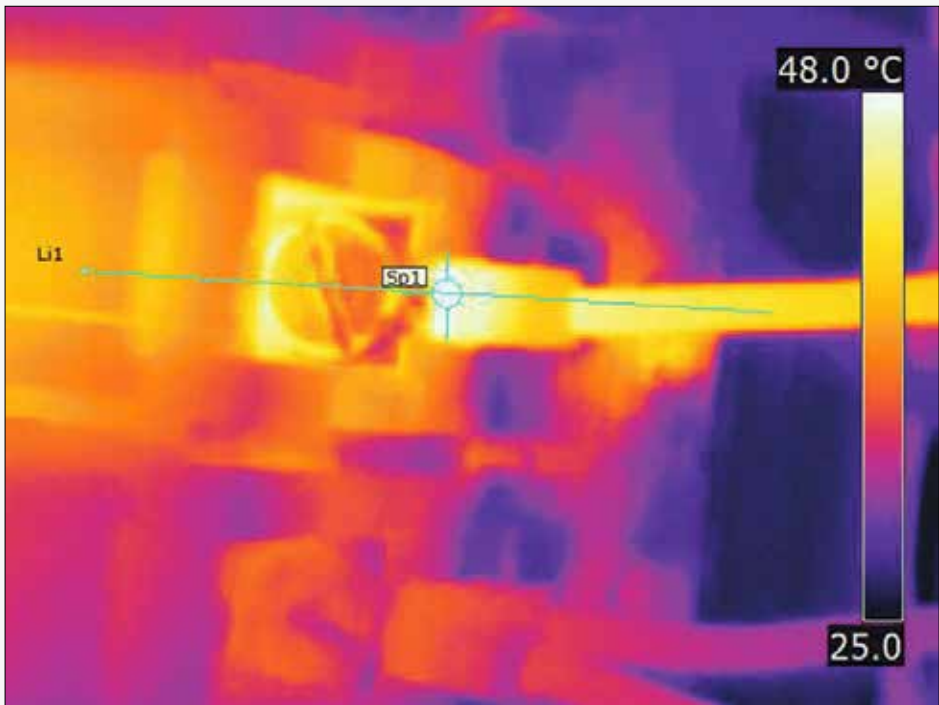
Thermography can assist with predictive maintenance by being able to be performed on equipment whilst it is still in service, and this allows for maintenance schedules to be amended prior to shutdowns to redirect where needed the resources to areas of concern that may not have been identified through other means.



Main Switch A Phase internal hot joint.



Fuses B and C phase showing poor fuse mating and poor joint on C phase load side.



Poor crimp joint at circuit breaker connection.



Stowe Australia has in excess of 1 500 staff throughout Australia.

To become a thermographer, as a minimum each technician is electrically trade qualified and then certified in Level I Thermography.

The company also employs specialist high-voltage trained technicians.

All of Stowe Australia's technicians are Level I thermography-certified, along with electrical qualifications, and the company has specialist high-voltage trained technicians too.

Level I trained thermographers have the ability to perform the day-to-day testing, analysis and reporting using thermographic cameras.

Stowe Australia also employs a number of Level 2 trained thermographers who, along with performing the tasks of Level I thermographers, can formulate thermographic maintenance programs and recommendations for clients.

Thermography practically applied

When JLL's annual inspection of its Barangaroo International Towers switchboards came up, the company employed Stowe Australia to use thermography and ultrasonic technology as the best method of non-invasive, low-voltage switchboard inspection.

This meant the switchboards were energised throughout the entire procedure.

As highlighted in the report, this busbar was only emitting around 20°C – which is an acceptable temperature for barwork of this nature – but the patterning of infrared light suggested that a fault was present.

When this was compared with the switchboard's current rating of 2000A and the actual current flowing in that portion of the busbar, about 260A, just over 10pc of the rating, an isolation and further investigation was suggested by the technician.

When this was isolated it was found that the connecting bolts of this barwork were only finger-tight.

Had this been under full load, the temperature would have been greatly increased and to a level of danger to the installation.

Looking to the future, Mr Collier said that as fully automated mines become more and more of a reality, thermography may become fundamental for heat monitoring of a different, much more direct kind – fire detection.

As mines become less and less reliant on human monitoring in favour of machines, thermography's uses can extend further to that of a 'watchdog' style monitoring device for areas that experience increasing temperatures, such as a flammable product on a belt becoming too hot.

Infrared detectors could send a signal to an alarm or even a fire extinguishing device that could then douse the belt and prevent a fire.

Thermography is just the beginning

Thermography is not the only service that Stowe Australia provides.

The company also offers other electrical maintenance services including transformer maintenance and repairs, oil sampling and analysis, HV circuit breaker and switchboard servicing and testing, low voltage circuit breaker and switchboard servicing and testing, protection relay testing and motor inspection, maintenance and testing, slipring inspection, maintenance and testing and power factor correction unit maintenance and repair.

SOME OF THE WORLD'S LARGEST COMPANIES RELY ON US FOR THEIR ELECTRICAL SERVICES.



As Australia's Leading Privately Owned Electrical and Communications Contractor, Stowe Australia has been pioneering the electrical industry for over 100 years.

And we don't just have the right equipment, we have the right people. Our in-house team of experts know how to drive innovation and meet any challenge. Stowe Australia delivers complete electrical and communications skills as an integrated service, with a commitment to adding value to the everyday operations of our clients now and into the future.

Installation, testing and maintenance of:

- All types of High Voltage and Low Voltage Switchgear
- Transformers
- Switchboards
- Power factor correction equipment
- Motors and industrial control equipment

Specialised services include:

- Thermographic Scanning
- Ultrasonic Testing
- Oil Sampling
- Preventative & Reactive Maintenance
- Specialised testing of HV & LV equipment
- Automation and Control

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CANBERRA
HOBART



The cameras can serve the dual purpose of fire safety and process control as they measure temperature in each pixel.

NATIONAL

Early fire detection

EVERYONE knows about serious risk fire poses for mining operations – especially when there is a risk of rapid-fire propagation or even explosion.

Thermal imaging systems can be successfully used for early detection of fire risk, often even before the fire starts.

The principle is based on non-contact temperature measurement.

Thermal cameras measure the surface temperature of the region of interest (ROI) and, based on a gradual rise in temperature are able (using appropriate software) to assess the risk that may arise before any further manifestation occurs.

This evaluation occurs automatically and continuously which is why the Applied Infrared Sensing recommends the SAFETIS system for mining operations.

The SAFETIS thermal imaging system is an excellent improvement of traditional fire detection systems in all three phases of fire:

- PHASE 1 - Gradual heating

Flames and even smoke have not started yet. There is only the risk of gradual warming.

Even though the smoke detectors do not respond, the SAFETIS system records small changes in warming and can respond ahead of fire.

- PHASE 2 - Smoke generation

Smoke detectors respond in this phase, i.e. at the time when the smoke is generated.

However, this is a risky phase where rapid escalation of destructive fire can occur.

The SAFETIS system could respond well before the occurrence of this event.

- PHASE 3 – Flare-up

In this phase, flames are visible and smoke is generated. Special CCTV cameras and the smoke detectors usually respond well to this.

However, at this stage required response is much greater and loss of property or even life can occur.

Mineral exploration

Thermal Hyperspectral Imaging is unique application of thermal imaging cameras, breaking

the spectrum into a large number of bands and analysing them to detect particular materials, minerals or gases.

Traditionally, several remote sensing technologies have been used for mineral exploration – both visible-near infrared (VNIR, 0.4-1.4 μm) and shortwave infrared (SWIR, 1.4-3.0 μm) are well established techniques in this field.

However, the reflectance spectral features measured in the VNIR and SWIR spectral ranges are generally overtones and combination bands from fundamental absorption bands at longer wavelengths, such as in the Longwave Infrared (LWIR, 8–13.5 μm).

The single absorption bands in the VNIR and SWIR spectral ranges are often very closely spaced so that the reflectance features measured by common spectrometers in this spectral region are typically broad and/or suffer from strong overlapping, which raises selectivity issues for mineral identification in some cases.

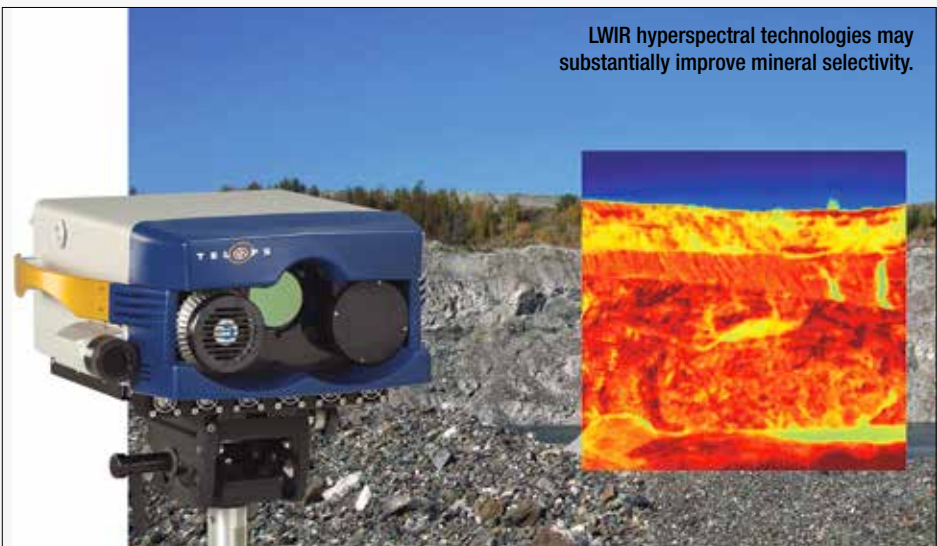
Since the spectral features associated with fundamental vibrations are stronger and sharper than their overtones, LWIR technologies may bring substantial selectivity improvement in certain situations.

In addition, the overtone signals of many minerals such as silicate, feldspar and olivine are too weak to give appreciable spectral features in the VNIR and SWIR.

Telops (Canada) is developing innovative solutions for mineral exploration based on Longwave Infrared (LWIR) Thermal Infrared (TIR) hyperspectral sensor technology with high spectral, spatial and temporal resolutions for cost-efficient mineralogy mapping of large cliff sections.

The instrument, named Hyper-Cam, is a lightweight and compact passive thermal infrared hyperspectral sensor for field measurements allowing surveys in various weather (cloudy, partly cloudy or clear sky) and illumination (day or night) conditions.

About 100 units have been deployed, proving this type of portable hyperspectral instruments as a tool of choice for routine field applications, such as mining exploration.





FAST DETECTION OF FIRE USING A THERMAL IMAGING CAMERA

The main purpose of the **Workswell SAFETIS thermal imaging system** is to prevent the risk of the occurrence of fire. The system records temperatures on individual parts of the surface and evaluates any trends in the increase of temperature.

Early fire detection	Smoke detection	Flame detection
 Workswell SAFETIS	 Smoke detector	 CCTV camera

Time -- Danger

www.applied-infrared.com.au

MORE INFORMATION: Applied Infrared Sensing
1300 557 205 | www.applied-infrared.com.au



Forewarned and forearmed

Detect problems and faults earlier with vibration monitoring.

NATIONAL

COMPREHENSIVE condition monitoring systems can mean the difference between expensive, unplanned downtime waiting on replacement parts, and a planned preventative maintenance schedule with minimal disruption to workflow.

Problems or malfunctions in plant and equipment operation often become apparent through changes in vibration behaviour, unusual temperature patterns or noise emissions.

Reliability and condition monitoring specialists, Schaeffler, have almost 20 years' experience in this field and primarily use vibration, temperature and acoustic emission diagnosis to detect damage or abnormal wear in machinery at a very early stage, so that these components can be repaired or replaced as part of planned downtime. Costly unscheduled downtime is therefore minimised.

Depending on the type of machine and its importance in the production process, condition monitoring can be carried out by means of either continuous (online) monitoring or regular periodic (offline) monitoring.

Schaeffler condition monitoring and reliability systems manager, Mark Ciechanowicz, said the company has several systems available, ranging from single point to multi-channel surveillance systems utilising multi-parameter sensors.

"Predominantly we measure vibration, but we also monitor other condition monitoring parameters such as acoustic emissions, component temperature and oil and grease condition. We can also accept other process parameters such as speed, load, pressure, etc," he said.

"We have a Remote Diagnostic Centre (RDC) in Sydney where we measure 300,000



Schaeffler specialises in online condition monitoring.

characteristic data points daily throughout Australia and New Zealand, which include assets like wind turbine generators, grinding mills, mobile mining equipment i.e. draglines, shovels and haulage trucks, fixed mining plant equipment, pumps in water sewage treatment plants. We also cover variable speed and ultra-slow applications."

The Schaeffler diagnostic experts are familiar with all analytical techniques — ranging from vibration measurements, infra-red thermography to torque analysis and endoscopy inspections — and as a result, they can quickly identify malfunctions and devise appropriate solutions.

Online monitoring options

When monitoring mobile fleets, such as haulage trucks, draglines and shovels, the focus is typically on electric wheel motors, alternators,

hoist, drag, swing, propel and crowd sections, and is carried out with dual parameter sensors monitoring both the vibration and temperature of each bearing.

All the data is collected automatically and communicates over the Schaeffler cloud back to the RDC where Schaeffler's reliability service engineers perform the diagnosis.

Should the 4G wireless signal drop out, the data is retained on the machine's data logger and will automatically transfer to the Schaeffler cloud once reconnected.

"We provide reports based on machine condition back to the client — that happens on a regular basis, normally monthly, however alarms are checked on a daily basis and any exceptions are reported straight away to the customer," Mr Ciechanowicz said.

This regularity provides more in-depth knowledge of the normal condition of the

machine and deviations can be more easily detected — forewarning mine sites of any components on the brink of failure or parts that could need replacement in the near future.

"In between that comprehensive diagnostic report, we also look at any alarms that have been generated in between the monthly reports and immediately provide any machine conditions that are an exception back to the client, so they are instantly notified if there's any kind of change in that machine's condition," Mr Ciechanowicz said.

"We also go further than that: not only do we detect problems, we can also provide a prognosis as to when the client needs to do something, and what exactly it is that they need to do and what kind of maintenance is required for a particular machine."

Seamless integration

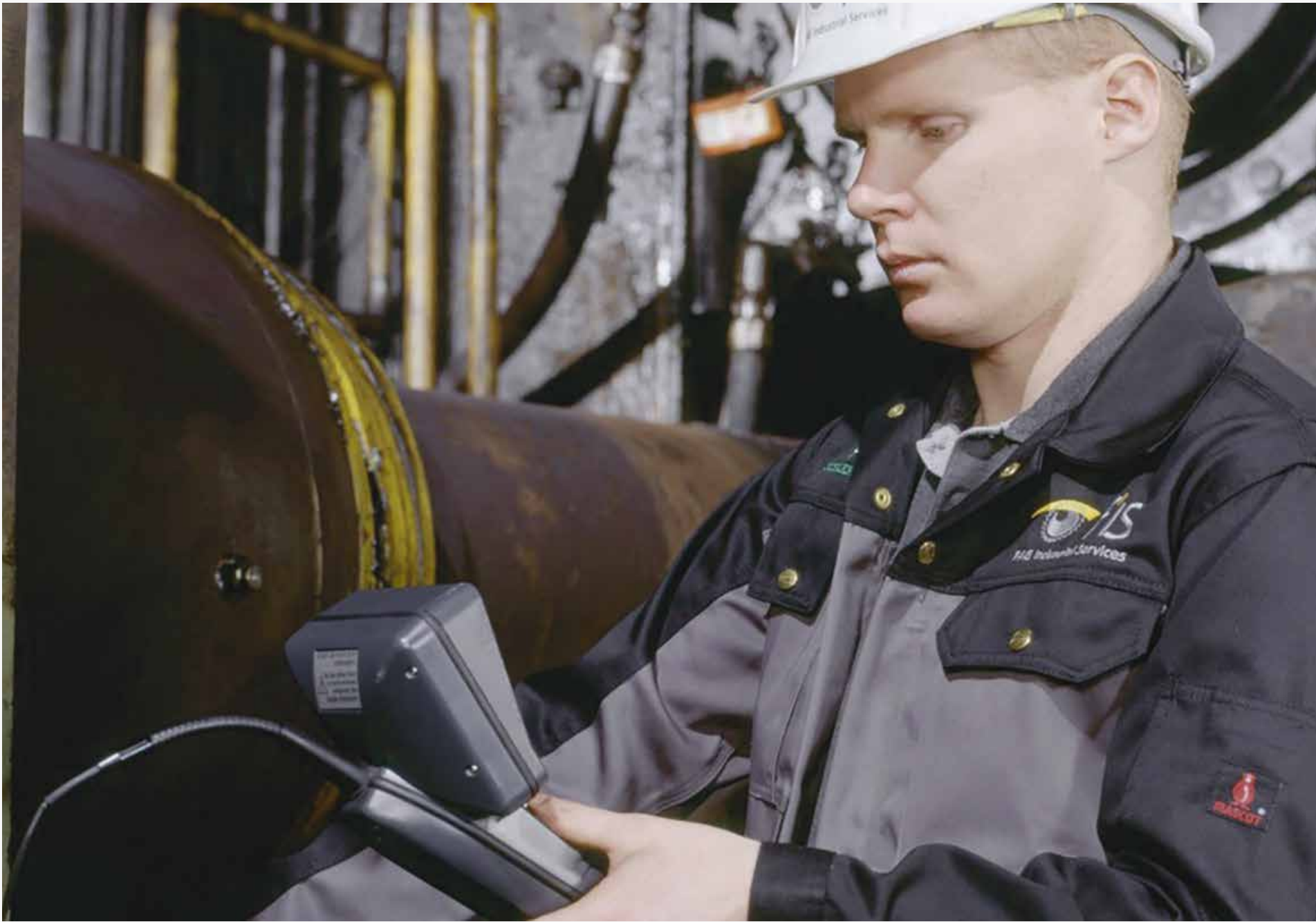
In addition to offering advice on selecting the right monitoring system, Schaeffler also offers turn-key solutions i.e. installing and implementing monitoring systems.

This not only includes hardware selection but also system configuration and, where necessary, its integration into existing data collection and reporting systems.

"We often install systems on critical equipment to monitor motor drives, gearboxes, trunnion and pinion bearings," Mr Ciechanowicz said.

"Because the mill bearings are actually rotating at quite a low speed, we're able to employ techniques such as high-gain accelerometer and acoustic emission sensors for monitoring these slow-speed bearing applications."

Schaeffler can install systems from new or retrofit to existing infrastructure.



“With both new and retrofitted systems, we set up baseline thresholds and tweak those alarms specifically over time to ensure that we eliminate the risk of any transient alarming that may occur.” Mr Ciechanowicz said.

“We help sites to increase the reliability of their plants which in turn increases the uptime and availability of the machines to produce when they are required to process.”

Invaluable investment

Investment in such monitoring systems often pays for itself in the first year due to the reduced failure costs.

“We’re arming clients with the time to ensure they have the inventory – particularly those components with long lead times – to plan maintenance activities in a proactive manner,” Mr Ciechanowicz said.

He pointed to the example of bucket wheel bearings as one such component where forewarning is particularly advantageous.

“Those large bearings aren’t just sitting around,” he said.

“Especially if they’re a custom bearing and the client doesn’t have one sitting in stock, there’s going to be a lead time and the costs start to escalate because you’ve got transport and

replacement costs and mounting downtime costs as well.”

The return on investment from a comprehensive condition and reliability monitoring system is phenomenal.

“We’ve done calculations on a dragline where we measure the hoist, swing, drag and propel sections and the cost wasn’t so much on the gearbox – even though it’s a half a million-dollar gearbox in its own right – it was actually in the cost of the downtime,” Mr Ciechanowicz said.

“If you look at the cost of the downtime, every hour that dragline is down (depending on

the commodity prices) it can be quite significant and vary from around \$40,000-60,000 per hour.

“If you don’t have a spare gearbox or bearings for the gearbox to replace, you could be looking at days of downtime, so you can see how the production costs quickly outweigh the cost of the replacement part itself.

“In one failure such as this, the client could have paid for the entire condition monitoring system across the whole dragline.

“So, our monitoring systems provide common-sense insurance for the client against this type of unscheduled downtime for all their mining plant and equipment.”





Digital Insights of Machine Health



Industry 4.0 has become one of the most popular buzzwords of industry. Schaeffler's focus is on showcasing the tangible benefits of Industry 4.0 that can lead to cost reductions and efficiency improvements.

Cost reductions are achieved through reduced downtime, reduced maintenance costs and reduced inventory holdings costs. Efficiency improvements are achieved through optimised production, shorter lead times and greater flexibility and adaptability to changing market needs.

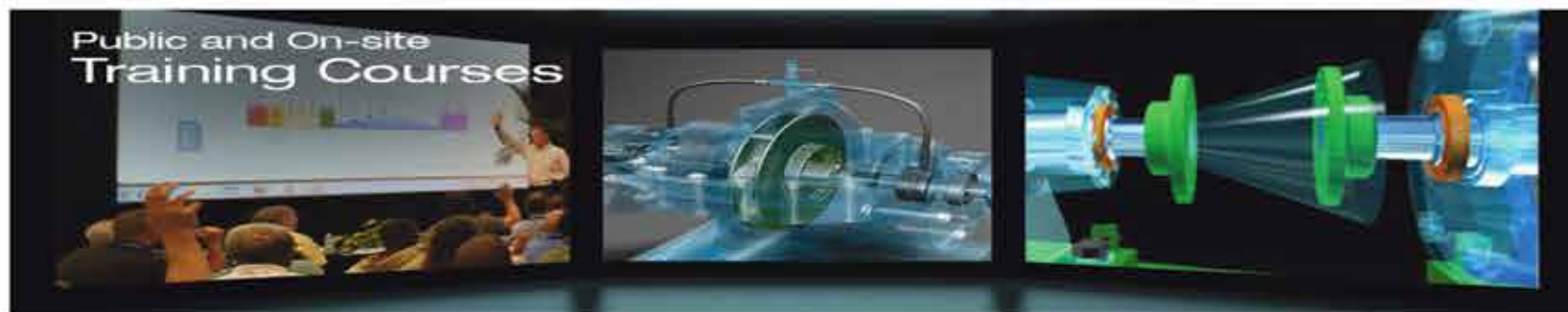
Locally, Schaeffler collects characteristic data points through its online condition monitoring systems throughout Australia. Schaeffler's Australian Online Monitoring Centre collects all this data, and inhouse experts can assist with analysing the data and providing specialist recommendations to improve efficiency and optimise maintenance programmes.

Through effective condition monitoring, our clients can monitor machine health, discover potential problems in advance, avoid costly unplanned downtime and loss of production.

Vibration Analysis/Shaft Alignment Training



VIBRATION ANALYSIS and **CONDITION MONITORING** with a strong **RELIABILITY** focus



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SHAFT ALIGNMENT COURSES

JOHN PIOTROWSKI, the master trainer and author of the unprecedented best-seller 'The Shaft Alignment Handbook' is coming to Australia and New Zealand for a strictly limited time.

- | | |
|-------------------------|--------------|
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| • 5 – 8 May 2020 | Perth, WA |
| • 19 – 22 May 2020 | Tauranga, NZ |

VIBRATION ANALYSIS ISO COURSES

CLYDE VOLPE is the founder of VIA and a Mobius™ Institute Training Partner for Category 1, 2, and 3 in Vibration Analysis. Mobius Institute awarded Clyde 'Instructor of the Century'. He has trained in over 30 countries to over 12,000 students.

Vibration Analysis ISO Category 1

- | | |
|-------------------------|----------------|
| • 28 April – 1 May 2020 | Sydney, NSW |
| • 5 – 8 May 2020 | Perth, WA |
| • 19 – 22 May 2020 | Tauranga, NZ |
| • 21 – 24 July 2020 | Melbourne, VIC |
| • 1 – 4 September 2020 | Perth, WA |
| • 15 – 18 December 2020 | Perth, WA |

Vibration Analysis ISO Category 2

- | | |
|-------------------------|----------------|
| • 10 – 14 February 2020 | Rotorua, NZ |
| • 22 – 26 June 2020 | Perth, WA |
| • 19 – 23 October 2020 | Sydney, NSW |
| • 16 – 20 November 2020 | Melbourne, VIC |
| • 7 – 11 December 2020 | Perth, WA |

Vibration Analysis ISO Category 3

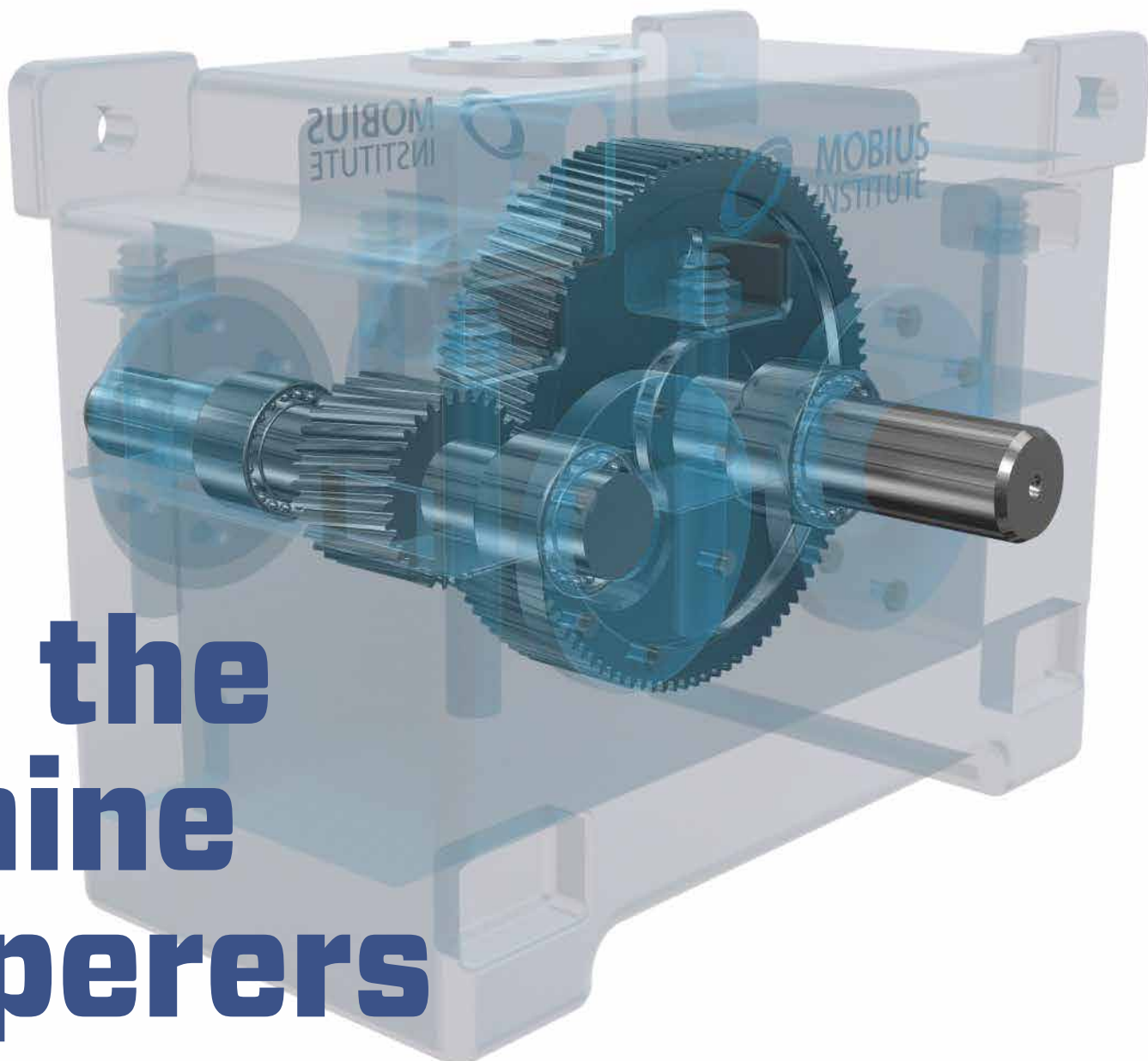
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| • 2 – 6 March 2020 | Tauranga, NZ |
| • 10 – 14 August 2020 | Perth, WA |



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Vibration Institute of Australia

Machine whisperers see the future and change the future of critical mining equipment with vibration analysis.



Meet the machine whisperers

JASON TRANTER
CEO AND FOUNDER
MOBIUS INSTITUTE
NATIONAL

THEY walk among us, machine whisperers who understand the health of your critical mining equipment.

While some resort to placing their hands on the equipment to feel for change, new age machine whisperers use sensitive vibration analysis instruments to detect problems that would have otherwise given you a bad day.

They can detect bearing faults months in advance.

Critical gears that are wearing, or worse, cracking, can be detected in plenty of time to order the replacement and plan the work. Conveyors, ball mills, crushers, screens, bucket wheels, and the supporting motors, pump, and gearboxes – no problem, all in a day's work.

Thanks to these machine whisperers, downtime can be significantly minimised.

The cost of repair can be drastically reduced. Safety and environmental incidents can also be reduced.

Not only can the machine whisperers see the future, they can change the future.

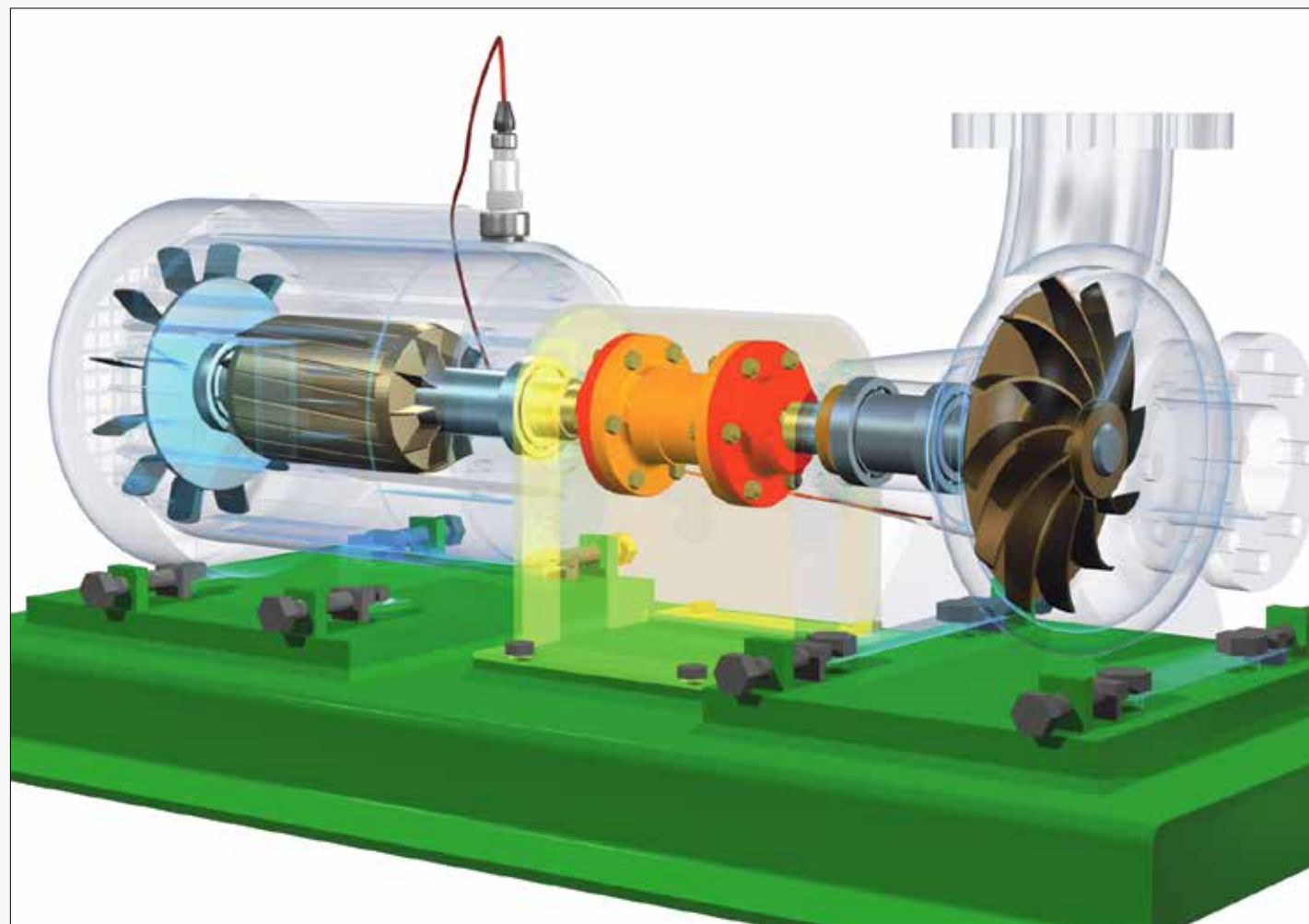
First, did you know that the equipment you buy may already be defective?

Plus the motor rewinds, balance jobs, gearbox overhauls, and other work by outside contractors can also be defective.

Even the maintenance work performed on-site may not be perfect.

Machine whisperers can detect it all, protecting you warranty disputes and from costly downtime and repairs.

Second, before mining equipment begins to fail, very often it will provide an indication that it is under stress because of operational issues,



lubrication issues, and for many other reasons.

The machine whisperers can detect that too. By avoiding the failures, you can achieve the highest levels of reliability and dependability.

What are "machine whisperers"?

They are men and women trained to be vibration analysts.

At one extreme, vibration instrumentation can be installed to monitor your critical assets 24/7.

Alternatively, portable instruments are carried from machine to machine where tests are performed to detect changes in vibration.

Either way, the information gathered will make a substantial financial impact profitability and competitiveness.

Mobius Institute provides training around the world, with accredited certification per the International Standards Organization.

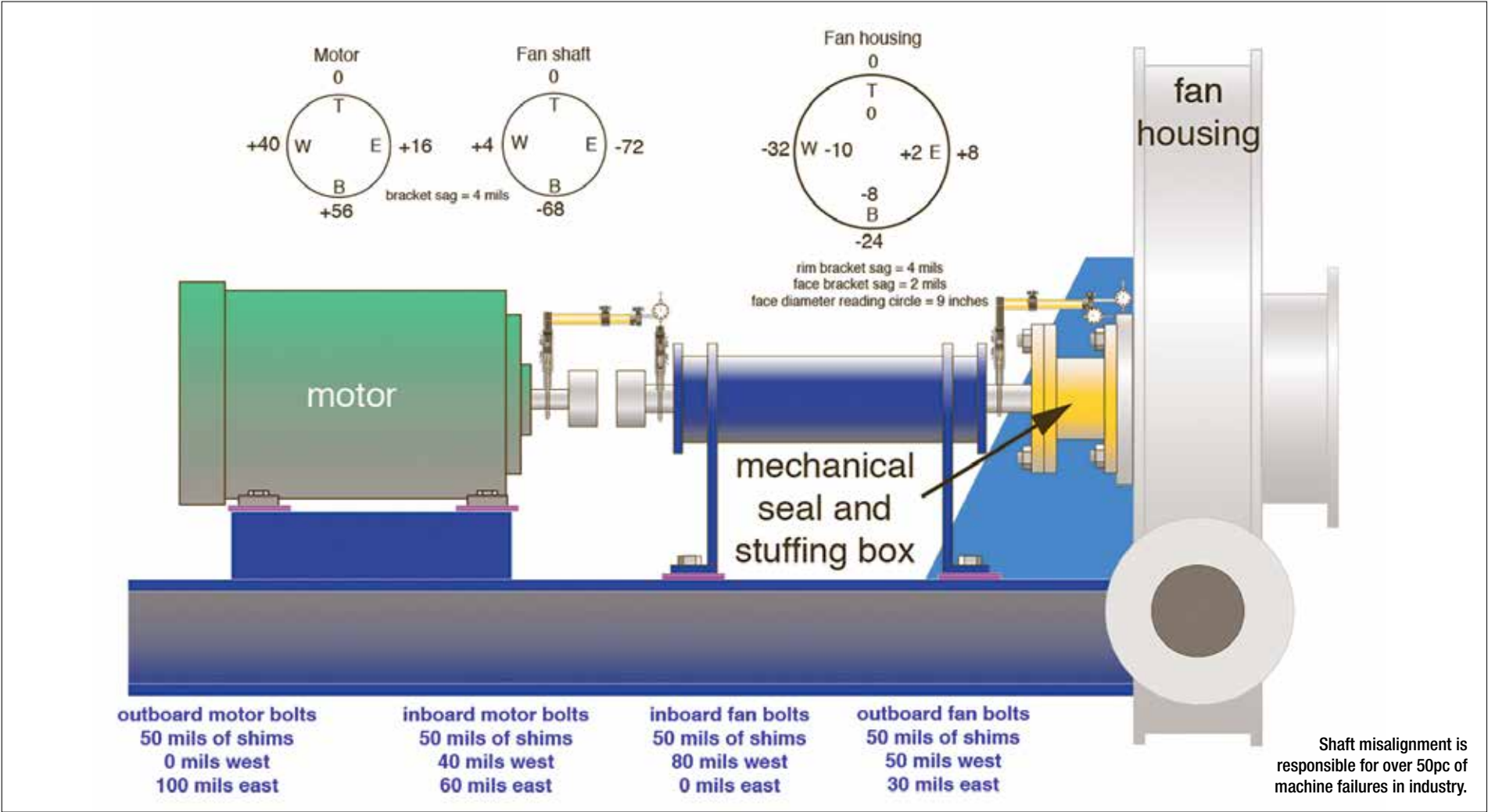
No one trains more people in vibration analysis, condition monitoring, and reliability

improvement.

In Australia and New Zealand, no one delivers better training than Clyde Volpe at the Vibration Institute of Australia.

Clyde has trained thousands of certified vibration analysts from the mining industry and across all other industries.

For information about vibration analysis training courses contact VIA at www.viaustralia.com.au or jennie@viaustralia.com.au.



Get it right with shaft alignment

NATIONAL

SOMETIMES machinery alignment is more than just aligning the shafts of a driver and driven machine.

For example, consider a particular drive system which may not have a vibration problem, but the mechanical seal would begin leaking very shortly after starting the unit up on this motor and fan drive system.

The fan shaft is supported with two rolling element bearings in a common housing.

The bearing housing for the fan shaft is not attached to the fan housing where the stuffing box and mechanical seal are located.

In this particular instance, a set of Reverse Indicator measurements were taken between the motor and fan shafts.

A laser alignment system could have been used here also.

Those measurements will tell us where the motor and fan shafts are located.

You also need to check the alignment between the fan shaft and the mechanical seal housing to make sure the fan shaft is concentric with the bore of the stuffing box.

The photo shows taking Face Rim measurements from the fan shaft to the mechanical seal housing.

A laser alignment system is not capable of doing that.

The illustration on the bottom left shows the up and down views (i.e. side view) of the motor and pump shafts as well as the centreline of the seal housing bore.

The illustration on the bottom right shows the east to west views (i.e. top view).

The objective is to align the motor and fan shafts to the centreline of the bore of the seal

housing.

The solutions for this problem are shown in the side and top view alignment models.

There are a variety of different alignment methods and alignment tools.

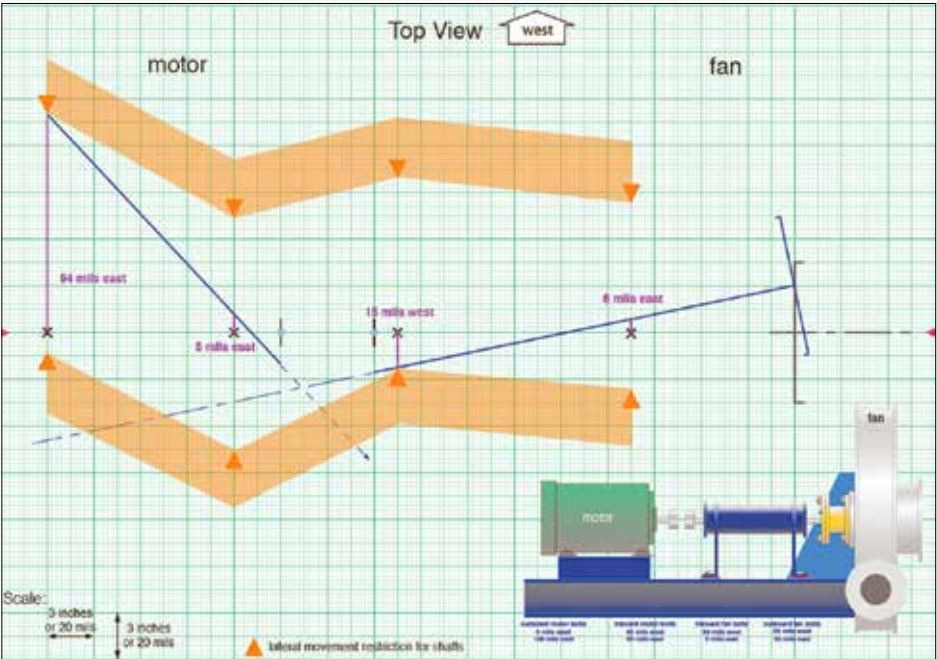
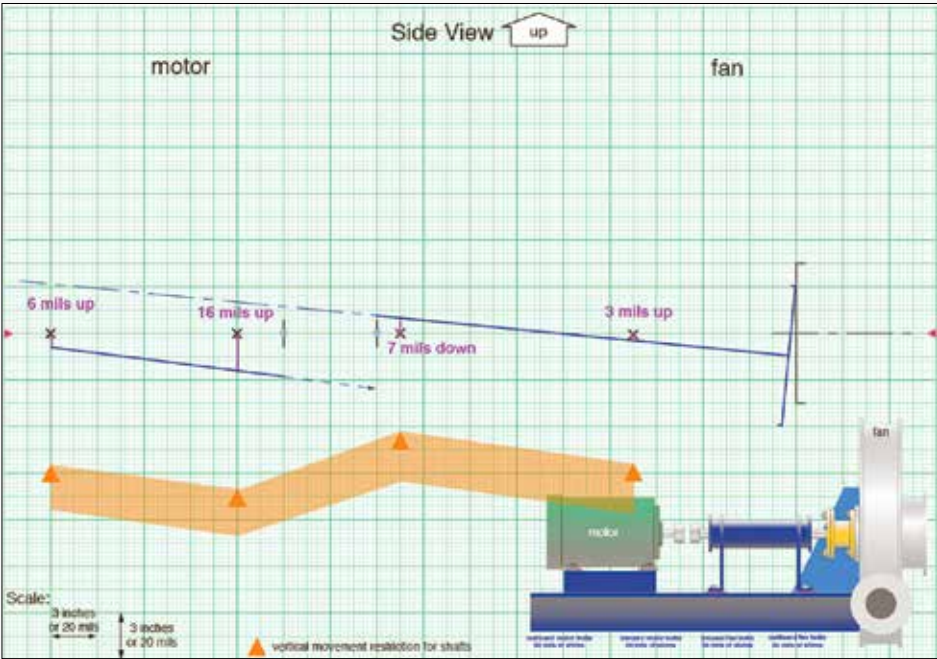
An alignment expert is someone who knows how to perform all of the different alignment methods and understands that the alignment tasks at hand may require more attention than just aligning the shafts of the machinery.

VIA is proud to be bringing, the master trainer and author of the definitive 'The Shaft Alignment Handbook', John Piotrowski, to Australia in April/May 2020.

This will be the last opportunity to be trained by John in Australia. Contact VIA at www.viaustralia.com.au or email jennie@viaustralia.com.au.



To properly align the drive system, alignment measurements need to be taken between the motor and fan shafts, as well as between the fan shaft and the mechanical seal housing.





Total power, air and light

The company distributes Generac lighting towers across Western Australia.

NATIONAL

BLUE Diamond is a leading, privately-owned equipment distributor with its head office in Kewdale, Perth.

The company's core products are diesel generators, diesel air compressors and lighting towers.

Standard mine spec generators through to highly customised set-ups are available with customised synchronisation and low noise level, plus hybrid sets with solar and battery options.

Blue Diamond director Justin Pitts said

the company has customised containerised generator sets for the RAAF, as well as completing customised mine spec Denyo generators for Sino Iron Ore, Anglo Gold, Rio Tinto, and FMG.

"Our highly skilled and flexible team will deliver the right outcome at the right price," Mr Pitts said.

"We offer the highly personalised service that you would expect from a leading WA-owned private business."

Blue Diamond has also supplied synchronised Denyo 150s for the Water Corporation and customised Cummins powered units for CBH.

The company offers mechanical support from the office in Kewdale or field support from its base in Karratha.

"We are focused on expanding our field and workshop mechanical service capabilities for diesel generators, air compressors and lighting towers," Mr Pitts said.

"With the expansion of our operations to Karratha and the relocation of our Kewdale facility to a far bigger location, our focus is well and truly on the WA mining, construction and agriculture markets."

Blue Diamond also stocks a huge range

of spare parts for Denyo, AIRMAN, Kubota, Cummins, Perkins and all the equipment it sells, including bundled diesel fuel tanks, large mobile air coolers and ute and truck toolboxes.

"We are the exclusive national distributor for Denyo generators from Japan, the exclusive national distributor for Rotair air compressors from Italy and the WA distributor for Generac lighting towers from Italy – which include diesel, hybrid and solar," Mr Pitts said.

"We carry massive stocks of equipment in our Kewdale warehouse so we're sure to have the equipment you need when you need it."



Diesel generators are customisable to suit any mine site requirements.

DENYO DIESEL GENERATORS

Denyo Generators are regarded as amongst the highest quality generators in the world. Having been established in Japan in 1948 to assist with the rebuild after WW2, they have forged a reputation very early on as the most reliable and fuel-efficient generators on the market.

They are revered in the Australian mining and rental markets due to their ability to run in extremely hot conditions, with compact robust canopies that are designed to be lifted, moved and truck mounted.

They are also more fuel efficient, being 11.25pc more fuel-efficient than other generators. Quite simply, if your project requires the highest portable diesel generator suited to Australia's harsh conditions, this is the best option available.

Not only is Denyo simple and bullet-proof, it is also progressive, having developed a remote monitoring system with its own app.

The generators can also be set up for synchronisation and can have inbuilt soft starters. They are available ex stock from Blue Diamond (6kVA to 500kVA).

ROTAIR AIR COMPRESSORS

Rotair is a 50+ year-old company located in the heart of old Europe, at the feet of the Maritime Alps and close to the French border.

It's air compressors are successfully sold across the globe, including the USA, Australia and New Zealand. They are manufactured in-house in Italy to the highest exacting standards; in fact they far exceed Australian environmental standards, meeting stage 4 European standards and are ready for tier 5.

All diesel units are capable of delivering 14 Bar pressure and operate in 50 degree ambient temperatures.

The canopies are made of electro-galvanised steel and to ensure they stand up to corrosion. They are available ex stock from Blue Diamond (75CFM to 800 CFM).

GENERAC LIGHTING TOWERS

The Generac Mobile range of light towers is the largest in the world, since 1997. High quality manufacturing from an Italian-made global leader almost goes without saying, but the focus on environmentally friendly solutions is where Generac has differentiated itself from the competition.

The Generac VT Hybrid is the first hybrid light tower in the world. It is equipped with 4 X 150W high efficiency LED floor lights powered by a rechargeable battery pack.

This range of light towers guarantees a range a great reliability and sustainability. They have been enthusiastically supported by the major national rental companies and are available to your site ex stock from Blue Diamond.

CUSTOMISED POWER SOLUTIONS

Blue Diamond's power solutions go beyond what can offered by the Denyo range. Having recently installed 3 X 650 kVA customised containerised sets to a Pilbara mine site, meeting tight noise, efficiency requirements and of course mine specifications, the company will also be maintaining the prime power units from its Karratha depot. Blue Diamond is currently delivering customised units across WA up to 2000 kVA.

The in-house team is experienced and hands on.

Call Blue Diamond if you would rather deal with an independent WA-owned company.



The highly skilled team at Blue Diamond can customise power and air solutions.



Blue Diamond is the exclusive national distributor for Rotair air compressors from Italy.



The company distributes Generac lighting towers across Western Australia.



Customised synchronisation, low noise level, hybrid sets with solar and battery options are available.



Quality is the key

NATIONAL

VM Drilling specialises in providing grade control and first pass exploration RC drilling services, utilising small footprint, versatile machines to offer clients an exemplary drilling service.

Traditional RC drill rigs are large and bulky, and these machines typically have up to a 15m stand-off from the pit wall - meaning that in the grade control process, holes that are in close proximity to a highwall are either missed from the program or are drilled at angles where the information produced from the hole is inadequate.

VM Drilling general manager Courtney Pacey said the company's grade control fleet consists of six Atlas Copco ROC L8s and one Atlas Copco D65 RC drill rigs.

"Our grade control fleet supports many of the mid-tier mining houses as they endeavour to de-risk project development and optimise resource grade and mill through-put," Mr Pacey said.

"With an articulated mast and boom set-up, these rigs can drill on nearly all axis and angles.

"This allows us to set up the drill with the mast at right angles to the machine as a blast hole rig would when drilling pre-splits.

"By doing this with minimum stand off from the highwall, we can achieve full pit coverage for our clients."

These rigs are also often utilised by clients as a first pass exploration alternative to traditional RAB or air-core drilling methods, because of the hands-free rod handling system.

VM Drilling found that custom attaching a Cyclone to a small Atlas Copco rig had multiple benefits for its operating processes.

"The machines have quite a small footprint so they can get up close in places where big RC machines are unable to," Mr Pacey said.

"Large machines can't get close to the pit wall so there's a lot of area the mining company actually misses when it comes to grade control drilling.

"We can offer full pit coverage, drilling a series of holes along the mine's pattern to determine the average grade or the ore and how it runs to dictate the blast and digging process."

Mr Pacey said the company has found a niche within its small and adaptable RC machines.

"We made our own kits to suit our needs using components from a few different suppliers" he said.

"We think its more efficient than the standard RC kits you buy off the shelf, and we've had a lot of success with it."

When drill depths required exceed the ROC L8 capability, VM Drilling uses a Hydco 800 track-based RC exploration drill rig to meet client needs, with depth capability of up to 800 meters.

Productive partnerships

Mr Pacey said the company has been in a range of successful partnerships to provide grade control drilling solutions for mining companies.



"At the moment 30 percent of our fleet are on multiyear contracts," he said.

"The remainder of our fleet rotate around on campaign work with the rest of our key clients. They are all kept very busy in this market."

Skilled workforce

"VM Drilling is committed to providing a skilled workforce, with a comprehensive internal verification of competency training program," Mr Pacey said.

"We have also partnered with AMPT Services and our operational staff are enrolled in Nationally Accredited Drilling Certification traineeships, which not only helps the company

fulfil its employee development program goals, but ultimately offer our clients a superior service.

"VM Drilling's difference is in our uniquely versatile approach, utilising fit-for-purpose equipment and highly trained individuals to assist our customers to achieve their goals."

Transport options

The company also has a transport division, VM Transport that includes a Western Star prime mover, a 30 ton tri-axle float and a 40 foot tri-axle sea container side lifter, VM Drilling offers the transportation of VM drilling rigs and ancillary equipment to site, saving on mobilisation costs to clients.

The sea container lifter is capable of transporting either a 20ft, a 40ft or two 20ft sea containers at once.

Utilising unique lifting aids, this unit can lift two 20ft sea containers at once with a payload of up to 36 ton and can stack sea containers two-high.

"We can offer lower mobilisation costs and travel wherever we need to go," Mr Pacey said.

"We've completed a few jobs in South Australia and have a project coming up next year in New South Wales - we're a contract drilling service so we'll go wherever the work is.

"Plus, we're self-sufficient on site, we bring everything we need on site to complete the work above and beyond our client's expectations.



THE BUSINESS

www.vmdrilling.com.au

VM Drilling is a well-established drilling services provider with more than 50 full time employees and a solid management team that has been providing innovative, professional drilling solutions to the Australian mining industry since 2004. Our operational base is located in Kalgoorlie-Boulder, Western Australia where we strive to contribute to the local community and employ staff who live in the city.

VM Drilling offer drilling services to clients throughout Australia and with an internal transport division we are able to cost effectively mobilise our equipment and freight to virtually any location.

VM Drilling's difference is in our uniquely versatile approach, utilising fit-for-purpose equipment to assist our customers to achieve their goals.

The right specialty service, when and where it's needed most.



EQUIPMENT



CAPABILITIES

- Track based grade control drilling to 54 metres
- Full pit coverage with articulated mast and boom setup
- RC track based exploration drilling to 800 metres
- First pass exploration/air core and slimline RC
- Internal transport company to reduce mobilisation costs
- Internal engineering company for innovative solutions

TESTIMONIALS

"I have utilised and relied upon VM Drilling since their establishment in 2004, having drilled thousands of safe, efficient metres in that time, primarily in the West Australian gold sector. VM's eye for continual improvement means sampling quality and work efficiency is second to none and well supported. Their fleet is well maintained which means every job is done with minimal downtime and maximum safety. This equates to cost savings for their clients. When I need an RC job done right the first time, VM is my first choice."

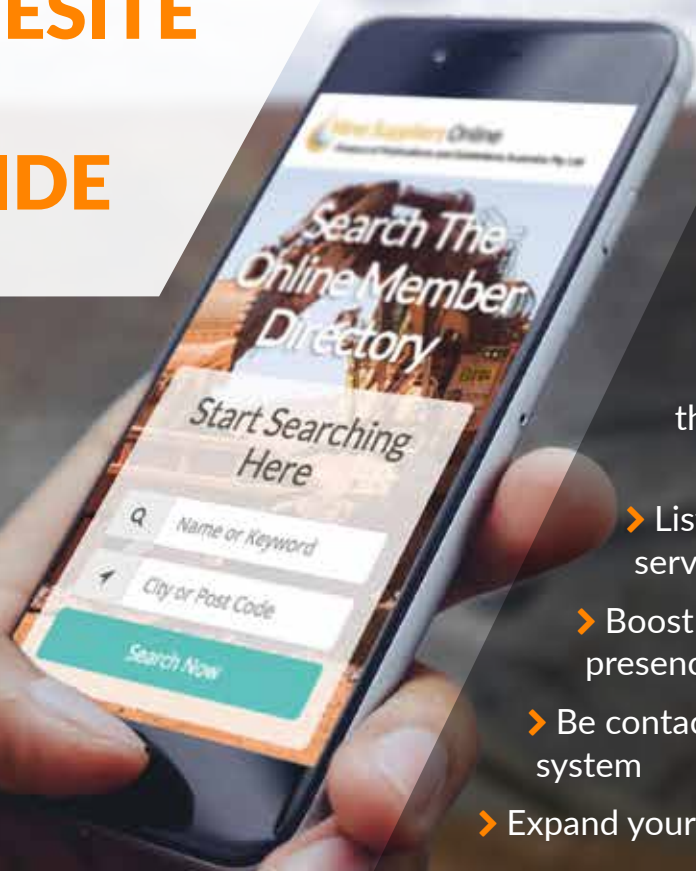
Ben Pollard
Director - Cadre Geology and Mining

"I have used VM Drilling since 2004 and have found them to be professional, supportive with flexible rig scheduling, have an ability to deliver on target metres and be cost effective. They deliver this with a sound approach to safety. Their ROC L8 rigs provide the in pit mobility and versatility required to drill the trickiest of holes. I highly recommend using VM Drilling for any grade control programme."

Darryl Mapleson
Director - BMGS

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Quality conveyor equipment

PROK conveyor products are the result of decades of engineering experience.

NATIONAL

PROK is one of the largest OEM manufacturers of quality conveyor products in the world, specialising in developing, manufacturing and supplying conveyor equipment to the global bulk materials handling market.

It has recently established a new facility in the Pilbara, located in Newman, which is expected to open early in 2020 to further extend its service to customers in the region.

This will allow the company to become more agile to meet customer requests with quicker turnaround times, local support and access to the best engineers and technicians in the market.

PROK has also continued to strengthen its position in the market both on the east and west coast of Australia, while increasing its global presence with new facilities established in Canada, Chile, the USA and Indonesia.

The brand you know and trust

With an emphasis on total-cost-of-ownership, performance and reliability, PROK provides products that support modern bulk material handling practices, both as original equipment and as replacements in existing systems.

Decades of engineering experience is designed into PROK conveyor products and its state-of-the-art design software with a complete offering across rollers, frames, pulleys, belt cleaners, and safety devices.

The company has continued research work on the new technologies and materials to develop the current range of PROK conveyor equipment.

Its presence across Australia includes a network of manufacturing facilities and specialised engineering and technical services facilities.

Recent projects

One of the major current projects for PROK is the manufacture and supply of low noise conveyor idlers and the manufacture and supply of pulleys for one of the fastest overland conveyors in Australia, which will operate at more than 10m/sec.

PROK was chosen for this project due to its experience with high speed conveyors and ability to meet complex specifications required by long distance, high speed, high tolerance applications.

Extending capability in East Coast of Australia

In January 2019, PROK extended its conveyor equipment capability on the East Coast of Australia with the addition of a specialised OEM pulley manufacturing facility based in Gosford and the investment in new equipment and technologies at its Smeaton Grange facility in Sydney.

The additional manufacturing capacity in Gosford includes six over-head cranes, plate rolling, state-of-the-art CNC machining, specialised welding to the highest standards, in-house stress relieving, shot-blasting, painting facilities, lagging facilities including an autoclave for hot vulcanised (with and without ceramic) lagging and specialised pulley acceptance testing equipment.

This provides a dedicated local option for OEM pulleys and pulley overhauls and further strengthens the company's pulley capabilities and product offering to customers across the east coast of Australia.

Advanced idlers

PROK is Australia's market leading idler manufacturer, operating the most advanced idler

production facilities in Australia.

Over the years, the company has built up an elite design and project management team who understands the diverse nature of the mining industry.

PROK offers a complete range of idlers and support services for all mining and resource segments and with its state-of-the-art manufacturing facilities, has the capability to deliver the highest quality manufactured rollers flexible in-house design and custom engineered solutions.

PROKOMPOSITE

PROK's latest generation all-composite roller, is a low-weight, low-noise innovation that meets the need for a superior conveyor component.

The new composite rollers deliver significantly more value than competing steel rollers, from lower cost to corrosion resistance in wet and high-salt environments: they're safer, quieter and more economical.

The rollers generate more than 50pc less noise, are 55pc lighter and cost up to 20pc less to own (due to easier maintenance and lower energy demands) than traditional steel rollers.

Despite their light weight, the new PROKOMPOSITE rollers deliver durability in demanding medium to heavy duty conveying applications.

PROK pulleys

PROK continues to lead the way in the conveyor pulley space due to its superior manufacturing capability and flexibility.

With industry leading design software, coupled with in-house manufacturing capabilities and bespoke design to meet customer requirements, PROK ensures quick turnaround on new and refurbished pulleys.

PROK offers a complete range of pulleys for all applications including live and dead shaft pulleys, light duty pulleys, medium duty pulleys and heavy duty engineered pulleys, with an emphasis on performance and reliability.

PROK technical services

The company has engineers and technicians capable of providing on-site services and solutions.

It is a service-oriented group with specialist conveyor expertise and is a gateway to the expansive engineering capability of the wider NEPEAN business.

PROK's conveyor engineering solutions cover:

- Product and equipment-based solutions
- Customised designs
- Application-specific conveyor equipment
- Specialist conveyor company providing holistic solutions
- Access to global specialist engineering and associated IP through the wider NEPEAN group

Pulley refurbishment services

PROK pulleys are engineered for extended service in heavy duty mining and industrial applications, which means they are built to last.

PROK pulleys are designed to be refurbished, breathing new life into old pulleys – an attractive option for many mining companies looking to increase operational efficiencies and reduce downtime.

PROK's Pulley Refurbishment Services are situated in key mining locations, offering global clients the opportunity to extend the life of their pulleys using leading engineers and technicians and original OEM components.

PROKOMPOSITE

ENGINEERED TO LAST

PROKOMPOSITE, our latest generation all-composite roller, is a low-weight, low-noise innovation that answers your need for a superior conveyor component.

Our new composite rollers deliver significantly more value than competing steel rollers, from lower cost to corrosion resistance in wet and high-salt environments. They're safer, quieter and more economical.

- Generate more than 50% less noise than traditional steel rollers
- Are up to 55% lighter than traditional steel rollers
- Cost up to 20% less to own due to easier maintenance and lower energy demands

PROK
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Equipment**

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in 



Leverlink makes impact

NATIONAL

AN idea by Leverlink founder Richard Sharp early in 1991 led to the production of the first "dynamic" impact bed for troughed conveyor belts in Australia, forming the foundation for Leverlink's current leading-edge technology.

Mr Sharp had the idea to develop a better and more reliable product; one that would dissipate kinetic energy and provide the benefits of long service life, as well as assisting in reducing maintenance costs in terms of consumables and labour.

The design for the dynamic impact bed – using rubber torsion springs as suspension – was radically different from the static impact beds that were dominating the Australian marketplace at the time.

Impact bed or belt support cradle?

Many so-called impact beds are nothing more than belt support cradles with limited design capacity to dissipate impact energy and provide belt damage protection.

Design and engineering

Leverlink's experience, engineering skills, and continuous improvement program through research and development and infield monitoring has made the company leaders in the design and application of dynamic impact beds in Australia.

All Leverlink dynamic impact beds are custom-built to suit the application, and in areas where installation space and access are restricted, the design can be such that the individual parts can be broken down and reassembled on the conveyor frame in manageable parts with minimum effort.

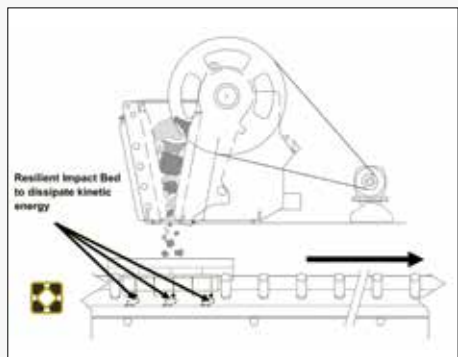
Rubber torsion springs - impact/vibration attenuation

Leverlink has developed rubber torsion springs that provide a unique method of absorbing impact with the added benefit of vibration attenuation.

Rubber torsion springs are used extensively in its designs for various applications.

Leverlink is the largest manufacturer of rubber torsion springs in Australia, and also manufactures some of the biggest rubber torsion springs in the world.

With a proven track record, the company uses in-house engineering and design combined with extensive infield representation and has years of experience in mining, quarrying, and material handling problems.



The dynamic impact bed difference.



Leverlink's dynamic impact beds are fully customised to client specifications and needs.



- No rollers to replace
- Reduced downtime
- Reduced maintenance costs
- Protects conveyor structure from impact damage
- Supports belt profile at load zone
- Long service life
- Cost effective
- Cost saving
- Easy to retrofit



Leverlink dynamic impact beds will stand the test of time.

Load zone design

The design of an effective conveyor load zone can often be a complex issue.

Functional specifications such as belt speed, width, type of belt, product size, free fall

heights, and product moisture content are all major design considerations.

Spillage control

Spillage can be controlled by effective skirting and inner wear plate design and the added use of belt support systems.

Case study one

Leverlink was contacted by a large mining operation who were continually experiencing failure of its impact roller frames.

The conveyor belt was 2000mm wide with a 45-degree trough angle, and the belt was running at 1.5 m/sec, the feed material was -500mm with

a free fall height of 2500mm, and the production rate was 1800 tph.

With the functional specifications supplied, Leverlink then visited the site to determine what additional information could be gained that would assist in the engineering and design of a Dynamic Impact Bed to minimise the damage to the conveyor belt and supporting structure.

The Dynamic Impact Bed was built and installed.

The goal was achieved, and the client completely satisfied, they then purchased a second unit for an identical load zone.

This was 26 years ago.

In this time the slider bars have been replaced three times and the impact mounts twice, but it is expected the Dynamic Impact Beds will last another 10 years.

Case study two

An offshore copper mine commissioned Leverlink to provide a solution for extremely high costs due to belt damage at a conveyor load zone.

The conveyor belt was 2400mm wide, 23 degrees trough angle, and running at 3.35m/sec.

The material was hard rock/copper ore at -250mm with a free fall height of 6000mm. The peak capacity was 10,000 tph.

Engineering calculations determined a multi-trough Dynamic Impact Bed was required for the application.

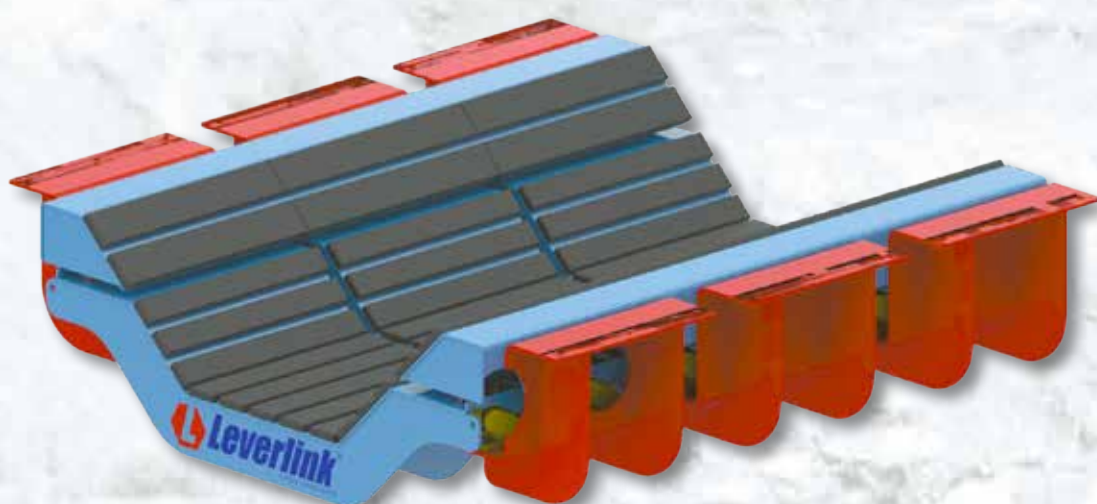
This was designed, manufactured and exported to the client.

When installed and commissioned it resolved the belt damage problem to the customer's satisfaction.

One year later the mine ordered a second unit for a similar conveyor belt.

Leverlink has been at the cutting edge of rubber torsion springs and dynamic impact beds for about 30 years, and can provide fully customised impact beds, and many more products and services.

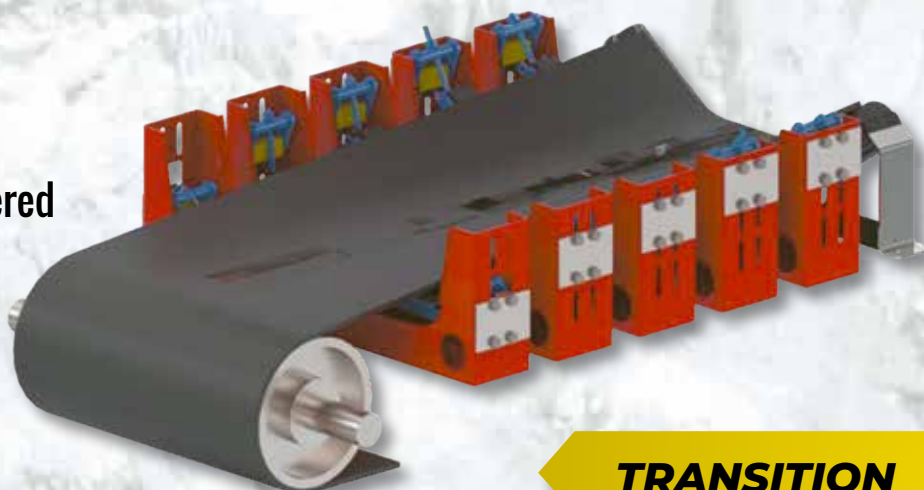
AUSTRALIA'S CONVEYOR BELT LOAD ZONE PROTECTION SPECIALISTS



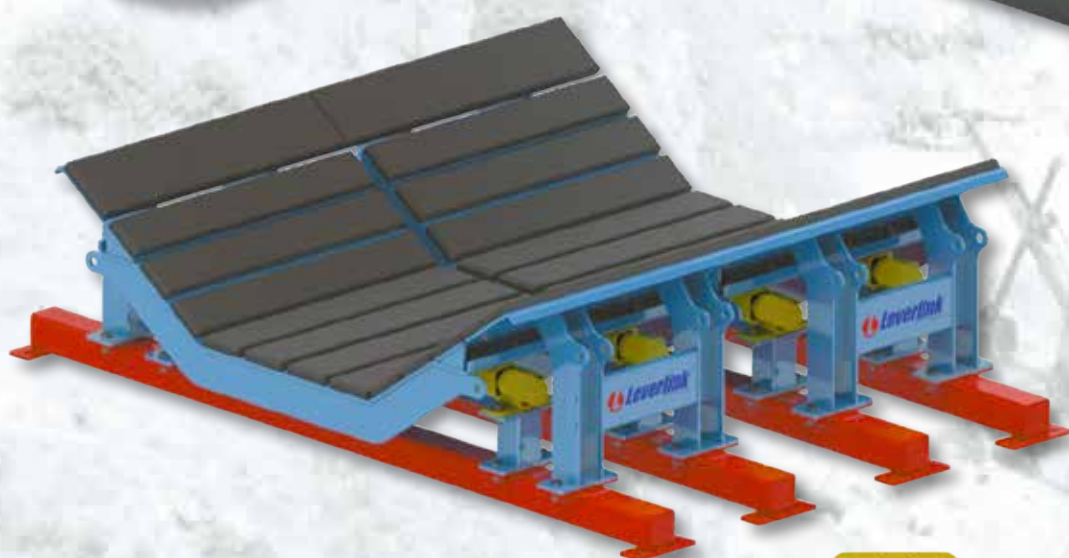
SUSPENDED

**CUSTOM
DESIGNED**

Custom designed and engineered
to protect the conveyor belt
and supporting structure



TRANSITION



FOOT MOUNTED

10

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The Trelleborg Brawler Soft Ride is changing industry expectations around the use of solid tyres.

Soft ride, tough tyre

NATIONAL

TRELLEBORG'S innovative tyre solutions have always been developed in response to the challenges faced by its customers.

So when the need to develop a softer-riding solid OTR tyre than was currently available to the market, Trelleborg developed its innovative Brawler 'Soft Ride' compound which built on its predecessor's formidable attributes of sheer toughness, excellent wear performance and the unique elliptical 'suspension' apertures.

The tyre has re-defined what operators can expect in terms of comfort and what machine owners can expect in terms of equipment longevity from their solid tyres.

The machines used by the Australian mining industry are diverse and expensive and the tyres that protect those machines need to be the latest technology.

Whether it's loaders, skid steer machines, graders, telehandlers or mobile material handlers, the Brawler Soft Ride can provide a cost-effective solution to any mine.

Trelleborg sales director Paul Hansen said it was a product with many diverse applications across many faculties of the mining industry.

"We even have custom-made Brawler tyres for underground machines" he said.

The purpose-designed 'soft ride' compound, together with the unique elliptical apertures mean the Brawler is fast becoming a serious option for mining solutions.

In comparison to its predecessor, the unique design of the Brawler HPS Soft Ride significantly reduces vibration to give ride comfort equivalent to a foam/solid filled pneumatic L5 tyre, while delivering the durability and toughness of a solid.

This demonstrates Trelleborg's commitment to offering radically improved operator comfort



Anti-vibration construction
Deep tread
Increased footprint
Puncture proof
Damage resistant compound
Elliptical apertures
Maximum value
Maximum uptime
Enhanced safety
Reduced impact

The Soft Ride rubber compound provides operators with an unmatched level of comfort for solid tyres, while the purpose-designed tread compound ensures maximum tyre life.

as well as extending equipment life.

Mr Hansen said that the tyre has been specifically developed to reduce the stresses associated with equipment that does not have suspension.

"Reduced stress on operators means a better 'office' to operate in and reduced stress on equipment means less downtime due to component fatigue and other failures associated with a 'hard ride' in a demanding

environment," he said.

By fitting a vibration measuring device to the seats and to the machines, Trelleborg was able to quantify a 35pc reduction in vibration, measured against three ISO standards.

This directly translates to cost savings associated with machine wear-caused vibration, operator efficiency, and a longer tyre life that reduces the need for maintenance and downtime.

Why choose Brawler?

The Brawler comes in two options for most sizes — the HPS is designed to be pressed onto a standard flat-based multi-piece wheel, while the HD is a tyre that has been moulded onto a steel band.

The centreplate is designed to be bolted into the Brawler wheel and then bolted onto the specific machine.

The benefits with HD is that no pressing is required (so there is no downtime whilst wheels are away getting new tyres fitted).

Should machines be changed out due to major machine issues or replacement, the centreplate can be changed to suit the new machine (as long as the original tyre size on both machines was the same).

Mr Hansen said that it all translates into better efficiencies – for both the operator and the machine – and these efficiencies save money.

“The Brawler is easily identified by the elliptical aperture holes in the sidewall,” he said.

“The cushion rubber compound significantly increases deflection and shock absorption, while the elliptical apertures compress into circular apertures; and when combined with the purpose-designed cut-resistant tread compound, the result is a solid tyre that is very tough, but much less stiff than its competitors.”

Customers get all the advantages associated with durability for a solid tyre, while also reaping the benefits of a much more comfortable ride, no loss of load index, and an increase in operator efficiency – even at higher operating speeds.

The tyre was rigorously field-tested over a two-year period at various facilities around the globe including Australia, Asia, America and Europe.

Segment manager specialty-mining, waste and recycling at Trelleborg, Diti Zweistra, said that despite the varying geographies and climates, the response from operators and

site manages was always the same: “We don’t want to switch back.”

“Our investment in this process and time spent with customers to understand and solve their key issues is what we at Trelleborg call applications expertise,” he said.

“Solid tyres mean no punctures or downtime and maximum uptime for equipment.

“It is exciting to know that there is a tyre out there that can provide a solution to many problems found on a mine site.

“By having respondents talking direct to us we can tailor a tyre/solution to overcome their issues.”

The Brawler was designed specifically to reduce the vibration associated with solid tyres.

Brawler has been an industry leader in the waste and recycling industries for many years, and Mr Hansen said that it was an exciting time for Trelleborg as the tyre is beginning to gain traction in the mining industry.

Mr Hansen said that the best way to see the difference is to view the Brawler Soft Ride promotional video on YouTube.

Trelleborg Wheel Systems is a leading global supplier of tyres and complete wheels for agricultural and forestry machines, materials handling, construction vehicles and other specialty segments.

The company offers highly specialised solutions to create added value for customers and is partner of the leading Original Equipment Manufacturers.



MORE INFORMATION: Trelleborg | +65 6662 8268 | www.trelleborg.com.au

Tough Jobs Soft Ride

BRAWLER SERIES

ANTI VIBRATION
CONSTRUCTION

CUT RESISTANT
COMPOUND

ELLIPTICAL
APERTURES

ULTRA
DEEP TREAD

SOFT
RIDE

Brawler HPS Soft Ride tyres are designed to perform in mining and tough recycling and waste management applications while providing the most comfortable ride within the Trelleborg Brawler range.

The Soft Ride compound combined with Brawler’s unique elliptical sidewall apertures delivers higher

shock absorption and reduced vibration ensuring the best possible protection for operators and machines.

Brawler HPS Soft Ride - Delivers the toughness of a traditional solid tyre and a ride comfort equivalent to a filled pneumatic tyre.

TRELLEBORG

www.trelleborg.com/en-au/wheels

Eliminate conveyor downtime

NATIONAL

CONVEYOR belt failure typically results in process line downtime, which equates to loss of production, loss of products, and ultimately loss of profits.

Currently, many companies have a shift operator or superintendent who is in charge of 'walking the belts', who actually walks along or drives alongside every conveyor belt in the plant, audibly listening for faults along the unpowered idlers that support the belt.

There is now a smarter, more efficient and reliable method to monitor conveyor health and prevent costly downtime.

The Praetorian Fibre Optic Sensing System, developed by Hawk Measurement Systems (HAWK), has the ability to immediately detect which idlers have failed or will soon fail, identifies the exact location of each idler, and reports it to the control system or operator.

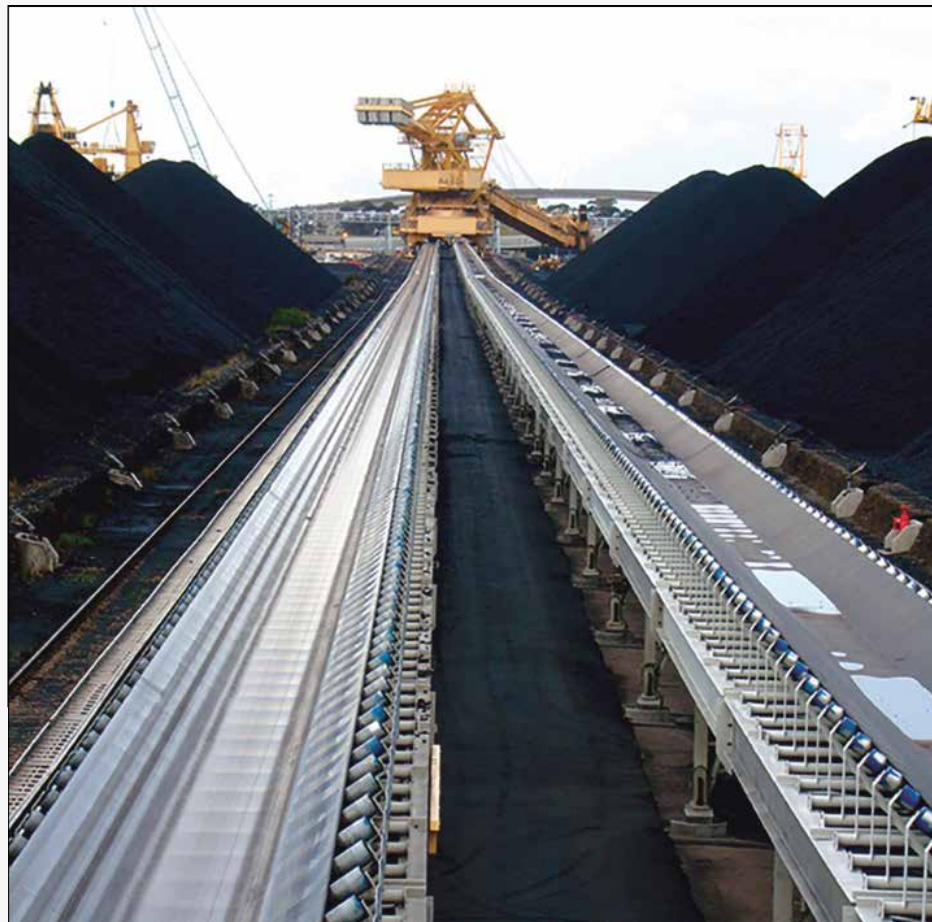
Not only does this real-time smart solution detect which idlers have failed, but it also prevents a failure from ever happening in the first place.

The Praetorian reports when an idler is going to potentially fail (in some cases, up to 20 days in advance) so it can then be replaced, drastically minimising or completely eliminating downtime.

This kind of preventative maintenance saves thousands.

It provides the convenience to predict and schedule a plant shutdown instead of having an unexpected shutdown, where the need to hire a contractor on emergency services is extremely costly. In order to keep equipment running smoothly and production operational, the need to monitor conveyor health with a reliable and intelligent technology is imperative.

The Praetorian Fibre Optic Sensing System features innovative technology called Field Programmable Gate Array (FPGA), which



Eliminate unscheduled conveyor downtime with real-time preventative roller failure detection.

quickly records, processes and analyses data, then reports signals generated by problematic events along the conveyor belt.

Using a combination of Rayleigh backscatter and time of flight, the Praetorian determines the presence, location, intensity, and frequency of vibrations along an optical fibre in real time.

The Praetorian analyses vibration through the frame of the conveyor, and then reports which idlers are failed or going to fail.

The system can be integrated within existing site infrastructure to provide alarm notifications (red, amber, and green) depending on the

condition of the components.

Reporting and alarms can be sent to smart phones, tablets and computers via SMS and email alerts.

The report includes the location of an alarm, the alarm classification, its longitude and latitude, the alarm intensity as well as the time and date.

Installed along the actual conveyor, the Praetorian can monitor up to 80km (50 miles) of belt at the same time.

With its adaptable design, the Praetorian is able to monitor a single large conveyor or

can be routed around a plant to cover multiple conveyors at once.

The Praetorian Fibre Optic Sensing System removes the requirement for ongoing periodic conveyor inspections, keeps equipment and production operational, and ultimately eliminates costly downtime.

Besides monitoring conveyor health, the Praetorian Fibre Optic Sensing System also has the ability to detect pipeline leaks, monitor ground disturbance, identify manual and machine excavation, vehicle movement, and hot tapping both above and underground.

The Praetorian can also be used for perimeter security and threat detection by monitoring the vibrations and movements along a fence, perimeter, or border.

HAWK is dedicated to asset monitoring and protection.

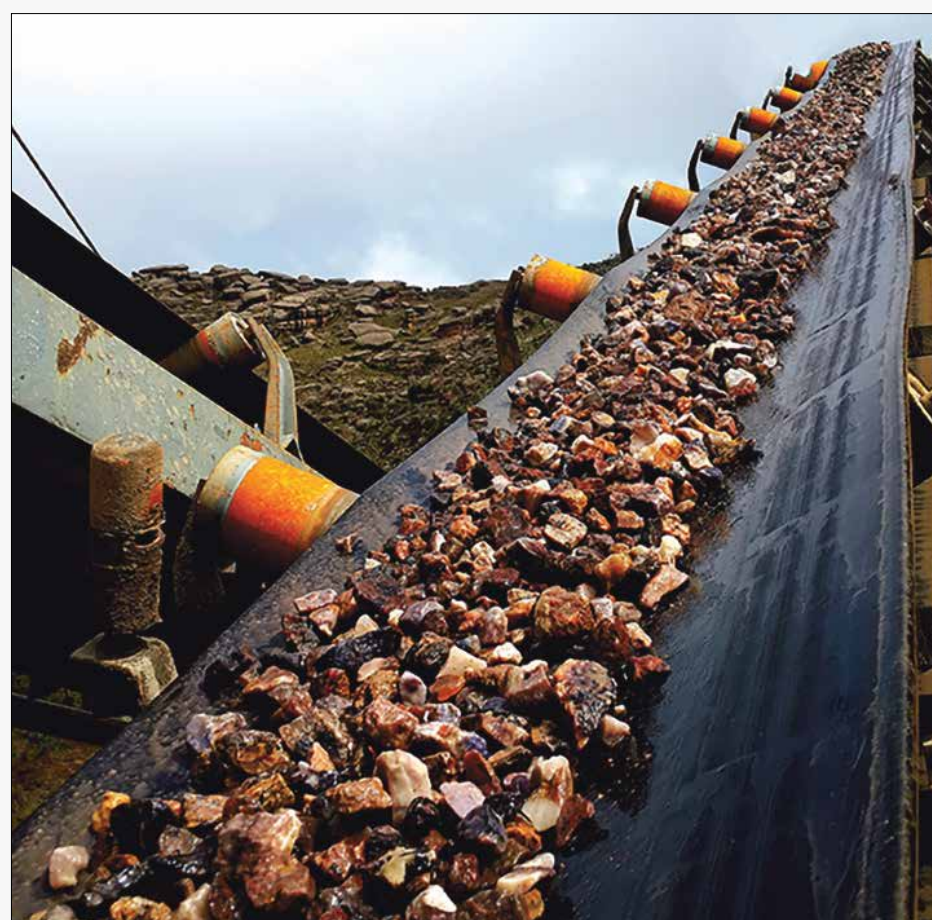
Established in 1988, HAWK is the world leader in level, positioning, asset monitoring and flow measurement technology, providing cutting-edge equipment and complete solutions to the global industrial market.

HAWK has won several prestigious awards for its breakthrough technologies. Some of these technologies include acoustic wave, ultrasonic, microwave, radar, and fibre optic sensing.

HAWK designs and develops innovative measurement technology that is extremely reliable and accurate, simple to install, easy to operate and offers maximum efficiency.

For over 30 years, HAWK has successfully solved difficult liquids and solids applications in a wide range of industries including mining/mineral processing, water supply/wastewater, oil and gas, bulk material handling, chemical, power, cement, pulp and paper and food.

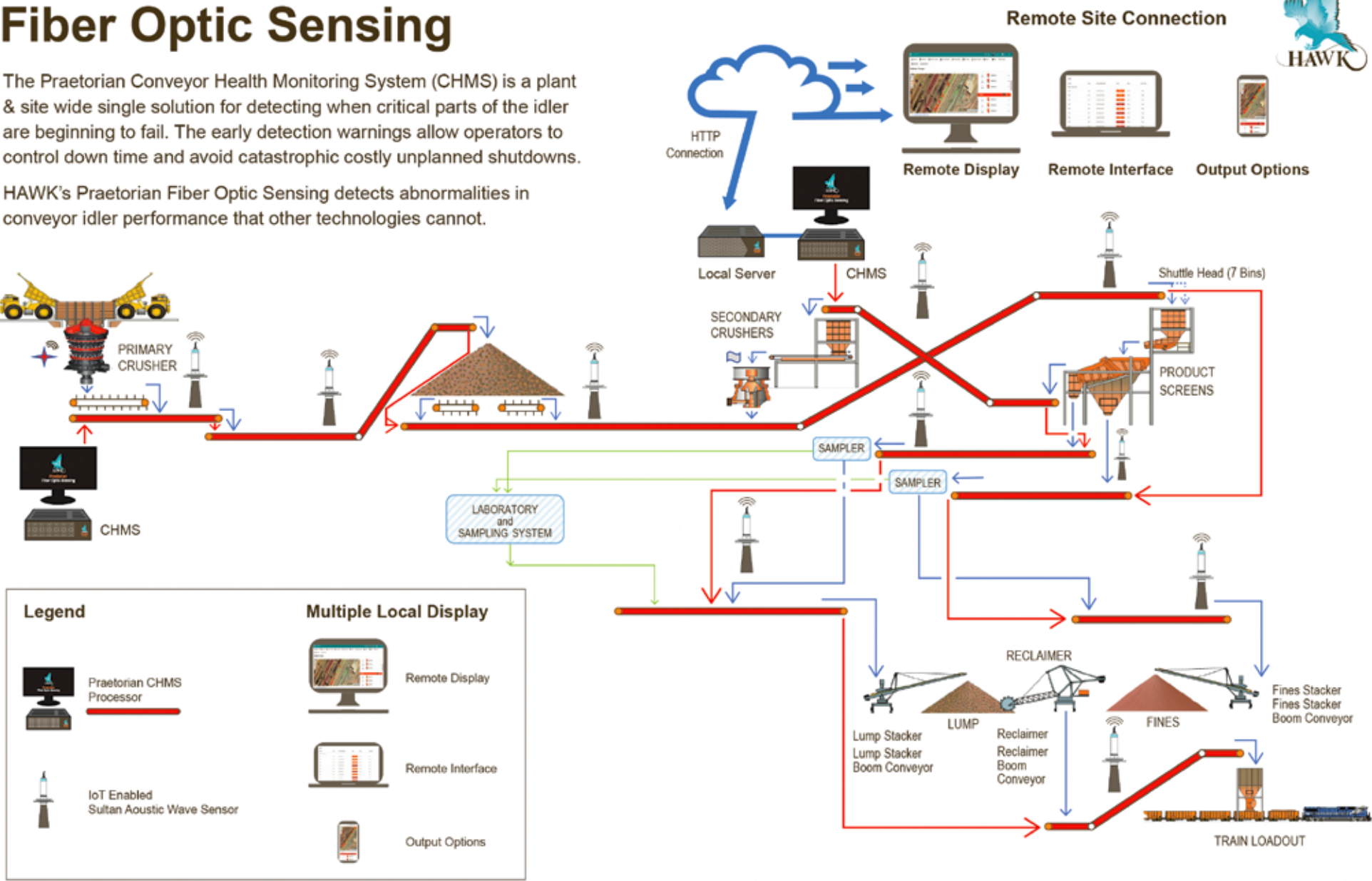
HAWK is committed to providing best-in-class products, services and technologies that will have unsurpassed value for their customers.



Praetorian Fiber Optic Sensing

The Praetorian Conveyor Health Monitoring System (CHMS) is a plant & site wide single solution for detecting when critical parts of the idler are beginning to fail. The early detection warnings allow operators to control down time and avoid catastrophic costly unplanned shutdowns.

HAWK's Praetorian Fiber Optic Sensing detects abnormalities in conveyor idler performance that other technologies cannot.



Always Unbeatable in Level Now Unparalleled at Fiber Optic Sensing!

Praetorian Fiber Optic Sensing for Conveyor Idler Monitoring

Our ongoing commitment is to develop & provide **industry leading technology** and **cost effective solutions**

Hawk Measurement Systems | fibre@hawk.com.au | www.hawkmeasure.com



Cyanide-free, economically viable

THE recovery of gold using cyanide in pulp or leach is the industry standard for most gold mining producers.

However, the use of cyanide comes with many direct and hidden costs and its continued use is drawing more and more scrutiny from mining commissions, environmental regulators and proximal communities around the world.

There are several alternatives to cyanide leaching already on the market but these can often be suited to particular ore types and gold particle size and may not be as economical or effective as cyanide in every application.

In June 2019, Clean Mining launched a new cyanide-free gold processing solution.

This innovative, cost-effective process replaces cyanide with a safer, less hazardous chemical reagent, thiosulphate.

This inorganic compound helps dissolve fine gold out of ores into a solution, which can then be recovered through further processing.

Unlike cyanide-based and other reagent methods such as the carbon-in-pulp or amalgamation method, the technology doesn't require the addition of acids, lime, oxygen, chlorine, high temperature or pressure vessels.

Effective and scalable

This revolutionary process uses thiosulphate, in conjunction with innovative plant technology, to achieve gold extraction at levels and returns that have been proven at an industrial scale.

The cyanide-free plant is scalable and can operate without a tailings dam.

Each solution is customised and can be scaled to suit site infrastructure, ore grade, metallurgical profile and the client's operating and capital budgets.

Clean Mining offers the flexibility to design a very small micro plant right through to the largest of scales.



Clean Mining Managing Director Jeff McCulloch.

Once the gold is liberated the chemical process is the same, and Clean Mining's solution can scale up or down to achieve feasibility.

This solution makes clean gold production a reality for miners of all sizes and scales, without the need for a large team of specialist consultants and project managers.

Background: testing and trials

The solution was developed by Australia's national science agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), over more than a decade.

After years of product development and refinement, Clean Mining's parent company, Eco Minerals Research Limited, partnered with CSIRO to build the first demonstration processing plant to test the technology at an industrial scale in Menzies

in the Goldfields region of Western Australia.

The success of the trial, in 2017-18, proved the technology could work successfully at an industrial scale.

The trial achieved gold liberation at a p80 greater than 300 microns, with leach reagent consumption at 1.6 kg/t – the majority of the consumption is entrained loss with the tails.

Unlike cyanide, the reagent chemicals do not deteriorate.

The reagent consumption is only limited by the level of solid/liquid separation to recapture and reuse the leach solution.

In the case of the demonstration project, the separation was not optimised to the full potential.

However, if miners choose to include Clean Mining's dewatering process option in their plant design, both the chemicals and water reclaimed

from the leach tailings are recyclable.

With an estimated moisture content of between 8pc to 15pc in most dry stack leach tailings, that provides great potential for both thiosulphate compound and water recycling within each operation.

The trial also involved the production of the first gold ingots and gold product sales to a Western Australian jeweller, who has reported a solid demand for the Clean Gold product.

In 2019, CSIRO transferred the technology to Clean Mining.

Environmental benefits

Cyanide is not only a toxic chemical, which presents risks to workers and communities involved in the supply and management of the product, it is usually expelled into tailing dams.

The larger the operation, the larger the tailing dam and the larger the costs of management and rehabilitation – not to mention the risks of potential chemical leaching into the environment or dam failure.

The reality is that cyanide is becoming more of a liability for miners every day.

Regulations associated with cyanide are even holding back development of some major global gold deposits.

Jurisdictions in China, Eastern Europe, Argentina, Central America, the United States and Africa have either implemented, or plan to implement, bans on cyanide use.

In October 2019, Sudan's Council of Ministers issued directives calling for an immediate halt to the use of toxic mercury and cyanide in mining operations.

Mercury use is rife in many African countries as artisanal miners use it for extraction of both hard rock and alluvial gold, with little or no regard for its impact on their own health or the local environment.



Clean Mining Managing Director Jeff McCulloch presenting at the Singapore Bullion Market Association (SBMA) Asia Pacific Precious Metals Conference in June 2019.



Ring produced with Clean Gold by Nordhoff Jewellery Couture.



Lapel leaf produced with Clean Gold.

In many areas artisanal miners use shared crushers and trommels to process their ore, so there is an opportunity for them to also share this new technology with the right support from local mineral commissions.

Existing users of cyanide will claim that is safe, but “safe” is an inaccurate term as cyanide is always toxic.

What cyanide users mean by “safe” is that risk has been mitigated, as a result of complex rules, regulations, processes, engineering design, reporting, and so on. However, it costs a lot to mitigate risk.

Costs

It would take a very comprehensive study to identify all of the costs that can be reduced or eliminated by using thiosulphate but, once this data is available, Clean Mining hopes it will be a driver for cyanide-based miners to actively consider a conversion of their leaching circuit away from cyanide.

For smaller miners who simply can't afford a cyanide-based plant, Clean Mining's solution provides a processing option with a lower entry cost that is also safer to operate.

Their leaching plant is smaller in scale than an entry level CiP/CiL plant that uses cyanide, which means it has a lower capital cost.

With the cost to invest in an entry level CiP/

CiL plant upwards of US\$20m, the solution potentially removes the cost barrier that prevents many miners from proceeding to production, as well as supporting small-scale artisanal miners and co-ops.

Traditional plants that require a tailing dam also incur massive compliance costs, which adds to the total size and scale of the processing plant to deliver a viable return to the mining company.

Clean Mining believes this is a cost barrier to more than 90pc of miners.

Modular and mobile

Clean Mining's solution can also be made in modular components and be mobile, therefore, it is scalable and the plant can be relocated to a number of mine sites as required.

For miners keen to utilise the technology, the setup process is simple and eliminates the need for a hoard of specialist consultants and project managers.

For larger miners, the costs of cyanide compliance are so embedded in their cost structures that it is a very complex process to do a “whole of mine life” cost comparison at this point in time.

However, the compliance and rehabilitation costs associated with cyanide use alone are significant and include:

- regulatory compliance requirements
- compliance with the International Cyanide Management Code
- environmental social governance (ESG) compliance and reporting
- stringent health and safety management, including PPE
- personnel costs associated with regulatory compliance
- additional capital and operating costs associated with plant design and process design to mitigate the risks of cyanide contamination to personnel and the environment
- ancillary chemicals and acids required to facilitate the cyanidation process
- contingency plans and infrastructure required in the event of a spill, leakage or disaster
- freight restrictions and costs for transporting dangerous goods
- high storage compliance costs
- monitoring and reporting
- insurances
- tailings dam infrastructure and management
- cyanide destruction chemicals
- rehabilitation bonds
- rehabilitation and monitoring requirements after mining has ceased

As Clean Mining's leach tailings are not toxic,

the solution does not require a tailings dam for chemical destruction, as is required with cyanide.

That saves miners the capital cost of building a tailings dam and the operating costs associated with maintaining, running, monitoring, reporting, and rehabilitating/remediating the dam and destroying the cyanide.

There are also specific instances where tailings dams are either too risky or are not possible, like areas of high rainfall, high seismic activity, proximity to dense populations, highly sensitive environmental areas, low water resources, high regulatory compliance or mountainous terrain, so our solution addresses all of these issues by eliminating that need.

Dry stack tailings option

Clean Mining's solution offers miners the option of producing dry stack tailings (DST) by including a dewatering and chemical recovery process.

Clean Mining's leaching reagent chemicals are reusable, so there is an immediate operating cost benefit if miners choose to recover the chemicals and water used.

In addition, the dewatering process produces DST that can be repatriated or stored.

As a result, a mine that uses Clean Mining's technology has a smaller footprint, lower environmental risk, reduced water use and chemical recycling options.



(CONTINUED OVER)

The Clean Mining/CSIRO demonstration plant in Menzies, WA.



Clean Mining Managing Director Jeff McCulloch meeting global gold producers, miners and market managers at the Singapore Bullion Market Association (SBMA) Asia Pacific Precious Metals Conference in June 2019.

(CONTINUED FROM PAGE 101)

Mining communities are safer and less likely to interrupt the mine's freedom to operate and, therefore, the operation has a lower risk profile to insure and presents a more attractive opportunity for shareholders to invest in a responsible mining operation.

Interest and progress to date

Several months after launching the product, Clean Mining is in active negotiations with a number of miners to build plants in Australia and Asia, and similar interest is stemming from other areas of the world.

Eco Minerals Research's gold processing plant in Menzies is the first mining operation to use the technology.

The demonstration plant has a 50t per day

capacity and this is currently being upgraded.

In Australia, Clean Mining is currently targeting small to medium scale miners that don't have the financial means to acquire an entry level cyanide plant or don't want to use cyanide.

Until now this industry segment has not had access to a small scale, cheaper leaching plant.

The aim is to open up the 85pc of gold tenements in Australia that are currently inactive.

Clean Mining is also targeting countries and regions that cannot use cyanide and tailings dams due to regulatory bans or other circumstances.

Clean Mining is not limited to a specific scale of mining in these locations and have already been approached by some of the largest international mining companies.

However, given cyanide-based circuits cannot

simply be 'upgraded' to use thiosulphate, the company is currently focused on junior and artisanal miners who can most benefit from the installation of a new mobile and scalable plant.

An initial small-scale plant may also be beneficial to companies seeking to commence bulk sampling as proof of commercial viability to management and shareholders.

Once successful, the modular nature of the thiosulphate plant enables it to be scaled up according to capital availability and permitted throughput.

Conclusion

Industry, regulators, environmental organisations, miners and local communities have been searching for a non-toxic solution to gold processing and

Clean Mining now offers that solution.

Thiosulphate is a game changer for the gold industry.

Clean Mining anticipates that there will be an ultimate realisation in the industry that there is no need to use cyanide anymore.

They believe the mining sector must, and can, do things differently – and options like Clean Mining's cyanide-free gold processing is part of the solution.

Clean Mining is committed to clean production and is also working to eliminate mercury from the extraction process.

They also promoting their Clean Gold accreditation as a key driver of awareness and visibility of clean production opportunities.

MORE INFORMATION: Clean Mining | 08 6117 5812 | www.cleanmining.co

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DANAKALI CHIEF EXECUTIVE NIELS WAGE

Danakali is developing the Colluli Potash Project, a world class greenfield Sulphate of Potash development project based in Eritrea expected to become one of the world's most significant and lowest cost potassium sulphate production centres. Emma Davies spoke with chief executive Niels Wage about development at Colluli and the company's goal to help address global food challenges by becoming a leading producer of SOP, and leading sustainable development in Africa.



Q. How is development progressing at the Colluli Project in Eritrea? What is the expected timeline?

We continue to progress well through our planned timeline. In August, following an extensive due diligence process, we hit another milestone and secured credit approval for US\$200M in senior debt from leading African development finance institutions, Africa Finance Corporation (AFC) and Afreximbank.

This funding provides a large proportion of the development capex for Module I (US\$302M).

With the majority of the necessary project funding in place, we are on target to commence development in late 2019.

The development phase is expected to take two and a quarter years.

We are now assessing a range of options for funding the balance of the capital required to bring Colluli into production, including advanced discussions with a number of potential strategic investors who have expressed interest in supporting the development of the Project.

Standard Chartered Bank is acting as corporate financial adviser to Danakali on these financing options.

Q. Can you please explain how the mine size, shallow depth and operating economics place the company in the potash market?

If operating in 2018, Colluli would have been the lowest cost producer in the Sulphate of Potash (SOP) industry.

SOP is the premium potash type. The Colluli deposit is unrivalled in the SOP industry, firstly because it is the shallowest known SOP deposit at 16m below surface, which minerals can be mined in solid form via open-cut mining.

This is significantly more cost-effective than other primary and secondary production methods – including brines and the environmentally unfriendly Mannheim Process, which is higher energy, higher cost and has hydrochloric acid as a by-product.

Colluli has the lowest capital intensity of the current greenfield SOP projects around the world.

It has an exceptionally high resource to reserve conversion at c. 85pc, thanks to the shallowness of the deposit allowing simple open cut mining methods.

Secondly, the product is very high quality. The best-in-class, high grade deposit comprises a JORC-2012 compliant ore reserve estimate of 1100Mt @ 10.5pc K₂O for 203Mt of contained SOP equivalent, which will deliver an almost 200-year mine life.

The Project is also very well positioned at only 230km by road to the well-established Massawa port, with the potential to develop a future port even nearer to the site at Anfile Bay, just 87km away.

The Front-End Engineering Design (FEED) results show that the operating costs for Colluli are low (first quartile) relative to currently prevailing and expected SOP prices.

This means attractive margins exist which should provide healthy profitability for Colluli in the future.

The FEED estimates average total cash costs of US\$242/t (Module I and II) for the Project versus current SOP prices of US\$500+.

Q. How will the size of this project impact the Eritrean economy?

In January this year, an independent report released by the United Nations stated that Colluli is forecast to comprise 3pc of the country's GDP by 2021, 50pc of

the country's exports by 2030, and support 10,000 direct and indirect local jobs.

The report also identifies how Colluli can meaningfully advance the Sustainable Development Agenda of Eritrea, in particular on 13 specific Sustainable Development Goals (SDGs).

These include: no poverty, zero hunger, quality education, gender equality, clean water and sanitation, sustainable economic growth and decent work, industry, innovation and infrastructure, reduced inequalities, climate action, peace, justice and strong institutions and partnerships for the SDGs.

Q. What offtake agreements are in place?

Following our binding take-or-pay offtake agreement with leading global fertiliser producer, trader and distributor EuroChem, announced in June 2018, we have secured future cash flow for Module I production.

EuroChem will take or pay up to 100pc of production (minimum 87pc) for a period of 10 years, with a 3-year extension option. EuroChem is an outstanding partner for the Project, with global reach and extensive fertiliser expertise and experience, which will be very valuable as we work with EuroChem on developing and allocating our product to the international markets.

Q. What plans are in place to ramp up to 1 million tonnes of production per annum after five years of operation?

Our main focus for the time-being is the delivery of Module I of Colluli, and then in due course developing Module II to deliver 944ktpa.

Module II is effectively a duplicate of Module I and it is expected that economies of scale and lessons learnt from Module I will ensure positive and profitable outcomes.

Diversification into the broader potash resources and other agricultural and industrial salts from Colluli is certainly an option after Modules I and II and presents substantial upside for investors.

Q. Where do you see Danakali in the next three to five years?

This is an exciting time for fertiliser companies. Our product will help to address a global food challenge as the world's population continues to rapidly grow and people's diets change – the need to ensure a stable and sustainable food supply will increase as the amount of arable land per person is expected to decrease from 4500sqm in 1960 to a forecast 1800sqm by 2050.

Once we are in production following the 2.25 year development phase, we will then move into annual production of 472ktpa for the initial years of operation during Module I.

The 472ktpa relates to about 13pc of current worldwide demand outside of China.

Theoretically, the resource is large enough to supply the entire world (outside of China) for over 50 years.

Our aim is to become a leading producer of SOP, and a leading exponent of sustainable development in Africa.

Q. Is there anything else you would like to add?

Danakali, with our partner ENAMCO, through our joint venture CMSC, is focused on unlocking value for all stakeholders.

The completion of project funding and the construction and production milestones that will follow provide strong catalysts for value accretion from environmental, social and economic perspectives.

Colluli will provide a fertiliser solution for the farmers around the world that need to grow more food and due to restraint on availability of arable land they need to increase yields.

Also, the change in diets to more fruits, nuts and vegetables will support the demand for SOP.

SOP is a fertiliser that is very low chlorine and therefore very suitable for these crops as it does not affect the taste of the fruits, nuts and vegetables.

We are committed to develop Colluli in a sustainable way and provide economic and social development opportunities to the region.

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