

THE AUSTRALIAN MINING REVIEW

PP100007123

NOVEMBER 2019

Incorporating THE AUSTRALIAN OIL & GAS REVIEW
australianminingreview.com.au

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SUNRISE DAM

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OF HAZARDS
AT MINESITES

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Image: Anglo American.

HYDROGEN HORSEPOWER



Anglo American has partnered with French multinational energy and energy services company Engie to develop the world's largest hydrogen-powered mine truck.

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PUBLISHED BY
ABN 28 112 572 433

A product of
**Publications &
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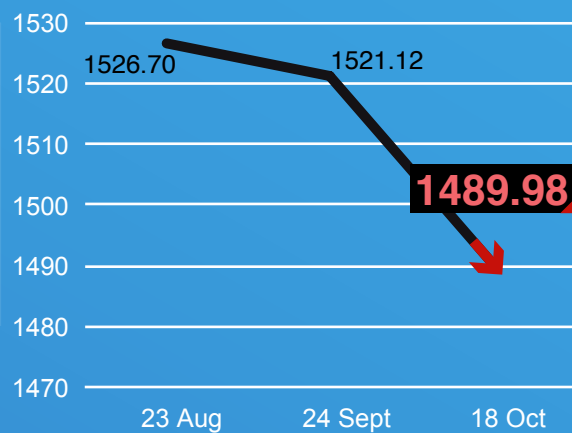
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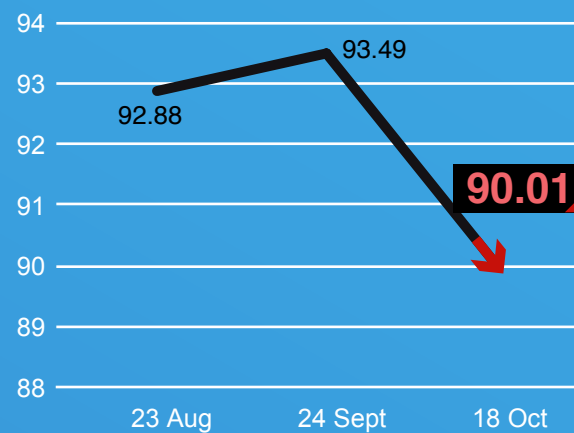
Gold prices have remained choppy, dropping slightly before levelling out after a new Brexit deal was announced in early October.



IRON ORE

\$US/t
62% Fe CFR China

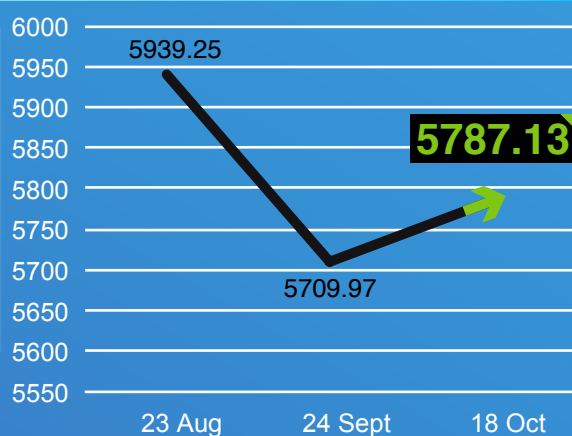
Chinese steel mill closures and limited operations from 70th anniversary celebrations caused a slight price drop which is expected to rebound as production restrictions ease.



COPPER

\$US/t
LME Price

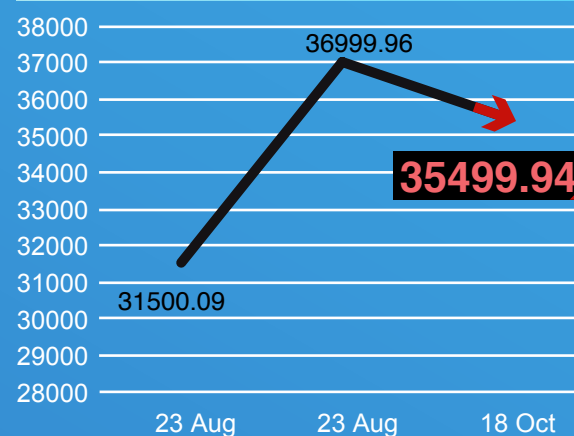
Copper rallied but is expected to dip due to concerns amid slowing economic growth in China could cause a fall in demand for industrial metals.



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

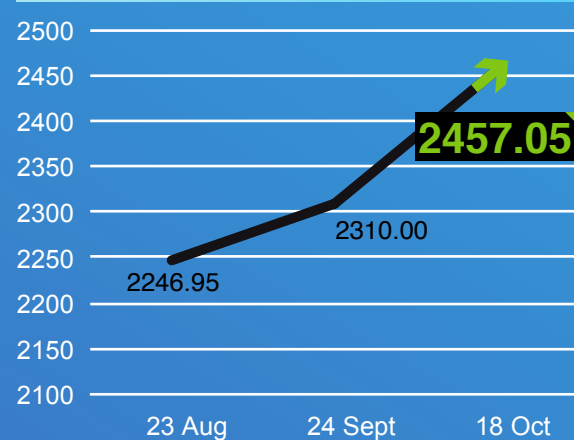
Aluminium dipped slightly with continuing trade tensions and even with demand prices could drop further in the last quarter of the year.



ZINC

\$US/t
LME Price

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



LEAD

\$US/t
LME Price

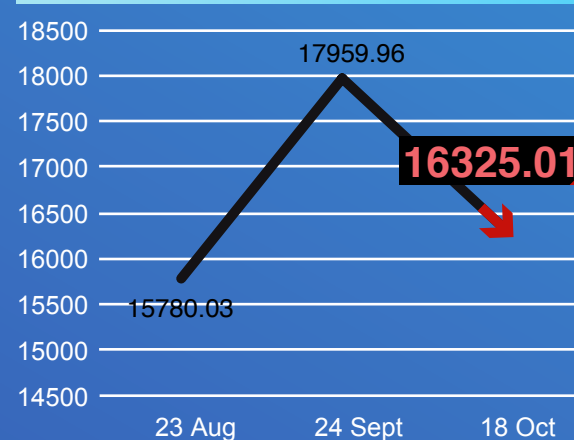
The lead price rose this month with slashed production at Chinese smelters, existing stockpiles expected to adequately meet supply deficits.



NICKEL

\$US/t
LME Price

Prices climbed as the Philippines suspended four mining operations, which, along with Indonesia's looming ban, has fuelled fresh supply concerns.



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Dr Tiddy's research has led to her nomination as a finalist in the 2019 Women in Innovation (Winnovation) Awards.

Prospecting for minerals just got easier

EMMA DAVIES
NATIONAL

FINDING valuable gold and mineral deposits can cost millions of dollars, but UniSA's Future Industries Institute senior research fellow Dr Caroline Tiddy has come up with a cost-saving solution.

Dr Tiddy has developed a suite of geochemical tools to more accurately target valuable mineral deposits and save drilling companies money in the process.

The tools use data collected from analysing drilling materials to help locate undiscovered precious metals buried by younger sediment and identify the right drill holes.

"The global demand for copper and gold is growing, but it is getting increasingly hard to find these metals as companies are forced to drill deeper and deeper, costing them significant amounts of money," Dr Tiddy said.

Diamond drilling can cost to \$400 a metre and it is not uncommon for companies to drill to depths of 1-2km.

"That amounts to an \$800,000 bill with no guarantee of success, so it limits the number of drill holes. To add to the challenge, ore deposits are tiny compared to the search space," Dr Tiddy said.

"It's a real life, global problem of looking for a needle in a haystack."

The new tools allow miners to map out where key chemical elements are found in greater concentrations.

Dr Tiddy aims to create geochemical algorithms that increase the chances of finding an ore deposit and decrease the cost of mineral exploration – resulting in faster, cheaper and more environmentally friendly drilling.

The tools have been successfully tested at Prominent Hill, an iron oxide-copper-gold deposit in the north of South Australia, increasing the footprint of the ore body fourfold and have also been trialled in the Yorke Peninsula, highlighting previously unexplored areas of copper.

"South Australia has a reputation for its copper and gold deposits so these data-driven approaches to exploration are revealing important information about mineral exploration in the state," Dr Tiddy said.

"By using these geochemical tools, companies can better focus their drilling resources into lower risk areas.

"Finding an economically viable copper-enriched area has the potential to generate revenues of up to \$175m a year as well as creating more than 500 jobs," she said.

Green light for SOP plant

RAY CHAN
WA

KALIUM Lakes will begin development of its 100pc-owned Beyondie Sulphate of Potash (SOP) Project located 160km south east of Newman in WA, making it one of only a handful of primary SOP producers globally.

The move follows the successful completion of the company's A\$72m capital raise in August, in conjunction with the loan facilities to be provided by KfW IPEX-Bank (about \$102m) and Northern Australia Infrastructure Facility (\$74m), plus a working capital facility from Westpac Banking Corporation (\$15m).

The Board's Final Investment Decision allows the acceleration of activities from the current approved early works program to full scale construction.

Company chairman Mal Randall said the decision was the most significant in Kalium Lakes' relatively short history and represented the culmination of an enormous amount of "unrelenting hard work by our close-knit team and key



KLL chairman Mal Randall, managing director Brett Hazelden and director Stephen Dennis at the Beyondie SOP Project site.

technology partners here in Australia and in Germany".

"This milestone effectively triggers the use of the company's financial capacity, to transform our core objective of becoming Australia's first commercial Sulphate of Potash producer into reality," he said.

"The world-class Beyondie SOP Project is now on track to join only a handful of existing primary SOP production facilities that are sparsely found around the world."

Kalium Lakes is also happy to

have the support and consent of the traditional owners from the Gingirana and Birriliburu people, who undertook a Welcome To Country ceremony on site as part of the company's strong relationship with local indigenous communities.

Following the ceremony, guests were able to view the recently completed infrastructure and facilities, as well as gaining an appreciation of the scale of the preparations for the brine extraction and evaporation pond system at the Beyondie site.

KLL managing director Brett Hazelden said the company was formed only five years ago as a private company and listed on the Australian Stock Exchange just before Christmas, 2016.

"To be able to have the support of the traditional owners over this period has been key to the success of the project and we look forward to everyone's involvement during the coming decades," he said.

"Kalium Lakes looks forward to Australian and New Zealand farmers being able to utilise our SOP towards the end of 2020, with full production capacity being achieved in 2021."

Anglo develops hydrogen-powered truck

EMMA DAVIES
INTERNATIONAL

ANGLO American has partnered with French multinational energy and energy services company Engie to develop the world's largest hydrogen-powered mine truck.

The project is part of Anglo American's FutureSmart Mining initiative, which applies innovative thinking and technological advances to address mining's major sustainability challenges.

"We are extremely pleased to be partnering with Engie and we look forward to developing and implementing this step-change technology," Anglo American technical director Tony O'Neill said.

"As part of our Smart Power Project, where we analysed our mine site power requirements and applied a unique decision process on how we look at renewable energy systems and their benefits, we came up with a mix that allows us to be carbon neutral and have a very different footprint.

"This is part of our plan to create a smart energy mix that moves us closer towards our carbon and energy targets for 2030 and, ultimately, our vision of operating a carbon-neutral mine."

Engie will provide the hydrogen generation solutions while Anglo American will develop the truck, which will have a load capacity of 300 metric tonnes.

The modifications to the existing truck include replacing the diesel tank with hydrogen tanks, and replacing the engine with hydrogen fuel cells and a battery pack.

The hydrogen will be provided by the solar power generation capacity at the mining site.

'First motion' is expected in 2020, following which a testing validation program will take place at Anglo American's Mogalakwena platinum group metals mine in South Africa, and, if successful, the trucks will be deployed to other Anglo American operations.



The new hydrogen-powered trucks will be tested at Anglo American's Mogalakwena mine in South Africa before being deployed to other operations.



The agreement was signed by the two companies on board the Energy Observer during the London stop of its round-the-world voyage.

As the world's first fully electric vessel powered exclusively by hydrogen and renewable energies, the Energy Observer is a fully functioning example of the full decarbonisation solution that Anglo American and Engie are working towards.

"We are delighted to join forces with Anglo American to design the first solution that aims to decarbonize heavy-duty

mobility in the mining sector," Engie chief executive of the hydrogen business unit Michele Azalbert said.

"This is part of Engie's strategy to develop industrial-scale hydrogen-based solutions to help our energy-intensive customers in their journey to carbon neutrality."

Once operational, the converted trucks are expected to be the same or better than the original diesel trucks, with the additional benefits of cleaner air, less noise and lower maintenance costs.

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Industry urged to recycle lithium

EMMA DAVIES
WA

The WA Mining Conference attracted pre-eminent experts across the fields of mining, automation, cybersecurity, digital transformation and artificial intelligence across the two-day conference that took place at the Perth Convention and Exhibition Centre. The inaugural event attracted attendees from Alcoa, Anglo Gold Ashanti, BHP, Fortescue, KMPG, Mitsui Iron Ore Development, Monadelphous, Origin Energy, Oz Minerals, Newmont, Rio Tinto, Roy Hill Holdings, South 32, Woodside and many more.

LITHIUM Australia chief executive officer Adrian Griffin has detailed the impact of new mineral demand on industry and infrastructure needs, with the aspiration to 'close the loop' on the energy-metal cycle in an ethical and sustainable manner.

Speaking at the WA Mining Conference and Exhibition in Perth, he said that there was more lithium going to waste at the moment than there is in the supply chain.

"What we've got to do is maximise the benefit of technology and infrastructure to supply a more sustainable product to the consumer," he said.

Mr Griffin said that lithium has fairly poor recoveries (between 50-70pc) with around half of the solids from spodumene recovery process ending up in tailings dams.

"They're using the wrong technology. And why is that? Because they don't control the supply chain and effectively the infrastructure," he said.

"Then we get to the consumer side and it's not much better.



The future generation of mining was the subject of one of the panels at the WA Mining Expo.

"Only around 9pc of lithium batteries on a global scale get back into the supply chain, and in Australia only around 2pc gets back into the supply chain.

"Municipal dumps are becoming the lithium and cobalt mines of tomorrow."

The lithium battery in a mobile phone consists of about 30pc cobalt – around 300 times the grade of what's produced from a cobalt mine – so it makes sense to re-use that material considering all the effort that went into its original production.

"We need to get on the tail end of the production cycle and capture, not only embedded energy that went in to making that battery, but return the

metals to the battery industry," Mr Griffin said.

Lithium Australia has taken steps to recover these materials, announcing the increase of its equity in Envirostream Australia (a mixed battery recycling company) from 18.9-23.9pc.

The company has already, at laboratory scale, successfully recovered metals from separated batteries, used the lithium so retrieved to regenerate cathode materials and, from those materials, manufactured coin-cell LIBs - the testing of which vindicated the company's aim of closing the loop on the energy-metal cycle.

"We've got all these batteries lying

around but only 3pc of them are getting recycled. There's an enormous commodity there going to waste," Mr Griffin said.

"We believe that not only is it the right thing to do but that we can make money out of it.

However, issues remain around the cultural shift needed to encourage recycling at the consumer level to ensure these materials get back into the production cycle.

"One of the problems is that there aren't that many places that you can take the batteries," Mr Griffin said.

"We've got to make it easier for people so they don't have to go far and they know where the collection stations are – so we can start to collect batteries.

"By doing this we not only will reduce the energy footprint of the product, but the impact will go right down the chain to the mine site because the mine site won't have to mine as much material in the first place," he said.

Mr Griffin said that recycling is the support needed to close the loop.

"We've got to improve efficiency by supplying the miners and processes with better processing technology, and we've got to track the material through to end of life so we can pick it up and reprocess to take all the valuable materials out," he said.

"We have all the ingredients to do this, what we've got to do is convince the mining industry at large, convince the battery industry at large and more importantly convince the public that they can get on board and help by recycling those materials."

Renewables and reliability

EMMA DAVIES
WA

CLEAN Energy Council (CEC) WA regional advisor Dermot Costello told delegates he was a keen supporter of renewables.

"Reliability is key and where gas and fossil fuels still make sense, I'm all for it," Mr Costello said.

"It's about what's economically reliable and renewables are moving into that space."

Mr Costello pointed to a range of examples, from FMG powering its Chichester hub with solar by 2021 (with the help of Alinta Energy) to Element 25 aiming for half solar half gas (plus wind power) within the next 18 months.

"South32 is using a company called Sunshift who are looking at mobile solar panels," he said.

"And Goldfields Agnew plans to build a large scale wind and solar hybrid system."

Mr Costello said from a camp perspective, companies could look at renewables on a smaller scale, or for where renewables can be integrated into transport and heavy power intensive operations.

"But again you have to weigh it all up with the reality of reliability and environmental considerations," he said.

Artificial intelligence is real

GERARD MCARTNEY
WA

MINING technology companies are utilising artificial intelligence in increasingly more innovative and disruptive ways.

Optika Solutions' managing director, Matt Schneider, believes that by 2050, mines could be capable of thinking for themselves.

Speaking at the Mining Conference, he said that when it comes to decision-making, a small mine might work on about 50,000 decisions per day, while a large iron ore value chain might make well over one million decisions every day.

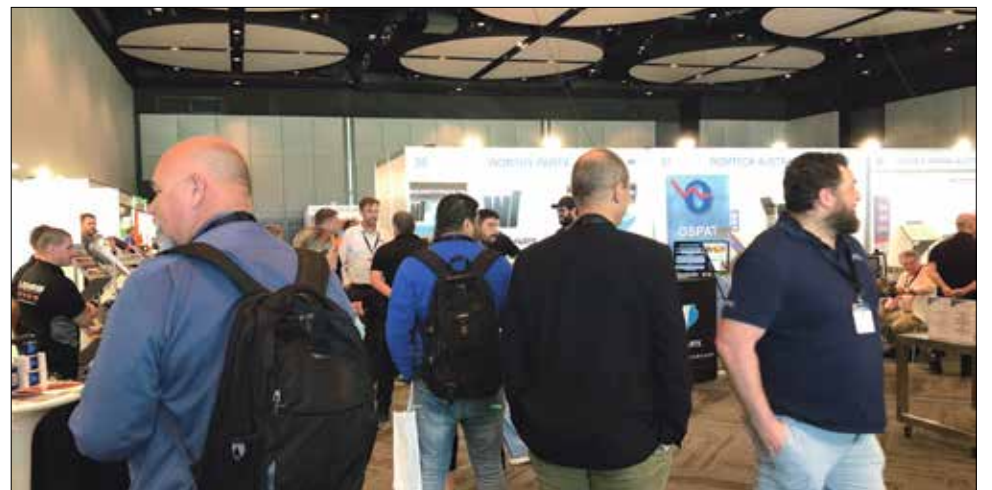
"It is important to think about artificial intelligence in the context of decision-making," he said.

"Humans are not good at making decisions, computers are good at making decisions, as long as they do not involve creativity."

With a lot of the decision making on the minesite being non-creative and administrative, a fusion between machine learning and human control has the potential to create new value throughout the whole value chain.

But minesites have been slow to catch on.

While we use AI and even deep learning applications on our phones



The WA Mining Expo was attended by representatives from across all the mining industries.

every day through apps like Google Maps and Uber, Mr Schneider said that the question for the mining industry has focused on how the METS community can enable this new technology to be consumed by mine operators.

"We are inundated with data," he said.

"But what turns data from information to knowledge to wisdom is our capacity to tell the story.

"Humans are really great story tellers, so how do we get machines to help us tell stories? It could be a thought or an action, or ultimately, it could be about making decisions, and insights drive decisions."

Technology is advancing and

developing to meet specific problems, and this according to Mr Schneider has created the need for a golden thread of collaboration between minesites.

"Because digital will allow us to be connected and collaborative, we're now able to see insights we couldn't see before and those insights actually allow us to make decisions," he said.

"Using digital technology, powered by AI, to come up with new operating models we can drive out new insights to create new value new models and new modes of operation that you can test before you move forward.

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Among the many speakers at the conference was Panoramic Resources managing director Peter Harold, who told delegates that the company aimed to deliver first ore from its Savannah North project near Hall's Creek, WA. This will occur only 16 months after the decision to reopen the mine, with big nickel strikes already discovered.

Legend drill set to start at Fraser Range

RAY CHAN
WA

A NEW drill program will start next week on one of WA's hottest nickel footprints, when Legend Mining commences its next round exploration push on its Rockford project in the Fraser Range in the State's southwest.

The schedule marks a new era for Legend, whose Fraser Range prospectivity has attracted veteran miner Mark Creasy and top WA nickel producer, Independence Group, to its share register with a total holding in excess of 40pc.

Addressing the Paydirt 2019 Australian Nickel Conference, Legend managing director Mark Wilson said a diamond drill rig had been booked for the drill start and barring any delays, should commence next Monday.

The company is targeting Rockford's D5 prospect contained within a bedrock conductor that has been upgraded by Legend's own geology, geochemistry and petrology work.

The planned drillhole has a planned depth of 500ms with contact with the D5 conductor expected at around 380m depth.

Mr Wilson said post completion of the drilling, downhole EM surveying of the hole will be undertaken to ensure the conductor has been intersected, and to test for any offhole conductors.

The new schedule marks yet another turning point for Legend.

In the past decade or so, the company has moved out of a heavy debt and low cash position into a no-debt, strong cash position (\$13.5m currently) and holdings of more than 3000 sqkm in wholly-owned and joint venture tenements within the highly prospective Fraser Range area.

Fraser Range is already home to the Nova nickel mine to the south and the Tropicana gold mine to its north, with Legend's Rockford project located about midway.

"Our exploration focus is to target at Rockford, Nova style nickel-copper, VMS style zinc-copper-silver and Tropicana style structurally controlled gold mineralisation," Mr Wilson said.

"The suite of data sets we have collated for our Rockford holding have proved extremely valuable in identifying areas for priority follow-up exploration."

Hopes for new nickel mine

RAY CHAN
WA

ST George Mining claims a raft of new nickel sulphide discoveries in central WA are sufficient to warrant a level of confidence that the ore body will emerge as a new Australian nickel mine.

The development of any such new mine at Leonora comes at a time the metal is enjoying a rebound in both demand and price.

Addressing the Paydirt 2019 Australian Nickel Conference in Perth, St George's executive chairman John Prineas said nickel tops the list of the "endangered" species as far as battery components go for the electric vehicle and new era energy storage markets.

"Demand from the battery market as well as traditional stainless-steel users continues to rise, resulting in plummeting stockpiles of nickel in 2019," he said.

"This has underpinned recent London Metal Exchange quotes for three-month nickel at US\$17,605/t or about US\$8/lb, putting the current price at close to five-year highs.

"That strengthening price has also reinforced market recognition that high-grade nickel sulphide deposits are scarce, and that new discoveries are highly prized.

"They are among the factors that are giving St George optimism that our Mt Alexander nickel project in WA's goldfields sits now as one of the best and most advanced high-grade nickel sulphide discoveries among ASX-listed explorers."

Mr Prineas said that with high-grade mineralisation now established over a



St George's executive chairman John Prineas.

5.5km strike of the east-west oriented Cathedrals Belt at Mt Alexander, the company was increasingly confident of the potential to develop a potential mining operation at this project.

St George continues to deliver successful exploration results at Mt Alexander, not far from BHP's Nickel West world class mines in the Agnew-Wiluna Belt.

The project's Radar prospect was confirmed as a fourth nickel sulphide discovery at Mt Alexander when assays from maiden drilling there returned best intercepts of 6m at 2.14pc nickel, 0.74pc copper and 1.62g/t platinum group metals

from a shallow depth of just 46m.

This latest discovery adds to the project's other nearby discoveries at Stricklands, Cathedrals and Investigators, where resource definition drilling is underway.

Mr Prineas said some analysts were already speculating that the mineral inventory discovered so far at Mt Alexander could tally up to 50,000t of contained nickel equivalent, with potential to discover more mineralisation with ongoing exploration.

St George has initiated early stage scoping studies to support a mining proposal and continues to work towards a maiden resource for Mt Alexander.

Future is bright at Kambalda

RAY CHAN
WA

THE new nickel sulphide mine discovered by Mincor is expected to become one of the first to showcase underground electric light vehicles when it opens, with first site works to achieve that target potentially occurring in the first quarter of calendar 2020.

Mincor Resources NL managing director David Southam told conference attendees that the planned restart of its Kambalda mines had been buoyed by a recent offtake deal to process the mines' high grade in-demand sulphide ores through BHP's nearby Kambalda concentrator.

"Re-starting Kambalda is coming at the right time for nickel's price and space in the global metals market," Mr Southam said.

"Strategically, we are running a dual track process of running a definitive feasibility study at the same time as completing a resource drill-out.

"One of those deposits, Cassini, is continuing to deliver multiple hole intercepts at stellar massive sulphide grades."

The new high-grade Cassini ore body discovery with its resource of 1Mt at 3.8pc Ni includes a super core intercept of 8.6m at 7pc Ni.

Mincor holds 300sqkm of tenements in the Kambalda district and sees its agreement with BHP as "bringing a strategic partner aboard" to deliver the "best economic outcome when balanced with risk" under the mine restart



Mincor Resources NL managing director David Southam.

strategy.

"What is key is that BHP's concentrator was specifically designed for Kambalda style ores and that is the type of ore we will be mining, processing and selling the resultant nickel concentrate," Mr Southam said.

Mincor is hoping to deliver initial throughputs of between 400,000t and 600,000t of its ore per year over an initial 4-5 year period.

"We are at a point that mining contractors are being short listed for the

DFS costing, whilst resources continue to evolve with an estimate over coming months," Mr Southam said.

He said the decision to restart underground nickel mining operations using new electric vehicles would reduce ventilation costs and diesel particulate counts.

"This mine restart will be a global showcase for this new and more environmentally friendly mining technology," Mr Southam said.



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Study into great balls of nickel

RAY CHAN
WA

THE proponents of one of the world's most unique nickel discoveries, where the metal is contained within super small clusters of "balls" but cannot be conventionally processed, has launched a scoping study into building a pilot plant to test a potential new processing breakthrough.

If successful, the new processing route could unlock the mining future for Australian-based Comet Minerals Limited's 20sqkm outcropping world-class Titan nickel project, 200km east of the Nigerian capital, Abuja, and where the balls visible at surface contain 95pc Ni metal.

As such, their metallurgy is naturally richer than nickel produced from a concentrator.

Speaking on the third and final day of the Paydirt 2019 Africa Downunder mining conference in Perth, Comet director and veteran Australian mining identity, Hugh Morgan, said Perth interests known as WildIP had patented a new metal extraction process thought applicable to the Titan metallurgy.

A royalty free licence to use the process has been granted to Comet specifically for the Titan project and a pilot plant scoping study using the technology, is now underway.

"WildIP's Ni metal digestion process uses low temperature and low cost reagents," Mr Morgan said.

"Its environmentally benign digest liquor has proved to be 100pc effective and efficient and can be recycled, meaning cheaper processing costs and less water requirements.

"This potentially points to the opportunity not to have a tailings dam on a mine site and for any dried residue to be used for backfill."

The new approach also allows the pregnant liquid to be precipitated to produce whatever nickel product



Some of the nickel ball deposits.

is required such as nickel sulphate hydroxide.

Mr Morgan said the breakthrough had broad application to metals and was particularly effective for Ni metal and other nickel ore types including laterites.

But it could also extract other metals including gold, platinum, palladium, copper and silver.

Initial testing of some gold ore types had returned 100pc gold extractions.

Comet discovered the unique deposition about four years ago as a new "ball" style of native Ni metal and of up to 0.5cm in diameter.

The balls comprise 95pc nickel and are disseminated in the host rock at a grade estimated at between 1.5-3pc nickel.

Mr Morgan acknowledged that the normal scheme of things would have been to start a drill out to define the

mineralised body and to assess its grade and depth extent and then move to mining – but it was found the Titan nickel balls were insoluble by conventional digestion methods, forcing a hunt for a new processing solution.

"Physical extraction was one possible method but would have resulted in only 25pc recovery of the Ni metal as 70pc of the balls are too fine to physically extract and many balls are buoyant and floated off in conventional processing tests," he said.

"It was clear to us that without a wet chemistry process, we could only extract 25pc of the metal.

"The new breakthrough maintains our conviction that there continues to be a reasonable expectation of developing Titan into a world-class Ni deposit able to rival the world's largest and important Ni mines."



Comet director Hugh Morgan.

Africa learns from dam collapses

RAY CHAN
WA

AFRICA'S mining industry has been encouraged to more closely monitor the lessons still being learned from Brazil's highly public and fatal tailings dam failures, so as not to repeat the same risk factors when negotiating mine rehabilitation agreements.

Speaking on the third and final day of the Paydirt 2019 Africa Downunder mining conference in Perth, Herbert Smith Freehills' Africa Group director, Matthew Burnell, said risk awareness had increased after the Brazilian dam collapses.

"We are seeing increased and elevated fiduciary assessments by mining board directors of the risk integrity of company exposure to dam incidents," Dr Burnell said.



Dr Matthew Burnell addresses the conference.

"There is a growing consolidation of the legal, corporate and social requirements that miners can now be expected to apply to the management of tailings dams regardless of whether they are current or

former dam owners.

"This consolidation includes pulling together the legislative risks and possible opportunities to mitigate these risks in respect of existing and historical dams,

contractual legacy claims, claims against sub-contractors, what insurance provisions were or are in effect and their adequacy, indemnity agreements for directors and whether they are relevant or sufficient, and a revision and update of any existing emergency incident plans."

Mr Burnell said that critically, the awareness should result in better management of incidents, from notification of stakeholders through to immediate mitigation measures, long-term corrective measures for a failed dam and long-term monitoring and preventative measures.

He said the improved enlightenment came at a time African miners, like their counterparts in other major jurisdictions, were also having to come to terms with emerging risks regarding the resilience of mines to climate change, and how the introduction of new technology may impact on the mental well-being of employees in the mining sector and job security.

There is also increasing intense public focus on mine waste supply chains, and social pressures on boards and management from shareholders and pressure groups to adopt heightened climate change protocols which are separate to the framework and contractual obligations under which a mine may have been established.



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People-powered tech in Pilbara

RAY CHAN
WA

KOMATSU has deployed an unprecedented 41 new model Komatsu 930E-5 ultra-class haul trucks, made autonomous ready, at BHP's new South Flank iron ore mine in the Pilbara region of WA.

Komatsu Australia's CEO and managing director Sean Taylor, said people-powered technology was the central philosophy at Komatsu.

"It's this people first approach to autonomous technology that underpins our relationship with BHP," he said.

"Komatsu focuses on autonomous technology job creation, with a focus on safety, diversity, upskilling and an innovative flexible work force that marries our people's needs with business goals.

"This is our blueprint for the future."

Komatsu has a proven record in safety, productivity and lower haulage costs, plus ground-breaking contributions to autonomous technology solutions in the industry.

Komatsu Australia's mining executive general manager Leo Kaloglou said it was Komatsu Australia which, 20 years ago, spearheaded the world-first automation of mining equipment, now known to the industry as Autonomous Haulage Systems (AHS).

"Komatsu's brand of AHS is FrontRunner, and the name speaks for itself," he said.

"Komatsu has 250 AHS trucks deployed and 180 operating now globally across three continents, across nine mine sites, and recently became the first autonomous truck qualified to operate on private long-term evolution (LTE) mobile broadband technology in commercial operations.

"The operation of FrontRunner AHS technology has been tested across three different commodities in three of the



Based on conventional large mining trucks, Komatsu's FrontRunner AHS trucks run completely autonomously with a full truck fleet able to be monitored by single controller located up to thousands of kilometres away.



Komatsu adds to its autonomous hauler fleet with big 930E-5 deployment in Australia.

harsh and most extreme environments in the world; in ambient temperatures of minus 45 degrees, in temperatures higher than 40 degrees, and finally at extreme altitude."

Mr Kaloglou said the equipment moved more than 2bt of material autonomously – more than all other commercial mining autonomous haulage systems combined –

without any resulting injuries.

"While the transport sector automates, including cars and trains, the sheer size and scale of our machinery and the harsh environments in which they operate indicate the impressive capabilities of our engineers and technical teams who make these challenges surmountable," he said.

With the launch of Komatsu's new Centre of Excellence for Autonomous Haulage Systems in April 2019 in Tucson, USA, Komatsu is committed to AHS innovation, training and people power.

According to Komatsu Australia people and strategy executive general manager Colin Shaw, the company invests in time and resources into ensuring forward thinking qualifications are available for its workforce of the future.

"These qualifications relate to automation, technology, operations and leadership to name a few," Mr Shaw said.

Komatsu is committed to employing local Western Australian workers to support the workforce needs of Komatsu's fleet for the BHP South Flank mine site.

Technicians, apprentices, mechanics, electricians and boiler maker welders plus more roles will be recruited, which will add job opportunities for the local Western Australian workers in both full time and part time capacities.

Good surface vibrations help unearth resources

RAY CHAN
NATIONAL

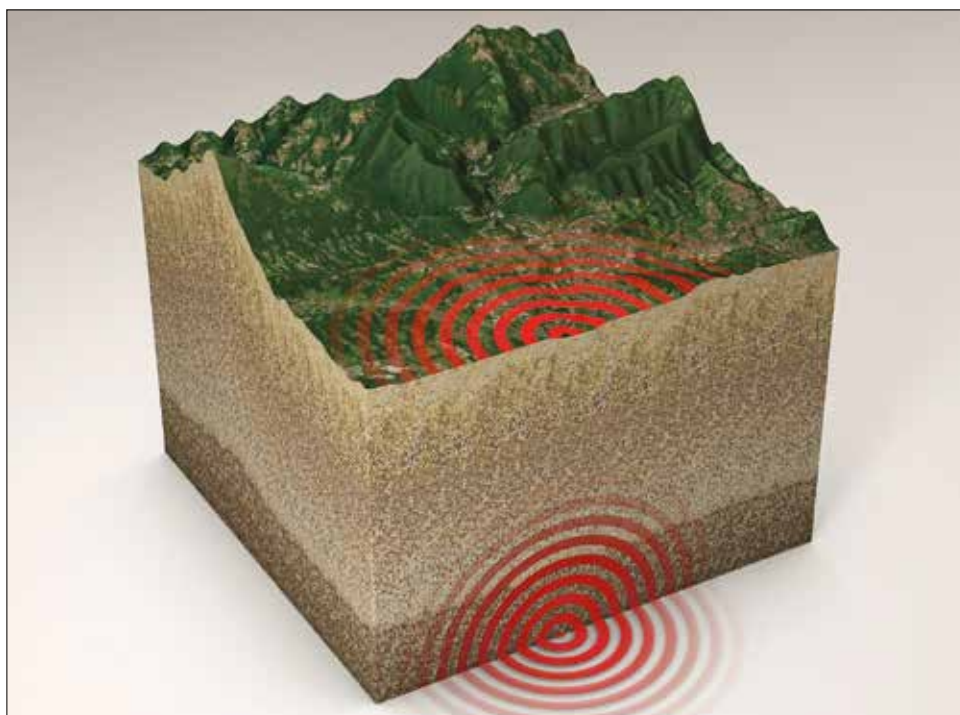
CSIRO'S Deep Earth Imaging future science platform team is developing the next generation of tools to craft models of the complex geology that lies deep beneath the surface.

To do this, they use as many sources of geoscientific information as possible – including electromagnetic, gravitational and seismic datasets.

Different geophysical methods will give different clues about what's below the surface and combining them can give researchers even more information.

But finding meaningful information from the vast amount of data is challenging.

As part of the Deep Earth Imaging team, CSIRO postdoctoral fellow Cericia Martinez, is automating two dimensional (2D) seismic



Scientists have found a way to dig deep into seismic velocity data to get a clearer image of our subterranean resources.

velocity models from seismic data to better understand Australia's crustal geology and build a picture of the subsurface.

"We can't always go and dig or drill a hole to figure out what's in the subsurface, but we can use physics and maps and data to help us do that," Dr Martinez said.

"One way we can understand what is

beneath the surface is to look at how seismic vibrations travel in the subsurface.

"Just like my voice travels through the air via sound waves, seismic waves travel through rocks in the Earth's crust."

By sending a vibration into the Earth and measuring the time that it takes for a wave to travel through the subsurface from

one location on Earth to another location on Earth, Dr Martinez says we can start to try to understand what lies hidden beneath us.

Because rocks and other subsurface features have different properties and densities, seismic waves travel at different velocities and are subject to other physical properties of waves such as reflection and refraction.

Dr Martinez has been mining the data acquired from seismic transects across the continent done by Geoscience Australia.

Her research focuses on looking at seismic travel-time data – the time it takes for seismic waves to travel through the subsurface – to identify the probable crustal architecture and geological features below.

Dr Martinez says that seismic velocity data can help to identify different subsurface features and geological units – such as water, oil and gas reservoirs and orebodies.

But there's a problem with this data: there's a huge volume of it, it's very complex, and analysis of it requires lots of time and effort from experts who have very specialised skills-sets and domain knowledge.

Dr Martinez's research incorporates geology, physics, mathematics and computer science to develop a new geophysical inversion algorithm for seismic travel-time data.

She is focusing on increased automation, classification and modelling to take away some of the time-consuming tedium of wrangling raw seismic data.



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Jumbo drill rig for tunnels

INTERNATIONAL

SANDVIK Mining and Rock Technology has launched its latest development for tunneling excavation, the massive Sandvik DT1132i jumbo.

This large and highly productive underground drill rig is the latest addition to Sandvik's already extensive range of underground drill rigs.

Together with the new high frequency rock drill, Sandvik RD535, and rock tools designed for high speed drilling, it provides users with a heavy duty solution for their underground drilling needs.

All Sandvik DTi tunneling jumbos have been developed with a special modular design that makes them highly flexible and versatile.

Suitable for fast face drilling or mechanised long-hole drilling and bolting, they are proving to be highly productive, reliable and effective across the world.

Furthermore, they use the latest developments in automated drilling solutions, such as the iSURE tunnel management software and SICA intelligent control system.

The new Sandvik DT1132i tunneling jumbo itself is a three-boom, electro-hydraulic jumbo that has been purpose-designed for fast and accurate drilling in tunneling and cavern excavation.

The computer-controlled rig possesses both operator-controlled boom positioning and full-face automatic drilling functions.

As well as incorporating some of Sandvik's latest developments in digital solutions, the new rig uses Sandvik's new high frequency RD535 rock drill, robust booms and advanced drill string guides, making it a complete and new high-speed drilling solution.

New rig, new features

The RD535 rock drill automated drilling features and new rock tools mean that the DT1132i delivers the results required, but with 40pc less exhaust particles, up to 20pc higher penetration rate and with 25pc more side coverage.

The essential premise behind the development of the new DT1132i is to provide



The CATR2900G guidance automation unit.

users with increased drilling performance and accuracy, thanks to its fast and adaptive drilling control capabilities, able to account for changing rock conditions.

The rig design also maximises operator safety and ergonomics, with improved fleet standardisation (high parts commonality) enabling extended rig usage across different work sites.

Among the many other features on the new rig is a new 3m telescopic TB160i boom, optimised with a front wrist structure that provides 1m additional side coverage as standard, and 4m side coverage with telescopic adjustment.

The new boom also uses a new fully proportional boom control for accurate and fast manual boom handling (automated boom controls come with the optional Platinum package), with intelligent compensation models to give accuracy in all operating conditions.

New cabin for safety and comfort

An ergonomic vibration-dampened cabin has been designed for the new rig. This provides the operator with excellent all-round

visibility, low noise level inside the cab thanks to its acoustic windows, a filtration system to minimize dust inside the cab (according to standard EU6/7) and an open and spacious operator environment.

Doorways have been located in the rear of the cab to minimise any disturbance for the operator, whilst safety has been maximised with a FOPS-compliant cabin.

To further boost the efficiency of the rig and the operator, comprehensive diagnostics information is integrated into one display.

These include drilling diagnostics for boom instrumentation, drilling control system and shank lubrication, together with carrier diagnostics for electric motors, pumps (hydraulics and water), transmission system, diesel engines, brake system, jacks and cable reels.

The rig also has durable covers and incorporates a new cover design, in which all sides are covered and all service points are easy to access.

Power and efficiency

The new RD535 is a high performance and high frequency rock drill, which boasts

maximised power transfer capabilities leading to a high drilling speed without compromising hole quality.

It has an efficient and powerful patented percussion mechanism, as well as a tool-saving, efficient and patented stabilizer structure for increased reliability.

These features, together with improved flushing and efficient cooling, provide uninterrupted high-speed drilling.

The rig steers by hydraulic rear wheel steering, and its electric current reducer unit provides electric reactive power element (kVar) from an onboard capacitor, reducing electric current draw by up to 20pc.

The three 90kW IE3 electric motors require 2.5pc less energy, with all working lights based on LED technology, automatically controlled based on tramming direction and with directional lights available where needed.

A new feed - TF535i - also provides increased feed force for high power drilling, whilst a saving hose reel structure gives longer service life for the hoses which are of an increased size.

A hose support structure enables the independent tightening of every single hose, thereby reducing any pressure drop.

An integrated accurate linear sensor ensures accurate rock drill positioning and a new slide piece design enables 50pc less wear and friction.

New drilling tools

An underground drill rig is only as effective as the rock tools, rock drills and bits it uses.

For face drilling, the DT1132i comes with the new Sandvik Alpha 360 drilling system for the RD535 rock drill, which delivers features such as an optimised rod diameter with increased flushing hole size, increased flushing and higher penetration rates, as well as a new Sandvik Alpha 360 connection.

The latter possesses a new larger bit thread for increased drilling power and straighter holes which gives higher advance rate per blast.

For grouting, the GT38 system provides 50pc less deviation and increased service life.

Autonomous technology at Chinova mine

QLD

AUTOMATION specialist RCT has entered into a project with Chinova Resources to install and commission autonomous technology at its Osborne Mine in Queensland.

The project involves RCT installing its ControlMaster Guidance Automation packages on two CAT 2900 loaders to operate at the copper-gold underground mine.

RCT will also provide an underground Teleremote Cabin complete with a Laser Guard Containment Unit and analogue communications as well as a Fibre Optic Control Station (FOCS) located on the mine's surface.

ControlMaster Guidance offers consistent machine operation and cycle



Autonomous technology at the Chinova mine.

times by reducing unplanned machine downtime from operator errors and improved safety for operators who can

manage the machines from remote locations.

RCT's Brisbane and Mount Isa branches

carried out installation and commissioning works in mid-2019 and will deliver operator and maintenance training to site personnel.



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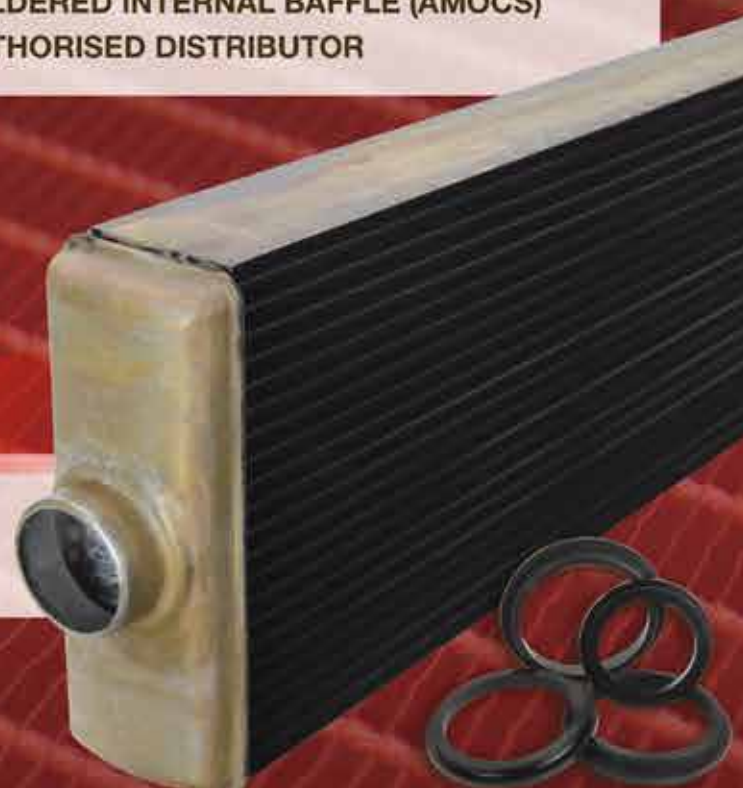


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POWERING UP

The outlook for nickel looks bright, with WA producers and explorers set to ride the wave of EV demand.

BHP has major expansion plans for its Nickel West site, as prices for the metal hit decade highs.

EMMA DAVIES

WITH nickel recently posting its best quarter in almost a decade and the recent Paydirt 2019 Australian Nickel Conference in Perth, it's no surprise that the future of the metal has been the talk of the town.

The London Metal Exchange (LME) nickel price hit \$US18,620/t early last month, having opened the year at \$US10,435/t.

This has been partially fuelled by concerns around the impact of Indonesia's decision to bring forward a ban on exports of raw nickel ore by two years.

The ban will take effect from January 1, removing an estimated 350,000t out of the global sea trade.

Another geopolitical wobble impacting prices was the Government of Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), an autonomous region within the southern Philippines, suspending operations of all four mining companies in its jurisdiction, on environmental grounds.

The price also benefited from falling LME and Shanghai Futures Exchange (SHFE) warehouse stocks and the metals ability to sidestep broader tensions and market jitters around the length and impact of the ongoing China-US trade tensions.

Overall, the resurgent nickel price has been a welcome boost for the base metal and has prompted some Australian producers in 2019 to investigate new exploration, mining and production opportunities.

WA Nickel

The geopolitical shifts and subsequent price rise have been a driving force for the West Australian nickel sector's recovery.

Independence Group and Western Areas have enjoyed strong investor support on the



The Nickel Institute's director market development Richard Matheson

back on nickel's role in the electric vehicles and BHP (who tried to sell off its Nickel West division a few years ago) has done a complete 360 turn – with major expansions planned and a nickel sulphate production facility at its Kwinana site now operational.

Mincor Resources and Panoramic Resources are reviving mothballed operations and Black Mountain Mining, Poseidon Nickel and Ardea Resources have plans for production and nickel explorers like St George Mining and Legend Mining have had recent share price spikes.

The Nickel Institute's director market development Richard Matheson said Australia's nickel industry was in overall in a very good position.

"There is a real opportunity here to grow and defend market share both for existing applications and emerging new applications such as in new-era electric vehicle batteries, energy storage and even food and water applications," Mr Matheson said.

"This opportunity is being driven by

mega trends in population growth and the need for 'more of everything'.

"So many parts of the world are urbanising quickly and massive migrations of people are elevating demand for more housing, more energy, more food and more clean water – all of which has to be delivered in sustainable ways.

"The scope of nickel's properties is excellent for assisting these needs so the market for nickel can best be described as fantastic."

Mr Matheson did warn the sector that it faced headwinds in reaching its true potential.

"The threats to nickel are very clear," he said.

"There are perceptions of high cost, a lack of knowledge about the metal even though it is used everywhere.

"This is particularly true for new young engineers coming through industry who are not aware of nickel's potential.

The Nickel Institute is attempting to circumvent this attitude and change perceptions around nickel in the head space of the younger generation who are designing and manufacturing new applications, like EVs.

"Nickel also faces competition and substitution from other materials as well as barriers to entry from any number of quarters," Mr Matheson said.

"Yet nickel is buoyant, its annual output has grown roughly between 5% and 6% per year over the past decade. The opportunity is there."

Bright outlook

Nickel has previously been dominated by the stainless steel sector, which comprises around 70pc of global nickel demand, but in recent years the emergence of the EV market has tipped the balance.

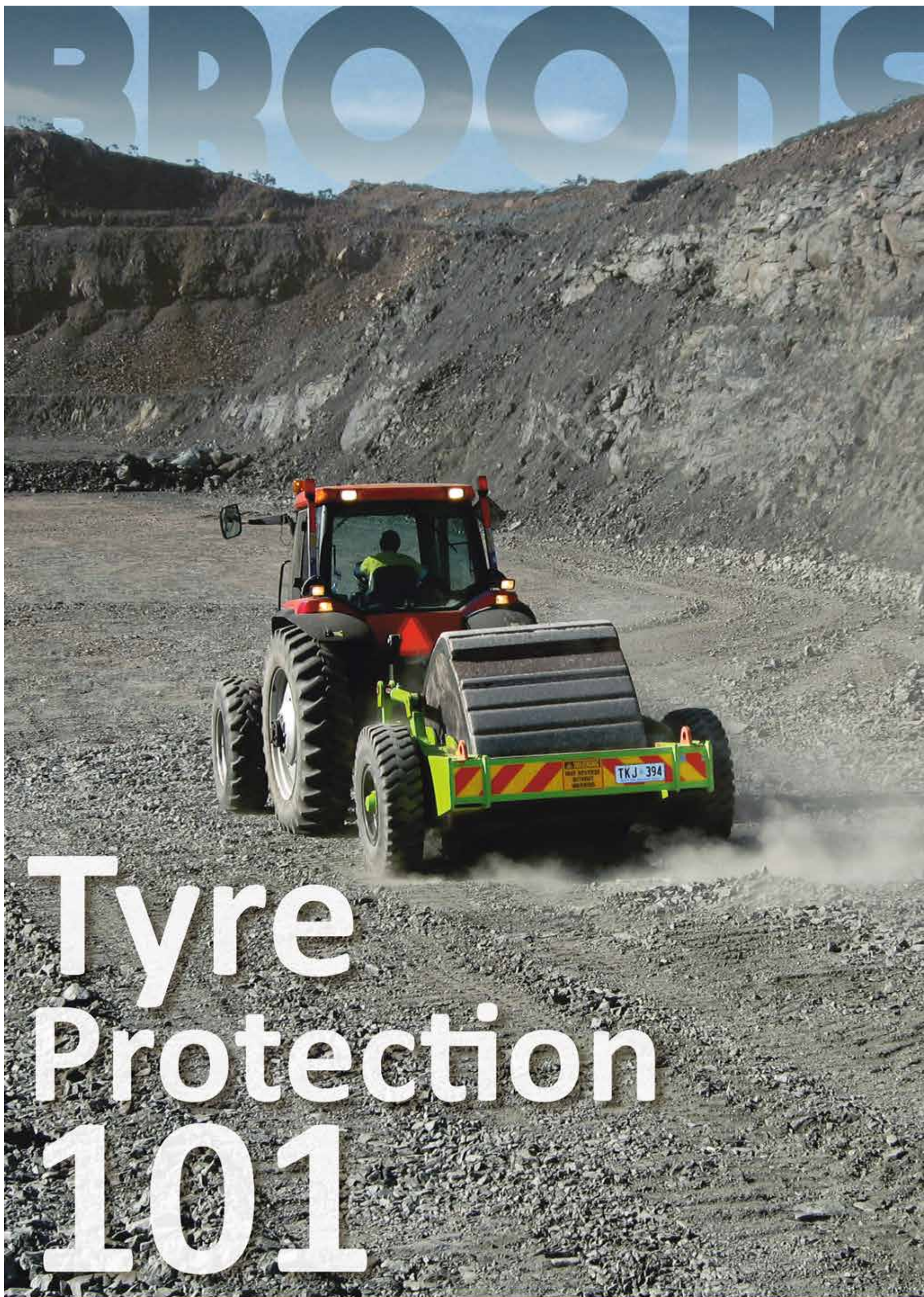
Analysts like UBS expect batteries in EVs to account for 12pc of global nickel demand by 2023, up from 3pc in 2018.

Nickel sulphate is essential to emerging new-era EV batteries as it is stable under high temperatures and resists over-charging – but battery materials buyers generally pay a premium.

There's potential for EV nickel demand to rise above 20pc market share over the next decade along with a nickel floor price around the \$US7-7.50-8.00/lb range – prompting a rush of negotiations over future offtake agreements.

The percentage customers pay compared to the actual nickel content of concentrates could also rise, potentially from the industry's current average 'payability' of 70pc to more than 80pc for non-traditional concentrate buyers.

The expected EV demand forecasts can only be good news for WA's nickel producers but the challenge remains whether or not they can keep up.



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EXPANSION IN THE WORKS

A two-phase expansion at its Cadia operation in NSW is set to add 1.8moz of gold and 67kt of copper to the project over its mine life.

Newcrest is ready to execute stage one of its Cadia expansion plans at a capital cost of \$685m.

EMMA DAVIES

NEWCREST has announced approval of the first stage of a two-pronged expansion at its 100pc-owned Cadia Valley operations in central New South Wales.

The estimated total capital costs sits at \$865m, \$685m for stage one and \$180m for stage two.

The first stage comprises commencement of the next cave development (PC2-3), materials handling system upgrades, associated infrastructure and the initial works to increase in the nameplate capacity of the process plant to 33mtpa – with PC2-3 mine targeting first production in FY23.

The second stage, which is in Feasibility Study, is focussed on a further increase in processing capacity to 35mtpa and recovery rate improvement projects targeting completion in late FY22, prior to the completion of PC2-3 mine development.

The rate of ore mined from Cadia is expected to vary over time according to draw rates, cave maturity and cave interaction as further caves are developed.

Newcrest managing director and chief executive officer, Sandeep Biswas, said the expansion plan is an improvement on the previous 2018 Pre-Feasibility Study.

“It includes an estimated additional 1.8moz of gold production and 67kt of copper production and an estimated \$800m increase in projected free cash flow generation by Cadia over its life,” Mr Biswas said.

“The capital investment has an estimated 21.5pc rate of return and ensures Cadia remains a Tier One asset for many years to come.”

However the actual Internal Rate of Return (IRR), which sits at 21.5pc, will vary according to the copper and gold prices realised.

Newcrest assumes a base gold price of \$1250/oz, copper price of \$3/lb and AUD/USD exchange rate of 0.75.

The expected financial outcomes from stages one, two (and eventually three) are an Expected Net Present Value (NPV) of \$1170m (real).

The expansion will also increase in estimated free cash flow generation of \$800m over Life of mine (LOM).

Operations to date

Since the start of 2019, Cadia has achieved record high annual gold and copper production



and record low AISC per ounce.

In its 2019 annual report, Newcrest stated that the AISC was \$39 per ounce lower than the prior period and reflects lower unit operating costs associated with the higher production volumes and gold grade and the benefits of the weaker Australian dollar, partially offset by lower copper revenue per ounce and higher sustaining capital expenditure.

“Cadia had an outstanding year, producing 913koz of gold and a record low AISC of \$132 per ounce,” Mr Biswas said.

Gold production was 52pc higher in the second half of the year, driven by a 39pc increase in the volume of material milled (achieving record mill throughput) and an 11pc increase in gold grade milled.

The higher gold grade in the current period reflected an increased proportion of mill feed being sourced from higher grade ore drawn from PC2, and the fact that in the prior period, lower grade ore from Ridgeway and the Cadia Hill stockpiles was processed while mining activity at Cadia East was constrained after a seismic event in April 2017.

Newcrest has settled and received its insurance claim in relation to the April 2017 seismic event at Cadia for \$155m, with \$34m of the proceeds attributed to material damage included in site production costs as an offset to the costs incurred to rectify damage to the Cadia Panel Cave.

Separate to the Cadia Expansion Study, Newcrest has also progressed to PFS stage the study pertaining to development of the next cave following PC2-3 (PC1-2).

This PFS for PC1-2 will continue to incorporate the knowledge gained in PC2-3 as well as further advance the introduction of Newcrest’s NextGen Caving techniques.

The PFS for PC1-2 is expected to be completed in calendar year 2021.

Proposed plant expansion

The total amount of capital expenditure associated with the plant expansion is estimated to be about \$270m, which includes upgrades to Concentrator circuits 1 and 2, the addition of a coarse ore flotation circuit and ancillary upgrades to equipment.

Of this \$270m, \$90m has been approved as part of stage one of the Cadia Expansion Project as Concentrator 1 is currently constrained by secondary crushing motor power and SAG motor power.

The goal is to increase Concentrator 1 throughput in stages from 23mtpa up to 25mtpa by conveyor upgrades and installation of a new secondary crushing circuit (which together are expected to increase throughput by 1mtpa).

It also includes replacing the SAG Mill motor to increase power from 20MW to 22MW (expected increase in throughput of 1mtpa) by the second half of FY21 – which would the reduction in milled tonnes in FY21.

The stage two capital of \$180m continues to be subject to a feasibility study that is expected to be completed around the middle of calendar year 2020.

The feasibility study recommends increasing the grind size, which allows a further 1mtpa in expected throughput of Concentrator 1 to a total rate of 26mtpa.

Together with the currently installed capacity of Concentrator 2 of 7mtpa, this provides Cadia with 33mtpa of milling capacity from FY27 onwards.

Processing volumes are expected to

progressively ramp up to be in the range of 33-35mtpa, subject to ore presentation from the mine which will vary over time according to draw rates, cave maturity and cave interaction as further caves are developed.

Stage 2 capital works will comprise of additional coarse ore flotation capacity be installed on Train 1 and Train 2, complementing the existing circuit on Train three on Concentrator 1.

For Concentrator 2, minor conveyor upgrades, upgrades to pumps, hoppers, pipes and thickeners as well as additional tertiary grinding capacity through new Vertimills and the installation of a large Jameson Cell to provide additional roughing capacity, is expected to increase the throughput from 7mtpa up to 9mtpa and increase recoveries.

Production and recovery improvements

The feasibility study recommended a range of methods to better understand recovery rates at lower grades, including the extended use of Jameson cells, upgrades to the gold gravity circuit, and the installation of additional coarse ore flotation, the expansion of the flotation circuits and increase grinding and crushing capacity.

Based on the study findings, these improvements are expected to deliver a LOM gold recovery of around 80pc, which is 9pc above the rate articulated in the 2018 PFS.

A 1pc benefit in LOM copper recovery is also expected as a result of changes to the processing circuit, with the LOM average copper recovery expected to hit around 85pc.

An additional 1.8moz of gold and 67kt of copper production is anticipated over the LOM.

“Through continued investment in innovation we continue to discover what is possible,” Mr Biswas stated in the company’s 2019 annual report.

“For example, we are pursuing the development of autonomous, semi-autonomous and remote mining solutions to reduce exposure of our personnel in hot mining conditions at Lihir and to the underground operations at Cadia and at Telfer.

“We continue to explore and trial technologies for selective processing, mass sensing and sorting at sites.

“We also use advanced analytics and digital technology such as artificial intelligence and virtual reality to increase safety and performance.”

Leading the way in belts

NATIONAL

ESTABLISHED in 1973, Reliable Conveyor Belt has an enviable reputation for excellence, and is regarded as an industry leader in comprehensive and efficient conveyor services.

Offering wide-ranging mechanical and rubber capabilities, the company is committed to delivering excellence in customer service to every project.

For more than 40 years, Reliable Conveyor Belt has demonstrated an unwavering commitment to health and safety, and a cutting edge internal training program that boasts nationally accredited qualifications - as a result, the team is competent, safe, and at the top of its field.

Reliable can supply a full range of conveyor components, including belting, rollers and trackers, skirting systems, pulleys, belt fasteners, hot and cold vulcanising materials as well as elevator buckets and accessories.

Total conveyor management

Reliable Conveyor Belt offers customers a total management service for all conveyor belt systems including consultation and design, engineering and installation, and a comprehensive maintenance package designed around a careful analysis of client systems and the predicted service



The company understands the importance of conveyor systems to the viability of any operation and knows that unscheduled down time is costly.

life of components for the operating regime under which the particular belt is installed.

As the maintenance management partner, the company ensures clients experience minimal downtime from component failure in conveying systems.

With a planned schedule of maintenance work, Reliable is able to work with the client to program downtime around production profiles – resulting in improved reliability and predictable costs,

plus increased confidence in the capability of materials handling systems.

Inspections and audits

In addition to maintenance services, Reliable utilises experience from its head office to assist with a range of specialised management services and design checks on existing conveyor systems to assist with performance and troubleshooting and solutions for problem situations.

Reliable uses belt analyst conveyor design software with services including tension calculations, counterweight and motor elections, transfer solutions including Discrete Element Modeling (DEM).

Repair and refurbishment

Reliable offers a diverse range of conveyor pulleys manufactured and refurbished to the highest standards to ensure product suitability, reliability and performance while reducing maintenance costs.

Products available include drive/head and high tension pulleys, tail, GTU/LTU and snub pulleys, spiral/slatted and wing pulleys (self-cleaning), flat or crowned in both live shaft and dead shaft.

Reliable can advise clients on the best solution for their particular application and improve existing designs.

Rapid response 24/7

With offices in Newcastle, Mudgee, Muswellbrook, Gunnedah, Lithgow and Parkes – each backed by a fully equipped workshop and well trained staff – Reliable Conveyor Belt takes pride in being readily

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RAY CHAN

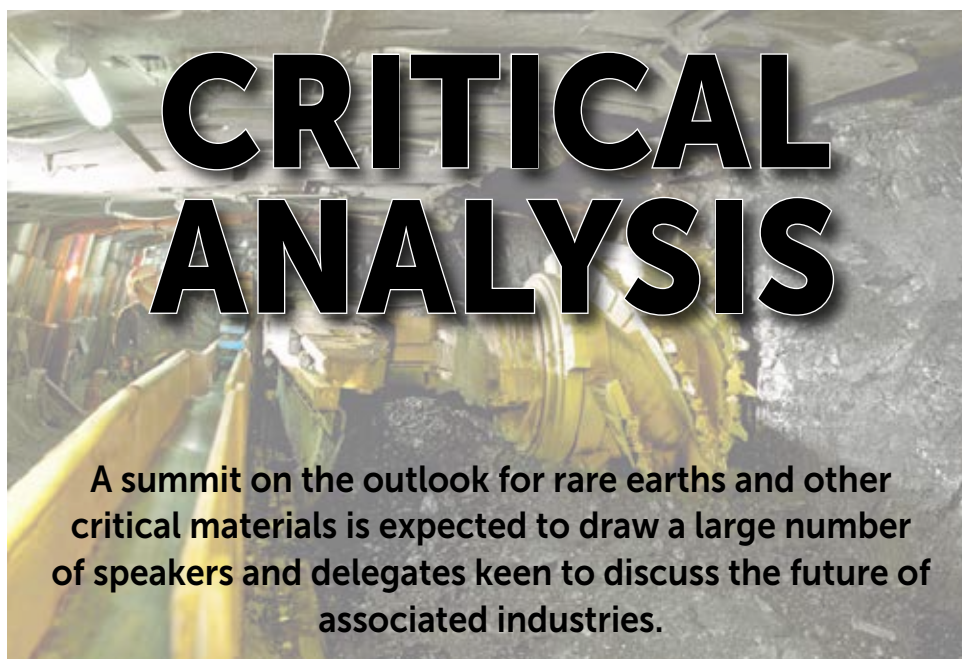
DEMAND for lithium, cobalt, vanadium, rare earth and other critical minerals are growing strongly, driven by the booming Li-ion battery industry as well as the stainless steel and super-alloy sectors.

As demand increases, supplies have tightened with consumers grappling with shortages and rising prices, amid new political factors that are disrupting supplies in major exporting countries.

A key question for consumers is whether there will be sufficient raw materials to support the growth in lithium demand.

With this scenario in the background, the forthcoming Global Critical Minerals and Mining Summit provides the ideal platform for industry members and stakeholders to meet, collaborate, and identify new investment opportunities.

Attending the event, to be held at Crown Perth from November 20-22, will be mining investors and the mining majors and juniors from Africa, Latin America, North America, China, Australia, Europe, Asia and Russia.



The Expo will also present innovations in critical minerals extraction, processing technology and production technologies.

The summit, which carries the theme Uncovering New Opportunities in Lithium, Cobalt, Rare Earth, Vanadium and Other

Critical Minerals, enables delegates to meet the world's key tech metal buyers and sellers at one singular platform and stay

ahead of fast-moving market trends.

There will be opportunities to discover new trends, threats and opportunities in the broad critical minerals sector in the global market, and to network with ministers, government and state/province decision-makers, key and new buyers, investors, as well as equipment and technology suppliers from all over the world.

Attendees can engage the world's investors and financiers for their on-going and new projects, explore state-of-the-art technological innovations to improve mine and plant productivity, and source for new off-takers for mines and minerals.

Companies represented at the event include Albemarle, Ausdrill Northwest, Australian Vanadium, BHP, Citic Pacific Mining, Dacian Gold, Fortescue Metals Group, Galaxy Lithium, Glencore, Northparkes Mines, Pilbara Metals Group, South32 Worsley Alumina,

Tianqi Lithium Corporation, Triton Minerals, and WorleyParsons – Koodaideri DES Project.

AT A GLANCE

DAY 1 (Nov 20):

- Pre-summit seminar
- Six technical seminars for critical minerals and mining

DAY 2 (Nov 21):

- How to profit from Australia's government incentives, tax credit benefits and policies promoting the Critical Minerals Sector
- Critical minerals and mining outlook, new projects pipeline, project expansion updates,

new financing and investment opportunities

- Meeting new capital funding needs and finding new sources of market supply
- Latest project and market updates on rare earths, lithium, vanadium, nickel, manganese, cobalt, graphite, iron ore, palladium and more.

DAY 3 (Nov 22):

- Find out the latest on the WA State Government Future Battery Industry Strategy: national strategies promoting lithium, cobalt

and rare earth production in Australia

- Spotlight presentations and meetings with investors: project updates, strategic collaboration and capital-raising opportunities for all critical minerals mining companies from Australia, Africa, Latin America, Asia, North America, Central Asia
- Find out why big tech, electric vehicle and energy storage companies, including Tesla, are considering investing in mining nickel and lithium to secure minerals for electric batteries

GLOBAL CRITICAL MINERALS & MINING SUMMIT 2019

Uncovering New Opportunities in Rare Earth, Cobalt, Gold, Vanadium & Other Critical Minerals

20 - 22 November 2019 | Crown Perth, Australia

For more info visit claridenglobal.com

Photography: Karl Schoemaker.

STRONG FINISH

Production at Sunrise Dam dropped 11pc mid-year, but AngloGold Ashanti anticipates a quick turnaround with a new underground mining management system to improve efficiency on site.

Despite a drop in production, AngloGold Ashanti's Sunrise Dam mine is expected to perform strongly for the remainder of 2019.

EMMA DAVIES

ANGLOGOLD Ashanti's assets have performed well in 2019, with overall production increasing by 7pc in the first quarter from 801,000oz from 752,000oz – despite a drop in production at Sunrise Dam in WA.

At Sunrise Dam, production was 11pc lower at 136,000oz for the first six months ended June 30, 2019, compared to 153,000oz during the same period last year.

The drop in production was due to a lower mill feed grade and lower metallurgical recovery from the ore mined.

The drop at Sunrise Dam, plus lower grades and plant throughput from the company's Siguiri asset and a planned production decrease at the Cerro Vanguardia site, was partially offset by strong improvements from Kibali, Iduapriem, Geita and Tropicana.

Chief executive officer Kelvin Dushnisky said that the company was expecting an especially strong fourth quarter with the gold price averaging around \$1414/oz as of August 4, 2019.

"While we've seen a rally in the gold price, this will not diminish our focus on improving free cash flow and returns through active portfolio management and strict capital discipline," Mr Dushnisky said.

"Tight cost management will continue to be a key driver for us."

The company transitioned from a particularly high grade, coarse-gold zone within Midway Shear that had a high metallurgical recovery in 2018, to ore development from the Vogue ore body at the start of 2019.

The Vogue ore body is expected to increase feed grade and recovery rates to REP feasibility study levels and would account for about two thirds of underground ore production for 2019.

Overall, Australian assets performed positively, producing 316,000oz at a total cash cost of \$704/oz in the first half of 2019, compared to 306,000oz at a total cash cost of

\$790/oz in the first half of last year.

All In Sustaining Costs (ASIC) for the same period was \$939/oz compared to \$1052/oz in the first half of last year.

Improving efficiency

Operational efficiency is expected to improve at Sunrise Dam going forward, with the company focused on targeting high-grade ore and using a new underground mining management system to incorporate more remotely controlled services.

Underground operations are contracted to Barmingo, whose Sandvik and CAT loader fleets operate with ControlMaster Guidance Automation.

These have now been fitted with enhancements including Multiple Machine Selection (MMS) and Multiple Machine Control (MMC) – cutting edge technology which gives an operator control of numerous mobile machines from the one station.

RCT automation and control product manager Brendon Cullen, who installed the technology, said it allowed one operator to tram one machine, while digging with another to make the process more efficient.

"Before the introduction of these features, one operator would only be able to concentrate on the activity of one mobile machine," Mr Cullen said.

"The new features allow them to attend to multiple machines safely and effectively thanks to guidance automation which will keep the machine on the correct path, to avoid machine damage and to ensure faster tramming."

RCT's Bridge communication network allowed the mine's work area to be digitised to support the autonomous features and acted as a stepping stone to integrate into the site's existing system.

Area Access Control (AAC) units have also been deployed as an extension of the automation control centre and interface

between the work areas and machines.

"These lightweight, cost effective and portable solutions are the ideal alternative to installing a cabin on site," Mr Cullen said.

The site has also been using MinLog's MineSuite system since mid-2018, which enables management, geologists, mining engineers, shift supervisors and operators to schedule, track, monitor and control operations.

A key component of this is the Distributed Store and Forward (DSF) technology – which finds the quickest path between equipment and server via a combination of access points and on-board field computer equipment – and safeguards the system against communications black spots.

Essentially this results in agility around activity planning and management, short interval control, task management and equipment allocation, material tracking and certification, proximity detection and traffic management, and ventilation control.

At Sunrise Dam and Tropicana, AngloGold Ashanti is trialling autonomous drilling which has the potential to improve drill productivity by about 15pc, reducing the number of drills and operators required from 2020 if the trial is successful.

Autonomous drilling is expected to reduce wear, extend drill bit life and improve utilisation of the equipment, and – like the underground management system – is designed to increase overall efficiency and productivity on site.

Exploration options

During 2018, AngloGold Ashanti earned a 51pc interest in the Butcher Well/Lake Carey exploration joint venture tenements, where there is potential for the discovery of an additional ore reserve for processing at Sunrise Dam – possibly displacing low-grade stockpiles currently being blended with underground ore.

AngloGold Ashanti Australia has the right to earn up to 70pc interest from Saracen Mineral Holdings by spending up to \$25m on exploration in the tenements, which are located approximately 22km from Sunrise Dam.

In the first half of 2019, a total of 26,284m of Air Core (AC) drilling was completed in the 100pc owned Laverton district; AC drilling at the Bismark prospect, 10km south of Sunrise Dam, highlighted three new coherent gold anomalies; while AC drilling at the Ahab prospect delineated NNW-trending zone of anomalous gold extending about 1km on strike.

AC drilling lines at the Cleveland prospect, a new regional target, intersected several anomalous gold intercepts associated with anomalous Ag, Pb and Zn.

Infill AC drilling and DD are planned at all three prospects during the third quarter of the year.

Brownfields exploration activities for the period included a regional gravity survey, covering all tenements within the Sunrise Dam Combined Reporting Group.

Drilling programs at Sunrise Dam completed a total of 70,112m and a total of 90 significant intercepts were reported: 53 from Vogue, 11 from Cosmo East, 18 from Midway Shear and Midway Shear Steeps, one from Carey Shear Zone, one from MLE3, five from Regional EIS drilling and one from Sunrise south.

The results included an extension of Vogue mineralisation south of the current Indicated Mineral Resource, over an approximate 200m strike length, continuity of mineralisation along a low angle structure between the Vogue domain and Carey Shear Zone and mineralisation 600m to the south of the mine, suggesting the continuation of the Vogue orebody.

The site is evaluating paste fill options to support production from wider sections of the large Vogue ore body and to improve mining flexibility going forward.



GRES is proud to have assisted AngloGold Ashanti Australia in the delivery of the Recovery project.

Shining support for AngloGold

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 mineral and resource processing industry internationally.

GRES helped deliver the Sunrise Dam Gold Recovery Enhancement Project for AngloGold Ashanti Australia (AngloGold), having previously completed the feasibility study work which established

the viable pathway for development of the project, which was delivered on time and on budget.

GRES is proud to have assisted AngloGold in the delivery of the project, where sulphide mineral recovery and ultra-fine grinding unit processes have been incorporated into the process plant to consistently increase gold recovery.

The High Intensity Grinding (HIG) mill installed is the largest unit of its type currently operating in Australia.

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.

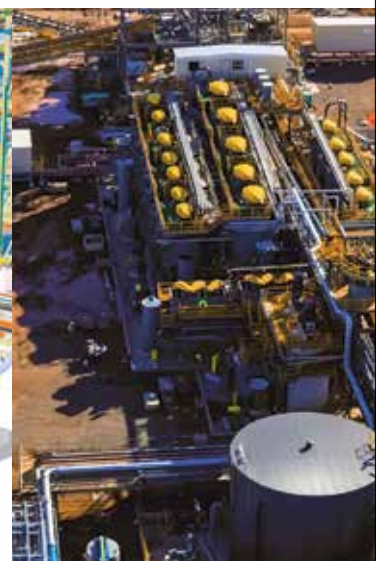
The innovative engineering solutions developed by GRES enable its clients

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

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

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Complete environmental data monitoring

NATIONAL

ANGLOGOLD Ashanti and the Sunrise Dam mining operation are committed to minimising waste and pollution.

The successful management of environmental performance allows the Sunrise gold mining operations to make appropriate efforts to remain compliant with strict regulatory demands.

The environmental team at Sunrise quickly realised that managing vast amounts of monitoring data and complex compliance criteria in spreadsheets was no longer realistic.

In 2009, MonitorPro was selected to professionally and effectively manage the site's environmental data.

By adopting a professional solution, Sunrise Dam now has full control of monitoring data, saving time on data validity, compliance checking and reporting, by automating a risky process that could have rendered serious fines if mishandled.

The environmental team on-site can rest easy with confidence that all environmental data is in order and that any missed data or compliance breaches are identified early on.

The MonitorPro solution at Sunrise Dam is the same AngloGold Ashanti is using at Tropicana; in fact, MonitorPro is the most commonly used environmental data management solution in the mining industry, worldwide.



EHS Data has provided environmental data management solutions to more than 1000 sites in 40 countries worldwide.

About MonitorPro

The complete, professional environmental data monitoring solution, MonitorPro is the IT solution trusted by environmental teams worldwide to manage environmental compliance and data collection. MonitorPro is a web-based or locally hosted solution for the collation of all

sources of environmental data, where it is generated by loggers, laboratories, weather stations, calculations or other data repositories.

Since 1996, world-leading UK based software company EHS Data's versatile software solution has helped organisations save time, improve planning, quality control, site analysis and reporting to manage environmental

obligations and sustainability.

MonitorPro is the first EHS Software solution to receive an MCERTS accreditation from the Environmental Agency and has provided environmental data management solutions to more than 1000 sites in 40 countries worldwide.

For more information about MonitorPro visit: www.ehsdata.com.



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MonitorPro is a trusted solution used by Sunrise Dam for 10 years to effectively monitor and manage their environmental data.



UNDERGROUND AND BEYOND

Alkane Resources' exploration program has yielded exciting results as it looks for new ore feed for the Tomingley Gold Project in central NSW. With a major discovery at the Northern Molong Porphyry Project and exciting results from the extensive drilling program at San Antonio and Roswell, 2019 looks set to finish on a high.

Tomingley's transition to underground mining is not the only big news coming from Alkane.

GERARD MCARTNEY

ALKANE Resources has continued on its stellar run for 2019.

The company's shares, hovering at about \$0.20c in May, have marched upward to \$0.80c by mid-October on the back of a strong gold market, the transition to underground mining commencing at its flagship Tomingley Gold Project in NSW and exciting results from its exploration program.

The exploration program has returned a host of high-grade results from an aggressive drilling campaign at the San Antonio and Roswell prospects, which provide ore feed for the Tomingley Gold Project.

And, in what is being compared to Newcrest's Cadia East deposit, the company has confirmed a significant copper-gold porphyry mineralisation at the Boda and Kaiser prospects in its Northern Molong Porphyry Project (NMPP).

Cadia 2.0

The project incorporates exploration licences covering 110sqkm of the Northern Molong Volcanic Belt (MVB).

The company said that the MVB within the eastern Lachlan Orogen is considered highly prospective for large porphyry gold-copper mineralisation, such as Newcrest's Cadia operation.

The NMPP incorporates three licences at Bodangora, Kaiser and Finns Crossing, and is situated conveniently between Dubbo, Orange and Parkes, which will provide the services for the mine.

The exploration work has established a geological framework for the region, which has shown a strong resemblance to that of Cadia.

The company said that although more structurally complex than Cadia, it had been able to reconstruct the geology to show a "stratigraphic sequence very similar to that at Cadia".



Alkane Resources
managing director
Nic Earner.

The Boda prospect returned one diamond drill core hole 200m beneath a zone of gold mineralisation previously defined in RC drilling.

The assay results indicated the increase in thickness and grade of porphyry gold-copper mineralisation at depth.

The intercepts included 502m at 0.48g/t and 0.2pc copper from 211m, 313m at 0.62g/t, 12m at 3.28g/t gold, 0.67pc copper from 419m and 35.8m at 0.21g/t gold and 0.49pc copper from 735m to EOH.

Kaiser prospect's assays have confirmed a strong gold-copper porphyry mineralisation 200m southeast of the near-surface Kaiser deposit.

The drill intercepts were 40m at 1.3g/t gold and 0.22pc copper from 0 meters, 10m at 2.86g/t of gold and 0.36pc copper from 0 meters and 2m at 3.24g/t gold and 0.26pc copper from 25m.

While the grade may appear to be low, porphyry orebodies are known for their easy-mining in large volumes, and for being economically viable at copper concentrations as low as 0.15pc.

Alkane managing director Nic Earner said that the results were exciting for the

company and exciting for the region with a history of delivering large, low-grade and long-life gold-copper mines.

"The project area has already delivered some strong indications of a big porphyry system near surface at Kaiser and, along with the results from this diamond drill hole at Boda, we can see clear evidence of Cadia style mineralisation and grade over hundreds of metres," he said.

"Alkane is immediately prioritising follow up drilling, seeking to determine the scale of this highly encouraging discovery."

Roswell and San Antonio

Over the past year, Alkane has conducted extensive regional exploration at the Roswell and San Antonio prospects to define the additional resources that have the potential to be mined either via open pit or underground operations to feed Tomingley.

To date, the program has yielded broad, shallow high-grade intercepts that the company says demonstrates potential for material project life extension, and shows that a return to open pit mining and underground extension is possible should the resource be confirmed.

The company reported significant high-grade results after the completion of a 17, 519m RC and diamond core drilling program for both Roswell and San Antonio, located about 4km south of the Tomingley gold project, and the El Paso prospect.

The massive 60,000m resource definition drilling program begun in June 2019 at Roswell and San Antonio, with the intention to define an initial inferred resource at the two prospects.

The aim of the exploration is to provide additional ore feed, either at surface or underground, in the future to the Tomingley gold operation.

At San Antonio, the company reported significant intercepts of 42m grading at 2.61g/t gold from 42m; 24m grading 6.30g/t gold from 48m including 12 meter grading 9.92g/t gold from 147m; 9m grading 2.33g/t gold from 24m and 44m grading 2.76g/t gold from 147m; 4m grading 14.6g/t gold from 252m including 2m grading 26.1g/t gold from 254m.

The significant intercepts at Roswell included 45m grading 3.66g/t gold from 195m including 3m grading 16.0g/t gold from 220m; 24m grading 5.33g/t gold from 186m including 3m grading 16.0g/t gold from 188m and 3m grading 21.8g/t gold from 194m.

Tomingley Gold Operation

The Tomingley Gold Operation has begun the transition to underground mining in 2019.

The mine has been in operation since 2014.

In order to ensure the resources have 'reasonable prospects of eventual economic extraction', the open pit resource have been restricted by an "indicative optimistic pit shell estimated at a gold price of \$2000 per ounce with the potential open pit component assessed at >0.5g/t gold cut-off".

The company will be processing low-grade ore stockpiles until underground ore becomes available in early 2020.



Drones and laser scanners provide safe and accurate surveys over mine sites.

60 years of surveying for Langford and Rowe

NSW

WHEN Richard (Dick) Ross Langford started a small consulting surveying business in 1957, he could never have imagined that more than 60 years later, his business would be a leader in NSW's highly competitive and highly skilled survey industry.

Dick's philosophy was to equip his surveyors with the latest surveying technology to enable him to offer the highest standard of professional surveying services.

In 1974, Dick purchased the first electronic distance measurer (EDM) – a Hewlett Packard 3800 – which was a large, heavy and expensive piece of surveying equipment that very few

survey companies owned. Langford and Rowe Consulting Surveyors Pty Ltd continues this philosophy with its surveyors having the use of both long range and high definition laser scanners, UAVs and inertial GPS systems.

Langford and Rowe employs registered land surveyors and registered mining (open cut) surveyors to service mines throughout NSW.

The combination of UAV and laser scanner enables its surveyors to carry out any as-built survey efficiently, and accurately and supply every possible deliverable, from raw point clouds to 3D models.

More information: www.lrsurveyors.com.au.

Environmental package

NATIONAL

REVEGETATION and Erosion Control Services is a diverse and nimble company dedicated to civil construction, mining rehabilitation and maintenance, major earthworks, mass rock placement and environmental and erosion control projects.

The company operates out of NSW and services all states of Australia with dedication to getting the job done on time.

Revegetation and Erosion Control Services sticks by its statement of 'one contractor offering the complete service'.

The company prides itself on offering exactly that – taking projects right through from consultation and design right through to handover in house.

This eliminates the need for multiple contractors, lengthy wait times, and logistics and scheduling issues.

The use of its highly-trained and reliable workforce and fleet of plant and machinery allows it to efficiently and effectively deploy its resources to meet any challenge or any change in clients' circumstances in a timely manner.

For many years, Revegetation and Erosion Control Services has been focused on the long term environmental sustainability of land development projects, and will be most willing to assist in any civil construction or environmental requirements clients need.

For more information about the company, visit: www.revegservices.com.au.



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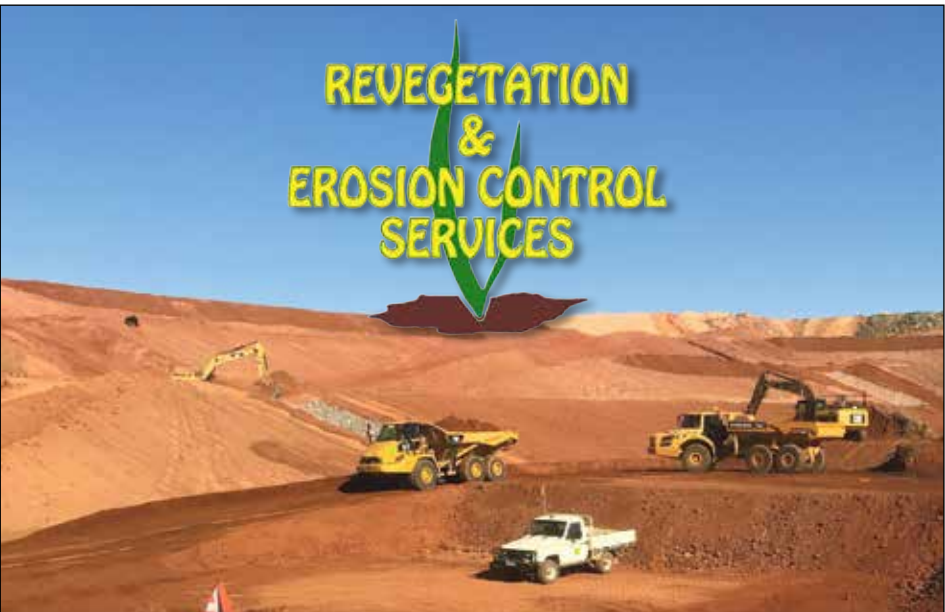
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EXPANDING HORIZONS

Northparkes mine is celebrating 25 years in operation and has big plans for the future with another block cave mine and capital works under way to improve processing capacity by 15pc.

The mine has always led the pack: it was the first in Australia to use block cave mining method and in 2015 reached 100pc production from automated loaders.

EMMA DAVIES

THE China Molybdenum Company (CMOC) and Sumitomo announced the final approval of an Expansion Project at CMOC-Northparkes Mines (Northparkes) in the Central West of New South Wales early this year, with main construction activities scheduled to commence this quarter.

While the project will include improvements to underground mining, ore processing and facilities to increase processing capacity by more than 15pc, to 7.6Mtpa, full benefits of the project are not expected to be realised till late 2020.

Northparkes managing director Hubert Lehman said the investment will be \$72M spread over two years.

"Following the announcement of our next block cave mine, E26 Lift 1 North earlier this year, this is another major investment in the future of our business," Mr Lehman said.

"This demonstrates CMOC's confidence in the sustainability and longevity of our operations, enabling us to achieve our vision of 'A century of mining together'."

The E26 Lift 1 North was announced in January and consists of 11km of underground development, an underground primary crusher, conveying systems and associated infrastructure.

It includes an upgrade to the ventilation system currently being developed, which will provide the new E26L1N mine with sufficient air flow to support development and production activities and will utilise an increased level of automation and digitisation, helping to deliver a safer and more productive mine.

The investment will be more than \$200m over a three-and-a-half year period, producing around 40mt of ore over a 10-year period. Construction commences in January



The company will invest \$72m into the expansion project.

with full production expected in mid-2022.

Comparatively, the new expansion project will be managed by an owner's team of Northparkes employees and a further 20 positions will be created to execute the project and an additional 100 contractors on-site during construction.

"This project is a major investment in the future of our business and a very exciting time for Northparkes," Mr Lehman said.

"As we are executing these major capital projects, our zero harm approach to every aspect of our operations will be at the forefront of our minds.

"We will continue to care for our people, our equipment, our environment and the community in which we live and work for years to come.

"We believe this approach is why we have been successful for over two decades, and it sets us up for decades to come."

25 years of operation

In August the mine marked 25 years of operations, celebrating key milestones such as being the first mine in Australia to use the highly efficient block cave mining method, and in 2015 becoming the world's most automated underground mine with 100pc of production from automated loaders.

On-site celebrations were held with Northparkes employees, Northparkes' owner and operator CMOC, and Joint Venture partners Sumitomo Mining Metal Oceania and Sumitomo Corporation Mineral Resources – which have been part of the Northparkes Joint Venture since its inception.

"When CMOC had the opportunity to purchase Northparkes back in 2013, they recognised the potential in not only the business and its future, but the people," Mr Li said.

"We are excited to watch Northparkes continue to grow and develop.

"The quality and excellence of the people at Northparkes, ultimately contribute to the success and reputation of our operation."

The company also celebrated the work of eight employees who reached 25 years of service at the site.

"Congratulations to Ian Cowle, Rob Cunningham, Dave Little, Tony Melhuish, Ian Rowe, Brad Mill, Alan Macdonald and Geoff Tilley," Mr Lehman said.

"This is an incredible milestone that needs to be recognised – we are extremely grateful to have these people a part of our Northparkes team.

"At the heart of Northparkes is our commitment to Zero Harm Operations.

"While this has been described in many different ways over the years, it has evolved into the way we work today."

A total of \$300m will be invested in Northparkes over a three-year period to support these projects, which Mr Lehman said demonstrates CMOC's confidence in the sustainability and longevity of the mine.

"We know the exploration potential of Northparkes and we believe we will discover more copper and gold deposits to take us even further into the future," he said.

"Northparkes is the world's most automated underground block-cave mine and we are proud of our history and achievements."

CMOC Group executive chairman and chief executive officer Steele Li said the company was excited to see the project come into fruition and to watch Northparkes continue to develop and grow.

"Northparkes plays a pivotal role in our strong and long-term presence in Australia as an internationally renowned mining company," Mr Li said.

Mr Lehman said that the approach includes a commitment to the community in which the staff live and work, with Northparkes assisting the growth of the Parkes and Forbes shires through salaries and funding programs for more than 20 years.

“The support and encouragement of our community, in particular both Parkes and Forbes Shire Councils, has been instrumental in our success,” Mr Lehman said.

“We are extremely proud of the positive and supportive relationships that have been built over the years.

“I would like to formally extend my thanks to both the local communities of Parkes and Forbes for their continued support.”

Mr Lehman said he had always been impressed with the passion and drive of the people who come to work each and every day.

“To all the people who work here today and to those that have come and gone, each and every one of you have played an integral part in what we are celebrating today,” he said.

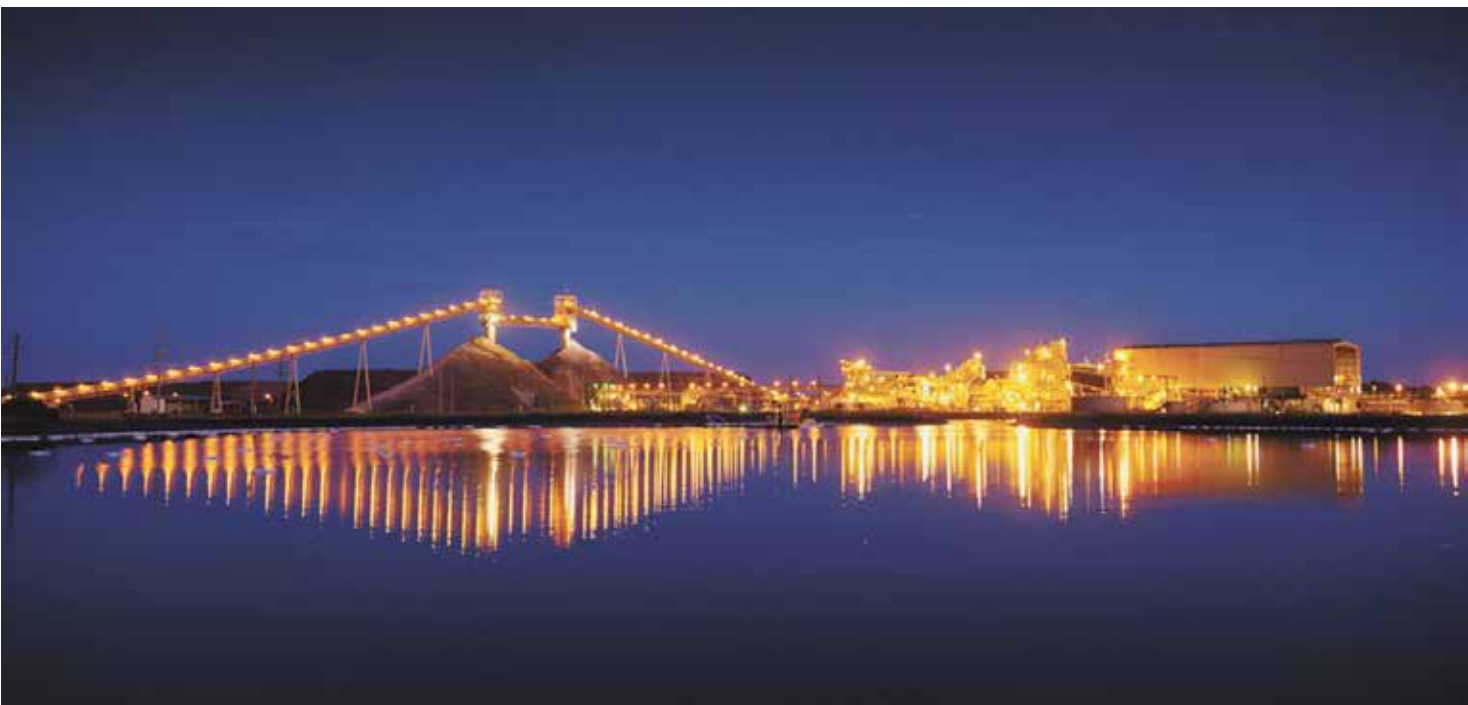
“The people are what make Northparkes the place it is today.”

Drought conditions

While Northparkes is confident in the longevity of its operations, there remain severe drought conditions in Central West NSW that could have impacts on the mine and surrounding communities.

The mine’s water supply comes from a variety of sources, including the Lachlan River, groundwater aquifers, rainfall and water recycled on site.

Despite the current drought conditions and the associated risks to the region,



North Parkes recently celebrated 25 years of operations.

Northparkes is confident in the ability of local councils and the water regulators in managing the situation with efficient use of available resources, ongoing water conservation measures and the continued implementation of water infrastructure projects.

Mr Lehman said that Northparkes had a longstanding valued relationship with both Parkes Shire Council, Forbes Shire Council and water regulators when it comes to operational water usage which has ensured a responsible and sustainable long-term supply of water to site.

“Parkes Shire Council has invested significantly in the water security of Parkes over the past five years and this proactive, integrated approach has strengthened our ability to withstand the current conditions,” Mr Lehman said.

“Water is our most important natural resource and we all have a responsibility to use it wisely.”

On-site water treatment facilities mean that low quality water can be made suitable for use and the company is committed to remaining focused on minimising and recycling fresh water where possible.

“We are proud to say that we recycle a high proportion of water on site, with a recycling and reusing rate of over 60pc,” Mr Lehman said.

“We have our own water licences, however we share infrastructure with the local councils.

“We have comprehensive management plans to monitor water quality and quantity.”

These include daily and weekly water

balances to measure the volume and quality of water inflows, current storage on site, usage, losses, and recycling.

“This information, plus predicted operational requirements and weather patterns, is used to plan for future water use,” he said.

Mr Lehman said continued collaboration with state and local governments and associated regulators is key to ensuring water security during the drought and that as part of its corporate social responsibility, Northparkes will continue planning for the future, by exploring various different options.

“As a business, we remain focused on looking for ways to conserve our fresh water usage onsite, particularly during this dire time,” he said.



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Image: ALG.

THE TRUMP CARD

Energy volatility is something that Tomago Aluminium, NSW's largest electricity consumer, has helped to regulate through the state's hottest summers. It has been a stalwart of the Hunter Valley since 1983, producing about 25pc of Australia's aluminium.

The 2022 closure of AGL's aging 1800MW Liddell Power Station in the Hunter Valley has been pushed back to April 2023 to help NSW cope with power uncertainties.

GERARD MCARTNEY

AUSTRALIA'S largest aluminium smelter, Tomago Aluminium, has been operational in the Hunter Valley region, about 13km north of Newcastle, 24/7 since 1983.

The smelter produces about 550,000t of remelt ingot, T-ingot, extrusion billet and rolling slab per year.

The independently operated Tomago operation is a joint venture between Rio Tinto (51.55pc), Gove Aluminium Finance (36.05pc) and Hydro Aluminium (12.40pc).

Aluminium has had a tough run in 2019, but Australia's aluminium industry could be one of the few benefactors from the US-China trade wars as it remains exempt from the 10pc tariff that foreign smelters were hit with, and American demand for the metal grows.

The Australian Government has already urged companies such as Alcoa and Tomago to not invoke the ire of Trump officials who could scrap the exemption to the tariff.

Heeding that warning could prove to be the way forward for an energy-intensive commodity that has been long suffering under increasingly volatile and expensive electricity prices.

The power crisis in the Hunter Valley has been an existential threat to Tomago Aluminium for quite some time but the company continues to go from strength to strength.

The company generates about \$1.5b annually and produces about 580,000t aluminium every year, providing about 25pc of Australia's aluminium, and exporting the remaining 90pc to the Asia-Pacific region.

The smelting process is electricity-intensive, with the smelter using about 10pc of NSW power supply.

The company has been instrumental in the Liddell Task Force which has pushed the power station closure out to 2023 as NSW looks to shore up its energy security.

As far back as 2015, Liddell power plant operator AGL announced its plans to close the 50-year-old plant in 2022, but in August 2019 announced its decision to push the



Aluminium Ingots.

closure back to April 2023 to ensure the reliability of power supplies during the 2022-2023 summer months.

Tomago chief executive, Matt Howell, told the *Australian Financial Review* that while his plant maybe responsible for 10pc of the state's energy consumption, NSW would be hit with large-scale blackouts if the smelter did not help to control loads over the summer months.

"It's true that our smelter is a large consumer of power," he said.

"But far from being a drain on power however, Tomago Aluminium is being increasingly called upon to act as a battery.

"It is the largest interruptible load in the country and precisely the reason the NSW grid can be stabilised in the event of a

system security threat."

And, in fact, Tomago's role as a stabilising force in the NSW energy market has been an ongoing saga as NSW coal plants continue to age.

In 2017, the company switched off three potlines to ease acute tensions as NSW baked through mid-40 degree heat and pushed power usage to record levels.

In 2018, the smelter was forced to close three pot lines for 45 minutes to one hour due to sky-rocketing electricity prices and poorly performing aluminium market.

A culture of safety

Tomago won the 2019 Hunter Valley Safety Awards' 'Golden Helmet' in the

Workplace Health and Safety Business of the Year Awards at a gala event held at Newcastle Ex-Servicemen's club in March.

Hunter Safety Awards Founder, Sarah-Jane Dunford, said Tomago Aluminium's ingrained workplace health and safety principles made it a stand-out leader with an enviable record.

"Tomago Aluminium's key philosophy behind its workplace health and safety program is 'Mates Looking after Mates', which encourages employees to speak up if they see a mate at risk," she said.

"The sense of community and the shared commitment to ensuring every person arrives safely, works in a safe environment, and goes home safely, is testament to the company recently reaching one million working hours without a serious or significant injury on site."

Tomago Aluminium People, Safety and Environment manager Simon Mitchell said it was a great honour to be recognised as WHS Business of the Year.

"As an employer of more than 1000 staff and contractors, we are constantly looking for ways to improve systems and processes to ensure every person is safe at work," Mr Mitchell said.

Central to the continued roll-out of the program was the recent development of the 'Coming Home' resource, a powerful video featuring current and past Tomago employees who have been involved in workplace incidents.

"The participants were very brave to share their personal experiences and their stories were real and emotional," Mr Mitchell said.

"We wanted to capture the hearts and minds of our employees and show the physical and mental health impacts a workplace incident has on the lives of employees, their families and friends.

"It was very powerful to watch, and everyone really related to their fellow workmates sharing their emotional stories in the hope that they could prevent this from happening to anyone else in the Tomago workplace."

Ten years with Tomago

NATIONAL

“THE place hasn’t burnt down yet, so that’s a tribute to the ER crews.”

So says Focus on Safety chief executive and technical rescue division trainer Scott Morante, who’s joking, of course, but his work is deadly serious.

This year is the 10th at Tomago Aluminium for Focus on Safety, where Mr Morante has been training the emergency response team to respond to some of the most volatile working conditions the mining industry can throw at it.

“They deal with molten metal, fire, confined spaces and heights,” he said.

“It’s very specialised training, you’re talking about molten metal.

“There are four emergency response crews that I train weekly.

“They have very specific equipment, they have one of the only two dry-chem tankers in Australia.”

Focus on Safety’s commitment to Tomago has kept the emergency response crews safe and at the top of their game – with Mr Morante excited for the future of their partnership.

“We’ve been doing emergency response training for 10 years, we’re hoping to be doing it for longer,” he said.

Emergency response courses are













Every Wednesday Mr Morante (right) trains the high-calibre emergency response crews at Tomago Aluminium.

just one of Focus on Safety’s fully customisable courses, as well as many standardised modules.

Whether your business needs ongoing training, or one-off training, Focus on Safety can provide the expert training to keep people safe.

For more safety advice and information on Focus on Safety, contact the industry training specialists at: admin@focusonsafety.com.au.





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FOR nearly 200 years, Bureau Veritas has been building on its reputation as the unrivalled global testing, inspection and certification company.

Today, the company operates in 140 countries, and has more than 1500 laboratories and offices, employing more than 75,000 experienced professionals.

Bureau Veritas continues to provide testing, inspection and certification services for a diverse range of industry clients from international mining, oil and gas clients to the clients in the construction and manufacturing industries, and everything in between.

Bureau Veritas has been servicing Tomago Aluminium in NSW for 25 years, and has provided the mine with statutory inspections of all highly specialised cranes such as pot tending assemblies, furnace tending assemblies and casthouse furnace tending assemblies, as well as statutory inspections of all other overhead cranes (single girder, twin girder and slewing jib), and all highly specialised lifting jigs.

It also provides Tomago with routine non-destructive testing of major operational equipment and vibration analysis of site-critical equipment.

The Tomago team is spearheaded by Ben Robinson and Dion Jeffries, both experienced technicians with

sound knowledge of Tomago's systems, processes and equipment, as well as a good working relationship with the Tomago staff.

They are fully involved with each inspection each step of the way – from the planning stage right through to the final report.

General manager of industry east region, Michael Hass said there had been some good wins at Tomago that reaffirmed the importance of the work the company carries out.

"Our team identified a cracked tie rod in the hook assembly on a CHFTA using ultrasonics," he said.

"It resulted in the hook assembly being changed out and preventing something potentially catastrophic from happening should the tie fail in service.

"They also found a suspected turning fault in a DC motor in the paste plant using vibration analysis."

The company's onsite achievements have been formally recognised at the Tomago Aluminium Supplier Awards, with Bureau Veritas taking out the Tier 3 Onsite Services Supplier of the Year in 2016 and 2017, and in 2018 winning the Environment Health and Safety award.

Bureau Veritas has proven itself an indispensable part of the team at Tomago for a quarter of a century, and is looking forward to continual improvement through the use of new technology to aid Tomago's operations into the future.



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POWER AND PASSION

ONE of WA's first female geologists, Dr Erica Smyth, was named the winner of the Business category for this year's WA Australian of the Year Awards, which honour outstanding Western Australians who have made a positive impact on the lives of others. Dr Smyth – who was made a Companion of the Order of Australia last year – is renowned for her contribution to WA's resources sector over the past 45 years, and long-standing commitment to the community, which extends from charitable organisations to medical research, high education, science, technology, aged care, women's interests and the arts. Ray Chan spoke to Dr Forsyth about her brilliant career, and how, as a trail-blazer for gender equality within her field, she has been actively engaged in enabling women to create their own future.

Q. You were born in Geraldton, WA. Can you tell us what prompted you to pursue a career in geology, at a time when it was arguably a male-dominated industry?

I fell into geology (at UWA) as I only ever added it to my science degree when I needed a fourth first year subject and I did not want to cut up frogs.

I quickly found minerals, crystals and fossils fascinating and there was a lot of excitement in the nickel and iron ore industries (and the ASX) in the early 1970s, so my choice to shift from a major in chemistry to a double major in geology in my second year just seemed to happen.

I did not think too hard about the gender ratios in geology although I was very aware of them as by the time I got to third year, there were only four women in a class of about 40.

Q. Did you have trouble getting a job and how did you progress through the ranks?

One of my friends in early 1974 suggested I talk to a contact he had in BHP, and after my interview, I was offered a job in Newman with Mt Newman Mining Company (a JV operated by BHP) as an exploration geologist.

As my career developed I had a couple of advantages – as a female geologist I was unusual and so people remembered me – and as a single person I was always willing to decide and move quickly so I could fill personnel gaps as they happened.

Q. Working in sometimes harsh environments may not seem appealing to many females. Was it a bit of a culture shock, or were you prepared for or aware of the conditions?

I was excited by the adventure of seeing different places and meeting new people.

I was in some harsh environments both in the deserts of Australia and living for a summer in far northern Canada but wow! At times it was too hot for me or too cold but I did not dwell on the bits I did not enjoy - there was often a wonderful night sky or a helicopter ride that would offset the climatic discomfort.

Q. Was it difficult working with your male peers in the early stages?

It was not all perfect and sometimes I knew I cramped their style a bit but most men I have worked with looked out for me. Occasionally, like everyone experiences in life, there were people I would not have chosen as my friends for, say, a camping trip to a remote location, but usually I could find a way to limit my interaction with the few people I could not get along with so I cannot really complain.

Q. Were you paid the same as males at the same level of competency?

I was promoted fairly quickly throughout my career and so often I would be at the lower end of the pay grade scale, but I knew if I performed there was always recognition at the next pay review.

I knew my comparison ratio so I only worried if I felt it was unfair. I did not spend a lot of time comparing salaries as I was more concerned about whether I had an interesting job.

Q. How did you overcome obstacles or possible perceptions that females were less prepared for working at the mines?

In the early part of my studies and



Dr Smyth is passionate about the mining industry, which she sees as becoming stronger every day as Australia supplies the increasing demand for new ways to capture, store and use energy and electronics.

career, women were not allowed to go underground.

I thought this was stupid but since I did not want to work underground, I was more focused on getting women to join exploration teams.

By the early 1980s BHP Minerals had women as geologists, geophysicists and field assistants.

In my working life I got underground a number of times in places like Mt Isa, Broken Hill, the Witwatersrand, Cannington and the uranium mines in the USA, but I never really wanted to work there.

I admire the women who broke through that barrier as it really was a tough and dangerous work environment.

Q. Back when you started, was the culture different at the minesites? Was it more blokey?

These days of course, most mining companies are very inclusive and have programs to ensure strict behaviour standards are met by employees.

Yes, most mine sites and some exploration camps were pretty blokey.

I was careful not to descend to the lowest common denominator of bad language and crude jokes – I tried to show I expected better and generally that was delivered.

In some circumstances the men around me intervened if they thought other men had gone too far – that was a real compliment in my eyes.

I stood out so most of the men knew who I was; and yes, occasionally I needed to stare some of them down.

Q. Do you believe that your success has prompted more females to enter the mining industry?



Dr Smyth in her younger days as a geologist.

I hope so – only they can answer that.

Q. What's your advice to females thinking of entering the industry?

The industry is diverse and has many leading edge innovations and opportunities so don't dismiss the chances it offers.

Be aware of the impact of your own actions and words. You will create respect if you deliver it yourself in how you interact with others.

(CONTINUED OVER)

(CONTINUED FROM PAGE 37)

There are few other industries where women can develop a well-paid and interesting career in a field that creates new wealth for the country – enabling our education, health and social safety nets to be funded.

Q. Tell us more about your mentoring roles.

If women seek me out “for a coffee” I try to oblige and hope to be an active listener.

Everyone faces their own challenges and if I can show them they are not alone – it is often a help.

I am also a mentor with a couple of formal programs and then I am “matched” with a stranger. Generally I find a new friend and expand my network.

Q. You wear many hats, including being director of many companies, through mentoring roles with WIMWA, as chair of the UWA Centenary Trust for Women, and as ambassador for 100 Women, a philanthropy group that works to provide grants for women in health, safety and education. What is your aim of sitting on these boards?

Being a Non-Executive Director is very different from hands-on management – it is not for everyone.

Transitioning from hands-on daily decision-making to providing constructive challenge and governance is not easy.

The most enjoyable boards are where there is respect around the table, both within the board itself and between the board and senior executives.

I only really enjoy the NED challenges



Dr Smith with her WA Australian of the Year Business award.

when the purpose of the company is more than “just making money”.

The products it produces, the footprint it makes and the culture of how it treats its employees and local communities also need to be things I can be proud of.

I particularly enjoy companies who are adding new knowledge or methods though innovation and research.

Q. Tell us more about your interest in diabetes research.

I was in my first real permanent job in Newman in 1974 when I developed Type 1 diabetes and had to be flown to Perth by the RFDS.

This is an auto-immune disease where you no longer produce insulin so it needs to be injected.

I realised I would need to learn as much as possible and keep control of my own health, and I am pleased to say that even after living with this disease for 45 years, I have not developed any of the normal complications.

I also know I am only alive because of excellent medical research, and so in 1998, when asked to join a fund raiser to support diabetes research in WA, I was pleased to help.

We raised enough funds to recruit Professor Grant Morahan to WA and we established the Centre for Diabetes Research at the (now) Harry Perkins Institute for Medical Research.

This led me to going the board of the Diabetes Research Foundation of WA (which funds two research projects a year in WA) and later to becoming Chair of this board.

After 20 years I have left the board but am still a strong supporter of the research it enables here in WA into both the causes of, and preventing the complications associated with, all types of diabetes.

Q. Currently, what keeps Erica Smyth occupied? Have you retired from the industry (apart from serving as a company director)?

I have not retired, but have not had a day job for the past 15 years after I left Woodside.

I now think of myself as semi-working as I am on a number of private, research, advisory, not-for-profit and regulatory boards. I no longer sit on any ASX listed boards.

I do this because I continue to be curious about the world around me and change

is happening rapidly as we move into the Industry 4.0 digital world.

This keeps me very interested and just as I think about being “experienced and knowledgeable”, I suddenly find there is so much more to learn and do.

Q. What do you do in your spare time, what interests do you have?

My real passion is still travel – generally to more remote parts of the world with interesting geology, geography and flora and fauna.

Since 2004 I have been able to maintain a major overseas trip every year (Antarctica, Botswana, Greenland, PNG. etc) as well as continuing to see Australasia.

I also enjoy fishing, AFL, live theatre, and a good book.

Q. Any last thoughts on the state of the mining industry?

I see the uptick in the mining industry becoming stronger every day as we supply the increasing demand for new ways to capture, store and use energy and electronics.

These need a complex mix of metals and rare earths, and Australia should continue to be a major world player if we keep pace with the new ways of exploration, extraction and value add.

Most importantly we cannot just do things as we have in the past – we need to also actively recruit young, digitally aware, people into our industry and bring their disruptive thinking together with the minds of the hands-on experience we already have.

Centenary reflected in art

RAY CHAN
NATIONAL

TO mark BP's centenary this year, the company has commissioned five established and emerging artists from around the country whose inspired artworks will form an exhibition that represents BP's contribution to Australia through the decades.

BP Australia president Andy Holmes from beginnings as a single fuel depot in Western Australia in 1919, BP now touches the lives of millions of Australians every day.

“Through the centenary artists program, we’ve represented the far and wide regions of the country, offering a glimpse of the role BP has played – and continues to play – in advancing energy in Australia,” he said.

“For 100 years BP has delivered energy for heat, power and transportation.

A lot has changed during this time, but one thing remains the same: BP is committed to meeting the ever-changing needs of busy Australians in a safe, innovative and sustainable way.”

The artwork will be displayed at events in Melbourne, Canberra, Sydney and Perth over the coming months.

Artist profiles:

• **Charmaine Pwerle** – Alice Springs

Defining a new representation of traditional indigenous art, Charmaine's interpretation of BP's Centenary hails from the stories passed down from her ancestors, in particular her grandmother, the late Minnie Pwerle, with the main focus in the piece being the ‘Aweyle Atnwegerrp’ dreamtime.



Charmaine Pwerle's artwork.



Marc Leib's glass vessels.

The small and large semi-circular shapes of the piece represent Australia's hills and valleys, and the lines are that of dry riverbeds and streams, winding across the canvas as they do at Utopia.

• **Jesse Marlow** – Melbourne

Award-winning Melbourne photographer Jesse Marlow presents a glimpse into life behind the wheel of a BP tanker.

The series focuses on the roads travelled between Darwin and Alice Springs, taking

a candid perspective on what life is like covering great distances to deliver fuel to the nation.

• **Marc Leib** – Perth

Glass artist Marc Leib's contribution to the Centenary series is through six vessels, representative of BP's humble beginnings, representing the growth of the company for the last 100 years via employment, revenue and expansion.

Each colour and pattern represents a



Nicole van Dijk's painting.

different element of BP's footprint into water, wind and oil.

• **Nicole Van Dijk** – Melbourne

‘Possible Landscape’ by Nicole van Dijk depicts a landscape in Papunya, one of the communities hardest hit by the petrol sniffing epidemic.

The waterhole remains, the green reeds flourish - beyond the frame of this landscape, lives were saved due to the introduction of the lower emission fuel, Opal.

• **Ricky Gestro** – Fremantle

Perth-based photographer Ricky Gestro explores the realities and possibilities of BP's past, present and future in a three-part photo series.

Focusing on the forecourt and BP's service station customers, Ricky's photography speaks to BP's diverse and pioneering technology as well as capturing futuristic tones and BP's recognisable green branding.

Customised equipment, experienced staff

NATIONAL

BASED in Perth, Assent Engineering has built its reputation for excellence off its highly qualified staff who have decades of combined experience across design, engineering, manufacturing and maintenance.

The team includes a mechanical engineer, mechanical draftsman, mechanic/fitter, and a team of highly skilled boilermakers.

The fully equipped Forrestfield workshop can complete manufacturing projects, maintenance, repairs and modifications to drilling, mining and transport equipment.

Mechanical engineer, Tony Graham, said that the team was passionate about the custom equipment it tailor makes for its clients.

“We will work with clients to carefully assess their requirements and produce solutions that are both practical and cost effective,” he said.

“Our knowledge of the industry means we have an in-depth understanding of Australian standards and specific minesite requirements.

“This means we’re able to produce compliant equipment ready for immediate use.”

All of the Assent team are highly experienced and well respected in their fields and this, Mr Graham said, is the company’s point of difference.

“Our goal is simple, we want to help our



Assent Engineering’s state-of-the-art Forrestfield workshop has the facilities to complete major mining projects from maintenance right through to design and manufacture of custom equipment.

clients overcome the unique challenges of their projects,” he said.

“Whether it’s the breakdown of an important piece of equipment, or a modification required for a unique issue on

site, we are dedicated to finding a solution.”

Whether clients need mechanical drafting, specialised mechanical fitting, welding inspection and certification, engineering consulting, custom equipment

or modification of existing equipment, Assent Engineering is there to help.

For more information about Assent Engineering’s range of services visit: www.assentengineering.com.au.



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Aussie Pump's range of 'bullet proof' pumps continues to evolve with the changing needs of the mining industry.

Mid-range cleaners with power

NATIONAL

AUSTRALIAN Pump Industries' evolution as Australia's leading designer, manufacturer and supplier of heavy-duty mining style pressure cleaners began 26 years ago.

The original idea for a "bullet-proof", pressure cleaner that suited mining and quarrying applications was generated by requests from operators.

Aussie Pumps chief engineer John Hales said there had been a lot of confusion by users who thought that buying super expensive, ultra high pressure machines would solve cleaning problems.

"Those UHP designs have their place, but are dangerous and expensive," he said.

Instead the company decided to make machines in the 5000 to 7000 PSI category.

These less expensive, production line units are highly capable when used with the right accessories.

The big breakthrough came with the introduction of Aussie Pumps' 5000 PSI Scud design.

Mines operators quickly came to appreciate the ergonomics of the Scud with its "no sharps" registered frame.

"The whole concept of the Scud was to make a machine that was safer but more capable than other commercial style pressure cleaners," Mr Hales said.

Market surveys work

The company undertook a survey of mining operations across the country.

It found that there were a host of 3000 and 4000 PSI low horse power pressure cleaners being used.

There was a gap going up to the big machines with pressure capabilities of in excess of 10,000 PSI.

"The middle ground was ignored," Mr Hales said.

The vacuum in the market led Mr Hales to come up with the design for the Aussie Predator, a 5000 PSI diesel drive unit built to mine specification requirements.

It was an instant success because it fulfilled the role that many of the big UHP machines were operating.

The heart of the system was a super heavy duty Big Bert Bertolini Triple X.

The pumps capability delivered extra capability at a reasonable price.

Aussie takes the gamble

Based on market research, the company decided to start the ball rolling with production line quantities of up to 25 units at a time.

Building in volume meant real economies of scale and of course that the machines being offered to the market were not "orphans", but bought against specific customer requirements.

"By asking the mines what they wanted, we were able to serve up machines that had been carefully prototyped and trialled, that exceeded the requirements and expectations of the users," Mr Hales said.

"Machines were small and compact enough to be trucked out to sites and hooked up to tankers for water supply.

Thus mobile cleaning could be done in the field even on big face shovels, or even breakdowns of big dump trucks or dozers."

For extreme applications, the company offered a heavy duty German turbo that

is able to take the 5000 PSI capability and extends its effective working pressure to 8500 PSI.

"Those big German turbos rattle like a machine gun when they are used with a 5000 PSI Predator and virtually double the effectiveness of the machine in many applications," Mr Hales said.

"Chopping, hardened clay off a crawler dozer's tracks or cleaning the mud of the under carriage of a dump truck became an easy task."

500 bar ... enter the raptor

Aussie's Raptor hit the market eight and a half years ago with a tremendous impact by offering the customers the same size machine as the Predator but with 7300 PSI capabilities.

The company used the Big Bert pumps again but this time in the RAS series with 316 stainless steel heads and huge crank cases to keep the pumps running cool and problem free.

Stainless steel valves, unique sealing devices and big suction ports enable these pumps to run 10-hour shifts, week in, week out.

Powered by Kohler twin cylinder diesels, they were able to do a mighty job on mines, cutting times for cost-conscious operations managers.

"We are able to use the same basic Scud design, the same engine and many of the same components for the Raptors as we use for Predators," Mr Hales said.

"Of course, the accessories including unloaders, guns, hoses and PPE clothing all had to be upgraded for those higher pressures."

The demand for electric Aussie scuds

When companies experienced the

savings and flexibility of these new revolutionary machines, they started asking for electric drive units for use in workshops and wash bays.

The result was the development of Aussie's Scud design (no sharps) Hurricane 5000 PSI and its big brother the Raptor E.

The Hurricane uses the "Big Bert" triplex 5000 PSI pump which is powered by a 12.5 kW three-phase, four-pole motor.

Pumps and motors are slow speed for guaranteed long life and reliability.

The machines were originally featured in heavy duty galvanised scud style frames with four big wheels for ease of movement.

Operator convenience was a key motivation of the design with safety also being a major factor.

Like the engine driven Predators and Raptors in the range, Aussie made sure that the machines all incorporated the "Aussie Safety Pack", which includes the most advanced safety equipment, including an integrated safety valve to protect the machine and operator from pressure spikes or unauthorised tampering with the pressure setting of the machine.

A thermal dump valve was also incorporated to compensate for the machines being left on bypass for excessive periods of time.

The Aussie thermal dump activated when the water temperature in the pump head reaching 60 degrees Celsius.

At that point the valve opens and dumps water to the amount of about "a cup full", allowing cold water into the pump to keep the machine running cool and to avoid any potential pump failures.

“ASP is absolutely essential and is now mandatory in our entire cold water production line program,” Mr Hales said.

Safety first

The Australian and New Zealand Safety Standards represent a breakthrough for mine operators when it comes to the safe operation of high pressure and ultra-high pressure equipment.

Designed to minimise injury and loss of life, the safety standards break the machines into A and B class categories.

Class B machines include all of the UHP units being used by mines as well as other machines even down as low as 4000 and 5000 PSI operations.

Having certified operators (by a registered RTO) with renewables every two years could be an issue for many operators.

Australian Pumps was the first to develop Predator machines in the 5000 PSI range that are classed as A with no operator certification required.

“This was a big breakthrough in high pressure water blaster engineering as it meant that the capability remained without the restrictions for operator certification,” Mr Hales said.

Producing these machines in Class A configuration doesn’t eliminate the need for operator training.

On the contrary, all operators on mines using high pressure cleaning equipment should be equipped with safety protection clothing and be trained in the basics of pressure cleaner operation, maintenance and safety.

To that end Aussie Pumps is developing a free Class A and Class B Aussie safe operator module training in the form of movie and presentation to allow operator to be trained anywhere in the country for



Aussie Pumps’ best-in-class pumps are all developed using cutting edge market research.

safe operation of pressure cleaners.

“We stress that our safety program covers Class A and B machines but does not represent itself as being a

substitute for a RTO certification course as recommended by the new safety standards,” Mr Hales said.

The course stresses the need for

companies employing pressure cleaner operators whether they are contractors or mine operators, to ensure that there staff are adequately protected with PPE from boots through to overalls, aprons, gloves and even helmets and visors with up to 500 BAR proof visors.

That equipment is all part of Aussie’s Safe Operator program, designed to eliminate high pressure water blaster work place injuries.

Aussie goes stainless

With a clear record of being ahead of the market not just in Australia but including European and US manufactures, Australian Pumps has now moved to the entire family of Scud machines from 3000 PSI to 7000 PSI being built in a stainless steel configuration.

That makes them suitable not just for corrosive mine environments but also any costal application including gas platforms, dry docks, ship maintenance or steel work protection where corrosion is an issue.

“We are very proud of this journey to develop what we believe is the world’s best mining pressure cleaners,” Mr Hales said.

“The machines are operating in oil and gas projects on the Kenyan Somalia border, right through the south pacific islands and in mining sites in the highlands of New Guinea.

“We designed in features to protect operators and to protect the machine so customers get the longest conceivable life and the most cost efficient cleaning result.

“We are always looking for safer, smarter and faster results for our customers.

“They come first, not our perceptions.”

The 500th Australian bucket

NATIONAL

LIEBHERR-AUSTRALIA’S fabrication workshop manufactured its 500th bucket in the Adelaide-based head office complex in October.

The 47.5m3 bucket that went to a valued coal customer in Queensland is a mark of the success of the facility, which will achieve another milestone – 25 years of production – in 2020.

Liebherr-Australia’s fabrication workshop manufactures buckets for the entire Liebherr mining excavator range from 8m3 to 50m3, weighing up to 45t with a maximum capacity of over 100t.

While traditionally manufactured alongside the excavators in Colmar (France), original fit buckets are now supplied exclusively from the local facility, which also manufactures second fit buckets for the market.

Additionally, Liebherr-Australia uses local, Australian-based suppliers.

Liebherr-Australia fabrication manager John Quinlan said that growth of the business in recent years had been outstanding.

“The number of buckets Adelaide are manufacturing show strong growth



Liebherr has just reached the 500-bucket milestone from its Adelaide-based factory.

over the past three years, enabling diversification into dozer blade manufacturing and refurbishment work in booms, buckets and undercarriage, allowing us to provide an improved service nationally,” he said.

Each bucket takes about 20 weeks to design and manufacture, with a team of more than 60 OEM-trained welders and boilermakers, supported by highly qualified welding inspectors and engineers within the fabrication team.

One of those team members, Paul Hermann, technical manager for fabrication and production, has been with Liebherr-Australia for more than 23 years, and has seen the growth and expansion of the fabrication facility.

“I starting working for Liebherr as a boilermaker in 1996, building the occasional R 996 bucket, but mostly buckets for midsized machines,” Mr Hermann said.

“My role has changed several times over the years, from leading hand, to management roles within fabrication.

“Liebherr-Australia’s fabrication department has provided a very rewarding and challenging career.”

Liebherr-Australia’s fabrication department works towards continuous improvement of its services countrywide, including increasing the facility’s production capacity, as well as introducing new services.

“We have previously offered buckets with minimal wear plate arrangement that have a shorter lifespan but remain cost effective based upon life hours to cost ratio,” Mr Quinlan said.

“The demand for this type of bucket is returning so we are working on creating new designs to better suit the modern market.

“In particular, a bucket that can have the basket readily changed at low cost.

“We are already well established in the refurbishment market and adding to our product range by developing a recyclable bucket is an extension of this refurbishment work.

“These developments will allow us to remain ahead of market demand.”

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Powering up plant reliability

NATIONAL

VOLTEX Power Engineers is experienced with major clients and projects in the mining industry.

This means that the company speaks the language of its clients.

Voltex specialises in HV power systems, providing electrical engineering design of power protection, control and monitoring systems, through to field testing and commissioning services, ensuring the safe and reliable performance of all critical power system assets.

Recent successful mining projects include:

- Site-wide power systems review for BHP Olympic Dam;
- Protection systems and IEC61850 network design and commissioning for 456 relays, and arc flash studies for 179 substations at Cobre Panama for First Quantum Mining;
- Power system design, commissioning and maintenance for Newcrest Lihir Gold;
- HA classification and compliance to AS60079 for CS Energy's Kogan Creek Power Station; and
- HV audits for MMG's Dugald River mine.

The company's principals have more than 100 years' experience in managing electrical risks and improving plant reliability.

Its staff work with clients to identify and



Voltex combines more than 100 years' experience in managing electrical risks and improving plant reliability.

troubleshoot issues in safety, criticality and compliance, and reducing unplanned outages and downtime so that they can focus more on their business.

With personnel exposure from all the major manufacturers, clients aren't paying for their field staff to "learn on the job".

Voltex is familiar with all types of electrical power equipment.

The company can provide accredited HV electrical auditors, hazardous area auditors (classification and design), and electrical engineering managers (Qld Coal mines).

Voltex is committed to an organisational culture of integrity in everything it does.

This means if it says it will do something, then it delivers on the promise.

Voltex core values are excellence in engineering, candour in communication, and reliability in reporting.

By providing advice to clients on what they need to know, not what they might want to hear, Voltex proposes solutions to minimise risks, to people, property and profitability.

More information: info@voltex.com.au.



HA AUDITORS ELECTRICAL EQUIPMENT IN HAZARDOUS AREAS

Voltex Power Engineers are accredited in the

- Design
- Classification
- Inspection
- Maintenance

of electrical equipment in hazardous areas (EEHA), with a number of Accredited HA Auditors available to assist with compliance for your project. Voltex provide HA Audit Guidelines for large projects to avoid unexpected delays in the auditing process, and to advise what documentation and inspections will be required.

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Voltex can assist in preparation of HA Verification Dossiers, whether for new installations, or if required by our Compliance reviews.



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A Noble game chain-ger

NATIONAL

A NOBLE & Son Limited (Nobles) has launched a new range of Grade 100 lifting chain, components and slings, named NOBLE10.

The chain slings will be offered pre-assembled or made-to-order for Nobles' customers nationally.

They come in five chain sizes from 8 to 20mm in diameter, together with enlarged master-links, optional grab hook shorteners and a choice of self-locking or safety latch hooks.

NOBLE10 is designed, manufactured and rigorously tested to Australian Standards and is 100pc exclusively imported by Nobles, Australia's leading lifting and rigging specialists.

While Nobles will continue to sell premium European grade 100 and locally made grade 80, the new NOBLE10 range will be offered to Nobles' customers at grade 80 equivalent pricing.

Nobles managing director Guy Roberts said Nobles was highly trusted by customers for its technical expertise and product quality.

"We have gone to great lengths to source and bring them a great quality grade 100 chain sling at a great price," he said.

"We fully expect that, over time, NOBLE10 will become the benchmark for high quality, high value chain slings in



Nobles has launched a new, high quality grade 100 lifting chain sling range, without the premium price tag.

the Australian market.
"In short, we believe it really will be a game changer for the lifting and rigging industry".

To mark the launch of NOBLE10 in October, Nobles is giving its customers a special behind-the-scenes look at the work its team has done over the past 12

months, to bring the product to market, via short video interviews on its website.

In addition, Nobles is offering visitors to its website the chance to win a trip for two to the UK in June 2020, including flights, three nights' accommodation and VIP tickets to attend The Strongman Classic at The Royal Albert Hall in London.

Full NOBLE10 product specifications and an online form to enter the competition are now available at www.nobles.com.au/noble10.

To enquire about a quote or place an order for NOBLE10, please contact Nobles via email at sales@nobles.com.au or phone 1300 711 559.

Jordan "Biggie" Steffens
Australia's most powerful man

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A TRIP TO
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Introducing NOBLE10™, Nobles' new Grade 100 chain lifting system.

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Go to nobles.com.au/noble10 to see 'Biggie' meet the team behind the new NOBLE10™, and for your chance to win a trip for two to see The Strongman Classic at The Royal Albert Hall in London*.

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* Conditions apply. See nobles.com.au/noble10 for details.



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& RIGGING SPECIALISTS



A Caterpillar DTH hammer with Cat bit.

The Cat is in the hole

NATIONAL

CATERPILLAR has introduced the first Cat down-the-hole hammer and bits for blasthole drilling, which are designed for the most severe blasthole drilling applications, yet cost-effective for a wide range of drilling needs.

The new Cat DTH Hammer is 152mm (6in) in diameter and is the first to be introduced in the new DTH line.

Its valved design provides reliable operation, low air consumption, easier maintenance and cost-effective rebuild.

The piston design delivers long life and efficient energy transfer.

The new hammer is rated to run with compressed air systems driving working pressures up to 34.5 bar (500psi).

This additional back-head pressure, when combined with corresponding airflow demanded, generates more blows-per-minute to generate faster penetration rates in the hardest of materials.

Caterpillar also is introducing bits for DTH drilling.

Several different configurations of 171mm (6.75in.) bits are now available in both standard and heavy-duty versions to allow matching the bit to the rock characteristics and job requirements.

The bit selections include a variety of carbide shapes (spherical, ballistic) and face shapes (concave, flat, convex).

Cat bits are optimised for high wear resistance and improved rock chipping.

The aggressive, long-lasting cutting structure in conjunction with the efficient Cat DTH Hammer delivers a superior rate of penetration.

Caterpillar's advanced materials and heat treatment technology used in the DTH products yield longer life and result in lower overall drilling costs in demanding conditions.

In head-to-head tests conducted in iron ore and quarry applications, Cat DTH hammers and bits demonstrated significantly lower total cost of drilling.



For more information about Mudex, visit: www.mudex.com.au

Innovation with drilling fluids

NATIONAL

FROM the beginning of Mudex in 2014, innovation has been at the forefront of the company's driving passion to bring new products to the market.

Many customers want simpler mud programs that run fewer products with a broader range of applications.

There is a big push from the drilling industry for one-drum and one-sack products and rather than have five or six products on site, customers want to run two to three products — or even less if possible.

This reduction helps to reduce waste and confusion with mud programs and also reduces costs.

Solids control equipment

As sister company to Mudex, Spinex has developed and patented a revolutionary centrifuge — The Mud Spinner — which is specifically designed for use in the diamond drilling market.

The prototype unit has been through significant field trials with great success and now the first production unit has gone into the field for the final testing before full production commences.

Four model designs are planned:

- Heli portable
- Underground unit
- Trailer/skid mounted
- Jack up sloop style unit with built in mud tanks

These units will outperform any other diamond drilling solids unit on the market for price, simplicity and effectiveness.

In conjunction with The Mud Spinner, Spinex is developing simple to use and low-cost mixing equipment and fluid injection units.

The injection unit is purposely built to feed the drilling fluids directly into

the mud pump which will give the ability to do away with or minimise mixing equipment needed on site.

A standardised injection system will lead to reduced waste, and greater consistency with mud programs and an improvement in drilling performance.

More information can be found at www.spinex.com.au

New products

Rather than be a 'me too' company and offer the same everyday products with an attitude of 'this is our product line, what would you like to buy?', Mudex has the philosophy of 'Tell us what you want, and we will make it'.

Customers have been very vocal regarding what new products they would like to see in drilling fluids and what will help them to achieve the best results while also reducing their volume and costs.

Mudex engages with site staff at all levels to offer new and innovative products that are easy to use, cost-effective and work.

Many of the sites that Mudex deal with are using highly mineralised water for the makeup fluid used in the mud programs.

The company has developed a hostile environment polymer system designed to maximise core recovery and performance in diamond drilling operations.

These polymers will work in all water types from hyper saline water to water with low to high pH and extremely high mineralisation, such as calcium and magnesium with an emphasis on soluble aluminium and iron.

Lost circulation is a big issue for many sites and the cost of transporting water can be very expensive.

Mudex has developed some very novel and innovative lost circulation material that is a simple, convenient, fast acting

and extremely cost-effective solution in most lost circulation conditions, including fractures and weak channels to underground crossflows and vugular formations.

The lost circulation product is formulated specifically for the diamond drilling market but may be utilised in any drilling programs.

Packaging

Mudex has recently invested in some very unique packaging equipment that allows it to offer multiple size and styles — it has everything from environmentally-friendly packaging to types that will handle the most arduous trips to remotes sites.

The company also supplies drum cradles which create a safer work environment by reducing manual handling and the risk of slips, trips and falls around the mud tanks.

The Mudex Mud Drum Cradle eliminates spills around the mud tank, and makes it easier for the drilling crew to deliver a consistent dosage of product while spending less time mixing muds.

To date Mudex has been very successful at reducing the cost of the drilling fluids by reducing the number of different products on-site, and by reducing the volume of product needed thereby reducing wastage.

The company prides itself in the ability to work closely with customers to deliver what is needed, and welcomes the opportunity to develop other products or equipment that can improve the safety, productivity and value of the drilling process.

For more information please contact:

Dave Williams

Manager

dwilliams@mudex.com.au

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Experienced drill services and solutions

WA

PROFILE Drilling is a privately owned, Perth-based company offering reverse circulation mineral exploration services and grade control and water boring capabilities.

Its services include (but are not limited to) remote exploration projects via self-contained exploration camps, to on-mine resource drilling programs capable of exceeding depths of more than 600m.

With a fleet of modern and well-equipped high capacity rigs and support vehicles on 8X8 trucks, Profile Drilling is able to quickly and effectively meet the needs of its clients Australia-wide.

Operations manager Grant Ingram said the company prided itself on the ability to provide innovative solutions

to any problem that clients may have experienced.

Mr Ingram said that Profile Drillings' experienced crews ensured minimal downtime while operating to maximum efficiency without compromising the quality of the client's needs and requirements.

"We have a commitment to continuous improvement in safety and drilling solutions without compromising production standards with our objective to provide a comprehensive drilling service second to none," he said.

"With the combination Profile offers to only provide the most experienced drillers, support staff and crews along with providing modern, well-maintained equipment, we are able to provide our clients with a safe, cost-effective service."

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



Profile Drilling's experienced crews ensure minimal down time and maximum efficiency on site.

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Redesigned for mining needs



The new TLT-Turbo auxiliary and booster fan range is available to clients worldwide.

GLOBAL ventilation fans and systems manufacturer, TLT-Turbo, has announced the redesign of its auxiliary and booster fan range.

Developed in close collaboration with clients, the new designs address both efficiency and cost-effectiveness, in a versatile product range that meets the specific ventilation requirements of the mining industry.

TLT-Turbo product manager of auxiliary and booster fans, Michael Minges, said the development of the fan range would not have been possible without the input of clients.

“This ensured that we focused on key market-driven requirements including energy efficiency, noise reduction, cost-effectiveness and turnaround time,” he said.

Mr Minges said that to sell these products, the company needed to ensure close customer relationships and visibility.

“We are striving to change the industry’s mindset on the use of such fans to ensure proper fan selection for the ventilation required,” he said.

“In optimising mine ventilation, efficient, high quality auxiliary and booster fans can add as much value as surface fan installations.”

Mr Minges explained that meeting identified market demands was the main focus of the improved designs.

“As energy efficiency is one of the main drivers of industrial equipment usage, and minimum efficiency requirements on certain equipment are often legislated, TLT-Turbo identified the need and opportunity in the market for more efficient mining fans compared to what is currently in use,” he said.

Innovative design

The new designs include several innovative additions to enhance performance in



The new TLT-Turbo Auxiliary and Booster fan range addresses both efficiency and cost effectiveness.

order to provide exceptional underground ventilation.

The fan range was developed using the latest in engineering flow technology which allowed TLT-Turbo to improve the aerodynamics, and thus efficiency of the fans.

A unique stator design and aerodynamic fairings, all manufactured from wear-resistant composite materials, result in improved efficiencies and reduced noise levels.

The modularity of the fan casings allow for quick and easy assembly with interchangeable ancillary fan parts.

The motor mounting, in coherence with a machined impeller track, ensures low and controllable blade tip clearances for improved performance and efficiencies.

Pad mount motors are used for all fan sizes and help reduce vibration levels in the axial direction of the motor significantly, which leads to longer motor bearing life and lower maintenance requirements.

“All fans are ISO 5801 tested, unless the client agrees to type testing on higher volume orders,” Mr Minges said.

“We ensure the client quoted performance is met before the fans leave



The first orders for the new range were received at the end of 2017.

the factory.

“Test certificates on both raw data and calculated performance can be provided on request.

“Fan efficiency is determined with the performance test and this quality check ensures we deliver on what we promised the client.”

In addition to performance and efficiency, ease of maintenance was also a major consideration in developing the new range.

The modularity of the product design and the interchangeable standardised parts allows for quick turnaround time on parts supply.

“For example, we only have two blade types for the full product range and generally only one motor barrel per fan size accommodating various motor sizes and types,” Mr Minges said.

“Standardisation on the product is the key to successfully managing maintenance and repair as it allows ample supply of spares for companies certified to do the repair work.

Roll-out

Preliminary testing at sites located in

sub-Saharan Africa has been launched successfully and the next phase is rolling out the new range in the USA, Canada, Europe, Russia and Australia.

Following this, product supply and support will be extended to TLT-Turbo offices in South America and India.

“The feedback that we have received thus far has been that the fans are meeting our and client expectations,” Mr Minges said.

“I am proud to say that one EPC consultant used the phrase ‘super fan’ to describe the new range and indicated that he has not heard a fan of this size so quiet before.”

Continual product development and keeping up to date with the latest technologies is ingrained within the engineering teams of TLT-Turbo.

“Ensuring that innovations are market and client-driven, with the end result being a benefit to the industry, puts us in the forefront of advancement in ventilation solutions,” Mr Minges said.

Visit www.tlt-turbo.com for more information.

Dust collector warning signs

NATIONAL

WHILE dust collectors are an important safety tool for many facilities, they must be properly designed, installed and maintained to provide the air quality required for safety.

Here are a few common warning signs of an unsafe dust collector:

Improper vent design

If operations produce combustible dust, then dust collectors must be fitted with deflagration protection.

Vents and flameless vents are common, cost-effective methods to help keep your facility and workers safe in the event of a dust collector explosion.

Unprotected ductwork

Facilities producing combustible dust should also protect the ductwork and safety processes upstream of dust collectors.

Equipping the ducting with dampers and isolation valves minimise the risk of deflagration within these components.

Overfilled hoppers

The hopper is designed to funnel dust to a storage bin.

Dust should never be allowed to accumulate in the hopper as this creates a significant risk of fire and deflagration.

It may also diminish the collector's



Camfil filter cartridges slide easily out of the housing making filter changes safe and simple.

performance by clogging the system and preventing the pulse cleaning from performing optimally.

Overdue filter replacement

Filters should be replaced when airflow through the system reaches a differential pressure limit as prescribed by the manufacturer.

Filter change-out is also necessary when the pressure drop across the collector is negatively affecting the ability of the system to capture dust, allowing it to escape into the facility.

Cumbersome filter change-outs

Workers should never have to enter the dust collector to change filters.

Cartridge dust collector filters are designed to slide in and out of the housing with ease.

Vertically mounted filters help to make both the pulse cleaning and change-out process easy and efficient.

To learn more about dust collector safety and maintenance, visit www.camfilapc.com.au or call 1300 733 277 to speak to Camfil's dust collection experts.



DOES YOUR DUST COLLECTOR NEED SERVICING?

Like all equipment, dust collectors need to be checked and maintained regularly to guarantee peak performance. Regardless of the brand or application, we can provide you with a tailored service program for your dust collector, ensuring performance and efficiency.

For more information, contact Camfil on australia.apc@camfil.com or 1300 733 277.



camfil
AIR POLLUTION CONTROL

Leaders in air pollution management

NATIONAL

AS part of a major mining company's expansion project in Broken Hill, Luehr Filter was awarded the contract to supply a 325,000Am³/hr shed ventilation and dust collection system for a new ore crushing facility.

The ventilation system is designed to limit the concentration of diesel emissions by meeting appropriate ventilation regulations, standards and guidelines, as well as prevent fugitive dust emissions from the building.

To achieve the stringent EPA emission requirements, Luehr Filter supplied, installed and commissioned its unique off-line reverse air cleaning technology with horizontally mounted bags.

Along with the proven performance and reliability of this Luehr Filter technology, the 'offline' reverse air cleaning system is not competing against the filter's main airflow during cleaning. Therefore, the force required to clean the filter bags is far less than the common compressed air reverse pulse alternative.

This gentler cleaning action greatly reduces emissions by allowing the bag to slowly deflate after cleaning, preventing dust migration through the filter media due to inertia, while it also significantly extends the life of the bags (up to three times) and eliminates the need for compressed air.



Luehr Filter ore crushing shed ventilation system.

The horizontally mounted filter bags enable all airflow through the baghouse to be in the downward direction, which, along with the neighbouring bags being 'offline' during the cleaning cycle, greatly assists the dust to settle to the collection hoppers, resulting in lower bag differential pressure and therefore lower energy requirements.

In addition to reduced maintenance requirements, removing the need for

compressed air also eliminates blow tubes, which cause manual handling and storage issues during a bag changeover.

This, combined with access to the horizontally mounted bags via the vertically hinged filter access doors, means the effort required to change filter bags is significantly reduced, and therefore safer than a typical vertical bag filter.

To help secure this contract, Luehr Filter Australia utilised its global supply chain with engineering, platforms and stack manufacturing executed locally, while cleaning systems were supplied from Luehr Filter GmbH and steel fabrication and fans supplied from Luehr Filter Asia.

For more information or sales enquiries, visit the Luehr Filter website: www.luehrfilter.com.au or call 03 9005 9086.

Global leader in dust and fume control

World leading products, serviced and maintained by the best local talent.

With over 35 years' experience in Australia, Luehr Filter Australia understands the domestic market and can offer a range of solutions to meet the needs of any client. With cutting edge innovation and a diverse manufacturing footprint that includes, Germany, China and Australia, it's no wonder Luehr Filter is an industry leader.

Luehr Filter products are engineered to last, with most systems still in operation decades after installation, even in the most demanding of applications.

Luehr Filter Australia offers:

- Supply, installation and commissioning of new equipment.
- Maintenance services, upgrades and overhauls.
- Training courses for maintenance and operating staff.

Every new project has a custom engineered solution to fit its specific needs. Luehr's earned reputation speaks for itself.

Luehr Filter Australia offers local industries state-of-the-art dust and fume control technologies backed by exceptional Australian customer service and maintenance support.



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All types of batteries recycled

NATIONAL

BATTERY consumption in Australia is on the rise.

But, unfortunately, Australians are recycling less than 5pc of the batteries they use.

When dumped into landfill, batteries all leak a range of toxic substances – from lead and mercury through to cadmium, which makes recycling all the more important.

Ecocycle will accept any and every battery, no matter the size, no matter the quantity.

The company's state-of-the-art facilities and automated sorting make sure batteries are collected, stored and recycled successfully and safely throughout the entire recycling chain.

Ecocycle can provide a tailored pick-up system for any business with its company-owned fleet of vehicles.

It can tailor a solution for any business, whether that be a 2l tin, 5l tin all the way up to a 20l bucket or, for more battery-heavy jobs, wheelie bins, drums or nally bins – depending on the business needs, Ecocycle will arrange to have the batteries collected.

There is even a range of fire safety containers for compromised batteries.

When the company says it can recycle anything, it means it.

Whether they are NiCad batteries,



Ecocycle is Australasia's most experienced mercury recovery and recycling company.

alkaline batteries, button cell batteries, single use, rechargeable NiMH batteries, lithium, lead acid, mobile phone and other tech, HEV, PHEV, EV or eBike batteries,

and even grid-scale batteries, Ecocycle can recycle them all, helping prevent dangerous chemicals from leaching into the ground, and recovering valuable

commodities.

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

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ecocycle
Your Specialist Recycler

Reduce minesite constructions costs with Geohex paver

NATIONAL

A+ PLASTICS is a family-owned injection moulding business based in Minto, NSW.

Since 1973, the company has manufactured a wide range of plastic products.

One of its more recent innovations is Geohex, a ground stabilisation paver which perfectly suits the harsh mining environment.

All minesites face challenges through erosion, and the safety hazards it creates.

The constant flow of machinery and personnel creates ruts, corrugation, potholes and soil erosion.

These factors combine to create surfaces which are hazardous to both walk or drive on safely.

The normal solution is to cover these surfaces with concrete or bitumen which is high cost to install, and very expensive to remediate at end of mine life.

As well, the environmental impact of hauling hundreds of tonnes of concrete across vast distances is significant.

A + Plastic offers a better solution.

Geohex is a heavy duty soil stabilisation system comprising of a unique hexagonal reinforced polymer paver which clips

together to prevent soil subsidence by enhancing soil stability.

It's Australian-made from recycled plastic.

And it's light, which means the cost to transport to site is significantly lower, and doesn't create manual handling issues during install.

It is easy to lay in any weather, and does not require specialised labour or machinery, with minimal ground preparation.

The Geohex system is designed to carry the heaviest machinery (rated to 1200 tonnes per m2), and can be used for pedestrian walkways, carparks, hard stands, lay down areas or anywhere a flat, level surface is required.

It can also be custom manufactured in a range of colours, enabling clearly defined zones to be established (ie. pedestrian right of way, LV only, no vehicle access, etc).

The next time you are asked what you are doing to minimise the environmental impact of your mine, you could reply: "We are eliminating the need to haul hundreds of tonnes of concrete to site, and replacing it with Geohex — a lightweight Australian-made recycled plastic paving system."

More information: <https://geohex.com.au>.



Geohex is a lightweight, environmentally-friendly solution for minesite erosion.

Creating Solid Ground

Geohex Erosion Control System is a unique and innovative ground stabilisation technology that is a cost effective alternative to **Concrete** or **Bitumen** in Mining operations. It is easy to use, quick to install, and drastically reduces the Carbon footprint of any site.

	CONCRETE	GEOHEX
Weight	240kg per m2 (100mm walkway)	6kg per m ²
Volume	1 cubic metre covers 10m ²	1 pallet covers 85m ²
Material	Cement and constituents carted to site in bulk	Recycled, environmentally friendly Polymer Plastic
Installation	Cement batching plant required, mixer truck, Grano workers	Semi skilled contract labour with basic hand tools. Mine tailings for fill material, or crushed granite
Permeability	Impervious. Creates water runoff, which generates more erosion and water pooling.	Permeable. Natural rainfall can pass back into the water table.
Environmental Impact	Heavy Carbon Footprint	Re-purposed Plastic saved from waste stream
Remediation	Hard to break up and dispose	Can easily be dug out and sent away for recycling

Made from high impact resistant 100% recycled and recyclable co-polymer polypropylene, the GEOHEX Erosion Control System has a maximum load bearing capacity of 1200 tonnes per m2, is environmentally friendly and designed to reduce maintenance and logistics costs while at the same time, increasing safety and water conservation.

To find out more please call 02 9603 2088 or visit geohex.com.au



Cleaning without interruption

INTERNATIONAL

MANY years ago, Klay Instruments developed a hydrostatic pressure level transmitter in response to industry demand.

At the time, there was nothing on the market that allowed the levelling device to be removed from the process, cleaned and calibrated without emptying the tank and shutting down the entire process.

Klay Instruments developed a unique combination of a ball valve and a special transmitter in that the extended diaphragm was completely 'flush' with the inside tank-wall.

A unique double O-ring construction made the whole design retractable and fully water-tight up to 10 bars – the valve assembly can handle up to 70 bars.

This provided an excellent solution to reliable level and pressure measurement in the dirty fluid-slurries seen in the mining industry.

Nowadays, these valve transmitters are used in the mining, pulp and paper starch, waste water and shipping industries and many more.

Klay Instruments make three different valve transmitters with a stainless steel diaphragm: series 8000 valve with basic accuracy of 0.2pc, series 2000 valve with accuracy of 0.1pc and Hart 5, and series 4000 valve with accuracy of 0.075pc and Hart 7 or Profibus PA.

These series can be supplied with the IECEx approval (Exi T4 up to T6).



Klay hydrostatic pressure level transmitters for the mining industry.

There are flanged transmitters (DIN, ANSI or JIS) for level applications and threaded versions (1-inch BSP or 1.5-inch BSP) for pressure applications (limited to 10 bars).

The extra thick SS membrane with backing plate and temperature compensate for the minimum amount of fluid to provide excellent accuracy and reliability of the Klay pressure transmitters.

The series 3000 valves are equipped with a capacitive ceramic diaphragm (99.9pc Al2O3) and can be applied in abrasive applications such as wasted paper treatment, mining slurries and mineral slurries.

The above series is just one of the special designs that Klay Instruments has developed for certain applications.

There are high temperature transmitters (up to 350C), high pressure transmitters (up

to 1000 bar), and special alloys like Hasteloy C, tantalum, titanium or even gold plate.

And there is also a full range of submersible level transmitters and level switches.

Pegasus Process Solutions is proud to be the official representative from Klay Instruments in Australia and the team can help you with all questions and inquiries on instrumentation.



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- Valves
- Level
- Pressure
- Liquid analysis
- Motion and position
- System components and accessories

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Get faster to safety

NATIONAL

MANY mining companies struggle to implement a critical and risk and control management framework that is easy to manage, flexible and gets top-down and bottom-up ownership.

With bowties as the go-to risk assessment methodology, common issues include getting stuck in endless risk workshop and review cycles, losing buy-in from operators and maintainers, and struggling to keep the leadership team on board because of the inefficiency of the process.

The International Council on Mining and Metals (ICMM) developed a standardised Critical Control Management framework to help operators navigate the implementation challenges.

Even so, making the process work sustainably using existing tools or spreadsheets can tie a company in knots.

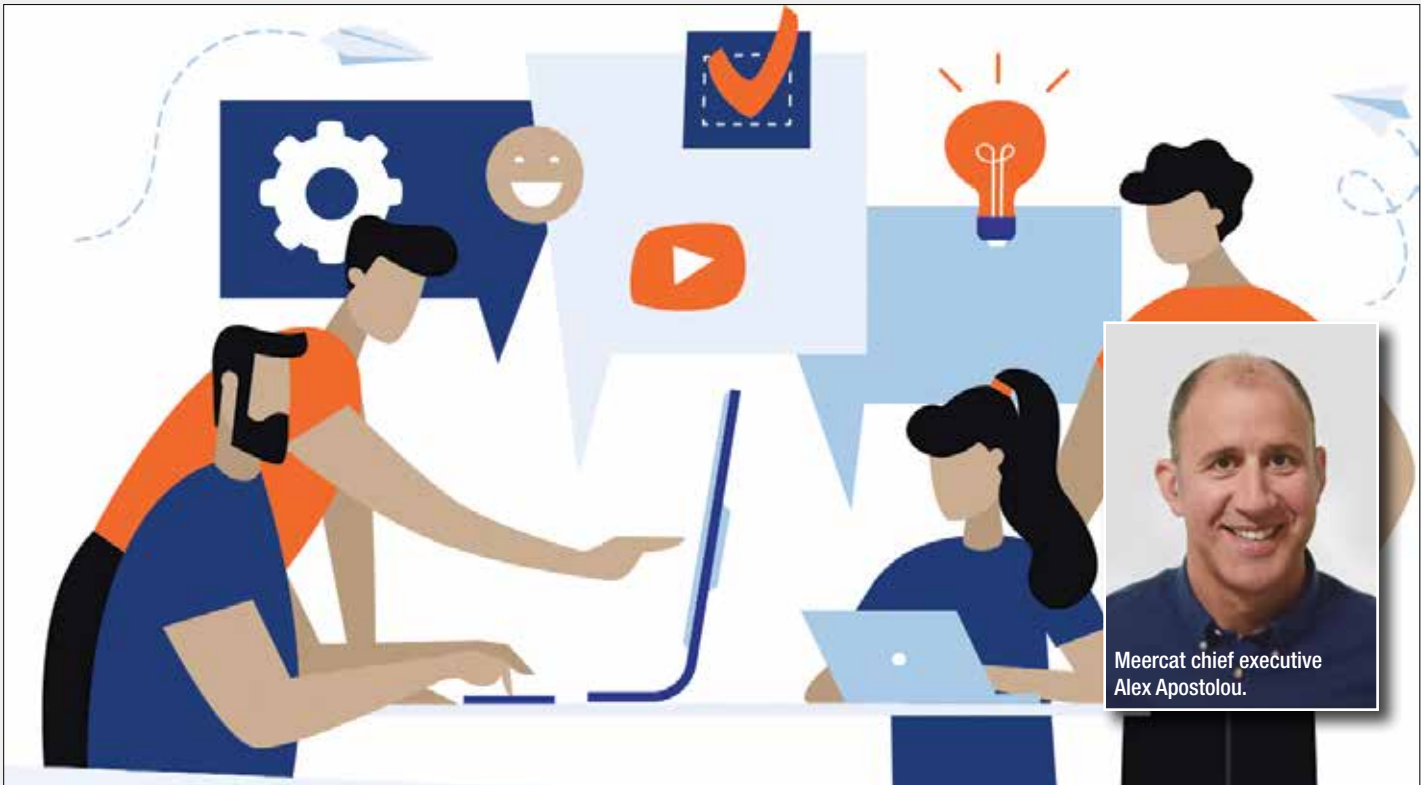
And in any case, how many ways are there of assessing a confined spaces, working at heights or vehicle interaction risk?

Understanding the risk is vital to understanding how the layers of protection are built around people and assets.

And the bowtie is one of the best tools for that job.

But bowties don't reduce risk, only controls reduce risk.

Meercat chief executive Alex Apostolou, said that 'risk management' can be a misnomer.



Meercat RiskView offers best-in-class risk and assurance management solution for the mining industry.

"It's all about control management," he said.

"Most companies know exactly what their controls are — organisational, procedural or engineering — what they don't know is how fit-for-purpose they are, how well they are implemented, and how well are they being used, and that requires regular review and verification."

Based on input from many of its mining customers, Meercat has brought together a built-for-purpose mining risk management package, which includes a library of best-practice risk bowties, their critical controls and performance standards, and verification templates to help mining

companies avoid re-inventing the wheel and get traction implementing critical control monitoring and improvements.

Meercat RiskView is considered by a number of operators as the best-in-class risk and assurance management solution for the mining industry.

As well as integrating all the necessary risk and assurance tools, it also provides the framework to deliver the rigour, oversight and insight businesses need to keep their plant, processes and people operating at peak performance.

It's fast to deploy, secure, and drives safety conversations around control health

and effectiveness between everyone in the company.

Get faster to safety

Meercat RiskView's mining package includes ready-made dashboards, risk registers, best-practice bowties, performance standards and verification templates.

With Meercat's mining package, the company will have you ready for risk within weeks — leverage the risk knowledge to get your organisation safer, faster.

More information: www.meercat.com.au/mining



Get Safer, Faster

Deliver your critical risk and control management framework project faster with Meercat RiskView.

Meercat RiskView is already the best and fastest way to rollout a critical risk and control management process, but adding in our best-practice mining library gets you there even faster.

Avoid the workshoping delays and use our top 20 critical industry risks, critical controls and verifications to start the conversations and improving your controls within a week.

With our data or yours, Meercat RiskView will get you to safer faster.

For more information on how to accelerate your risk management maturity, talk to one of our consultants on +61 (0)8 6468 5351 or email sales@meercat.com.au

www.meercat.com.au/mining



Company in the box seat

WA

MODERN Motor Trimmers has been supplying vehicle seats to various industries within WA for over 25 years.

From trucks to dozers, excavators, drills and mining trucks, the company has learnt a thing or two over the years keeping its customers safe.

This involves making sure it starts off by supplying fit-for-purpose seats, and then following up with regular service and reconditioning of existing seats to either get a little more life out of them, or to make sure that they are in tip top working order.

According to Modern Motor Trimmers sales manager Grant Van Elswyk, the company has customers from different areas, all working in different environments.

"So, we've really got to take this into consideration when supplying seats," he said.

"We have to look at the sites they are working at, and figure out the seat configuration to suit.

"It's not just a matter of pulling a seat out of a box and crossing your fingers."

Modern Motor Trimmers considers itself to be a team of problem solvers, and this includes helping all customers to maintain a safe and efficient work



Modern Motor Trimmers is at the cutting edge of seat technology and predictive seat maintenance.

environment for their equipment operators.

The company makes considered and

continuing efforts to provide the best solutions for its customers, and is currently developing a system to not

only help them understand where their seats assets are located, but also how often they are rotated and serviced.

This information makes it much easier to manage a "fleet of seats" and get the most out of the products it supplies.

This will be achieved by the installation of a beacon into targeted seats, along with a long range outdoor gateway which will be connected to, and send information back to, a cloud-based database.

This system will provide Modern Motor Trimmers with the capability to provide customers with important information on each individual seat asset for tracking, monitoring and managing its life.

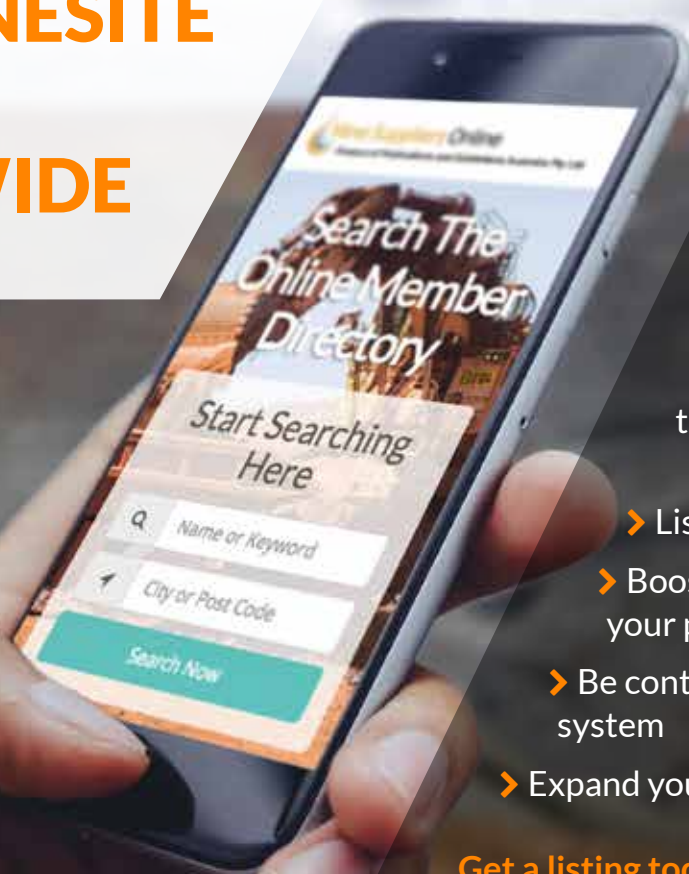
The tracking data can also be used to track assets on Google Maps or any similar tracking system dashboard clients may have.

As this project is in the early stages, the company is keen to hear from the Australian mining community on thoughts about this project.

How could it be best used? And what functionality may be important to users?

You can provide feedback by emailing: info@moderntrimmers.com.au.

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modern motor trimmers

news

SEAT MOUNT CONTROLS

In an effort to increase in cab ergonomics, Modern Motor Trimmers have produced a "Mining & Construction seat" that can accommodate the mounting of operator controls directly onto the seat mount. Much like some of our previous bespoke products, this setup allows for a clear floor space in the cab facilitating not only plenty of operator legroom, but better entry and exit capability.

SEATS FOR MINING

Modern Motor Trimmers have been supplying seats to various industries within WA for over 25 years now. From trucks to dozers, excavators, drills and mining trucks, we have learnt a thing or two over the years keeping our customers safe.

SOUNDPROOF YOUR CAB

We're now doing more and more work in the soundproofing space, including regular work in the mining engineering industry. A great majority of noise that enters an operator's cab comes from the diesel engine, in addition to other external noise sources. By soundproofing, noise reduction of up to 50% can be achieved.

This is a whole lot of noise and stress taken out of the job.

seat tracking

In our continuing efforts to be problem solvers and provide solutions to our customers, we are currently developing a system to not only help you understand where your seats assets are located, but also how often they are rotated and serviced. This information will make it much easier to manage a "fleet of seats" and get the most out of the products we supply.

This will be achieved by the installation of a beacon into targeted seats along with a long range outdoor gateway which will be connected to and sending information back to a cloud based database.

This system will provide us with the capability to provide you with important information on each individual seat asset for tracking, monitoring and managing its life. The tracking data can also be used to track assets on a google map or any similar tracking system dashboard you may have.

As this project is in the early stages, we would be keen to hear from you as to your thoughts on this project. How could you use it and what functionality may be important to you.



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Record items at Euro Auctions sale

NATIONAL

EURO Auctions, the record-breaking international auctioneers of industrial plant, construction and agricultural machinery, is already receiving consignments for the next sale, to be held in Brisbane.

On November 14, a one-day on-site auction will be held at its popular Brisbane site.

Like all Euro Auctions events, this auction will be unreserved, and will see an impressive array of quality equipment, much unused, being sold on the day to the highest bidder.

Euro Auctions' Qld territory manager Craig Hart said demand for quality used equipment in this part of the world is definitely on the increase.

"So the fact that our sales are unreserved is very popular with the Australian buyer," he said.

"At all Euro Auction sales, everything is sold on the day to the highest bidder.

"Our buyers know they can get the equipment they want without having to worry about if the item will sell or not – if they are the highest bidder, it's theirs."

The one-day physical on-site sale provides buyers with the perfect opportunity to personally inspect the various lots being offered, before bidding.

"Plus it's the perfect chance to meet up with likeminded people and discuss activities face-to-face," Mr Hart said.



Euro Auctions predicts massive turnouts for the upcoming Brisbane unreserved auction. Everything will be sold on the day.

"However if you can't make it to our site, on-line bidding is available.

"We are seeing significant growth in bidder participation in all our auctions and the increased demand for new equipment is helping drive auction activity in the used equipment sector.

"We expect to see many consignors allocate quality used equipment to both these auctions over coming weeks,

releasing quality used equipment back into the market to meet the strong demand for it."

Key upcoming Euro Auctions sales include:

- Zaragoza, Spain: Nov
- Leeds, UK: Nov 19-27
- Dubai, UAE: Dec 9
- Dormagen, Germany: Dec 11-13

All offer potential buyers a great opportunity to acquire impressive lots, so for specific details on all upcoming sales and to obtain relevant bidder catalogues, visit Euro Auctions at www.euroauctions.com.

Potential consignors should also contact info@euroauctions.com or call +61 73607 4800.

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WHEEL DOZERS

LOCATION: BRISBANE
MODEL: WD900-3 (LOW HOUR)

WARRANTY:

● **PLATINUM CLASS**
36MONTHS/4000HRS EPTW
PRICE: \$1,600,000.00

HYDRAULIC MINING SHOVELS

LOCATION: MT THORLEY
MODEL: PC3000_6DBH (REFURBISHED)

WARRANTY:

● **SILVER CLASS**
12 MONTHS / 2000HRS EPTW
PRICE: \$2,750,000.00



BULLDOZERS

LOCATION: BRISBANE
MODEL: D475A-5ED (LOW HOUR)

WARRANTY:

● **SILVER CLASS** 12MONTHS/2000HRS EPTW
PRICE: \$1,490,000.00
● **GOLD CLASS** 24 MONTHS/3000HRS EPTW
PRICE: \$1,590,000.00

2 UNITS AVAILABLE

RIGID DUMP TRUCKS

LOCATION: PERTH
MODEL: HD785-7 (REBUILT)

WARRANTY:

● **GOLD CLASS** 24 MONTHS/3000HRS EPTW
PRICE: \$900,000.00



4 UNITS AVAILABLE

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6,563Hrs, Dual Tilt, ROPS, SU Blade, EPA
Compliant, SS Ripper.....\$POA



2017 CAT D8T DOZER
15Hrs, Isolators, E-Stops, Multi Shank Ripper,
SU Blade-Single Tilt, New U/C.....\$POA



2011 JOHN DEERE 872GP GRADER
7,600Hrs, 16Ft Mold Board, Push Block,
Fire Supp., Rippers, Tyres 17.5R25....\$POA



2018 CAT 988K WHEEL LOADER
2,286Hrs, New Tyres & Bucket, 6.7m³
Rock Bucket, Standard Lift.....\$POA



2018 CAT 980M WHEEL LOADER
2,400Hrs, New GP Bucket 5.7m³, New
Tyres, Standard Lift.....\$POA



2011 JOHN DEERE 844K LOADER
8,761Hrs, A/C Cab, Auto Lube, Fire Supp.,
GP Bucket, Tyres 29.5R25.....\$175,000+GST



2014 CAT 740B ARTIC DUMP TRUCK
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Ext., Isolator, New Tyres, UHF.....\$POA

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Large-capacity tanks for flexibility

NATIONAL

AUSTRALIA'S largest provider of portable toilets and sanitation solutions, Formit Services, has recently released a portable 6000l waste storage tank primarily for the mining industry.

The company recognised that a larger capacity waste tank for remote areas would give operators more flexibility with the pump-out requirements and it also suited some of the larger ablution blocks now being used.

Formit Services has a range of portable waste tanks specifically designed to be placed under portable buildings of various sizes.

The waste tank range consists of 2000l, 4000l and the new 6000l models, and all are made with heavy duty polyethylene tanks mounted in a galvanised steel frame which will take up to 7000kg plus 12 people.

The use of plastic tanks is not only lighter but also provides a solution to the corrosion issues commonly experienced with steel waste tanks.

The waste tanks are 100pc Australian-made by Formit and have been tried and tested over many years, and are a common sight under ablution blocks provided by leading portable building manufacturers and hirers throughout Australia.

With distributors based in WA, Qld, NSW and Victoria, Formit Services offers an Australian-wide distribution network.



Formit Services now has bigger corrosion-free ablution waste storage tanks available.



FORMIT SERVICES — DELIVERING YOUR WASTE TANK STORAGE SOLUTIONS.

Formit Portable Waste Tanks are designed specifically for Australian conditions and are tried and tested over many years. Models ranging from 2000L to 6000L holding capacity are manufactured in Australia using heavy duty polyethylene tanks that simply will not rust like conventional steel tanks. These corrosion free tanks are framed with a heavy duty galvanised steel frame that can withstand up to 7000kg plus 12 persons. Formit also have a range Australian made Portable Toilets to suit all applications from underground mining, construction and event type toilets — Check out our web site for the full range.



WASTE TANK FEATURES AND SPECIFICATIONS:

- 3 Sizes to suit your needs — 2,000, 4,000 and 6,000 litres
- Heavy Duty Steel frame certified to carry up to 7000kg load
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- Drag Hook and Skids on all models
- Heavy Duty Polyethylene Tanks — WILL NOT CORRODE
- Access / Pump Out Ports on all comers

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On-site safety made easy

WA

NEVER before has on-site safety been as important as it is today.

Businesses need to keep their workers safe, and mining is a dangerous job.

Inventory Vending Solutions' newest offering, SafetyVEND, offers business owners a time-saving, money-saving solution to the problems of personal protective equipment inventory waste and downtime for staff unable to access essential workplace PPE.

The SafetyVEND units are as varied as the inventory the company can stock.

Whether it is for mining and mining services, manufacturing, engineering or heavy industrial, SafetyVEND has the machine which will dispense inventory to meet clients' needs.

SafetyVEND units can be located in any covered area, and the company's dedicated sales team will come to site for a free appraisal to personally assist in best-practice on-site location and placement of vending machines.

The SafetyVEND system works on an individual staff member, contractor identifier card or fob that gives access to machines.

Every transaction is then recorded in



SafetyVEND units are changing the way minesite operators manage PPE.

real time, and at the end of the month, data of who is using what and when is available in PDF or Excel formats which can then be imported into client systems.

This gives total access and visibility as to who has used each unit and when.

The benefits include improved safety on-site, at least 40pc reduced consumption, higher levels of accountability, improved inventory turn rates, elimination of obsolete inventory and many more.

Some customers need better visibility of staff, some use it for convenience and others just want a simple, cost-effective way to support their staff.

For more information, call Tony Halfhide on 0412 266 486.





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- ➔ Electrical & Thread Tape
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....and many more

CONTACT

Call Tony Halfhide on

☎ 0412 266 486

✉ thalfhide@ivsolutions.com.au

🌐 www.safetyvend.com.au

Tech cleans contaminated wastewater

NATIONAL

CSIRO has developed a new cost-effective technology to treat mining wastewater and reduce sludge by up to 90 per cent.

The technology, called Virtual Curtain, was used to remove metal contaminants from wastewater at a Queensland mine and the equivalent of around 20 Olympic swimming pools of rainwater-quality water was safely discharged.

Water is of course a precious resource throughout Australia. Mining is often water-intensive and is estimated to generate hundreds of millions of tonnes of wastewater each year.

Sludge is a semi-solid by-product of wastewater treatment and reducing the amount produced has huge environmental and economic benefits.

Techniques and technologies that can reduce and treat contaminants in wastewater will help mining companies improve water management practices and be more sustainable.

The CSIRO Virtual Curtain technology uses hydrotalcites to trap metal contaminants in the wastewater.



Virtual Curtain is a more efficient and economic way to treat wastewater.

Hydrotalcites are minerals, sometimes found in stomach antacids, which are able to absorb a variety of contaminants including arsenic, cadmium, and iron.

CSIRO found that hydrotalcites could be formed by adjusting the concentrations of common wastewater contaminants, aluminium and magnesium, to an ideal ratio, and increasing the pH.

By using contaminants already present in the wastewater, researchers have avoided

the need for expensive infrastructure and complicated chemistry to treat the waste.

If required, the treated water can be purified much more efficiently via reverse osmosis and either released to the environment or recycled back into the plant.

At the Qld mine, the CSIRO treatment produced only a fraction of the sludge that a conventional lime-based method would have and allowed the mine water to be treated in a more environmentally sound way.

Virtual Curtain is a more efficient and economic way to treat wastewater and is enabling the global mining industry to reduce its environmental footprint and extract wealth from waste.

The licensed technology, which can be applied to a range of industrial applications, is available through Australian company Virtual Curtain Limited.



CRS Envitube dewatering technology is suitable for mining and industrial applications.

Envitube dewatering technology

NATIONAL

SINCE the introduction of geotextile dewatering technology into the domestic market in 2001, Dredging Solutions has been at the forefront of utilising geotextile tubes for a variety of different projects.

Envitubes are high strength woven geotextile bags suitable for mining and industrial applications and can handle a wide range of materials; having successfully been utilised to dewater fly

ash ponds, restore capacity to run off ponds and isolate contaminated marine sediment.

Envitubes represent an attractive alternative compared to dewatering via centrifuge and belt press, highlighted by 24-hour continuous passive dewatering, excellent filtrate quality, high capture rate and unmatched feed flows.

They are highly suitable for projects with ample space available on site and time to allow the material to passively dewater.

The benefit of utilising Envitubes

is emphasised by low CAPEX and OPEX costs compared to mechanical dewatering alternatives.

Envitubes are engineered to cater for up to 400m³ per/h of material, while traditionally mechanical dewatering methods are limited to processing 80m³ per/h of material.

This increase in capacity leads to significant reduction in the active pumping time and the overheads associated with the project.

Envitubes can be manufactured to suit the specific size and space requirements

of individual projects, which allows for capacity to be carefully managed and ultimately optimised.

Dredging Solutions provide nationwide contract dredging and dewatering services utilising Envitubes.

Underpinned by a versatile fleet of dredges that are suitable for harvesting material from a wide variety of situations, Dredging Solutions is your sludge management expert.

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Reverse osmosis protection

NATIONAL

THE dry and arid conditions faced by many miners in the Australian mining industry can make the sourcing and use of water particularly problematic.

Hardrock mining uses water at every stage, and the Golden Grove copper-zinc mine near Geraldton, WA, is no different.

The mine has been in operation for 27 years, and its mine life has more than 10 years in reserve.

The 17.1mt resource consists of zinc ore, 22.2mt of copper ore and 0.2mt of gold oxide, and its throughput is about 1.3mtpa, producing three separate saleable concentrates via standard froth flotation which can be water-intensive.

So, when the Golden Grove mine required a new reverse osmosis water treatment plant, it called on DMI-65 to ensure sustainable, clean and safe portable water for the mine and its accommodation village.

The mine consists of a 720-room accommodation village and two underground mines: Gossal Hill and Scuddles.

DMI-65's solution was to replace the existing hired reverse osmosis water treatment units with two M83 Vantage RO units operating in parallel to provide water compliant with Australian drinking water guidelines.

DMI-65's catalytic filter media is infused technology, not merely a surface coating.



DMI-65 installed the new reverse osmosis water treatment plant at the Golden Grove mine in WA.

The revolutionary infusion technology catalytic filtration media is designed for the removal of iron and manganese without the use of potassium permanganate.

The micro-structure of DMI-65 is able to efficiently remove dissolved iron to as low as 0.001ppm and manganese 0.001ppm.

DMI-65 has been used extensively

across a wide range of industries for more than 30 years.

This means it allows for a high oxidation rate and superior performance in the removal of iron, manganese, aluminium and arsenic from water.

The company installed PTI filters prior to the RO skids, and the overall system to produce permeate of TDS less than 500mg/l.

The skids were all factory tested for ease of start-up.

DMI-65 was able to optimise the water treatment plant's capabilities to provide 600kl per day of potable water inside a shed for protection from the elements, and major ancillaries included two RO skids with CIP clean, two filters, chemical dosing systems and a control panel.

More information: www.dmi65.com.

Improved performance, less need for maintenance

NATIONAL

BASED in Sydney, SWA Water is a part of a multinational environmental engineering group specialising in the design, construction and manufacture of industrial waste water treatment plants.

SWA designs, manufactures and constructs industrial waste water treatment plants and manufactures industrial oil separators, solids separators and DAF units.

The projects range from very small separators for workshops and service stations to large oil refineries, and the company has a range of CPI style oil separators available as cross flow interceptor and tilted plate interceptor parallel plate gravity separators.

The company provides full turnkey solutions to meet any project requirements, from design through to manufacture and supply of equipment, installation, lab test work, site investigations, pilot plant trials and service maintenance.

SWA's world-class products are all developed and rigorously tested through the SWA R&D program, and all



SWA water has manufactured and sold hundreds of oil separators, solids separators and DAF units all over the world.

products meet the stringent performance guidelines.

Through its broad range of industry experience, the company has come to learn the critical aspects of each phase during design and construction – for every industry.

SWA's oil separators can achieve less than 1mg/l free oil in the treated effluent – far better than any other competitor with similar equipment.

The separators can be manufactured to suit specific operating conditions: clients just need to nominate the flow rate, influent oil concentration, specific gravity of oil, operating temperature, discharge oil concentration required, and SWA will size the condition specific oil separator for every client and every condition.

The company's products are normally manufactured from stainless steel, and therefore have an incredibly long life with very little maintenance.

The standard material is SS304; however, when required, SS316, painted carbon steel, painted stainless steel, duplex and super duplex stainless steel can be used.

The company can also supply modular plate packs for installation into concrete tanks, as well as stainless steel and GRP plate packs.

For more information visit: www.swawater.com.au



DMI-65 ADVANTAGES

- Reduce downtime
- Prevents staining
- Significantly improve system performance reducing initial system capital investment
- High Disinfection rate achieved
- No leaching of chemicals
- Substantial whole of life cost savings

DMI-65 IS USED IN:

- Reverse Osmosis Pretreatment
- Drinking Water Treatment
- Arsenic Removal
- Irrigation Systems
- Landscape Reticulation
- Cooling Towers and Boilers
- Environmental Dewatering
- Industrial Applications
- Food and Beverage

WATER MANAGEMENT – ADVANTAGES OF USING DMI-65

- Membrane Protection
- Regulatory Compliance
- Reduced Costs
- High Flow Rates
- High Load Capacity
- Regeneration Not Required
- Wide Operating Environment
- Long Life



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

1300 303 281
info@dm65.com
www.dmi65.com





INDUSTRIAL WATER TREATMENT

SWA is an environmental engineering company specialising in industrial waste water. For the past 20 years SWA has built and supplied our equipment over hundreds of projects in 20+ countries.



SWA PROVIDE SERVICE FOR

- Design
- Manufacturing
- Construction
- Installation
- Test & commission
- Operator training
- Plant servicing
- Spare parts
- Process definition
- Process test work
- Automation & Control

SWA ALSO HAS EXPERIENCE SPANNING THROUGHOUT A BOARD RANGE INDUSTRIES, SUCH AS

- Mining
- Oil & Gas
- Oil refinery
- Textile
- Petrochemical
- Power station
- Steel works
- food industry
- Motor vehicle and many more....

SWA PRODUCTS:

- CPI Oil Separators
 - above ground & in ground
 - flowrates up to 1,000m³/hr
 - < 5ppm oil in outlet
 - DAF Units (Dissolved Air Flotation)
 - DAF, DGF, DNF, DAFT
 - EX Rated
 - integral oil separation packs
 - emulsion breaking
 - Lamella Separators
- Sludge Dewatering Systems

SWA CLIENTS INCLUDE:

Rio Tinto | Freeport | Shell | Sydney Water
Bluescope Steel | Cleanaway | Veolia



SWA Water Australia

Water & Waste Water Engineers

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HOW AUSTRALIA'S REGIONAL VISA CHANGES WILL IMPACT EMPLOYERS IN THE RESOURCE INDUSTRY



Australia's new Regional 494 Visa will commence in November 2019 and provide employers greater flexibility to sponsor skilled overseas workers in remote areas.

Employers in the resource industry may particularly benefit from the changes with access to:

- Over 450 more eligible occupations to sponsor visa holders;
- Priority visa processing;
- Regional visa sponsorship across Australia in addition to Designated Area Migration Agreements [DAMA's];
- And more cost-effective Permanent Residence pathways to attract and retain suitably skilled workers.



INTERSTAFF

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REGIONAL VISA Q&A SERIES

How Australia's Regional Visa Changes Will Impact Employers in the Resource Industry

HR Professionals, Site/Operations Managers and Business Owners are invited to attend Interstaff's Regional Visa Q&A Series.

Managing Director of Interstaff migration consultancy, Sheila Woods will discuss how the new Regional 494 Visa can provide flexible labour solutions to sponsor skilled overseas workers from November 2019.

Attendees will receive Visa Tools to aid in their workforce planning. Register now to find out more.

Register Now

interstaff.com.au/register



New visas boost for resources



Australia's regional visa changes will impact employees and employers in the resource industry.

IN March 2018, the replacement of the 457 Visa with the Temporary Skills Shortage (TSS) Subclass 482 Visa marked a shift in Australia's migration program.

Employers have had to respond and adapt to a more complex, restrictive and costly legislative framework to sponsor overseas workers.

This year, the Government formalised further restrictions to Australia's migration program by reducing the permanent migration intake by 30,000 people per year.

The revised migration planning levels reflect a policy shift towards encouraging migrants to live and work in regional areas.

Australia's permanent migration intake is now set at 160,000 places per year for the next four years, with 23,000 of those placements becoming available for new Regional Skilled Visas commencing in November – including a new employer sponsored regional visa.

Compared to the TSS 482 Visa program, the new Subclass 494 Skilled Employer Sponsored Regional (SESR) Visa will enable employers to sponsor workers under a broader list of eligible occupations, with priority visa processing and a pathway to permanent residence after an applicant has lived and worked regionally for three years.

Despite this flexibility, the visa process will be complex, and both employers and visa applicants will need to provide substantial evidence to satisfy application requirements.

The new 494 visa

The new 494 provisional visa will commence on November 16, 2019 and replace the current 187 Visa. According to Interstaff managing director Sheila Woods, the



The changes are expected to boost regional migration.

new regional 494 visa can offer skilled overseas workers a more certain pathway to permanent residence (PR) as applicants generally only need to satisfy two conditions: that the candidate lives and works in a regional area under an eligible occupation for three years.

Overseas employees on a 494 visa may be eligible for permanent residence through the 191 visa from November 2022, whether

or not their occupation remains on the list of eligible occupations for skilled migration, which is a current risk in the 187 and 186 visa programs.

In some cases, the 494 visa can also provide a pathway to permanent residence for applicants who currently have limited options to stay. "If your business employs Subclass 457 or 482 Visa holders in regional areas, it could consider the 494 visa as an

alternative method of securing permanent residence where it is otherwise not available – especially for 482 Short Term Stream visa holders," Ms Woods said.

"In our experience, most skilled migrants want to stay – so a pathway to permanent residence is a great incentive for migrants and can help your business attract and retain global talent."

Complexities in the application process

Ms Woods said the introduction of the provisional regional visa will require employers and visa applicants to provide substantial evidence for a valid application – as it will be assessed with similar rigour as visas for permanent residence.

There’s a level of complexity involved in sponsoring under the new visa and Ms Woods notes employers will be required to obtain support from a regional certifying body.

“There are skills assessments, English and health and character assessments to satisfy rigorous visa requirements and reviews by the Department of Home Affairs, as if for permanent residence,” she said.

“It also requires employers to have a lot of visa knowledge, making it more difficult and time consuming than ever for businesses to navigate the migration process.”

As with the 482 Visa program, labour market testing will also be required to show how employers have difficulty in finding suitably skilled candidates locally. Ms Woods said this has come down to a very rigid approach to assess whether or not sufficient advertising in the local market has been undertaken. The particular requirements for the 494 are expected in late October.

“Employers in the resources sector can directly benefit from the regional visa changes in November, but as we’ve seen with legislative changes in the past, one barrier to making use of the available visa programs can be a lack of understanding about what

the changes really mean for businesses,” Ms Woods said.

According to Ms Woods, employers generally enquire about sponsorship compliance and eligibility for new visas as recent changes have made skilled visa processes more complex.

“Not knowing how visa changes impact a business’ specific labour needs can make it difficult to predict requirements for project timelines and workforce planning,” she said.

“Employers need to be aware of how complexities in the new application process, such as requirements for skills assessments, will impact the level of preparation required to submit a valid regional visa application – and consequently the timeframes needed for this.”

As Government fees become more costly, businesses also face a greater financial risk if a visa is rejected.

“This can be a good reason to seek advice as the process now demands employers to have a greater understanding of work visa requirements.”

Benefits to the resources sector

Once the visa changes commence in November, businesses will have greater flexibility to sponsor skilled migrants, particularly in the resource sector in regional areas.

The introduction of the 494 visa will widen the availability of regional skilled visas to employers across a broader area of Australia (the classification of eligible ‘regional areas’ for visa and migration purposes will change to

include all of Australia except Perth, Melbourne, Sydney, Brisbane and the Gold Coast) and employers will be able to sponsor overseas workers under 450 more occupations than for non-regional employer-sponsored visas.

“Resource-based businesses may wish to consider using the new regional visas to meet labour shortages,” Ms Woods said.

“The extended list of occupations available for skilled migration will assist employers across a broad range of industries, including mining, oil and gas.”

Employers will also have access to priority Government visa processing to more quickly secure overseas workers for regional operations - which can be crucial to meeting project timelines.

“The new regional visa will help employers both attract and retain global talent for technical roles that may be difficult to fill locally – because migrants will have an incentive to stay working with their employer for three years to become eligible for permanent residence.”

The new visa also provides a more cost-effective way to secure permanent residence for employees (after they have worked regionally for three years) as the employer can save up to \$5000 per visa applicant for the National Training Contribution Charge (NTCC) fees – Government fees that usually apply when sponsoring a visa holder for permanent residence.

New Designated Area Migration Agreements (DAMA’s)

As part of the Government’s focus on regional

migration, Designated Area Migration Agreements (DAMA) are being fast-tracked across Australia.

DAMA’s allow employers a five-year period to sponsor overseas workers with agreed concessions for skill level, occupations and salary levels.

“For example, the recent agreement put in place for the Goldfields region includes semi-skilled occupations such as driller, driller’s assistant, truck drivers, trade and professional occupations,” Ms Woods said.

Other DAMA’s have been established in resource-based locations such as Adelaide and regional South Australia and more are being established across the country.

“I would encourage businesses to enquire about their visa and sponsorship options for clarity and assurance on how the changes impact their specific labour requirements,” she said.

Interstaff is an established business migration consultancy specialising in skilled migration matters for the resource industry and operating for the past 30 years.

“We have witnessed many visa changes over this time and their impact on the industry’s labour options,” Ms Woods said.

“HR professionals and project/site managers are invited to attend our free Q&A Series to find out more about how the regional skilled visas can aid their workforce planning.”

To register for the Regional Visa Q&A Series visit: www.interstaff.com.au/register





NATIONAL

PACIFIC Urethanes, with its cutting-edge technology, provides Australia and many export markets, specialist products, processes and applications for the mining and resource sector.

With its significant year-on-year growth and a reputation for being the formulation experts, it has had more than 20 years' experience specialising in the development and production of polyurethane systems.

The company's formulating expertise enables it to translate advances in raw materials development into improved products and increased asset life which puts them ahead of the competition.

Advanced technology

Pacific Urethanes has always maintained a strong commitment to meeting the needs of its customers, by providing them with the latest technological solutions tailored to their business or their customers' business needs.

Their highly experienced technical team are at the forefront of product development and are the leaders in their fields.

This allows the development and application of the polyurethane systems at Pacific Urethanes to be globally competitive.

The company has developed a wide range of products, with capabilities beyond their competitors which is showcased in their unique blends of polyurea and polyurethane products.

These blends provide extremely high physical properties and wear-resistant properties which no other competitor has been able to simulate.



With cutting-edge technology, Pacific Urethanes has more than 20 years experience in the mining and resources sector.

Application experience and global technology partners

Pacific Urethanes has an exclusive arrangement with Polycoat Products, one of the world leaders in polyurethane, polyurea, and polyaspartic coatings.

The company takes the time to listen and understand customers' challenges, to develop



Pacific Urethanes specialises in assisting customers with applications and project implementations for a wide range of applications.

solutions that work, and are tailored to their environment or application.

Pacific Urethanes' specialist staff have a purpose-built, state-of-the-art laboratory and testing facility, to ensure product development of the highest quality, with the fastest turnaround, to commercialise customers' products in the shortest possible timeframe.

And by having a long-standing distributorship with Graco and its market leading equipment

and systems, Pacific Urethanes adds to its application expertise with specialists on hand to assist customers with applications and project implementations for a wide range of applications.

Customised development

Pacific Urethanes works side by side with its customers, which makes the company more of a partner than a supplier.

It adapts and creates solutions for customers along with maintenance advice and design ideas to suit the customers' needs and conditions.

It's that practical industrial experience and specially developed technologies that customers value the most.

Wear and corrosion coatings

Pacific Urethanes' polyurethane coatings provide high levels of corrosion protection combined with high levels of wear resistance that provides protection and extend the asset life.

Ultimately this will result in substantial cost savings in the long term, reduction to service times, and minimal wear and tear regardless of the environment they are used in or operation they are designed for. These coatings can stand the heat.

LNG foams

Pacific Urethanes has a long history in the supply of high-density foams for pipe support, a range of low-density foams suitable for insulation of pipes, valves and flanges.

These systems come in various grades from spray applied to injection grades. They have extensive experience in the cryogenic Liquefied Natural Gas domain.

The company has used its extensive experience on the Shell Prelude project on the insulated pipe hook-up from the vessel to the land, as well as the Wheatstone Project.



The company works side by side with its customers to create solutions.

Pacific Urethanes has also provided trench breaker foams (water diversion barriers) for some of the largest gas pipelines built in Australia, with demonstrated ability to delivery and end to end solution for pipeline installation customers.

These projects include Chevron's Gorgon project as well as APLNG and QCLNG running from the Surat Basin to the Gladstone LNG facility.

Sustainable innovation

In line with environmental stewardship and ISO14001 initiatives, Pacific Urethanes utilises the latest technology in polyurethane foams with its low Global Warming Potential blowing agents.

These foams have certain characteristics and

performance properties to be able to handle demanding and changing environments and meet future environmental requirements.

With the latest push to improve environmental regulations around the use of hydrofluorocarbons (HFCs), Pacific Urethanes is already ahead of the game.

The trend towards sustainable practices has also created opportunities for Pacific Urethanes, with its extensive experience in changing blowing agent formulation, to phase out HFCs for expansion to additional export markets.

It is driving sustainable change by phasing out HFCs to low GWP, hydrofluoro-olefin (HFO) as its blowing agents in the near future.

The phase-out of HFCs in the United States is set for 2020 with Australia ideally to follow this initiative shortly after.

High performance elastomers

Pacific Urethanes covers the entire polyurethane range from coatings and foams to high performance engineered elastomers.

Developed through extensive research and testing procedures, the company's elastomer offerings have been designed to suit hand mixing and machine dispensing applications.

It can produce products with high mechanical properties, excellent abrasion resistance, high tensile strength, high resilience, excellent chemical resistance and low temperature resistance.

Typical examples of products made from these materials for use in high-wear areas include trommel screens, pulleys, scraper blades, wheels and rollers.

End-to-end solutions

Pacific Urethanes' one-stop specialist service includes professional advice as to the optimal machine for any application, initial supply and setup, training, spare parts and technical support, complete with all the polyurethane formulations required for the desired outcome.

From initiation to execution, the company works with and supports customers to achieve the desired result, caring about each and every client and focusing on a tailor-made solution – whether that's application, advice or training clients to ensure the product is used to the highest capabilities and standards.

MORE INFORMATION: Pacific Urethanes | 1300 736 963 | info@pacificurethanes.com | www.pacificurethanes.com

Pacific Urethanes

Polyurethane Formulations for the Mining Industry – Globally

Pacific Urethanes is an Australian owned company specialising in the development and production of Polyurethane Systems for Australian and export Markets. We have a proven track record in supplying customised, high performance systems across all environments.



MATTHEW SLATYER
National Sales Manager
Mobile 0413 052 255
matthew.slatyer@pacificurethanes.com

To register your interest please contact Matthew by mobile phone directly or by email. We really look forward to hearing from you.



The polyurethane perfectionists

NATIONAL

CONCORD Engineering is an Australian business that specialises in the manufacture and application of high performance abrasion-resistant materials for mining, mineral processing and general industry.

The company works with clients to design and manufacture specific pipelines to eliminate problem high-wear areas and improve functionality.

The drafting department, along with engineering design, provides detailed drawings and the company's project managers help to assist sites with project schedules, delivering and overseeing installations under budget and on time.

Concord Engineering director David Lea said the company was currently working with a client whose aim is to tidy up the various pipework in the processing plant.

"We are offering to update the old drawings and standardise their pipework, including pipe lining material selection, to increase wearlife and ease of maintenance that will happen in the future and allow their stores to hold less inventory as parts are interchangeable," Mr Lea said.

"We are also offering spares to be held at Concord premises to allow for quick supply and rotatable refurbishment works."

As a result, the site was able to streamline processes, update drawings, implement a material change recommendation after proposed trial to increase wear life of the pipeline (less downtime lead to increased production) and identify specific spools for specified pipe runs.

Production capability

Concord Engineering has increased its production capability with larger polyurethane process machines and invested in equipment to allow larger pipe sizes and lengths to be lined.

Additionally, the company now offers ceramic lining of pipes using monolithic silicon carbide ceramic liners and also HDPE and PP linings for chemical resistance.

"Concord offers a one-stop shop with controllability from beginning to end," Mr Lea said.

"From onsite scanning and job installation supervision, everything is done in-house as we offer drafting, stripping, fabrication, sand/grit blasting, painting, lining and machining services, so we are able to provide the best lead time possible."

Choosing materials

The company also has the ability to select the correct polyurethane material for toluene diisocyanate (TDI) or methylene diphenyl diisocyanate (MDI) applications.

Choosing the material that best fits the application can be a daunting task considering the vast number of materials available.

Following the steps to solving a wear problem should help clarify what mechanisms are operating and therefore help narrow down the material choice options.

A more desirable service life is possible for installed mineral processing components when the erosion and corrosion is minimised by more informed material choice.

How to solve a wear problem:

1. Identify the mode of failure before thinking about



Concord Engineering has been solving client mineral processing and plant wear problems for more than 45 years.



Concord Engineering's products and solutions deliver real results by reducing plant down time and increasing productivity.

the solution.

2. List environmental conditions the component will be subject to.
3. Is redesign warranted or possible?
4. Think carefully about your material selection. What properties are required to improve erosion/corrosion behaviour in this situation? What materials have these properties?
5. Conduct a cost-benefit analysis.
6. Remember to consider plant downtime in the cost benefit analysis.
7. Trial new material options in a laboratory setting where possible.
8. Conduct field trials of the new material in the industrial environment.



Concord Engineering's products and solutions deliver real results by reducing plant down time and increasing productivity.



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FACTORIES**

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DELIVERING REAL RESULTS

We take pride in manufacturing high quality mineral processing equipment and wear product parts.



- ISO accredited company QEC3503 • 100% Australian manufacture
- Onsite support services laser scanning and drafting of pipe spools





The forefront of innovation

Morgan Engineering offers unparalleled 24/7 field service support.

NSW

MORGAN Engineering is committed to innovation and has solidified its reputation as one of the most extensive and state-of-the-art engineering facilities in the Hunter Valley.

The company prides itself on retaining a team of highly skilled machinists, fitters, welders, draftsmen, mechanical engineers and line borers who can deliver efficient, reliable solutions and industry best practice for customers utilizing the latest technology and their extensive experience in the industry.

Service exchange components

Morgan Engineering carries a comprehensive range of service exchange components to suit Caterpillar and other various OEM earthmoving equipment.

This means that mining customers can avoid replacing and stocking expensive new parts, such as the steering components, and instead access Morgan's extensive stock of cost effective service exchange components.

Morgan Engineering has implemented an

innovative, state-of-the-art, process to reclaim and re-machine the tapered bores of steering components in-house and on-site anywhere in Australia.

Typically, these components would be run to the OEM guide lines, once guide lines have been exceeded components would then be replaced with new.

Morgan Engineering's service exchange and on-site repair option is around 60pc less than a new replacement part and the cost savings by eliminating the downtime on a machine are significantly greater again.

Morgan Engineering developed this process in order to deliver service exchange parts that either met or exceeded OEM specifications.

In order to provide their customers a guarantee of this level of quality, they engaged an external certification provider to certify the entire reclaim and re-machine process.

This certification applies to chassis steering boxes, steering Y-links and steering arm components, reassuring the customers' expectations of quality repairs.

This innovative solution is just one of the ways Morgan Engineering is leading the industry in

improving customer service, reducing cost and providing solutions for their mining customers.

CNC milling and turning

Morgan Engineering also has a high level of CNC milling and turning capabilities with state-of-the-art equipment, tools, processes and procedures.

The company has recently installed and commissioned a Soraluce FP6000 CNC machine to significantly extend its capabilities by increasing capacity and reducing turnaround time.

The Soraluce FP6000 is a multi-purpose milling and boring machine with a modular design, offering remarkable versatility and enabling the machine to be adapted to customer requirements – resulting in high productivity, high accuracy and improved customer satisfaction.

The new CNC travelling column milling machine has a 6m travel and a 100t table loading capacity to handle even the largest jobs.

Two new Mazak CNC machines add to the

stable of high precision machining equipment.

The Integrex i400 x 2500 is a five-axis, multi-tasking machine capable of turning and milling the most intricate components in multiple planes.

Line boring and on-site machining

Morgan Engineering also provides specialised field services across Australia.

All its field service trucks are fully equipped and fitted out with dual boring systems capable of welding two bores and then machining two bores simultaneously.

This allows a quick turnaround for repairable items, and combined with its extensive range of service exchange components, Morgan's has become a one-stop-shop for mining clients because once its team are in the field, they can turn the job around from start to finish in a matter of hours in most cases.

The company also has the capacity to carry out all facets of onsite machining from three-axis milling, circular milling, keyway milling, journal turning, flange facing, drilling and tapping.



Morgan Engineering uses highly skilled and experienced tradesmen.



CAT Service exchange steering components.



State-of-the-art equipment.

Portable machines carry out machine shop operations in the field, without the need to remove the plant or equipment from the site (which typically costs the client in extended equipment downtime, higher labour expenses and lost production).

With a think-outside-the-square approach, Morgan Engineering can also offer customised tooling and jigs to get the job done where others may think it is not possible.

With this refreshing approach, customers enjoy increased productivity as the need to disassemble large pieces of equipment and transport off-site is often eliminated.

This results in a faster return of the equipment back to production.

Morgan Engineering's ability to provide safe, reliable and bespoke machining solutions in restricted access applications ensures that its clients see the advantages of using a system that has been developed and proven to encompass industry best practice.

Vision and values

Morgan Engineering is driven by its key core values and that is what separates it from the competition.

The company values customer service with the slogan 'we make it happen', reflecting the commitment to jump through any hoop to ensure the client is 100pc satisfied with the quality of their products and service.

The slogan 'we think outside the square' is an example of how innovation also underpins every development within the company, as well as Morgan Engineering's guarantee to work to achieve the best possible tailor-made solution for each clients' needs.

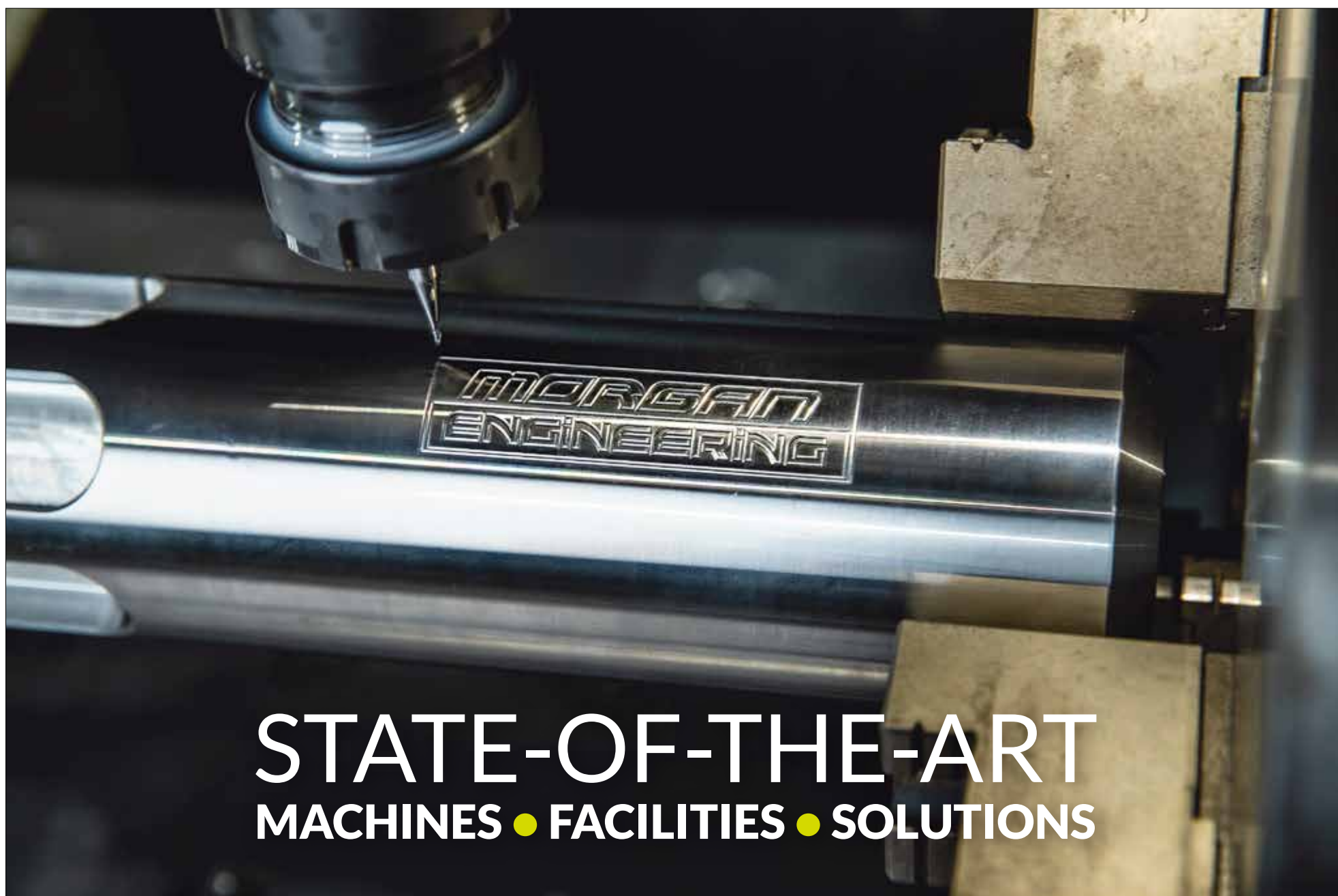
As a value-driven, family-owned, business with a corporate structure, Morgan Engineering is big enough to matter but small enough to care.



Soraluce FP6000.



The company offers innovative on site machining and the line boring solutions.



STATE-OF-THE-ART MACHINES • FACILITIES • SOLUTIONS

Our Services

Morgan Engineering has highly skilled tradesmen with the experience to provide fast, cost-effective solutions to the highest standard.

- Heavy CNC Machining
- CAD Drawing and Design
- Lineboring
- Onsite Machining
- Liquid Nitrogen
- Heavy Weld Reclamation and Fabrication
- CAT Service Exchange Components

Service Exchange Components

Advantage

Morgan Engineering carries a comprehensive range of service exchange components to suit Caterpillar earthmoving equipment.

Efficiency

Don't waste time and money replacing with new – Morgan Engineering can provide a cost-effective and timely solution to maintain your productivity.

Availability

Morgan's extensive stock of repaired components can get your equipment back up and running while we refurbish the worn component back up to OEM standards.

With over 45 years' experience, Morgan Engineering's experience and safety result in the highest standards of product excellence for you.

MORGAN
ENGINEERING

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☎ 02 6572 2032

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🌐 www.morganengineering.com.au

Helping make things simple

NATIONAL

AUSTRALIAN Mining Product and Services is a one-stop design, manufacturing, sourcing, and supply company with 35 years' experience in manufacturing wear products for applications in mineral extraction, quarrying and ore beneficiation process plants.

The company believes its customers are not just an income stream, but a rich source for improvement and innovation – a credible source of information and direction to improve plant and machinery uptime and production reliability.

Its customers are behind the R&D of their ceramic-lined hoses and ceramic lined valves, and their revolutionary, Hose, HDPE and Steel pipe couplings and repair clamps.

Australian Mining Products and Services sources globally and work with a credible range of design and manufacturing partners to redefine engineering outcomes.

Mining products include rubber, composite, Ceramic steel and polyurethane liners, with the company coordinating and organising

qualified and competent personnel for their installation.

Australian Mining Products and Services also offers screening media, material handling hoses, flexible joints, wear components with fabrication facilities nationally.

The mining range offers a solution for every wear problem with design, manufacturing, installation and performance reliability ensured by the team of experienced application engineers.

Product development

Australian Mining Products and Services offers game-changing innovation through its ability to evaluate mineral ore extraction and ore beneficiation bottlenecks, and then uses the knowledge of a network of experienced manufacturers, engineers and other mine maintenance planners and superintendents to then make those ideas into a product that will eventually alter the very process flow of the operation.

For more information visit:
www.australianminingservices.com.au



Australian Mining Products and Services has 35 years' experience manufacturing and supplying products and applications for the mining industry.

MORE INFORMATION: Australian Mining Products and Services | sales@australianminingservices.com.au | www.australianminingservices.com.au

AUSTRALIAN MINING PRODUCT AND SERVICES

IT'S WHAT WE DO

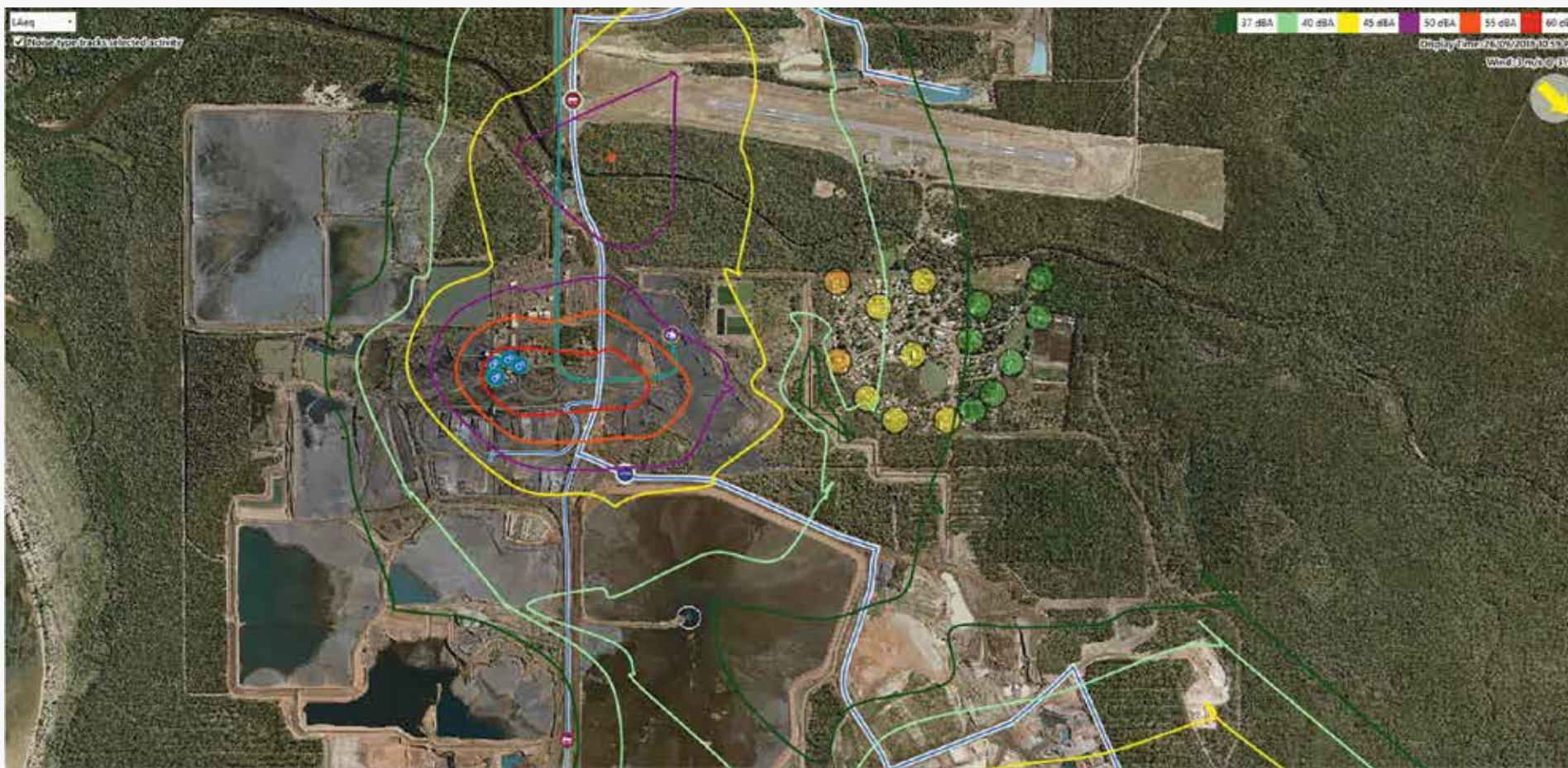


- RUBBER & CERAMIC WEAR LINER
- MATERIAL HANDLING HOSES – CERAMIC OR RUBBER INTERNALS
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- WEAR RUBBER SHEETING

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Nexus' advanced modelling plus monitoring makes for the most complete picture available.

Technology hears the whole story

NATIONAL

THERE'S a significant problem with conventional methods of 'modelling' when managing noise associated with mine sites, ports and refineries – they potentially limit revenue and stymie operational effectiveness.

How? Well, put simply, they are merely blunt-force implements that predict static, worst-case scenarios to determine operational noise impacts on communities.

These worse case scenarios are, in effect, estimations that result in high error margins, uncertainty and overly conservative productivity targets.

But all that has changed with the development of Nexus.

It's a paradigm shift in noise management using modelling plus monitoring that overcomes the inaccuracy and mistrust that plague current conventions.

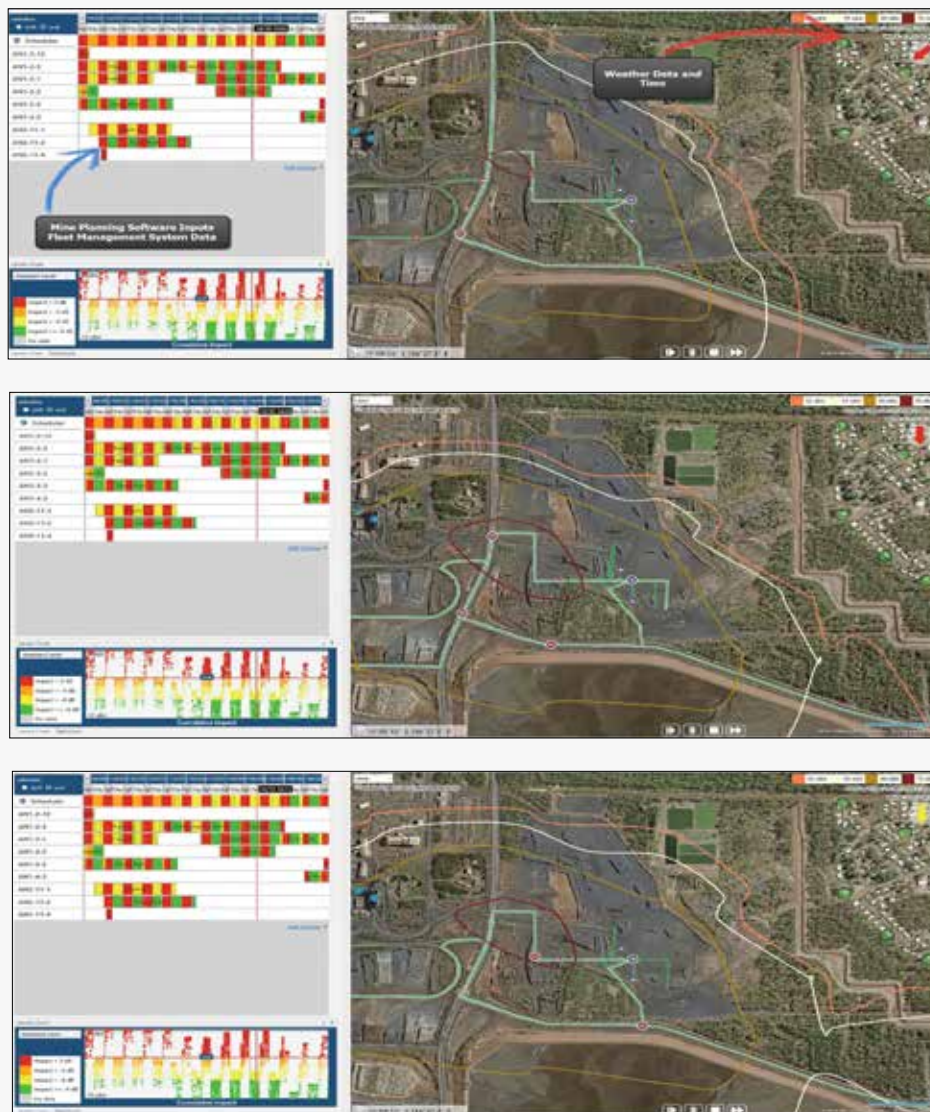
And it accomplishes this right before your eyes – real time data benefiting real time operations.

By coupling recent advancements with the latest technology, Nexus:

- Addresses specific and variable circumstances,
- Takes into account all aspects of the environment in which you operate,
- Removes barriers to optimal efficiency, performance and the achievement of commercial goals,
- Integrates seamlessly into your established operational protocol.

That's what Nexus does but what does it do for clients specifically? It ensures that site-based managers and operators can expect improved performance both in the field and on the balance sheet thanks to Nexus's:

- Fact-based planning using forecast and predictive data,
- Real-time compliance tools that clear the path for adaptive management and risk-mitigated operations,
- ROI based on enhanced ability to forecast



Noise as you've never seen it before

accurately and adaptively manage effectively,

- Ease of use allowing for informed decision making at a glance,

In other words, Nexus real time data benefits real time operations.

Complex environments require detailed technologies

It is widely understood that industrial and mining areas are highly complex noise environments. They include noise created

from diverse sources such as other industries or mines that are situated close to your operation, transportation, communities and weather. Nexus' authoritative predictive capability combined with real-time monitoring offers the most comprehensive noise management solution on the market – providing the most accurate indication of just how much noise your activity is impacting surrounding communities. In short, Nexus takes all the in-depth detail and turns it into an interactive, easy-to-use system.



Granger Bennett.

But accuracy is everything

'About', 'give or take' and 'around' are some of the most frightening words for a production manager, scheduler, mine planner or head of operations to hear in relation to reported noise levels versus allowable levels.

They can directly affect schedules, output and of course balance sheets.

It's a problem because where there is doubt, it's doubtful that full potential (aka optimal performance) can be achieved, let alone sustained over time.

The Nexus difference makes all the difference

So, to the critical question – how accurate is "nexus accurate"?

The company validated and compared Nexus predictions with actual measurements at a number of locations for a number of clients from mines, refineries and ports.



Upon validation, it was shown that the average error registered between just 0.3 and 2.2 dB over more than 30,000 predicted modelling points at each location when compared to the same number of measurements.

If it is considered that there is an inherent error in the measurements themselves the level of accuracy offered using Nexus, combined with the easy-to-access, depth of data provides a platform that allows the scheduling and execution of operations with confidence.

The Nexus difference therefore, is in fact, the difference between operating very conservatively and dealing with those opportunity costs, and being able to plan more aggressively in pursuit of fulfilling potential, both in the field and on the balance sheet.

Working on technology that works in your industry

According to Vanguard Technologies chief technical officer Granger Bennett, expertise in applied problem-solving within industries – where efficiencies go hand in hand with compliance – is a highly sought-after commodity.

“Coupled with practical experience in the field as well as an understanding of both corporate and organisational imperatives, our team of specialists established a company dedicated to translating progressive thought into commercial benefit,” he said.

Vanguard Technologies was created specifically to meet the needs of industries looking to increase production output, efficiencies and achieve budgets while in primarily noise and dust-constrained areas.

Clients rely on Vanguard to develop simple

solutions, with robust technology to generate excellent results.

“Our deep understanding of commercial, production and management challenges means that our research and development is always geared to solving real issues that affect real companies,” Mr Bennett said.

“New technology development remains at the heart of what we do and our team is always available to discuss how our work can increase the effectiveness and efficiencies that drive yours.

“To talk with us about how our work can assist you in achieving your production and commercial objectives, feel free to contact us directly.”

Nexus vs the conservative past	
So how does Nexus and its revolutionary integration of modelling and monitoring measure up against conventional tech?	
Here's a comparison:	
Nexus noise management (modelling and monitoring) technology	Conventional methods
Forward-looking and predictive based on meaningful data (i.e. incorporates past data, as well as present and future considerations).	Only works with historical data , doesn't consider the plan, the present or the future.
Noise predictions and monitored data combine to allow separation between industry or mine noise and background noise, as well as assisting with validation, inversion detection and continuous improvement.	Measurements are geospatially confined to a single location . Impossible to separate industry or mine noise from background noise (for which the industry or mine is not responsible).
Extra layers of extensive analysis and reporting capabilities from 1000s of locations, equipment contributions, spectral analysis, comparison with planned and actual – all increasing certainty and understanding.	Offers limited analysis capabilities, often only trading in absolutes.
Uses the entire range of available data sets including FMS, collision avoidance, SCADA and weather.	Works with limited data sets , ignores data from FMS, collision avoidance systems, and SCADA.
Provides real-time noise contour maps , converting technical noise data into easily-digested visual representations.	—
Eliminates the arduous necessity of listening to hours of audio analysis during investigations.	—
Cost effective , doesn't require maintenance and offers site-based validation.	Expensive systems that require re-calibration, maintenance and replacement.

MORE INFORMATION: Vanguard Technologies | 1300 251 070 | info@vanguardtech.com.au | www.vanguardtech.com.au

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Chemical attraction

NATIONAL

ADDING the right chemicals to solids/liquid separation processes will help lower the total cost of operation.

With the right choice of chemical, the solid particles will flocculate: that is, bind together to make larger particles.

Adding chemicals to aid flocculation is a common practice in the resources industry, as those in the know realise that as the solid particle size gets bigger, both the capital and operating cost to separate it from the surrounding water decreases.

Choosing the best chemical to achieve flocculation is not easy.

There is a wide range of choice, from inorganic coagulants, to organic coagulants, to organic polymers.

Sometimes a combination of these chemical types will give the best results.

Knowing what best suits a specific process requires expertise and experience, and this is where support from Hydroflux will benefit the resources industry.

Reducing operating costs

The best flocculant chemistry reduces the total operating costs in a number of ways.

The added chemistry will speed up the solids/liquid separation process, and provide more concentrated solids, as well as producing a much cleaner water after separation.

When designing a new plant, a faster process means a lower plant footprint (i.e. lower capital spend), and a much higher throughput per unit time thus improving overall operational efficiency.

More concentrated solids means improved solids recovery and leads to lower footprint for downstream solids handling, whether for re-use, for further dewatering, or just a smaller tailings dam.

Cleaner water means less downstream processing before reuse or discharge.

Conversely, for existing plant and equipment, the best flocculant chemistry will increase throughput, decrease the volume of solids, and improve discharge water quality.

Separating a solid from a liquid can be considered as a two-step process.

Step one is where the flocculant is added to the process stream so that a distinct solid phase and a distinct liquid phase is created.

Step two is the separation phase where a unit process separates the two distinct phases into separate streams.

The most common separation methods are via sedimentation using a clarifier or thickener, via flotation using dissolved air flotation, or via filtration.

The key to success is two-fold. First, you need to add the right chemistry, in the right quantity, to the right part of the process stream.

Second, you need an appropriate piece of separation equipment designed to handle the type of water/solids mixture created in Step one.

Having a partner like Hydroflux – which offers end-to-end solutions ranging from design and build of separation plants to the supply of chemistry – to maximise plant efficiency helps guarantee success.



Hydroflux has a skilled team to carry out testing of fluids to determine the specific flocculants required.

Coagulants and polymers

Knowing a little bit about Step one, the flocculant chemistry and how flocculants work, can be invaluable.

Flocculants are characterised in a number of different ways including via their molecular size (point charge, small chain, or extremely large chain of repeating units), via their specific chemical make-up (organic or inorganic), via the apparent charge on the flocculant

molecule (cationic, non-ionic, anionic), or via the process with which flocculation takes place (charge destabilisation, chemical bridging due to adsorption, sweep flocculation).

If we look at molecular size as a starting point, flocculant molecules can range in size from the very small and individual almost point-like charges with a molecular weight as low as 24 atomic mass units (AMUs), right up to very large chains of repeating molecular units (polymers) of molecular weights up to 30m AMUs.

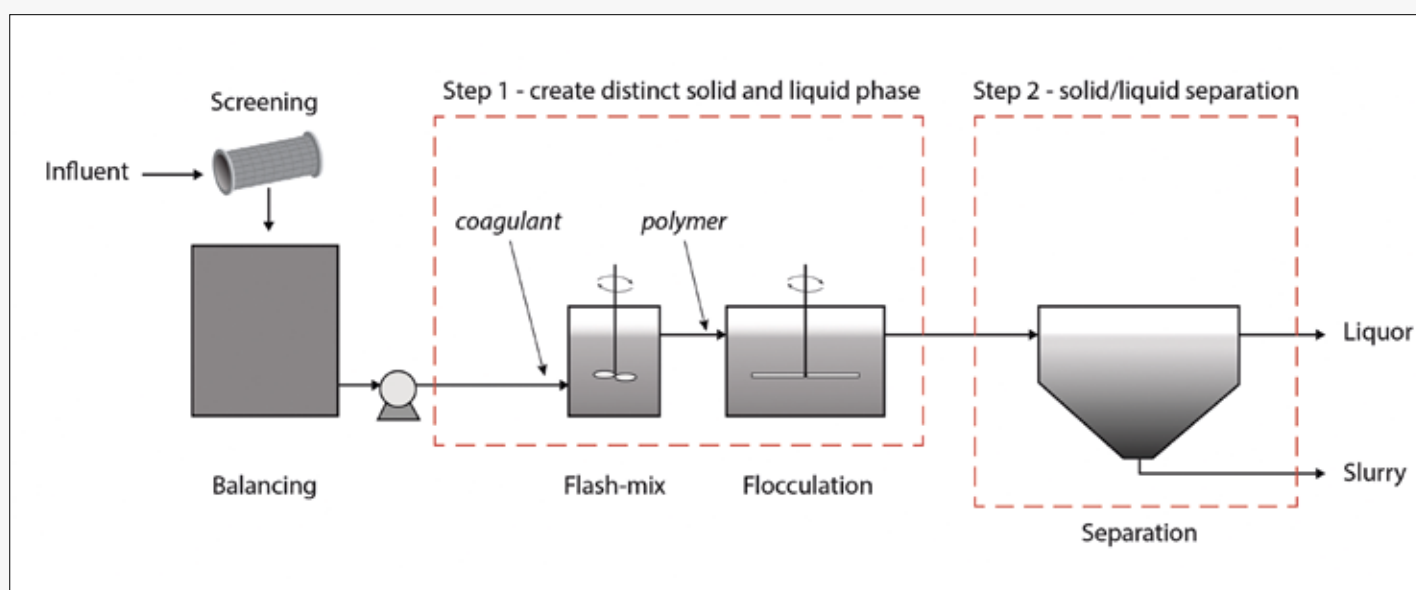


Hydroflux-installed dosing station onsite.

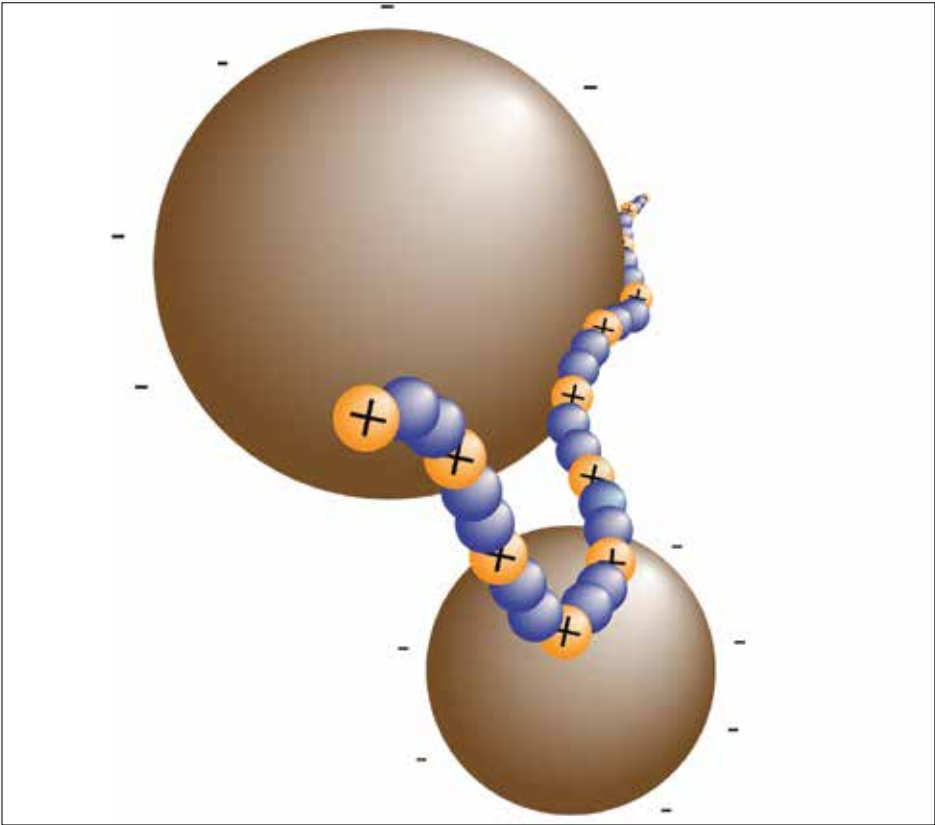
If we could stretch these two molecular structures out, the low AMU molecule would be about 0.0001 microns in length, compared to about 80 microns in length for the very high AMU molecule.

Thus, the largest flocculant molecule is about one million times longer than the smallest one.

Since all sized flocculant molecules can produce a floc, we reference the words coagulant and polymer to distinguish between them based on their size (or length).



Hydroflux engineers and chemists can design, construct and commission complete systems suited to a client's requirements.



Chemical bridging.

Coagulants are flocculant molecules with an AMU of less than about 500,000.

Polymers are the very high molecular weight flocculant molecules of AMU greater than 500,000.

Even though a lot of molecules referred to as coagulants are made up of repeating units and strictly speaking are polymers as well, they are distinguished as coagulants to help us understand how the small and large molecular structures work.

For instance, coagulant molecules are always considered positive in charge, whilst the polymers can be positive (cationic), neutral (non-ionic) or negative (anionic) in charge.

Inorganic coagulants work via charge destabilisation and/or sweep flocculation, whereas organic coagulants work via charge destabilisation and/or chemical bridging.

Polymers on the other hand mainly work via chemical bridging.

Knowing how these different types of flocculants work and thus how they will affect a system helps experts in the field, like Hydroflux, hone in on the most suitable chemistry for your process.

Some selection examples

For heavy solids-laden waters, sedimentation is the most common separation mechanism.

In this case chemical bridging gives the best results by producing the largest particles and fastest settling rates.

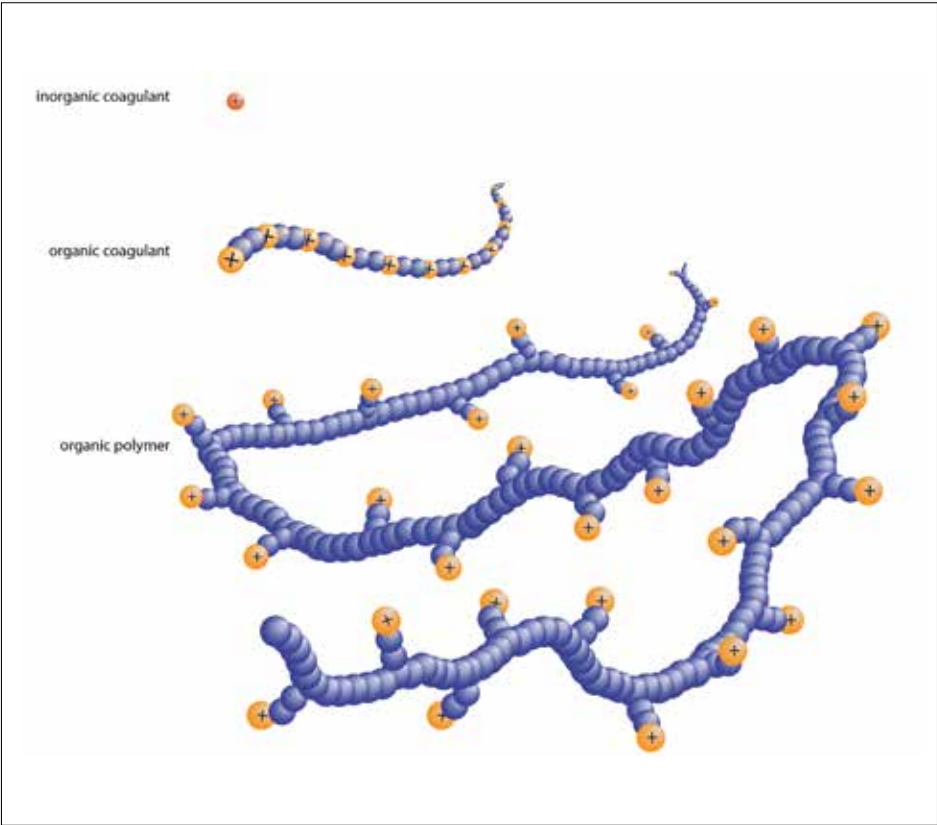
Compared to coagulants, polymers are the best at bridging, and they tend to work better as their chain length gets longer and longer; that is, as their molecular weight goes up.

While both cationic and anionic polymers are good at bridging, anionic polymers generally have much longer chain lengths (higher molecular weights) so tend to work better, and the dose required is often lower.

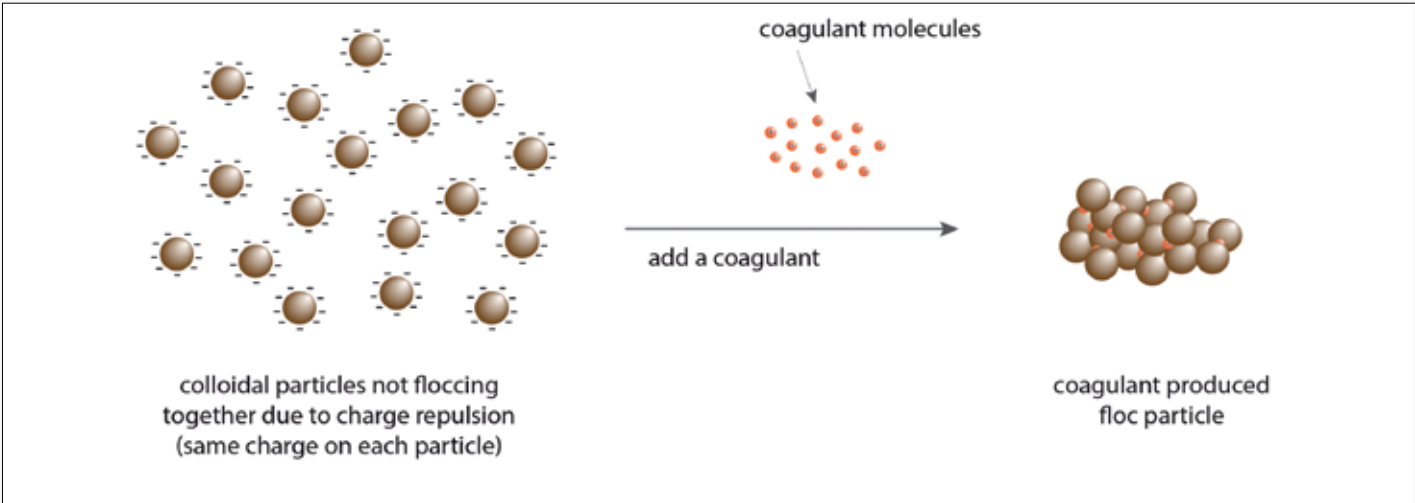
In many mining slurries, anionic polymers are the polymer of choice.

For lighter solids-laden waters, and for polishing turbid waters, a combination of coagulant followed by a polymer is often used.

In these cases, it is difficult to predict which flocculation process will give the best result;



Flocculant size variation.



The coagulation process.

sometimes charge destabilisation works best, and other times sweep flocculation is the only process that works.

The choice of polymer also becomes more difficult as the number of dose combinations of coagulant plus polymer starts to multiply.

This is where a partner such as Hydroflux can help.

Its field technicians have extensive experience across the resources industry, and they can visit site and perform jar testing to help determine the most suitable combination for your process.

Suitable flocculation chemistry can also improve filtration processes. Often just a small dose of

coagulant helps to produce a shear resistant uniform porous floc structure on the filter surface.

Compared to a dense, compact structure, the porous structure created by a coagulant allows water to pass through without letting the solid particles through.

This in turn increases filter throughput and gives longer filter runs.

Due to their very long chain lengths, polymers are rarely if ever used on filtration processes as these tend to blind the filter and reduce throughput.

About Hydroflux

Hydroflux began operation in 2013 and has

grown rapidly since its inception.

With a team of highly skilled and experienced process and chemical engineers, Hydroflux gives its clients the best opportunity to resolve any issues presented.

Hydroflux operates Australia wide and in the South Pacific and differentiates itself from other players in the resources industry by being able to offer end-to-end solutions from design and build of plant, to chemistry, to operations.

This unique holistic approach to water treatment gives Hydroflux and its clients the greatest of opportunity of success at the lowest possible cost.



The coagulation process.

Right boom for the job



The Rammer S Series boom.



Positioning of the boom is important to worker safety, as well as to rockbreaker efficiency.

NATIONAL

SELECTING the right boom is essential to getting the job done right.

Before selecting the boom system, the needs of both operators and maintenance personnel should be taken into consideration as they are often overlooked during initial design.

When positioning the boom system, thought should be given as to where an operator might be able to safely stand, out of reach of the boom, to ensure a clear view of the work area.

By properly positioning an operator viewing platform, or an operator cabin, the risk of operator injury can be eliminated.

Similarly, by considering and making provision for suitable maintenance park locations with tool and rockbreaker change frames, changing rockbreaker tools and rockbreaker removal for servicing can be done safely and efficiently.

There are several critical factors that should be considered when purchasing a new rockbreaker boom: the correct sizing of the rockbreaker, the correct boom size and reach, the correct positioning of the slew base to optimise the working area, the availability of safety systems including automation and remote operation and of course the availability of tools and spare parts.

The correct sizing of a boom allows the rockbreaker to optimise its role in any crushing circuit.

Rammer boom systems have been an integral part of Australian crushing circuits for more than 40 years.

The company's tried and tested designs are manufactured on a global scale for a global market, and as a result they are also priced competitively.

Total Rockbreaking Solutions engineering manager Paul Ingleson said that the starting point for any new boom is two-fold.

"Firstly, the correct hydraulic rockbreaker for the rockbreaking duty and application needs to be selected and then, secondly the necessary reach for the boom system must be determined by selecting the best, or most practical, location to mount the rockbreaker boom system base and then assessing the horizontal and vertical reach requirements from that mounting location," he said.

The correct hydraulic rockbreaker requires the consideration of the size and hardness of the rocks that will be broken, and also the number of oversize rocks to be broken per hour.

Mr Ingleson said that this is what is known as the 'rockbreaking duty'.

"You might think that as the rock hardness increases, the rockbreaker needs to get larger," he said.

"But that is not necessarily the case.

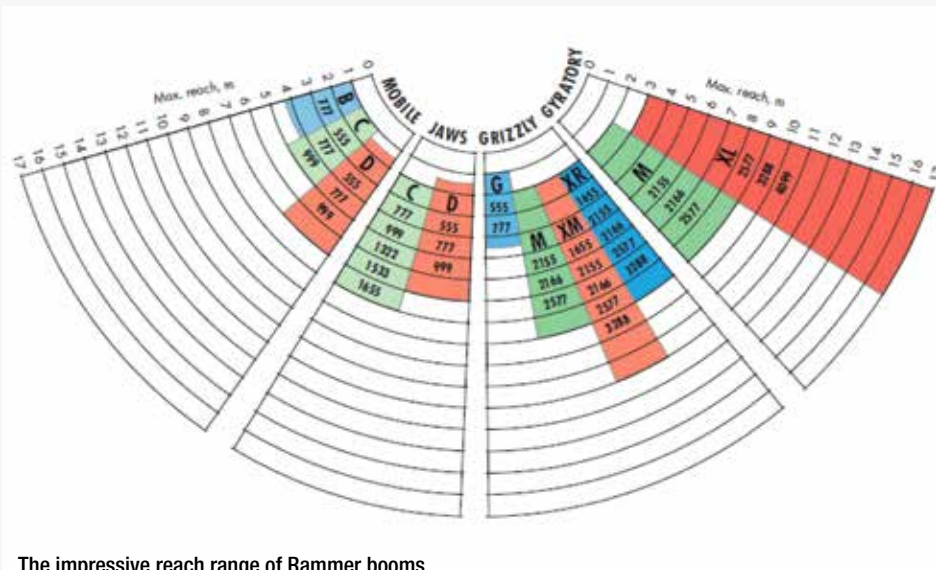
"If you only expect an oversize rock every three or four hours, it might not be absolutely necessary to install the largest rockbreaker available, as there are other practical considerations that should be taken into account."

These considerations include such things as if there are any physical limitations to get the rockbreaker to the rock – such as the size of the chute, and also the capacity of the existing support structure and the size of boom it can support without major modifications.

The loads imposed on structures with a long reach boom and a heavy rockbreaker can be significant and must be taken into consideration.

Rammer boom systems are available in many different sizes with more than 40 models that suit all types of mining and quarrying applications.

The smaller C series booms start at a 3m reach, which makes them perfect for smaller stationary crushing plants or mobile crushers, while the massive, heavy duty XL series reach up to 17m and are used in mining operations over gyratory crushers or ROM bins.



The impressive reach range of Rammer booms.

And, as expected, for each boom model there is a range of possible rockbreaker sizes that should be carefully considered.

Hydraulic power units are also available to suit the required pressure and flow for any boom and rockbreaker combination.

Safety

Safety is a primary objective for all modern mines.

Increasingly, mine operators are turning to technology and remote operation to reduce the exposure to risk for operators and nearby personnel.

BoomSafe is a system that has been developed specifically for hydraulic boom systems to provide collision prevention and automated movements to improve safety of rockbreaking operations.

Mr Ingleson said that it works by monitoring the

position and orientation of the boom – effectively ‘supervising’ all movement commands from the local radio controller or remote operation station.

“With self-aligning gyro sensors and a rotary encoder to determine slew location, BoomSafe is able to determine the precise orientation and position of the rockbreaker at all times,” he said.

“Configuration of the system involves simply driving the boom through the ‘safe area’ to create a 3D safe working envelope.

“Once defined, the system will ensure that operators cannot drive the boom system outside of this safe work area – preventing contact with surrounding structures and equipment.

“Automated movements are simply and quickly programmed by trained maintenance staff for any movement sequence, including park, deploy or maintenance and when set, the boom system can



Rammer has been an integral part of Australian crushing circuits for more than 40 years.

be deployed or parked by the simple press of a button.

“The system can also allow accurate movement of the rockbreaker into maintenance cradles or horizontal positions for tool changing.”

Remote operation

BoomSafe also has application in the emerging field of remote operation.

Many large mining companies are moving toward remote operation of rockbreaker boom systems, as with remote operation systems, companies can operate their rockbreakers via a plant network at any location in the world via a laptop or PC.

BoomSafe allows for the control of multiple rockbreakers across multiple sites.

Mr Ingleson said that there is no limit to the

number of rockbreakers that can be added.

“With one of more remote operator stations running the Remote Operating Station application, sharing control of a group of rockbreakers is on a first-come-first-serve basis,” he said.

“Each rockbreaker can be assigned a unique remote operation password for security, and is protected by an optional IP address whitelist to prevent unauthorised access.”

The Rammer line of booms, rockbreakers and the state-of-the-art BoomSafe system will make any rockbreaking project run smoothly, safely and efficiently.

More Information can be obtained from any authorised Rammer dealer or by visiting rammer.com.

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With more than 40 years of experience in supplying boom systems Rammer specialises in providing safe turn-key packages comprising boom, rock breaker, power pack and full electrification of the system to meet specific customer needs.

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Renewed, revitalised, reborn

NATIONAL

LIKE a phoenix rising from the ashes, Castings Tasmania (CT) has gone from strength to strength since the purchase of the almost 200-year old foundry in Launceston, in 2016.

CT general manager Chris Smart said that while the company purchased land, buildings, plant equipment from Bradken, it started from scratch when building a reputation.

"We have the right combination of expertise and customer service to offer technical solutions specific to each customer," he said.

"We're known as a foundry who can make things others can't."

CT's goals are to expand on that record to provide customers with exemplary service in terms of quality and reliability, deliver on time, and maintain compliance to specification.

"We went from a loss in our first year to almost \$6m in our third," Mr Smart said.

"But now, customers are recognising our expertise and we're starting to break into new markets."

Modern equipment

The Castings plant is modern, having benefited from an extensive capital expenditure program over the past 15-years in the areas of melting,



CT can pour up to 5t at the time.

moulding and heat treatment.

CT has an automated fast loop system in place, allowing for large orders using sand moulds (that can also incorporate multiple patterns and even different casting metals) and the ability to pour up to 5t at a time using a large induction furnace.

The company also has two 3-tonne furnaces with a total annual capacity of 3500t.

Over the past three years of operation, CT's work has consisted of Caterpillar parts for underground trucks including axle housings, cross beams and tilt levers, as well as mining drag

and hoist chain and rigging gear.

Drag chains of up to 5-inch link diameter and 21-links in length have been cast on site for customers around the world.

"Our capabilities include crusher liners, mill liners, apron feeder pans, rotary breaker liners, scrap shredder hammers and liners, rail and truck components – to name but a few," Mr Smart said.

"Metals include carbon, low-quench and tempered steels, manganese steel, stainless and heat resisting steels, alloy white irons, and grey and SG iron."

Technical expertise

Though many companies in the mining industry have turned to China for steel and iron castings, Mr Smart says CT stands apart by offering technical expertise and a heritage of the Bradken plant's history of quality and service.

"The business employs previous experienced ex-Bradken staff, many of whom have worked at this facility for many years," he said.

"Our many years of industry experience allows us to advise our customers on ways to improve efficiency and save money on most jobs, whether it is by reducing the number of patterns required through clever design or using specific techniques and metals.

"It is this experience that leads to a better quality product, with a longer service life that directly translates to lower operating costs over life of mine.

"Added to our capabilities, is our cost structure, which ensures that we remain competitive, especially for steel castings in the weight range of 50kg to 3t.

"Our prices are a viable alternative to importing and we are an ISO 9001:2015 certified manufacturer - so our customers can be assured of exemplary service in terms of quality, reliability and on-time service delivery."

CT also offers nightly shipping to Melbourne for trans-shipment by road or rail to all Australian destinations.

MORE INFORMATION: Castings Tasmania | 03 6343 1570 | www.castingstas.com.au

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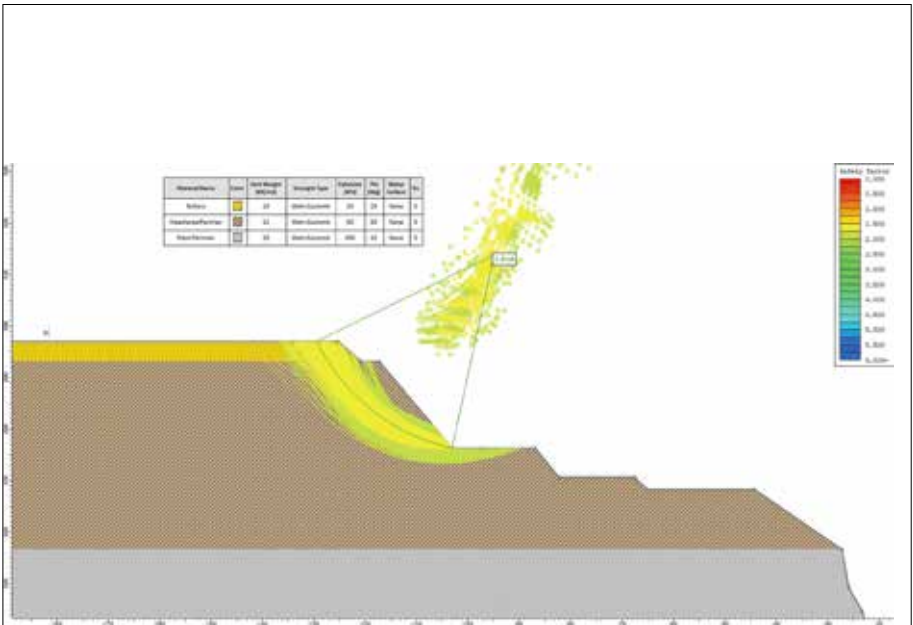


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Map the grades and the hazards

The Loupe transmitter mounted on an ergonomic backpack can be carried for a day of data collection.

NATIONAL

A Western Australian company, Loupe Geophysics, has developed a new instrument to map electrical conductivity in the near-surface to a depth of around 25 metres.

The instrument, called 'Loupe', is a backpack-mounted two-man portable system that measures conductivity over a range of depths while the operators are walking.

Data collection rates of around 5-6km per hour are possible.

Loupe Geophysics is a project founded by Greg Street and Andrew Duncan, two Perth-based veterans of the geophysical instrument business.

Mr Street has been working with geophysical systems in mining, groundwater and environmental applications for 40 years and Mr Duncan is the owner of Electromagnetic Imaging Technology (EMIT), the developer of equipment that has been responsible for a considerable amount of the recent geophysics exploration success in base metals exploration worldwide.

Mr Street said Loupe is a completely new type of electromagnetic (EM) instrument, with a wide range of applications.

"There are no man-portable time-domain EM systems in the market and this was one of the drivers to build Loupe," he said.

"We decided to fill that hole by developing

Loupe and we believe it is quite a special thing – the productivity and data quality is excellent. "The range of depths of investigation exceeds any of the man-portable systems out there and this system has the benefits of modern technology.

"Being a time-domain system, it can map electrical conductivity over a range of depths simultaneously and that's a big point of difference – we're able to analyse a complete cross-section of conductivity values as we walk along."

Mr Duncan said that modern technology has added considerably to the capabilities of this instrument.

"Modern digital systems are incredibly powerful compared to the technology of a decade or two ago," he said.

"We're leveraging the power of modern semiconductors to sample very quickly at high resolution, to store and process a huge volume of digital data in real-time and to provide tools for the equipment operator and the geophysicist to help them make decisions about the survey.

"EM geophysics is increasingly being used in environments with considerable EM interference – in mines, industrial work sites and urban areas.

"There is interference from our electric world – this interference would have been very difficult to deal with in a system like this 20 years ago."

The Loupe system has applications including:

- Mapping moisture in the walls of TSFs

- Mapping shallow sulphide and graphite mineralisation, both in exploration and in-mine
- Mapping clay in iron ore
- Mapping volcanics in coal beds
- Mapping water filled voids such as old mine workings
- Mapping buried rubbish
- Mapping depth of weathering
- Mapping acid mine drainage

Features of Loupe include:

- A comfortable, adjustable carrying system that can be used in the field for long periods
- A web-based architecture so that the operator can log into the equipment with a handheld phone or tablet to view data and navigation information on a browser in real time
- Sophisticated signal processing leading to interference rejection and good performance in mining, industrial and urban areas
- Three-component receiver coil set with 100 kHz bandwidth allowing measurement from very shallow sources down to around 25m whilst walking
- Integrated with an RTK GPS system for accurate positioning
- The receiver samples up to 480,000 samples per second @ 24-bit allowing extremely high resolution spatially and with depth

- Real-time signal processing allowing the operator to see results in real-time and modify survey appropriately and,
- Storage that can deal with approximately 6 Mbytes of raw data per second

The Loupe system combines very high spatial and depth resolution with fast acquisition rates and survey speed.

Survey costs are significantly lower than other ground-based systems but data volume is vastly increased.

Small- to medium-scale projects can then be completed in very short timeframes – a survey looking for increased moisture in a tailings dam wall should take no more than one day.

In addition, the loupe equipment can be easily packed for air-freight.

Why map ground electrical conductivity?

Mapping electrical conductivity of the ground has been used for more than 100 years by scientists for a wide range of applications.

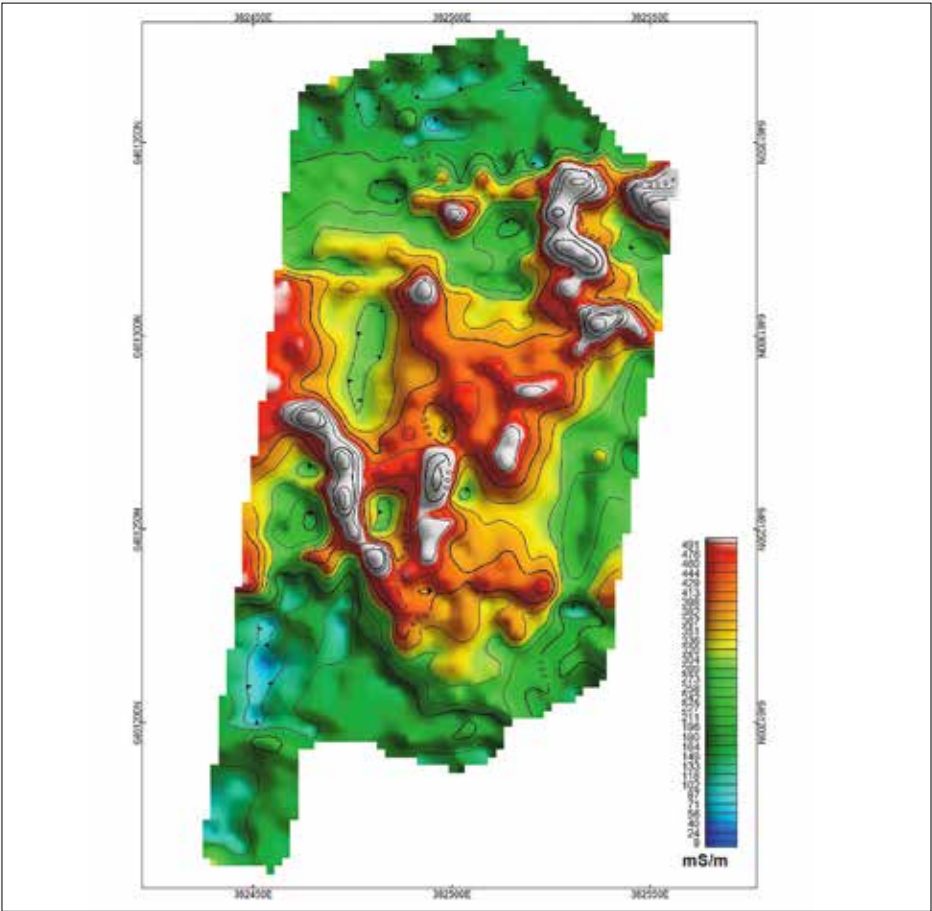
In the ground above basement rock, the variation in water content is the dominant factor controlling electrical conductivity, but changes in the salinity and pH of the water also change the conductivity. Increasing salinity can increase conductivity by factors of 100 to 1000.



The Loupe receiver incorporates three orthogonal receiver coils and weighs less than 10 kg. The operator can view the measured results in real-time



The Loupe system in action showing the transmitter loop in front mounted on an ergonomically-designed backpack and the receiver behind mounted on a similar backpack. The system is designed for continuous operation but can be used in a stop/start mode if desired.



Map of conductivity under the oval test-site showing the extent of buried conductive rubbish (orange to red).

Both low and high pH water can be as much two orders of magnitude more conductive than neutral water.

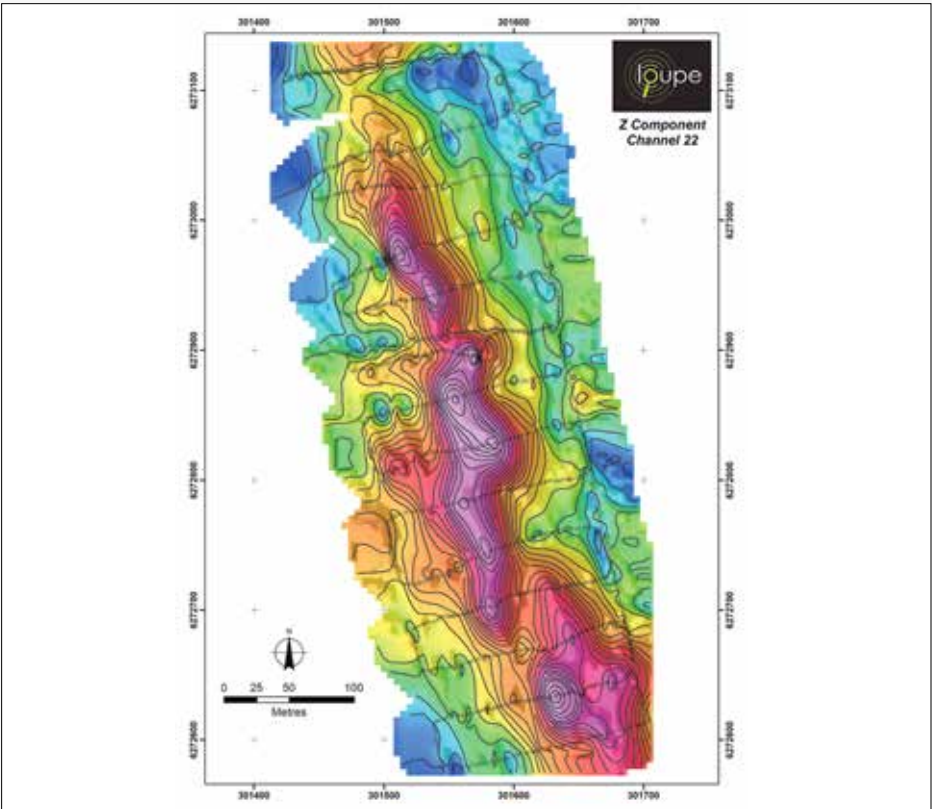
The next most important factor is porosity of the ground which varies from almost zero in crystalline rocks to around 50pc for some clays.

Thus, granite has very low conductivity and a clay much higher (assuming the salinity of the

water held in the pore spaces is the same).

Sandstones, although more permeable than clays, contain less water and usually have lower conductivity and, because they are more permeable, usually contain less salt.

“On mine sites we deal with a range of mixtures particularly in the weathered zone (regolith) above basement rock,” Mr Street said.



Map of the electromagnetic response of a graphite deposit near Ravensthorpe.



Data collection along rehabilitated drill lines over the graphite deposit.



Mapping moisture variations in a TSF wall using the Loupe system.

“In a fairly uniformly weathered rock, we tend to see variations in the salt content causing most of the conductivity variation but changes in porosity also can influence the results.”

According to Mr Street, cavities or old mine voids will be very resistive if empty but may be quite conductive if filled with saline water.

“When mining iron ore, coal or base metals we want to know where the best material lies as well as the location of any hazards that might exist,” he said.

Considerable effort goes into defining the grades and hazards prior to, and during, mining.

A drill pattern to establish grade is common but even at very close spacing all the variability cannot be fully defined.

The Loupe system can map between, and potentially below drillholes, to help define the extent of sulphide mineralisation; clay pods in iron ore; volcanic intrusions in coal beds; or water-filled cavities.

Sampling every metre along traverses gives Loupe a high spatial definition.

Examples from Loupe

The company has carried out a series of tests on a range of targets and more are planned in the immediate future.

The Loupe developers have used a coastal suburban oval many times as a test site.

The oval has been constructed on an old waste burial site. Buried rubbish under the

oval provides high conductivity targets in contrast to the surrounding sand dunes.

Infrastructure in the area (including houses, high voltage powerlines, traffic and buried cables) contributes significant EM interference to test the Loupe data processing.

In addition, the VLF communications station at Exmouth – which is one of the strongest radio stations in the world – sends out a booming signal right in the middle of the EM spectrum measured by the Loupe system.

These interference effects are effectively eliminated by smart processing in the receiver.

Surveys have shown that Loupe can derive, in one survey, a valuable 3-D picture of underground electrical conductivity.

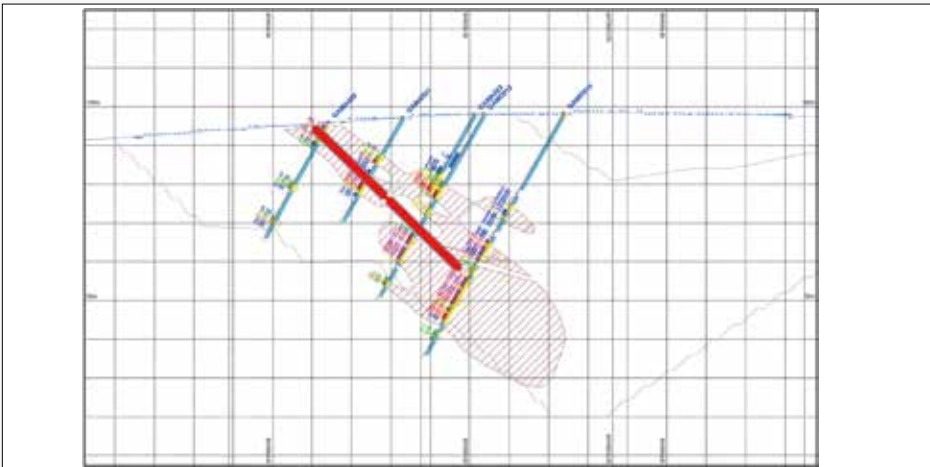
Loupe electromagnetic system adds value to mining

The Loupe system is a new generation of electromagnetic instrumentation developed in Western Australia and shows great promise for a wide range of applications in mining, exploration and ground water.

It has the ability to add value in discovery, delineation, grade control and hazard mapping.

It also has the ability to home in on potential defects in TSF walls and levee banks as well as map groundwater problems such as acid mine drainage.

For more information please contact: info@loupegeophysics.com.au.



A section view from south-east showing a conductive plate (thick red line) simulating the Loupe response of the graphite horizons dipping to the east.

Protecting against silica



CleanSpace's full face mask has a high impact rating and can be used with the CleanSpace Ultra and CleanSpace EX.

NATIONAL

THE recent national crisis from the dangers of crystalline silica has centered on stone-cutting but the risks of respirable silica is nothing new to the mining industry.

Miners have readily acknowledged silicosis as one of the primary diseases to affect miners since the industrialisation of drilling operations in the 20th century.

Silica dust is harmful when inhaled into the lungs as it is 100 times smaller than a grain of sand - so small it can be inhaled without knowing.

Respirable crystalline silica exposure can cause silicosis, a debilitating and irreversible lung condition that can cut short careers, reduce quality of life and lead to death.

Respirable silica is also linked to lung cancer, chronic obstructive pulmonary disease (COPD), and kidney disease.

There are common industrial activities where people are frequently and regularly exposed to respirable crystalline silica, the most notable being quarrying, excavation, construction, mining, tunnelling and abrasive blasting.

Silica dust is 20 times more toxic than coal dust and is one of the most abundant minerals found in the earth's crust.

For the mining industry, this is why it is the primary respiratory hazard.

When looking to protect yourself or your staff from any airborne contaminants, Powered Air Purifying Respirators (PAPRs) offer high and reliable protection, far exceeding disposable masks.

CleanSpace respirators are a revolution in the area of respiratory protection because while they provide all the protection of a PAPR, they are free



CleanSpace Ultra is IP-rated 66 water-tolerant.

from belts, battery packs and hoses, making them more comfortable and easy to deploy.

When used in hot or humid conditions, CleanSpace respirators provide cool, clean air to the user and eliminate fogging and moisture.

They are light, easy to put on, reliably safe and comfortable.

These smart powered devices are easily operated using a one-button smart system.

These unique features mean more workers wear these respirators for a full shift every time.

CleanSpace assists miners and their staff, to be safe and compliant when working around silica dust.

Compared to disposable masks, CleanSpace respirators are high protection reusable devices with economic advantages, as the annual cost of replacing disposables stacks up.

Disposable masks are well-known for causing fogging and discomfort, leading to low compliance, frequent stopping or mask changes.

To guard against silica exposure, State regulators have moved to recommending staff wear powered respiratory protection using the minimum of a P2 filter. CleanSpace respirators meet and exceed these requirements with a P3 filter.

Regardless of whether you see the dust or not, silica is a hazard you cannot afford to ignore.

Under the Standards, all worn tight fitting respirators (regardless of whether it's a disposable mask or powered respirator), must achieve a correct fit to ensure the wearer is protected.

If there is facial hair, including stubble, beards, moustaches and sideburns, between the edge of a tight-facing facepiece and the face, respirator will be prevented from sealing properly.

CleanSpace offers both half face and full face masks. The full face mask also has a high impact rating.

CleanSpace respirators are compact systems that have up to six hours run time and fast top-up charging.

"The feedback we get from teams wearing CleanSpace Ultra, full face mask for mining activities, is that the mask is comfortable to wear all day, and the cool fresh air on the face is a dramatic improvement on disposable or reusable half masks," CleanSpace chief executive Alex Birrell said.

"They have also told us there is no fogging or hot moisture on their face."

CleanSpace respirators are available in different models with a range of particulate and combination gas filters depending on the task requirements.

CleanSpace EX is intrinsically safety-approved and can be worn in potentially explosive environments.

CleanSpace Ultra is IP-rated 66, making it water-tolerant, and CleanSpace2 is the standard model suitable for those that do not require the aforementioned features.

The newly launched CleanSpace HALO is designed specifically for laboratories and testing facilities.

CleanSpace Technology's team of product specialists can assist with on-site product training, fit testing, trouble shooting and instructions on maintenance.

With the renewed focus of regulators and the industry on silica, it is a great time to re-evaluate your site's respiratory program and equipment.

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NATIONAL

EQUIPMENT failure is responsible for roughly 30pc of deaths on-site.

The lives of all site personnel depend on their safety equipment.

But safety isn't just about having the right equipment, it is about having the right mind frame, knowledge and behaviours.

No matter what the job is, every second workers spend on the site they are exposed to potential risks.

It is imperative that businesses have the best safety gear, the right training and an ingrained culture of safety to ensure everyone goes home to their families.

Integrated Safety Group (ISG) has more than two decades of experience keeping Australian workers safe, and its reputation has been built upon three core values: prevention is the best medicine, quality is the only option, and industry experience underpins all activity.

ISG general manager Richard Speers said that his company's focus on worker safety had set it apart from the competition.

"Year on year we've been proven as the only choice for breathing apparatus because whether service, hire or training, we make sure the job gets done and the workers get home safe," he said.

Breathing apparatus

As we learn more about the effects of silicosis and coal workers pneumoconiosis, dust inhalation protection is becoming an increasingly important to Australian occupational health and safety practices.

Worksafe Australia said that by law employers must provide health monitoring and air monitoring to ensure their workers are adequately protected from exposure to coal dust and to crystalline silica.

Crystalline silica is found in sand, stone, concrete and mortar, as well as many composite products.

When workers are exposed to dust from cutting, crushing, drilling, polishing, sawing or grinding products containing silica, the dust particles generated are small enough to lodge deep into the lungs and cause silicosis.

When silica dust gets into the lung tissue, a chemical reaction can occur which results in tissue injury followed by the healing response of the lung.

Silicosis can be severe enough to cause respiratory failure which can eventually lead to death.

Many similarities can be found with coal workers pneumoconiosis, and this makes protection from dust inhalation paramount to safety on any site as many workers are exposed to this kind of risk.

Work, health and safety legislation places an obligation on everyone at the workplace to manage health and safety; it is the responsibility of an employer to provide a safe workplace that reduces the risk and hazardous levels of exposure to not just silica for their employees, but all manner of respirable hazards.

The employees themselves have obligations to participate and contribute to a safety focused culture.

Life support equipment is subject to some

POSI test machine - performing dynamic bench testing of self-contained breathing apparatus.



Breathe easy with ISG



Specialist LP Airline system ready for use in IDLH environments.

of the harshest conditions that the mining and many industries offer.

Emergency or rescue equipment is used when atmospheres can pose an immediate threat to life.

When it comes to HAZMAT, search and rescue, firefighting or confined space entries, equipment failure can have mortal consequences.

ISG has quantitative mask fit testing capabilities to help clients comply with the AS1715: 2009 requirements for employees required to wear a close-fitting respiratory face piece.

The company offers service, repair and certification to all brands of life support.

ISG uses genuine OEM spare

parts that comply with manufacturer's recommendations and Australian standards which means the equipment is not only compliant, but reliable and ready for immediate use.

ISG will provide:

- certification to AS1715:2009
- NFPA 1852 compliance testing
- Electronic dynamic breathing simulation tests
- Onsite scheduled maintenance plans
- MSA technical partner
- Bauer Compressor technical partner

Along with the maintenance and sale of breathing apparatus, ISG offers rental services from as little as \$20 per day and can service, test and fill BA cylinders on site.



Quantitative mask fit testing.

ISG's rental stores have all the safety needs of its clients covered – whether they need new equipment, or upgraded equipment, ISG can provide the 'try before you buy' option.

The company is aware that renting is a cost-effective way to maintain compliance whilst repairs are carried out, or to provide additional specialised equipment for planned shutdowns or turn-arounds.

With the company's shutdown container, it can mobilise to site with a fully self-contained rental solution.

Full cleaning, decontamination and service facilities are integrated into one package for breathing apparatus/gas detection/cylinder recharging and re-certification.

Technical solutions providers

90% of work-site accidents could be prevented with the right gear, servicing and know how. That's why you need a partner you can trust, delivering high-quality safety equipment, servicing you can rely on, and training that can save lives.

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- First-class customer service
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- Service and support all major manufacturer apparatus

"What sets us apart from our competitors is we service everything we sell. We use all the equipment ourselves placing us in the unique position to advise our customers on the best product for their situation.

Our business prides itself on decades of industry experience and a first class customer service experience."

– Managing Director Richard Speers.

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Safety-first communications

NATIONAL

AUSTDAC was founded in 1983 to provide intrinsically safe telephone systems, communications equipment and conveyor monitoring equipment to the Australian mining industry.

Austdac is driven to utilise leading-edge technologies and manufacturing techniques to help clients with safety and production concerns.

It supplies advanced communication solutions, environmental monitoring systems, safety equipment, safe lighting, power supplies and conveyor control equipment worldwide.

The mining industry is continuously evolving, and as a result Austdac products utilise the latest technology to help facilitate continued growth.

The principal focus is the design and manufacture of rugged and hard-wearing reliable products designed to operate in extreme outdoor and underground hazardous areas – improving the ability to communicate, monitor and control equipment in the mining industry.

Austdac now offers the ability to monitor and control equipment in the field from the control room and vice versa with the introduction of Hubbus.

Hubbus is a long range (10-20km) data bus system for analogue and digital I/O with the unique feature of devices being powered downline from the one signal line.

Austdac product ranges are designed and certified according to the leading global standards.



Austdac continues to evolve with the mining industry.

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