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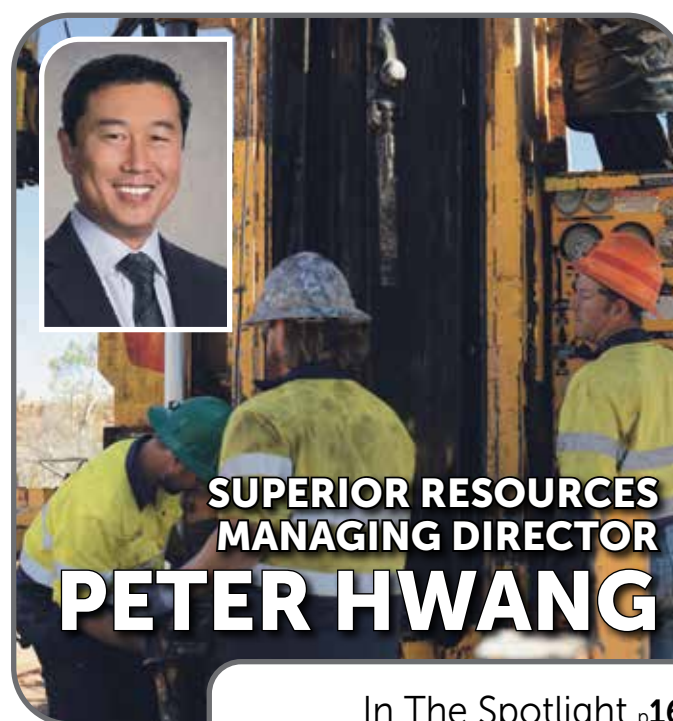
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MAJOR COMMODITIES SNAPSHOT

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\$US/oz

Gold levelled out due to strong jobs data, which eased concerns about the US economy and reinforced the expectation the Federal Reserve won't be cutting rates in the near term.



IRON ORE

\$US/t
62% Fe CFR China

In the near-term iron remains stable with robust demand from Chinese construction activity; however, analysts predict it will decelerate in the second half of 2020.



COPPER

\$US/t
LME Price

Copper prices rose, also benefitting from US jobs data and hopes of that the economically damaging trade dispute with China would ease. The metal is expected to remain strong in Q1 2020.



COBALT

\$US/t
LME Price

Cobalt has dipped slightly amid weakening demand from the battery market and is expected to drop further as downstream battery producers continue to clear inventories.



ALUMINIUM

\$US/t
LME Price

Production cuts at Chinese aluminium smelters over winter have somewhat stabilised the metal with prices remaining steady over the month.



ZINC

\$US/t
LME Price

Prices have dropped significantly this month as the US and China trade negotiations stabilised, but the potential of restricted supply amid tariff rumours could see prices spike again in the new year.



LEAD

\$US/t
LME Price

Lead dropped below US\$2000/t for the first time since August, with declining Chinese use and production meaning that existing stockpiles have been meeting supply deficits.



NICKEL

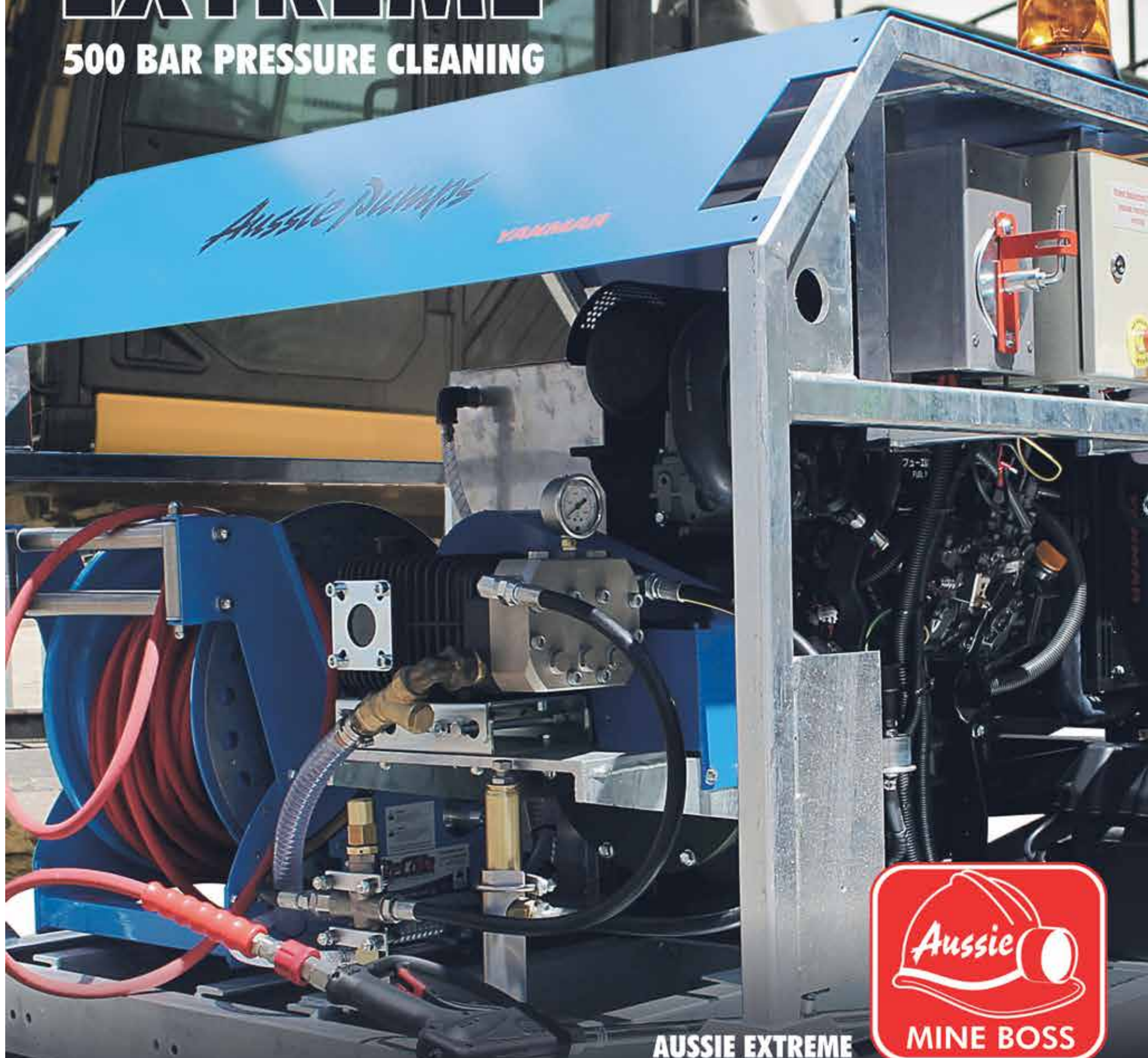
\$US/t
LME Price

Nickel prices have plateaued but with the Indonesian ore ban to take effect from January, the metal could rebound along with fresh supply concerns.



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IN BRIEF

Govt to speed up approvals

NATIONAL

THE Federal Government has announced plans to streamline and speed up approval processes for resource and mining projects in its next wave of deregulation reform.

Prime Minister Scott Morrison said his government was focused on removing the obstacles that slow down and even stop business investment and new job creation.

“We want to create the space for businesses in our economy to back themselves and take our growth to the next level,” the Prime Minister said.

The new reforms include the use of a single digital environmental approvals process and biodiversity database, to get beneficial major projects up and running by transforming the approvals process, reducing approval times and bringing forward economic activity.

The Commonwealth will partner with the WA Government, where there is a large pipeline of major projects coming forward over the next decade, on the new system as a first step towards a consistent nationwide process.

Perenti exits after massacre

AFRICA

WA-BASED mining services company Perenti will exit some mining services contracts in Burkina Faso following an ambush in November which killed 39 mine workers and wounded 60 others.

They were local employees of Perenti’s African Mining Services subsidiary, taking part in a convoy of five buses heading to Canadian-based miner Semafo’s Boungou mine site.

Survivors of the attack said a security vehicle escorting the convoy first hit a landmine, and then gunmen laying in wait opened fire on the buses.

Perenti managing director Mark Norwell said the attack was unprecedented and had prompted the company to re-assess where and how it is prepared to operate.

Semafo suspended operations at Boungou following the attack, vowing to resume only after security was assured.

Perenti said it was in talks with Semafo to terminate the contract should circumstances surrounding the mine remain the same.

AMS has also notified Nordgold that it will exit its contract for mining services in Bissa in northern Burkina Faso, which was due for renewal at the end of the year.

However, the company said it would continue to operate in three other sites located in central Burkina Faso considering them to be “lower risk” regions.

Saracen snaps up Super Pit

RAY CHAN
WA

SARACEN Mineral Holdings has acquired 50pc of Barrick Gold’s stake in Kalgoorlie Consolidated Gold Mines (KCGM) for \$750m in cash.

KCGM had been a joint venture (JV) between Barrick and Newmont Goldcorp, which retains its 50pc share.

The stake acquisition in KCGM will enable Saracen to procure the Super Pit gold mine in Kalgoorlie-Boulder, owned and operated by the JV.

The deal with Barrick Gold was made two months after Saracen began a private “competitive” sale process.

The transaction was completed with a drawdown of \$400m under Saracen’s new \$450m senior secured term loan, after the miner fulfilled a condition to receive consent from the WA Minister for Finance, Aboriginal Affairs and Lands.

Saracen managing director Raleigh Finlayson said the move transformed the company into one of Australia’s leading gold producers.

The new deal is expected to make Saracen Australia’s fourth-biggest gold producer after Newcrest Mining, Northern Star Resources, and Evolution Mining.

The purchase takes place months after the Super Pit underwent major rock falls in 2018, with 1mt of rock slipping down.

Although this led to financial losses and a 32pc drop in production, Saracen is confident the move will prove beneficial over the following years.

“We now have three long-life assets generating strong cash flow in a tier-



Saracen has acquired the Super Pit gold mine.

one location,” Mr Finlayson said.

“Each asset also has outstanding exploration potential, providing scope to create further value for shareholders through organic growth.

“We are looking forward to partnering with Newmont Goldcorp, which has extensive knowledge of the Super Pit and vast experience in open-pit and underground operations.”

Saracen’s other operating hubs are at Carouse Dam mine near Kalgoorlie and the Thunderbox operation near Leinster in WA.

Newmont’s guidance forecasts production of 285,000oz at an all-in sustaining cost (AISC) of US\$1035/

oz in respect to its half-share of the Super Pit, while Saracen’s production guidance is 245,000oz at an AISC of A\$1470/oz for the financial year ending June 30, 2020.

Following the acquisition, Ben Wessely has been appointed general manager of KCGM.

Joining Newmont Goldcorp as mine optimisation manager at the Merian mine in Surinam in July 2017, he moved to the Boddington gold mine in WA as senior manager mining in December that year.

Mr Wessely has worked in both technical and operational roles in bauxite, aluminium, coal, iron ore, manganese and gold.

Iluka considers BHP demerger

EMMA DAVIES
NATIONAL

WITH the development of BHP’s South Flank in WA’s Pilbara well under way, Iluka Resources is considering a demerger of the royalty it pockets from BHP’s Mining Area C (MAC).

The development of South Flank means the capacity of the expanded MAC hub will sit at around 145 wmtpa from 2023 onwards and would equate to an increase in annual iron ore production (within the MAC royalty area) from around 55m dmtpa to 135m dmtpa.

With this increase in production (and cash flow), Iluka is considering a structural separation of MAC by way of demerger.

Iluka managing director Tom O’Leary said that the MAC area is a high grade, low cost iron ore asset with a tier one operator in BHP.

“Thanks to the South Flank development, it has significant growth in expected cash flows,” he said.

“In addition, further growth in the value of MAC is possible given the potential for the development by BHP of deposits within the area covered by the royalty agreement.”

MAC’s earnings contribution to Iluka will ultimately be dependent on a range



The MAC area is a high grade, low cost iron ore asset for Iluka.

of factors including iron ore pricing and the US/Aus dollar exchange rate, but the asset could be fruitful in more ways than one.

Beyond the existing South Flank development, BHP has identified two potential future operations in its long-term plan, Tandanya and Mudlark, which are likely to fall at least partially within the royalty area – another cherry on top of the potential demerger sundae.

Iluka chairman Greg Martin said the review would determine what is ultimately in the best long-term interest for the company and shareholders.

“Given the substantial scale of the mineral sands business and the prospective scale of MAC, the time is right to formally review Iluka’s corporate and capital structure with the objective of fully capitalising on the respective features of both assets,” Mr Martin said.

The review will consider Iluka’s corporate and capital structure, capital requirements, business plans, management structures, and cost and tax implications.

An update is anticipated at the announcement of the company’s full year results in February 2020.

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IN BRIEF

MILLENNIUM MINERALS

WA gold producer Millennium Minerals has entered into voluntary administration.

The ASX-listed miner had been involved in fundraising efforts to support its 100pc-owned Nullagine Gold Project in the East Pilbara region.

Administrator Deloitte Financial Advisory is undertaking “an urgent assessment” of Millennium’s trading position and near-term liquidity to determine the company’s future viability and options going forward.

In February, Millennium Minerals announced plans to develop a second underground mine at the Golden Gate mining centre, which hosts some of the highest-grade deposits identified at Nullagine to date.

But the company has been experiencing delays in receiving Nullagine open pit mining approvals, ramping up the existing Bartons underground mine, and commissioning a sulphide plant

RIO TINTO

MINING giant Rio Tinto will invest \$10m in a four-year national program targeted at school-age learners, that aims to fast-track the development of skills needed for the digital future, including critical thinking, problem-solving, automation, systems design, and data analytics.

Developed in partnership with leading education and innovation start-up accelerator BlueChilli and Amazon Web Services (AWS), the program will crowd-source and fund ideas from start-ups and schools – identifying existing EdTech projects aimed at enhancing future skills, that can be scaled up quickly for the use of students, teachers and parents.

EdTech refers to software designed to enhance teacher-led learning in classrooms and improve students’ education outcomes.

Rio Tinto chief executive J-S Jacques said the new program uses a bold and disruptive method to identifying solutions that will help equip young people with the knowledge and skills for a changing world.

“Addressing the change in skills required by mining requires new thinking. This approach significantly expands the network of organisations focused on equipping people for a digital future,” he said.

KIRKLAND LAKE

CANADA’S Detour Gold is set to be acquired by Kirkland Gold in a deal worth around \$C4.9b (\$5.4b).

The move will make Kirkland Lake a producer of 1.5m oz of gold a year, up on its plans to deliver 1m oz by the end of 2019.

The company’s Fosterville mine in Australia and Macassa mine in Canada have already achieved record production, driving the company’s output 41pc higher in December compared with the same period last year.

Fosterville and Macassa are expected to easily achieve their 2019 full-year guidance of 240,000–250,000oz and 570,000–610,000oz respectively.

Lynas confirms Kalgoorlie plant

RAY CHAN
WA

LYNAS Corporation has confirmed Kalgoorlie as the location for its new cracking and leaching plant, creating new jobs and a first step in establishing a critical minerals hub in the Goldfields region.

The site was selected from the two shortlisted locations in the Goldfields region following extensive due diligence.

Kalgoorlie provides close proximity to the Lynas mine at Mt Weld, as well as a skilled workforce and a rich history in the mining and processing industries.

Lynas has signed an option to sub-lease an industrial zoned property from the City of Kalgoorlie-Boulder, with the terms of the proposed sublease now being finalised.

The company’s Kalgoorlie cracking and leaching plant will upgrade the Mt Weld rare earth concentrate that is currently exported to the Lynas rare earth processing facility in Malaysia.

The miner will also explore opportunities for the next stage processing (upstream solvent extraction) in WA, while facilitating investment in infrastructure and supply chain capabilities which can form the basis of further industry development in the region.

Lynas CEO and managing director Amanda Lacaze said Kalgoorlie was “a terrific city” and an ideal location for the



The Lynas mine at Mt Weld.

cracking and leaching plant.

“We are excited to contribute to economic development in Kalgoorlie-Boulder,” she said.

“Lynas was built from the ground up as an environmentally responsible rare earths producer and we will take the same approach to our facility in Kalgoorlie.

“We also acknowledge the support from the WA Government and the Australian Government to enhance the critical minerals industry in the Kalgoorlie region.”

City of Kalgoorlie-Boulder CEO John Walker welcomed the move, saying it was a “fantastic step forward in the

work we have been doing to diversify our local economy and expand the number of skilled residential jobs available in our City”.

“There are so many exciting opportunities that this partnership brings about, and we look forward to working with all of the key stakeholders, including the State and Federal Governments to further support downstream processing here in Kalgoorlie-Boulder. “The City would also like to thank Neometals for its support in varying its option to sub-lease, to allow both Lynas and Neometals to be accommodated within our strategic industrial areas.”

OZ strikes deal with Vale



Part of the Pedra Branca mining site.

RAY CHAN
BRAZIL

AUSTRALIAN mining company OZ Minerals has started construction of its Pedra Branca underground copper-gold mine in southern Carajás in the Pará state of Brazil.

It comes after OZ signed a series of inter-linked strategic agreements with Brazilian iron ore miner Vale, which enable the miner to use Vale’s extensive transport infrastructure and their processing facilities, while gaining access to small and medium high-grade Vale exploration projects in the Carajás.

Decline construction at the 1mtpa Pedra Branca mine is expected to start next month, with first development ore

slated for the middle of next year.

After the takeover of Avanco Resources in August last year for \$418m, OZ Minerals aimed at transforming the small open-cut Pedra Branca mine into a larger underground operation, enabling it to access seven mines in the next six years, including Prominent Hill, Carrapateena, West Musgrave, Antas, CentroGold, Pedra Branca and Pantera.

The company will ramp up annual production to about 18,000t of copper and 11,000oz of gold.

The project will create around 100 jobs during construction, and 450 people in steady state operations throughout an eight-year mine life.

OZ Minerals Brazil chief executive

Carlos Gonzalez said the Vale agreements simplified and focussed the firm’s activities in the Carajás, as well as benefitting Vale by increasing its concentrate sale volumes and creating the potential to receive higher grade ore from OZ Minerals Brazil in the future.

“The Vale Carajás concentrate sales agreement utilises Vale’s extensive in-country transport infrastructure which provides logistics and marketing cost savings and simplifies our activities in the region,” he said.

“The earn-in agreements with Vale provide the OZ Minerals’ Brazilian operations with the option to purchase two additional exploration projects, providing a pathway to potential future mines in the Carajás.”



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IGO makes a push for Panoramic

GERARD MCARTNEY
NATIONAL

INDEPENDENCE Group Has launched a \$312m takeover bid for Panoramic Resources.

IGO said the hostile all-scrip bid was taken to shareholders after a number of attempts to engage with the board for a friendly takeover were unsuccessful.

The company cited poor performance and a “lack of engagement from the Panoramic board” as the reason for backing the takeover.

“The offer represents, in IGO’s view, the best opportunity for Panoramic’s shareholders to crystallise and de-risk meaningful value from their investment in Panoramic in the foreseeable future,” it said.

The offer would pay a premium 42pc to the last closing price of Panoramic shares before the date of the bidder’s statement, and 51pc to the one-month VWAP.

Under the offer, shareholders would receive one IGO share for every 13 Panoramic shares, which values each Panoramic share at \$0.476c.

The company said that there would also be an opportunity for capital gains tax scrip for scrip rollover relief.

The takeover would be in line with IGO’s strategy to increase its production of nickel, and the company said that it would leverage its capabilities and expertise to maximise value from Savannah.

This comes just days after IGO finalised offtake agreements with BHP and Nickel West at the Nova mine in WA, including the completion of concentrate tendering processes and the downstream nickel sulphate pre-feasibility study.

Panoramic is currently developing the Savannah nickel mine in WA, and has a substantial exploration portfolio in the Kimberley.

The Savannah operation is a 217kt nickel mineral resource, with a 110kt nickel ore reserve.

It averages about 10.8ktpa and has a mine life of about eight years.

Panoramic Resources has urged its shareholders to take no action in what it called an “unsolicited, highly conditional scrip takeover offer”.

IGO managing director Peter Bradford said that it was an opportunity that would be mutually beneficial for shareholders of both companies.

“Panoramic shareholders will be able to crystallise future value from Savannah at a very attractive price and retain exposure to its upside potential, while also gaining exposure to Nova and Tropicana and Independence Group’s extensive portfolio of belt-scale exploration projects prospective for nickel and copper,” he said.

“The company remains leveraged to the nickel market and we believe Independence has the financial, operational and technical capability to fully unlock value from Savannah and Panoramic’s exploration portfolio.”

Wodgina in care and maintenance

GERARD MCARTNEY
WA

MINERAL Resources and Albermarle have mothballed the Wodgina lithium project in the Pilbara to wait out the lithium price slump after finalising the establishment of the unincorporated MARBL JV.

The joint venture has joined a growing number of developments cutting back, or halting lithium production to wait for better prices as the US-China trade wars and the stalled EV boom continues to frustrate the international market.

In the time it takes to transition to care and maintenance, Albermarle will manage the marketing and sale of spodumene concentrate, and under the terms of the JV, Mineral Resources will continue to manage it once Wodgina goes back into production.

Company managing director Chris Ellison cited tough market conditions, but said that the mine would be regularly reviewed by the JV, with production resuming when there was demand.

“Given the current market conditions for lithium, the MARBL Lithium Joint Venture believes there is more value to be delivered in the long term by placing Wodgina on care and maintenance now,” he said.

“This was a tough decision, but the right decision and we are working with affected employees to try to deploy as many of them as possible across MRL’s other operations.

“We remain confident in lithium’s long-term positive fundamentals.”

Wodgina is the latest in a string of companies to downgrade or stop production as the downturn for battery metals forces them to reassess their options.

Albermarle’s other significant Australian JV with Chinese Tianqi Lithium has postponed the expansion of the world’s largest lithium mine at Greenbushes in WA’s south west, and



Image: Mineral Resources.

The Wodgina beneficiation plant.

Galaxy Resources slashed its production by 40pc.

The decision to mothball Wodgina comes as the two companies finalised the establishment of the MARBL JV, for which negotiations began in December 2018.

The deal would give Albermarle the controlling interest of the mine, with Mineral Resources selling 60pc of the project for US\$280m and gaining a 40pc interest in the first two 25ktpa lithium hydroxide conversion units to be built by Albermarle at its Kemerton hydroxide facility.

The establishment of the 60:40 unincorporated MARBL JV completes the binding Wodgina asset sale, and the revised arrangement with Albermarle.

“We are delighted to have established the MARBL Lithium Joint Venture with a great partner in Albermarle,” Mr Ellison said.

“Wodgina is a world-class asset

with a mine life of more than 30 years while Kemerton, once constructed, will provide lithium hydroxide to battery makers globally.

“This transaction enables MRL to participate in the high-margin lithium hydroxide market on an accelerated basis through our investment in the Kemerton Modules while we are able to preserve all the upside potential of Wodgina.”

The next steps would see Albermarle foot the estimated US\$1.2b cost of construction and successful commission of specific infrastructure at the Kemerton facility in relation to the Kemerton modules.

The JV expects the modules to be commissioned in stages beginning in the first half of 2021, following which, Albermarle would hand over the care, custody and control of the Kemerton modules to the modules manager.

Renascor greenlights Siviour

GERARD MCARTNEY
SOUTH AUSTRALIA

RENASCOR Resources has completed the Definitive Feasibility Study (DFS) at its 100pc owned Siviour graphite project in South Australia.

The proposed Siviour mine would be an open pit with an adjacent graphite production plant, which the company said has the potential to be a world-class, low OPEX project.

The DFS, completed by Royal IHC and Wave International, has been based on staged development, aiming for an average production of 80ktpa during the first stage, before expansion in year five that would be funded through the expected cash flows, ramping up production to 144ktpa between years five to 10.

The projected life of mine operating cost is expected to be about \$508/t, which according to the company is amongst the lowest projected costs in the world.

Renascor said it would need about \$118m for start-up capital, allocating about \$4m for a mining pre-strip.

The post-tax NPV was estimated at \$338m with an IRR of 33pc.

Renascor managing director David Christensen said that despite the

After completing the DFS in the Siviour project, Renascor Resources could have one of the world’s lowest-cost graphite mines on its hands, predicting an operating cost of about \$508/t for the 10-year mine life.



current state of the graphite market, the Siviour project has the potential to deliver attractive profit margins.

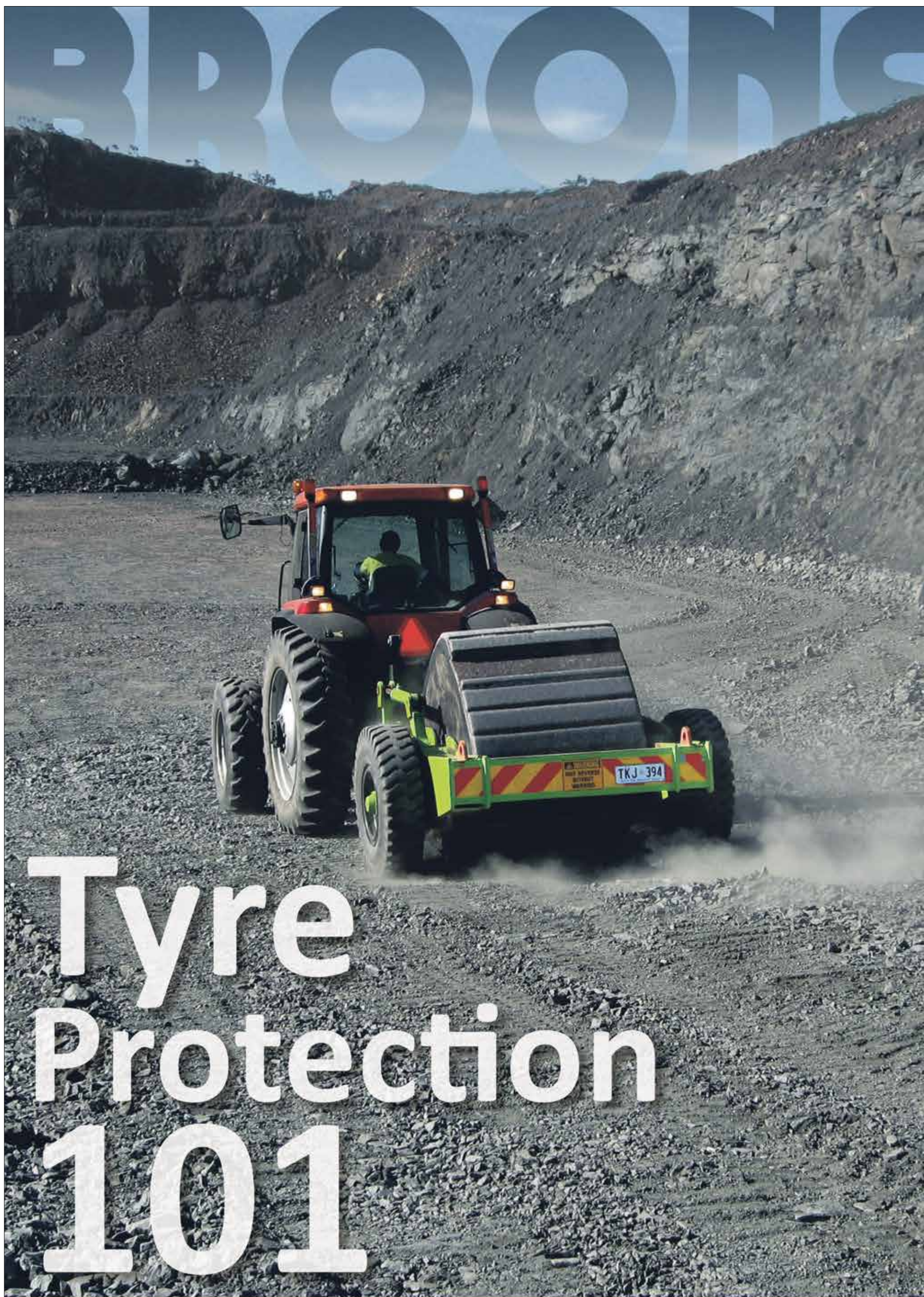
“With the DFS now complete, we look forward to advancing towards securing binding offtake agreements and working with our finance partners to secure funding for Siviour’s stage-one development,” he said.

“We believe this cost advantage, coupled with our location in the low sovereign risk jurisdiction of South Australia, will enable Siviour to become

a premier provider of graphite for the growing lithium-ion battery market, as this sector becomes the dominant end-used of natural flake graphite.”

The company will also need to secure final project permitting, which involves addressing the conditions set by the Government’s two-stage assessment and approval process.

Renascor aims to lodge its Program for Environment Protection and Rehabilitation before the end of 2019.



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Paladin sizes up Namibian mine restart

GERARD MCARTNEY
AFRICA

PALADIN Energy has completed the first of a two-part pre-feasibility study (PFS1) to assess the restart of its Namibian uranium mine, Langer Heinrich.

The company said that it can return to production after a rapid 12-month ramp-up and would require about US\$80m to return to production levels of about 5.2mlb pa.

The capital would be divided into US\$38m needed for plant repair and US\$42m needed for working capital.

Production could increase to about 6.5mlb pa through expansion of the mine during the ramp-up period, which the company said would target the processing of high and medium-grade ore over a six-year period at an additional cost of \$US30m.

PFS1 put the mine potentially back in production within 12 months of securing finance, assuming the full completion of appropriate studies during the care and maintenance period.

The study confirmed the average life-of-mine ASIC target to be about US\$30/lb, with the potential for further ASIC improvements of about US\$4.50 through significant process changes on the restart.

The company hopes to increase process plant surge capacity to enable the leach facility to operate at full rate, increase the water storage capacity on site to avoid production interruptions from pipeline disruptions.

And it would increase the level of automation to enable remote, semi-automatic monitoring and operation.

Paladin chief executive, Scott Sullivan, said that the study put the company back into the position of a first mover in the uranium market.

"Paladin has assembled a first-class team to conduct these studies and they have systematically reviewed in detail the entire Langer Heinrich production history and processes," he said.

"Achieving production of over 5mlb pa at a cost of under \$US30/lb ASIC. and with a 12-month lead time in execution, were key targets of the board and executive team and will see Langer Heinrich in an enviable position when uranium priced recover."

The company also confirmed a maiden vanadium resource at the mine of 122mt at 145ppm of vanadium, which Mr Sullivan said was something the company would look at in the future.

"We are excited about the prospect of vanadium production in the future," he said.

"We will continue to explore these opportunities, once the market shows signs of improvement."

Langer Heinrich was placed on care and maintenance in August 2018 after sustained low uranium prices.

In March, Paladin commenced a two-stream prefeasibility study, with the recently completed PFS1 focusing on the rapid restart of the mine over 12 months after an improved uranium market.

During the next phase of the two-part study (PFS2) the company will focus on the completion of test work, and updating the pipeline of improvements for further development after the restart.

It is expected to take nine months for completion and be finished in June 2020.



Kirkland Lakes' Fosterville Mine near Bendigo.

Coalition to block gold royalty

GERARD MCARTNEY
VICTORIA

THE Victorian Liberal National Coalition will block the Andrews Government's planned 2.75pc gold royalty when it is tabled in the state parliament.

Introduced at the May budget, the royalty shocked the emerging Victorian gold industry which had seen something of a renaissance since 2015, with Kirkland Lake's Fosterville gold mine becoming Australia's most lucrative pure-play gold mine.

While a gold royalty applies in all other states, there was concern that it would cripple vital early investment in Victoria.

Although the industry has said it was not opposed to a gold royalty, it said proper consultation on its structure was needed, and that it be introduced over three years.

But successful opposition of the tax will be hard fought.

Labor controls 18 of the 40 available seats in Victoria's upper house, and the Liberal National Coalition controls 11, meaning that 10 of the 11 crossbenchers must side with the Coalition for the royalty to be disallowed.

The Coalition said that the tax would have a detrimental effect to investment in the regions and would hurt jobs.

"The gold industry is vital to the local economies in our regions, including Stawell, Ballarat and Fosterville, and

Labor's gold tax is going to make life even tougher for regional Victoria," it said.

This comes within the same week that possibly the hottest piece of real estate in the Victorian gold industry was put up for tender by the government.

Four new exploration tenements will be up for bids, and the exploration tenement previously known as EL3539, which was taken off Fosterville in a deal that allowed the miner to absorb portions of the tenement into its lease, is back on the market as Block 4.

Block 4 will cover more land and, given the extraordinary success of Fosterville, is likely to be the most sought after of the four available tenders.

Rio to explore Carawine projects

RAY CHAN
WA

GOLD and base metals explorer Carawine Resources has entered into a \$6m farm-in and joint venture agreement with Rio Tinto.

The mining giant will be given exploratory access to the Baton and Red Dog tenements – part of Carawine's Paterson gold-copper and copper-cobalt project in northern WA – paying Carawine \$200,000 in cash within 30 days of the agreement's execution.

It will also spend at least \$1m, drill at least 2000m within the first two years of the agreement and subscribe to \$300,000 worth of Carawine shares once the two-year minimum commitment is complete.

Rio Tinto will earn a 70pc interest in Baton and Red Dog if it achieves 3000m of diamond or reverse circulation drilling and \$5.5m exploration expenditure within six years of the agreement date, after which a joint venture can be established.

Carawine has already identified more than 20 high priority targets across its project, with the targets indicating a range of potential deposit types.

Carawine managing director David Boyd said Rio Tinto's commitment underlined the exciting potential of the Baton and Red Dog prospects.

"To have one of the world's largest resources companies committing to significant expenditure on our Baton



Prospect mapping undertaken by Carawine Resources.

and Red Dog tenements is a strong endorsement of the prospectivity of the tenements," Mr Boyd said.

"They have the technical knowledge and resources to rapidly and systematically evaluate the numerous high-priority targets at Baton and Red Dog, increasing the chances of a successful discovery."

He said the deal also ensured

Carawine was well positioned to share in the benefit of any future discoveries, with Rio Tinto well placed to support a potential development should the exploration activities be successful.

The agreement will add to Rio Tinto and Carawine's existing joint ventures within the Paterson project, the Calibre and Magnum prospects.

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Evolution Mining acquires Red Lake

EMMA DAVIES
INTERNATIONAL

NEWMONT Goldcorp has continued to streamline its asset base, selling its Red Lake complex in Ontario, Canada, to Evolution Mining.

As part of the binding agreement, Newmont will receive \$375m in cash as well as contingent payments of up to an additional \$100m tied to new resource discoveries.

Newmont president and chief executive Tom Palmer said the transaction both strengthens the company's balance sheet and provides ongoing exposure to new discoveries at Red Lake.

"Evolution is a highly respected and responsible gold producer who is committed to the success of Red Lake and who we believe will prove a great partner for surrounding communities and stakeholders," Mr Palmer said.

Under terms of the \$100m contingent payment, Evolution will pay Newmont \$20m for each 1m oz of new gold resources added to the existing Red Lake resource base over a 15-year period.

The contingent payment is applicable to the first 5m oz of new resources and Newmont intends to use proceeds to support the company's capital allocation priorities of returning cash to shareholders, maintaining an investment-grade balance sheet, and investing in a world-class portfolio.

Evolution executive chairman Jake Klein said the company was excited to add Red Lake, a high-grade long-life gold asset, to its portfolio.

"We have been actively looking at assets in Canada since 2017 as we believe it is a country with low geopolitical risk, high geological prospectivity and a strong mining culture," Mr Klein said.

"Red Lake is an undercapitalised asset which, through a committed investment in development and exploration, is intended to become a cornerstone asset in the Evolution portfolio.

"We have identified a range of opportunities to deliver an operational turnaround of the asset which is expected to create significant value for our shareholders and improve the quality of our portfolio.

Mr Klein said the camp has significant exploration potential which, coupled with its relatively unexplored recent past, provides significant upside potential for Evolution to extend the longevity of the operation well beyond its current 13-year life of mine plan.

"We are confident that Evolution will be an excellent and committed steward of Red Lake and look forward to continuing Newmont Goldcorp's track record of safe and sustainable operation for the long-term benefit of a broad range of stakeholders including the local workforce, regional communities and the Lac Seul and Wabauskang First Nations Groups," he said.

The transaction is expected to be finalised in the first quarter of 2020.



Image: Rio Tinto.

BGC is currently contracted to undertake bulk earth and civil works to the value of \$100-200m at Rio Tinto's West Angelas mine until September 2020.

New owners for BGC

EMMA DAVIES
NATIONAL

MINING services company NRW has acquired 100pc of BGC Contracting for an equity value of \$116.4m and implied enterprise value (EV) of \$310m.

Essentially, the implied EV is an alternative measure of a company's value and covers BGC's market cap including short and long-term debt as well as any cash on the balance sheet.

NRW's chief executive and managing director Jules Pemberton said the company is extremely pleased with the acquisition as it aligns with goals to pursue diverse revenue opportunities.

"BGC Contracting has a well-recognised and proud history built around the strong foundations set by the late Len Buckeridge," Mr Pemberton said.

"With an excellent track record supported by a diversified earnings base, extensive fleet and a long history with several high-profile clients,

the acquisition is strategically and financially compelling and aligns with NRW's objective to deliver growth to the business and drive NRW shareholder value."

BGC Contracting consists of three core businesses: mining, construction and DIAB Engineering – with the latter being the key attraction for NRW.

The company said DIAB Engineering would 'significantly strengthen' its mining technologies pillar through the addition of specialist industrial engineering, shutdown maintenance and fabrication services.

"This transaction will enhance our core business across a variety of key financial and operational metrics and provides our shareholders with diversified exposure to the mining technologies pillar, which delivers annuity style earnings," Mr Pemberton said.

The value of the acquisition is underpinned by a fleet of more than 200 items of high-quality mobile mining

equipment with a book value in excess of \$200m and an existing contract portfolio and order book of around \$1.5b.

"We are enthusiastic about the opportunities ahead for the expanded NRW group, to leverage the additional capabilities and regional strengths of the combined group and further capitalise on our strong market reputation," Mr Pemberton said.

"Together with our combined workforce of around 6000 people supporting more than 100 projects around Australia, we are well placed to offer a diverse range of services and project solutions to clients across the infrastructure, resources, industrial engineering, maintenance and urban sectors."

NRW is undertaking a fully underwritten placement to raise \$120m (before costs) and separate to this, intends to undertake a share purchase plan (subject to a \$10m cap) and will assume \$193m of debt related to asset finance.

\$749m boost for Pilbara

EMMA DAVIES
WA

RIO Tinto has announced a \$749m (or A\$1b) investment in its existing Greater Tom Price operations to help sustain the production capacity of its world-class iron ore business in the Pilbara.

The hub includes Tom Price, Western Turner Syncline Phase 1 (WTS1) and Western Turner Syncline Phase 2 (WTS2) satellite hubs, with main investment in WTS2 expected to facilitate mining of existing and new deposits, and includes construction of a new crusher as well as a 13-kilometre conveyor.

The new conveyor system will help lower greenhouse gas emissions from the mine by 3.5pc compared to road haulage and, pending final government approvals, is expected to start construction in early 2020 with first ore in 2021.

Rio Tinto iron ore chief executive Chris Salisbury said production of high-quality Brockman ore will support Rio's flagship Pilbara Blend.

"Our iron ore business continues to



The Greater Tom Price hub includes Tom Price, Western Turner Syncline Phase 1 (WTS1) and Western Turner Syncline Phase 2 (WTS2) satellite hubs.

deliver industry-leading margins as we drive performance from our mines," Mr Salisbury said.

"This significant investment in the Greater Tom Price hub is one of a pipeline of high-quality, low-cost options that will underpin production of our flagship Pilbara Blend product well into the future."

Productivity is expected to be improved with the haul truck fleet at

WTS2 to be fitted with Autonomous Haulage System (AHS) technology from 2021, which should result in reduced operating costs on site.

Rio anticipates an attractive internal rate of return with a capital intensity of about \$25 per tonne of production capacity – which is included in the company's existing guidance for Pilbara replacement capital for 2020 to 2022.



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Drilling is underway at the Nicholson project where Superior and South32 hope to find a Mount-Isa-style discovery.

SUPERIOR RESOURCES MANAGING DIRECTOR PETER HWANG

Superior Resources is a Brisbane-based copper-lead-zinc and gold explorer operating in north Queensland. **Emma Davies** spoke with managing director **Peter Hwang** about signing a Joint Venture with global miner South32 for the Nicholson Project, drilling programs and the potential for a Mount-Isa-style lead-zinc-silver discovery.



Superior Resources managing director Peter Hwang.

Q. How did the recent JV with South32 come about? And what does this partnership mean for Superior?

As part of their global search for Tier 1-potential base metal exploration projects, South32 identified Superior's 100pc-owned Nicholson Project in north-west Queensland as being highly prospective and worthy of a joint venture investment.

This is located within the globally attractive Carpentaria Zinc Province, which contains around 20pc of the world's zinc inventory, and the drilling program is targeting Tier 1 equivalent, Mount Isa-style lead-zinc-silver targets similar in size to the McArthur River and Century deposits.

For Superior, having a partner with the size and expertise of South32 is a huge asset

as we look to identify potentially world-class discoveries within this underexplored metals province.

Q. What is South32 bringing to the table financially?

South32 has committed to fully funding an initial \$2m or 4000m of drilling within the first 12 months at the project, under stage one of the agreement.

Under stage two, South32 has the option of earning a 70pc interest by funding a minimum of \$4m of exploration expenditure within 48 months of completion of stage one.

South32 has the option under stage three to earn an additional 10pc interest by electing within six months of the completion of stage two to commence and sole fund a pre-feasibility study.

Q. What is the potential next step after the initial drilling program?

Four diamond drill holes have been completed under the joint venture, totalling 3176m, including three holes at Nicholson West and one at Kingfisher East, with drilling confirming the presence of SEDEX mineralisation systems (McArthur River and Mt Isa style) developed within thick (up to 340m) Mount Les siltstone.

Up to 11 diamond drill holes are planned under stage one of the joint venture.

The potential next step would be to follow up the initial program with more extensive drilling of the highest priority targets.

If results are positive, stage two would likely accelerate in activity and expenditure.

Q. Does the Nicholson Project have the potential for a Mount Isa-style discovery?

Definitely.

Superior's Nicholson Project is located within the globally attractive Carpentaria Zinc Province, which contains around 20pc of the world's zinc inventory and the drilling program is targeting Tier 1 equivalent, Mount Isa-style lead-zinc-silver targets similar in size to the McArthur River and Century deposits.

Q. How do the Victor and Greenvale projects compare? Is there potential for a Tier 1 discovery?

Similar to the Nicholson Project, Superior's 100pc-owned Victor Project is located within the globally attractive Carpentaria Zinc Province, which contains around 20pc of the world's zinc inventory.

It is also underexplored and considered the most likely area for the next Tier 1, Mount Isa-style discovery.

Superior's 100 pc-owned Greenvale Project is also highly prospective, with the total project area encompassing the majority of the Lucky Creek Mineral Province, seen as the northern-most extension of the Macquarie Arc, which hosts the world-class Cadia-Ridgeway and North Parkes porphyry copper-gold mines.

Superior believes that the company

may be on the cusp of a significant copper discovery at its Bottletree prospect.

In July 2019, Superior was awarded an exploration permit over the regionally large Big Mag magnetic feature, which is prospective for nickel-cobalt and copper-gold mineralisation and is largely unexplored.

It is also located within the same geological domain as the former Greenvale Nickel Mine, now part of the \$1.3b Sconi project.

Q. Where do you see Superior in the next three to five years?

Superior is targeting Tier 1 lead-zinc-silver, copper, gold and nickel-cobalt deposits and we would expect to have delivered a significant discovery for one or more such projects within the next three to five years.

Such a discovery should generate a significant increase in market value for the company, rewarding our shareholders and other stakeholders.

Q. Is there anything else you would like to add?

Superior is confident it is exploring in the right areas for Tier 1 discoveries.

With rising demand for minerals from industrialising Asia, we are confident of the outlook for our projects and our company, with an experienced board and management that has a proven track record of discovering, developing and funding projects.

A RECORD HIGH

Stanmore Coal has had great success with its pivot to Isaac Plains East operations in Queensland's Bowen Basin, and looks set for a strong finish for 2019 with a solid toehold in the metallurgical coal market into 2020 and beyond.

Stanmore aims to extend saleable coal production from 2.4mt to 5mt per annum by 2022.

EMMA DAVIES

STANMORE Coal has reaped the financial rewards this year from its transition from the original Isaac Plains mine to Isaac Plains East in 2018.

Chairman Stuart Bute said that favourable conditions and lower strip ratios at the new mine helped the company achieve an improved mix of coking and thermal coals, reduce production costs and increased sales prices and margins.

"The company's revenue from operations totalled a new record of \$403.1m, an increase of 93pc on the previous year," Mr Bute said.

"This resulted in gross profit of \$164.8m which was a 215pc improvement on FY18."

Underlying Earnings Before Interest, Tax, Depreciation and Amortisation (EBITDA) improved by 240pc to \$154.9m, and the company reported Net Profit After Tax of \$91.6m, compared with \$6m in the previous financial year.

Cash generation from operations was \$140m, another substantial improvement compared with \$21.9m in FY18.

"This was balanced against cash outflows that will support the future growth and performance of the business including the acquisition of Isaac Downs, development capital for Isaac Plains East and planned maintenance of major equipment and infrastructure," Mr Bute said.

As a result of this strong operational and financial performance, the Stanmore Board declared a fully franked final dividend of eight cents per share, along with the fully franked interim dividend of three cents per share.

"The combination of share price growth

and dividends paid during the 2019 financial year delivered a total shareholder return of 69.5pc, which was the best outcome of any ASX-listed coal company," Mr Bute said.

In October, Stanmore managing director Dan Clifford resigned and, while a recruitment process is underway, Jon Romcke (previously general manager business development) has stepped into the role of interim chief executive to ensure an orderly leadership transition.

"Jon has outstanding credentials in the resources sector over more than 30 years and the board has every confidence in his ability to continue to implement the company's strategic direction and maintain our positive momentum," Mr Bute said.

Operational performance

Mr Romcke said the transition to Isaac Plains East underpinned record coal production over the course of the year, which in turn delivered record underlying earnings.

"Stanmore delivered record operating performance during the year, with a 10pc increase in overburden removal, and a 78pc increase in open cut run of mine (ROM) coal production to 2.93mt," he said.

"Our guidance for the current financial year is to increase ROM coal production to 3mt."

Total product coal production for the financial year was 2.39mt and the percentage of metallurgical coal produced increased to 89pc, with an 11pc thermal coal by-product.

"This increased our average sale price to \$173.80/t sold," Mr Romcke said.

"Our guidance for this year is that product coal quantities will be maintained at this level with 2.35mt produced, with

over 95pc of the coal produced marketed as IPE Coking Coal."

Mr Romcke said the quality of coal resource and lower strip ratio at Isaac Plains East has meant the cost of producing coal is lower than it was at Isaac Plains.

"We expect that production costs will increase to \$100/t (excluding royalties) this year driven by increases to strip ratios at Isaac Plains East as the open-cut operations mine deeper coal resources," he said.

"After a solid start in the first quarter of this financial year, we remain on track to achieve EBITDA guidance of \$53-56m for the six months to December 2019."

Isaac Plains complex

Stanmore aims to further extend saleable coal production from 2.4mt to 5mt per annum by 2022, with a focus on the Isaac Downs open-cut project to hit this lofty target.

During the financial year, the Bankable Feasibility Study for the Isaac Plains Underground was completed, confirming the financial viability of the project, however the company decided to defer in favour of Isaac Downs due to the superior margins forecast from the surface operations in the first five to 10 years of mine life.

"The project approval process for Isaac Downs is now well-established," Mr Romcke said.

"The environmental studies for the project have been completed, and our Environmental Impact Statement is complete and currently being considered by both the state and federal governments as a precursor to the public display process.

"Once community feedback is sought, the subsequent approvals for the environmental authority and mining leases are expected to

be finalised in late 2020 and early 2021."

Industry outlook

While the outlook for metallurgical coal remains fairly positive, Mr Bute said the company is always mindful that coal is a cyclical commodity, which creates the potential for pricing volatility.

"There is no doubt that coal prices have been under pressure over the past six months and the premium hard coking coal price has fallen 25pc since February this year," he said.

"To address this, Stanmore concentrates on higher margin metallurgical coal and minimises the amount of by-product thermal coal."

Mr Bute said the company has some protection against the cyclical nature of our market.

"A large proportion of the company's product coal is contracted to term customers, which means we expect achieved prices to remain stable and well above the cost of production, and in line with industry forecasts," he said.

Mr Romcke concurred, stating that Stanmore is somewhat insulated against price volatility.

"We expect achieved sales prices to be under pressure over the short term but are expected to remain well above our cost of production," he said.

"Opportunities to enhance product quality and focus on producing higher value metallurgical coal will also support our achieved margins.

"As our operations move into Isaac Downs, we expect that a lower strip ratio and higher-ranking coking coals will provide considerable improvement in unit margins."

Superior services for Stanmore

QLD

IN October 2019, HME Earthmoving was engaged by Stanmore Coal to remove trees out on the miner's IPE boundary that were pushed up by dozers during the development stages.

HME managing director David Hills said that due to the company's close working relations with Stanmore Coal, HME was able to come up with a solution that didn't involve burning or mulching of the timber, which proved beneficial for both the environmental purposes and minimising wash in the way of a silt trap barrier.

"Timber was selectively cleared using a dozer and raked to offer fauna time to escape using independent contractors," Mr Hills said.

"Timber was stockpiled into windrows for easy access for the shears, which have a 1.3m opening and 90t downforce at the tip."

It was cut into billets using Embey hydraulic shears on a 40t Caterpillar excavator, breaking it into pieces that could easily be loaded into moxys without tail gates.

Timber was then loaded into moxy trucks using an Embrey hydraulic grab on a Hitachi excavator and carted out into existing rehab problems areas and used for soil retention and a haven for animals.

"Darren King from Stanmore Coal was suitably impressed with the outcome as the work was conducted in a safe and timely



HME Earthmoving has built a solid reputation for providing a quality, personal service at competitive market rates.

manner and achieved a great outcome for his operation," Mr Hills said.

"Currently HME Earthmoving is now stripping topsoil off the back boundary with an excavator so the dozers and drill can move in."

HME Earthmoving has built a reputation for providing superior equipment to the mining industry.

The company provides dry and wet equipment hire on a variety of graders, excavators, dozers, articulated dump trucks, front end loaders, compactors and rollers.

"HME Earthmoving provides reliable, well-maintained equipment that delivers the performance you expect," Mr Hills said.

"Our rates are competitive on short or long term equipment hire through dry and wet hire agreements.

"Operators and fitters can be provided as required and deliver equipment to your desired location for a completely hassle-free service."

HME Earthmoving can service highway and dam construction, haul road construction, mining and mine

rehabilitation as well as quarrying and bulk earthworks.

"We maintain ongoing communication with our clients to foster positive working relationships which allows us to supply quality operators, machinery and service support for any project," Mr Hills said.

HME Earthmoving is proud to be a long-term contractor for Stanmore and wishes Stanmore all the best in the future.

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



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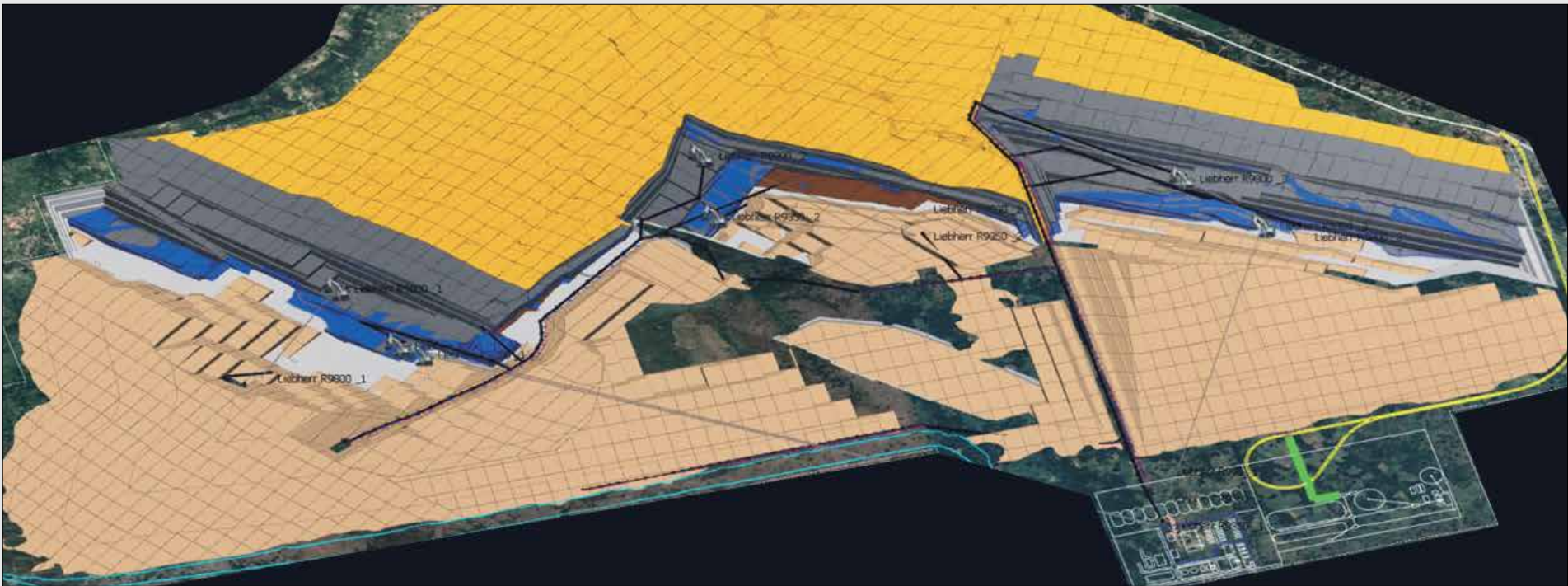
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Proud partnership at Isaac Plains

NATIONAL

OPTIMAL Mining Solutions uses the latest technology to help drive production and cost efficiencies for mining operations across Australia and around the world.

Since founding the company in 2004, managing director Tony O'Connell has provided mine planning consultancy services to all the major mining houses, as well as smaller exploration companies looking for guidance.

In 2015, it began work at Stanmore Coal's newly acquired Isaac Plains mine, assisting with mine planning, scheduling and optimisation of all tenements within the Isaac Plains Complex and JORC Reserves for three Stanmore tenements.

In addition to coal, the company has worked across a large range of commodities, including iron ore, copper, gold, tin, chromite, vanadium and lithium.

"Our vision is to incorporate accountability, efficiency and the development of strong customer-client

relationships," Mr O'Connell said.

"We personalise our work for each client to ensure 100 per cent satisfaction with the delivered product, and value our highly regarded reputation in the mining industry and will constantly continue to improve and provide the best possible mining solutions."

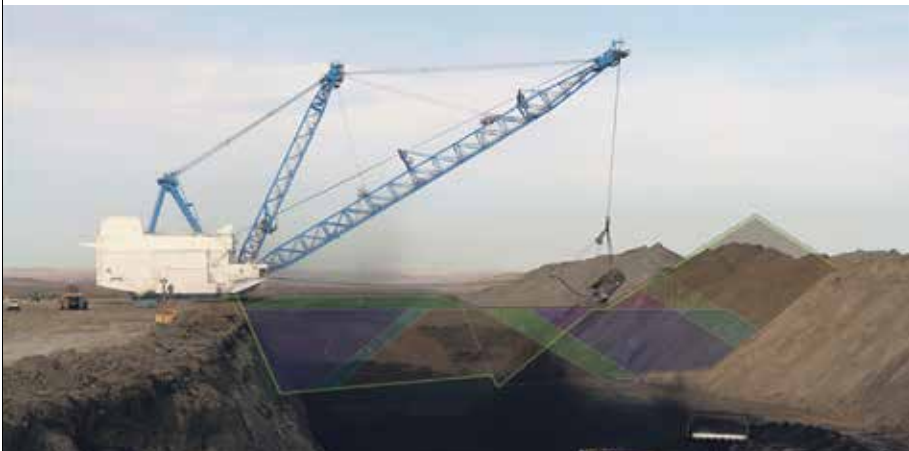
Optimal Mining Solutions' services include mine planning, scheduling, simulation, life of asset and feasibility studies, haulage modelling and costing, fleet selection, due diligence, JORC Reserve reporting, resource optimisation and

environmental planning, reporting and statistics, cost reduction and productivity optimisation and much more.

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DRIVE TO SURVIVE



Australia's mines pose some of the most challenging, toughest workplace scenarios for vehicles, and so they must be equally tough to a scale not seen in any other industry.

GERARD MCARTNEY

MINESITES would grind to a halt if it were not for 4WD light vehicles.

And the people operating those vehicles must be suitably qualified.

Driver incompetence has been a leading cause of 4WD accidents on site, but this can easily be rectified with driver training.

Accidents on a minesite are in the public eye more than ever, and mine operators come under more scrutiny than just about any other industry.

Each mine operator will have a specific set of rules that govern the way vehicles operate onsite, and will have a list of required modifications that ensure the vehicles are fit for purpose: what is known as Min-Spec.

Standard 4WDs must be customised with aftermarket parts that increase the safety, visibility, performance and function of the vehicles.

Mine specifications will vary significantly from site to site and will cover all aspects of a vehicle's safety, function and performance while on a mine.

At a base level, there will be roll protection, visibility enhancement, bull-bar, fire extinguisher, in-vehicle monitoring, GPS tracking and a VHF radio, to name a few.

The requirements placed on vehicles are varied and complex, but what is often overlooked is the importance of correct training for the workers driving those vehicles on a daily basis.

There is no specialised licence required to drive off-road, even though there are many technical aspects to four-wheel-driving that are understood by those "in the know".

Andre Botha from the South African National Offroad Trainers Association (SONTA) had some practical tips for anyone operating an offroad vehicle on site.

Hand position is a simple consideration that could prevent potentially hazardous situations, he said.

Thumbs should never be placed inside the steering wheel.

If a worker drives over a large pothole or rut, the wheel can suddenly jerk which can dislocate and even break if inside the rim.

This is something that should be second nature to anyone operating a 4WD.

When breaking before a pothole or rut, often the brakes are applied with force.

This means that the front suspension is often compressed, using up the suspension travel.

If it becomes impossible to stop before impact with the pothole or rut, Mr Botha recommended releasing the brakes just prior to impact.

"This will allow the front suspension

to return to its normal height and give more suspension travel when hitting the obstacle," he said.

And it is important to know the limitations of a vehicle.

4WDs cannot be treated like a regular car when it comes to cornering at speed.

They are top-heavy and will roll over much easier than a car while cornering if driven too fast.

Mr Botha said that this applied to both gravel and paved roads.

"Although a 4WD vehicle generally has better traction on gravel than a car, when safe cornering speeds are exceeded the 4WD will tend to roll earlier than a car," he said.

Similarly, it is important to know the position of the front and rear differentials, as they are usually the lowest ground clearance point of a vehicle.

Any other low ground clearance points should be noted such as the exhaust or spare tyre.

This way, when a large rock or obstacle must be negotiated, drivers can ensure they do not drive directly over it with the lowest ground clearance point of the vehicle.

Mr Botha said that it is important that drivers are always driving within their ability, and that taking a slower, more considered approach was often necessary to avoid potential accidents.

"If you have a ground clearance

deficiency, going slow helps here, in that, if you do hit a rock with the differential or other rock grabber, it will usually stop the vehicle on impact or you will lightly scrape over it," he said.

"If you were going too fast and hit a rock or other obstacle, it could knock a hole in the oil pan, differential, or even knock off the oil filter.

"Always drive straight down hills or steep terrain.

"Know your approach and departure angles, the bumper to tyre distance.

"Some trails will require off-camber driving.

"In situations like this it's best to go slow, keeping the tyres in the tracks.

"Make every attempt to avoid losing attention and ascending up a rock or stump on the up side of the hill.

"Trucks will tend to slide sideways before rolling over – the tyres will slip sideways a little.

"Stop if the slide puts you off the edge of the track.

"If it is clear downhill and a rollover is imminent, immediately turn the vehicle into the slide and drive it down.

"If that is not an option, and you are going over, turn the vehicle off and hold on to your seat-bottom while hoping that the seat belt works properly."

Driver training essential

NATIONAL

TWO decades ago, tough cars were the norm.

They were built to take on the harsh environments of the Australian outback and even handle the abuse of living underground.

Today's vehicles are a very different beast, with creature comforts that can turn any trip into something closer to taking an expensive lounge for a drive.

Not only that, it is a lounge that has an inbuilt entertainment system which can often all but drive itself.

Has this made driving safer?

With all technology, consideration needs to be given in order to adjust and adopt, and there is no end in sight.

With active cruise, lane keep assist and electric vehicles becoming more readily available, vehicles in the mining industry will soon be very different to the past.

The key with any technology is to understand how it works and how it affects your operation.

Effective training can assist in providing the knowledge as well as practical experience in how the vehicles perform in day to day situations as well as in adverse conditions.

Performance Driving Australia programs are flexible and take into consideration drivers' experience and



Modern technology in today's minesite vehicles creates a more comfortable ride, but without proper training it can also create a false sense of security.

ability levels, the work environment and the vehicle specifications.

With a unique approach to delivery that is focused on group discussion and exercises as opposed to 'Powerpoint' style training, Performance Driving Australia's programs allow for open conversation on a range of scenarios.

With this training, drivers can benefit from the latest features in modern vehicles while being in a much more comfortable environment.

Drivers are spoilt when they get into a current model vehicle as opposed to those used 20 years ago, but without training, they are just going to be more comfortable while they crash.

More information: www.performancedrivingaustralia.com.au.



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The waste tailings from the mothballed Hellyer gold mine near Beaconsfield in Tasmania has been revived by NQ Minerals. The company ramped up to production late in 2018 after acquiring the mine and its assets in 2017, and is looking for the next big project.

All images: NQ Minerals.

Hellyer had been on care and maintenance since 2002, but was acquired by NQ Minerals in 2017.

GERARD MCARTNEY

NORTHERN Queensland Minerals (NQ Minerals) will see out its inaugural year of production at its flagship, 100pc-owned Hellyer mine on a high note.

The company acquired the Hellyer gold mine, an 8mt reserve of high-grade tailings, in 2017, and after a relatively short ramp-up period, started production late in 2018 dredging the tailings for lead, zinc and precious metals concentrates.

The project has a 10-year mine life and a projected revenue of US\$706m, with an EBITDA of US\$28m.

The existing infrastructure includes a fully-operable 1.6mtpa fully-automated flotation plant, an undercover concentrate loading station, existing port concentrate housing, handling and loading facilities and an existing tailings dredge.

During 2019, the company contracted a second, high-capacity mining dredge for its operations.

The 100tph dredge will be on site by the year-end and complement the existing mining dredge at Hellyer, Seabird III, which is currently feeding 100tph to the processing plant.

NQ Minerals said that the second dredge will provide opportunities for increased tonnage through the plant.

It said it would “reduce risk of a major stoppage of feed to the plant, continuity and consistency of feed tonnage and grade to the plant, options in relation to tails transfer logistics, backup operation during maintenance to Seabird III”, which to date has amounted to about 22 hours per month.

A record quarter

The September quarter saw the company improve plant performance to achieve record monthly production with the trend continuing through October.

The company said that during this period, production emphasis was placed on concentrate grades and metallurgical recoveries in the lead and zinc circuits.

“The improvements in metallurgical recoveries from August to September increased from 36.5pc to 45.35pc in the lead circuit and from 33.7pc to 42pc in the zinc circuit,” it said.

“These recoveries compare with life of mine projections of 47pc for lead and 38pc for zinc.”



A cutter head on the dredge.

The lead recoveries were 41.4pc, and zinc was 48.3pc.

Zinc recovery was lower in the quarter compared to Q2, mainly as a result of the lower zinc grades as the zone being dredged, and lower pyrite production was a result of the process changes that required a temporary halt in pyrite production, which the company said had been resolved.

Outgoing NQ Minerals chair, Brian Stockbridge, said that there was a continued positive trend in milled tonnes and metallurgical recoveries at Hellyer.

“The company achieved record production in September, and we continue to realise improvements in the current month,” he said.

“With operations now stabilised, we are evaluating multiple opportunities for further value creation.”

The company continued its winning streak in November, posting \$2.44m revenue from \$5.64m.

It mined 73,358t and processed 73,532t of tailings, producing 2780t lead concentrates and 1426t zinc concentrates.

NQ Minerals appoints new chair

Mr Stockbridge stepped down as chair of the company in November, with the company appointing David Lenigas in his place.

Mr Lenigas has a long history of directorship and has chaired many boards,

including his most recent position at Future Farm Technologies as non-executive chairman in 2019, and Hampton Bay Capital as director.

Mr Lenigas said that he was excited by the prospect of improving the output of the mine going forward.

“This output is ahead of initial project estimates and resulted in revenue for the month of \$5.25m with an operating profit of \$1.6m,” he said.

“For the 10 months to October 31, 2019, the project has generated unaudited turnover of \$43.7m with an operating profit of \$9.1m.

“The dedication of management and operations teams has achieved remarkable success at Hellyer over the past year and we all expect to see even further improvements in operational performance over the coming months from this long-life mining operation.”

Forecasting future growth potential for NQ Minerals, Mr Lenigas said the company had a fantastic operation at Hellyer, and significant efforts are being made to improve profitability and further extend the operation’s life of mine.

“I am also particularly keen to assist the board and management with their initiatives towards the development of long-life nickel operations in Tasmania, through their recently announced strategic investment into Tasmania Energy Metals,” he said.

“New JORC 2014 resources for the Nickel Project will be available for release over the coming weeks.

“And finally, I join the entire board, management, staff, off-take partners, shareholders, bond and debt providers of NQ Minerals in sincerely thanking Brian Stockbridge for his tremendous efforts with chairing the company since it was formed some four years ago.

“His achievements in assisting to make the Hellyer operations the success we see today, are a true credit to him and a testament to his perseverance and belief in project.”

Barnes Hill, Scotts Hill and Mt Vulcan

The company is looking to expand its operations in Tasmania, launching a pre-feasibility study into the Barnes Hill nickel project, about 120km from Hellyer, and new resources at the Scotts Hill and Mt Vulcan deposits.

The Barnes Hill project has an estimated 14.3mt grading at 0.72pc nickel and 0.05pc cobalt.

The pre-feasibility study is targeting throughput of about 630,000tpa nickel ore, and 240,000tpa of pyrite/precious metal concentrate from Hellyer.

Scotts Hill and Mt Vulcan deposits, or the Scotts-Vulcan, are lateric nickel deposits located 2km from Tasmania Energy Metals (TEM) 100pc-owned Barnes Hill North deposit.

Mr Lenigas said that he was pleased at the progress being made at the projects.

“The new Mineral Resource estimates for TEM’s Scotts Hill and Mt Vulcan deposits more than doubles their available nickel and cobalt resource in the local areas surrounding our Hellyer operations, pushing resource estimates from 6.6Mt to 14.3Mt,” he said.

“TEM is working towards a feasibility study that targets more than 20 years of plant feed for a planned operation in the Bell Bay area.

“NQ’s investment in this project has the potential to materially enhance the economic returns on Hellyer’s gold and silver reserves and add nickel and cobalt to the company’s suite of metals available for global sales from our Tasmanian operations.”

Unburnable power poles

NATIONAL

PATENTED Titan distribution poles are fast being taken up by far-sighted electricity distributors.

These poles, manufactured in Geelong, Victoria by Dulhunty Poles – founded by industry icon Philip Dulhunty, OAM – meet so many distribution criteria beyond the capability of competitors.

With no steel reinforcement, hollow Titan poles are corrosion-proof, fire-proof, termite-proof, rot-proof, and electrically non-conductive, offering service lives of 70 years and more.

They can be pre-drilled for all necessary fastenings, or drilled in the field.

They are lightweight, enabling helicopter installation in difficult terrain.

Longer poles can be delivered in multiple parts, making for easy manhandling, quicker installation times and reduced transport and site costs.

The special qualities of Titan poles and the skills of Powerlines Tasmania came together to present a series of solutions for the renovation of the power supply to the rejuvenated Hellyer Gold Mine, under the ownership of NQ Minerals.

The mine site is situated in undeveloped fire prone terrain and replacement of aged hardwood poles required innovative collaboration between Dulhunty Poles and Powerlines Tasmania.



With no steel reinforcement, hollow Titan poles are corrosion-proof, fire-proof, termite-proof, rot-proof, and electrically non-conductive, offering service lives of 70 years and more.

Installation of tall poles was aided by installing direct buried butt pieces followed by fitting of the top piece when mine operations could tolerate temporary loss of power.

Access clearance for large machinery near the processing plant called for the

design and manufacture of a special three-part pole and new installation techniques.

Powerlines Tasmania staff have quickly adapted to the possibilities provided by Titan poles, including the use of new types of pole hardware, ensuring the Hellyer

Mine powerline is secure for many decades.

Titan poles are made to high standards from high strength concrete reinforced by glass fibre.

Individual designs are engineered using finite element analysis (FEA) to meet customer specifications including heavy equipment poles, providing for the long term robust support of transformers and switchgear which often outlast wood poles.

All Titans are embedded at manufacture with an RFID to aid quality assurance and pole inspection.

Dulhunty Poles Pty Ltd is the sole manufacturer of Titan poles and is ISO9001 certified.

From its establishment in 2010 the market has grown steadily, despite the understandable conservatism of Australia's electricity distribution industry originally founded on timber poles.

Today hardwoods are in short supply and softwoods, offering much shorter lives, suffer from fire, rot and termites.

Thus lifetime costs for Titan, allowing for replacements, can be much lower.

Australian customers include Ausgrid (NSW), AusNet (Victoria) and TasNetworks (Tasmania), while Electricité de Tahiti has installed more than 13,000 Titans.

Most recently the Western Australian electricity regulator has approved fibre reinforced cement poles for use in private properties and poles will be available from All Round Supplies of Malaga.



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Upgrading power at Hellyer



Powerlinestas brings more than two decades of experience to every job.

TASMANIA

AFTER 10 years in care and maintenance, the Hellyer gold mine had more than 5km of overhead, a 22,000v network and apparatus in desperate need of detailed inspection, refurbishment and upgrade in order to meet compliance requirements.

Tasmanian electrical contracting

and overhead power services company, Powerlinestas, was faced with the challenge of carrying out the detailed inspection, remediation works, maintenance and upgrades to the system, while also minimising the amount of planned power outages which would adversely impact mine operations.

Tasmania's rugged west coast provided many challenges from unpredictable weather

including snow, high wind, low lying cloud and heavy rain, so the work was scheduled over three separate, 10-hour shutdowns.

Firstly, the company conducted a detailed line and pole audit to determine the condition of the system in order to prepare a detailed system condition report and to outline the solutions and timelines.

Once the scope of work was defined,

Powerlinestas selected Dulhunty two-part Titan concrete poles in order to enable the base installation without isolating the high-voltage system, using NOJA reclosers for the mine and satellite services' high-voltage main switches, and Insulect air break switches were used for site overhead high-voltage overhead isolators.

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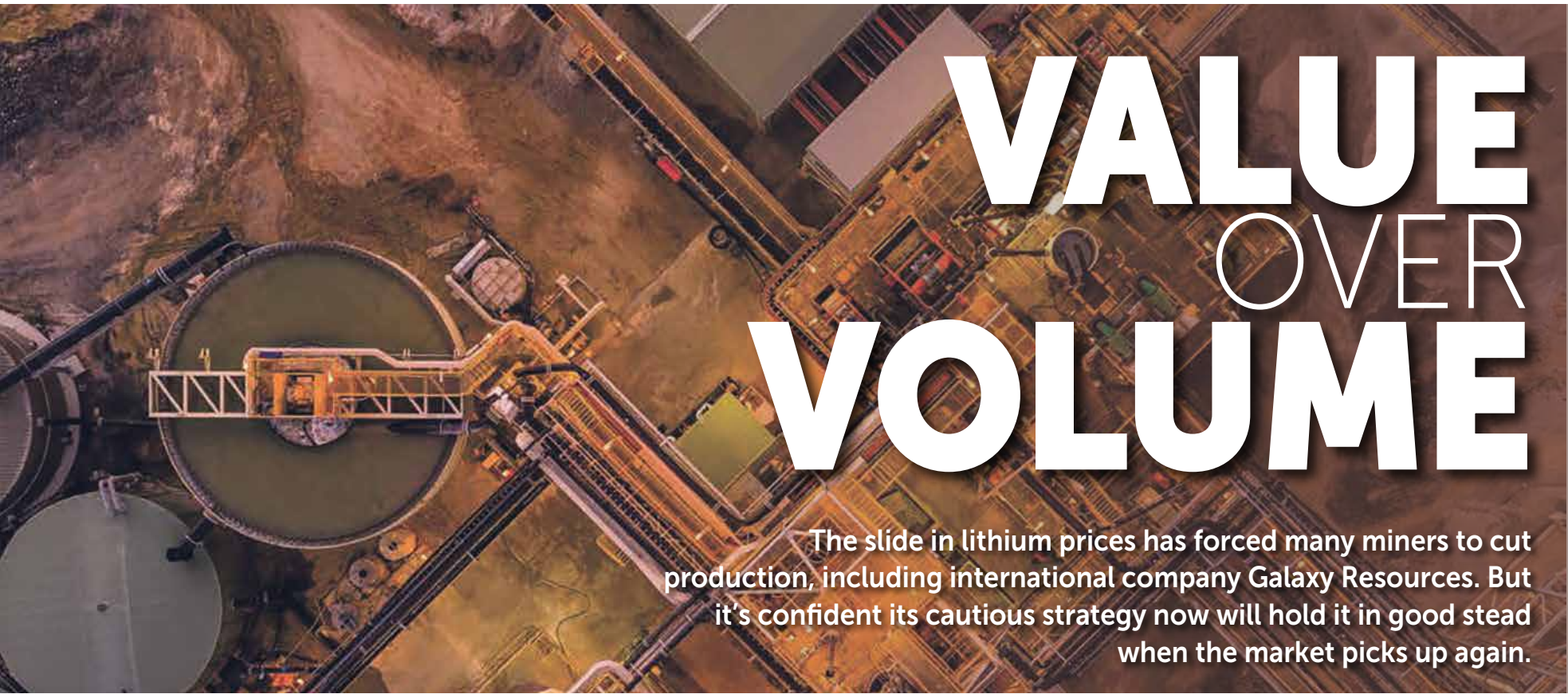
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The mine at Mt Cattlin.

RAY CHAN

DESPITE the recent slump in the world lithium market, Galaxy Resources remains optimistic and excited about the future, with the company committed to unlocking and creating superior returns for shareholders from its existing assets.

The international ASX-listed company holds lithium production facilities, hard rock mines and brine assets in Australia, Canada and Argentina, wholly owning and operating the James Bay lithium pegmatite project in Quebec, Canada, and Mt Cattlin in Ravensthorpe, WA, which produces spodumene and tantalum concentrate.

The miner recently announced that work at the WA site would be cut by 40pc next year, joining the list of battery minerals producers scaling back their mine output.

The strategy prioritises value over volume, and is designed to stem the company’s cash burn amid the collapsing lithium prices, which have seen Galaxy’s net cash position (including debt) drop by almost half from \$US285m just half a year ago.

Prices for all battery minerals are currently being hurt by changes to Chinese electric vehicle subsidies and a global slowdown in new car sales, which have coincided with dramatically increasing global supply of lithium and graphite.

However Galaxy chairman Martin Rowley said, overall, he was bullish about the long-term global demand for lithium, especially as China switches more towards electric vehicles.

“The lithium business remains strong with a very exciting future,” he said.

“The trend in vehicle electrification, together with the exponential growth in battery storage, is expected to drive significant growth in the demand for lithium products for at least the next decade.

“Roskill Consulting Group is forecasting that EV sales worldwide will grow at a 32pc compound annual growth rate through 2027, reaching 19.6m vehicles in annual sales volumes.

“Bloomberg New Energy Finance predicts EV sales to reach 60.2m units in 2040, representing a penetration rate of 55pc of all new vehicles sold annually.

“Demand from EV batteries is expected to represent 64pc of the total consumption of lithium compounds by 2027.”

Mr Rowley said structural changes in the electrification of transportation, along with continued policy and regulatory support, was accelerating investment all the way along the

lithium value chain.

He said Galaxy had established strong relationships with reliable customers for its Mt Cattlin production.

“These customers have confirmed that Mt Cattlin material meets their evolving performance and quality requirements and ... we remain very confident in the lithium business model,” he said.

In fact, during the first half of this year, Mt Cattlin enjoyed one of the strongest periods of operational execution since the plant was restarted in 2017, after being put into care and maintenance in 2013.

Key operational achievements in the period included a record quarter of production results for Q2, with total lithium concentrate production up by 51pc compared with the previous half-year, with an average final product grade of 5.9pc Li2O.

The cash cost per tonne of US\$387/dmt produced, positioning Mt Cattlin as one of the lowest cost producers of spodumene.

The operational turnaround – the result of a strong focus on mining and processing optimisation and cost rationalisation – included improved mine planning and scheduling to better match process plant throughput, improved mining fleet utilisation, and in-pit ore sorting to reduce the amount of contaminated ore reporting to the plant.

For the moment, with the depressed conditions, Galaxy plans to reduce production at Mt Cattlin, in addition to lowering costs, to maintain positive cash margins and preserving resource life.

Galaxy anticipates the lowered production combined with existing inventory will be able to meet contract commitments and additional demand throughout the year.

“Production can be ramped up swiftly and efficiently should market conditions materially improve,” Galaxy said in a statement.

The company expects to process its stockpiles to produce lithium-rich spodumene concentrate about 75pc of existing rates.

“This reduced scale of operation, combined with the cost initiatives currently under way, will allow Galaxy to maintain a low unit operating cost and a forecasted positive operating cash margin,” Galaxy said.

“As there will be no change in staff levels and contractors, production will be able to be ramped back up to full rates promptly when market conditions improve or as required by Galaxy’s customers.”

The plan to cut production comes after Pilbara Minerals significantly reduced operations at its Pilgangoora lithium mine in

WA, Glencore slashed production of cobalt in Africa, and graphite producer Syrah Resources cut production by 66pc.

Chinese giant Tianqi, which is half-owner of Australia’s biggest lithium mine at Greenbushes in WA, also reported losses in the latter part of 2019.

Mt Cattlin

The Mt Cattlin spodumene project is located at Ravensthorpe, where Galaxy mines pegmatite ore and processes on-site to produce a spodumene concentrate and a tantalum by-product.

At full capacity, ore can be processed at a rate of 1.6mtpa with lithium oxide concentrate production of 180,000tpa.

Galaxy Resources holds a series of tenements surrounding and including the mining lease M74/244, which contains the majority of the spodumene (LiAlSi2O6) resource identified to date and which hosts the Mt Cattlin mine.

The operations include open-pit mining of a flat-lying pegmatite ore body, allowing mining to proceed at a constant strip ratio once the ore is uncovered.

Mining is carried out using excavator and truck operations, delivering to a conventional crushing and HMS gravity recovery circuit.

Contract mining is used for grade control drilling and earthmoving operations (drilling, blasting, load, haul and ancillary work) for the open-cut mining operation. The pit design, encompassing existing measured and indicated resources, has been defined as the Dowling pit.

Galaxy has 14 giant solar trackers and two wind turbines in operation at Mt Cattlin, which together generate 226 MWh per year of renewable energy.

Mt Cattlin was the first mine site in Australia to use real-time solar tracking panels as part of its power generating requirements, which enable the solar panels to follow the sun in all directions to maximise the power generated, providing 15pc more power than a single axis system.

The wind and solar hybrid system supplements power from Galaxy’s 5MW diesel generator.

This system also promotes savings in carbon emissions.

Sal de Vida

Galaxy is advancing plans to develop the Sal de Vida (Salt of Life) lithium and potash brine project in Argentina situated in the lithium

triangle (where Chile, Argentina and Bolivia meet), which is currently the source of 60pc of global lithium production.

It has excellent potential as a low-cost brine-based lithium carbonate production facility.

Galaxy has revealed plans to make a final investment decision to develop the project by mid-2020, with first production anticipated in 2022.

The company expects to fund the first stage from its balance sheet once the final investment decision has been made and after a partial sell-down in the project.

All up, Galaxy plans to develop the project in two to three stages, which, according to the company, allows capital expenditure to be broken up into phases in addition to reducing development risk and simpler management of construction.

Feasibility studies support the development of Sal de Vida, which when completed, will include evaporation ponds, a battery grade lithium carbonate plant and a potash plant.

The rationale behind the strategy is to take advantage of the asset’s potential as a low-cost brine-based lithium carbonate operation.

This has been underpinned by a simplified flowsheet along with reduced energy and water requirements to enhance sustainability.

Galaxy is targeting a 40-year operation at Sal de Vida with 1.1mt of lithium carbonate equivalent firmed up in reserves and 4.9mt lithium carbonate equivalent estimated in resources with potential for this to be grown.

Ongoing field activities include continued exploration drilling, with the target objective of enhancing the company’s understanding of the hydrogeological nature of the basin and hydraulic behaviour of the brine at depth.

James Bay

The James Bay Project lies in the northeast part of the Superior Province, within the Archean Lower Eastmain greenstone belt composed predominantly of amphibolite grade mafic to felsic metavolcanic and metasedimentary rock and minor gabbro.

The deposit comprises of several swarms of pegmatite dykes. Surface mapping identified 15 different pegmatite swarms, each consisting of up to seven dykes.

Feasibility studies are ongoing and the James Bay Project Notice has been submitted to both the Federal Government of Canada and the Quebec Government.

The company’s plan for James Bay is to provide expansion capacity to meet future lithium demand as it arises.

More than 3.4mt crushed

WA

RAPID Crushing's production output in Galaxy Resources' Mt Cattlin spodumene project at Ravensthorpe is currently at 3.4mt.

During 2019, Rapid crushed more than 1.6mt, with its three-stage modular electric circuit plant that has the capacity to easily run at 600t/hr with 85-90pc availability.

The Mt Cattlin mine operation involves open-pit mining of a flat-lying pegmatite ore body.

The flat-lying nature of the ore body allows mining to proceed at a constant strip ratio once the ore is uncovered.

Mining is carried out using excavator and truck operations, delivering to Rapid's crushing and screening circuit, and thereafter into Galaxy's HMS gravity recovery circuit.

Crushing is restricted to the hours of 7am to 10pm because the mine is close to the Ravensthorpe townsite.

The downtime is well utilised as it allows for most maintenance work to be carried out at night.

The 24-hour operation works with a crew totalling just 16 people.

Rapid has three small crews of four people, each with supervisors, a second-in-command and project manager overseeing the works.

The plant handling the project is Rapid's designed three-stage modular



Mining at Mt Cattlin is carried out using excavator and truck operations, delivering to Rapid's crushing and screening circuit, and thereafter into Galaxy's HMS gravity recovery circuit.

electric circuit that took the well organised construction team just six weeks to set up and commission.

It consists of the following:

- 1 x C125 electric Jaw with Crusher cab
- 1 x cone screen trailer consisting of a 20x6 screen flowing into a MVP550 secondary cone crusher
- 2 x 20 x 8 Terex screens
- 2 x MVP 550 fine liner cones
- 15 x conveyors
- 1 x 36M tele stacker
- 1 x Free standing electro magnet
- 3 x 900 KVA generators

- 2 x overflow bins
- 60T crane plus service trucks, watercart, telehandler, EWP, bobcat
- Workshop and office facilities

Project expansion

January 2020 will see the installation of a new optical ore sorter plant.

This will consist of an additional 10 conveyors, 20 screens, a feed bin and two ore sorters running in series that will allow all of the generated waste fines to be reprocessed.

The outcome will facilitate Galaxy being

able to process more tonnes and extend the life of the mine by an additional two to three years.

An additional 75t per hour will be processed through the sorter with the possibility of even more once commissioning is fully completed.

For Rapid Crushing and Screening Contractors, working this project with Galaxy Resources has been a great pleasure.

The project has involved creativity and close co-operation, with the result that a high production operation has been achieved that is operating smoothly and at substantial capacity.

**PROUD TO BE A PART OF
GALAXY'S SPODUMENE/LITHIUM
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The first Boonanarring HMC loaded for transport to storage near the Port of Bunbury.

GERARD MCARTNEY

IMAGE Resource’s 100pc-owned, high-grade, zircon-rich Boonanarring mineral sands project, 80km north of Perth, exceeded nameplate capacity in the second month of operation in January 2019.

The company achieved profitability in Q1 and was cashflow positive in Q2.

At Q3, it had produced 201.4kt heavy mineral concentrate (HMC) for the year, with full-year guidance lifted to 260-280kt HMC, which the company said reflected the “better than expected operation performance”.

The company’s ore processing rates had benefited significantly from the installation of a larger trommel at the feed preparation plant in August, which allowed for an 11pc increase in Q3 to hit 874kt.

Image Resources managing director, Patrick Mutz, said that the success of the project in its first year of production had been “nothing short of exceptional”, and that the company was on a journey from “Australia’s newest mineral sands miner to rapidly growing mid-tier prospect”.

The company began pre-construction activities at Boonanarring in March 2018 with the site entry road and, following the wet commissioning of the plant in December 2018, production ramp-up commenced immediately.

The rapid eight-month ramp up cost about \$52m.

The mine is expected to produce about 32,400t zircon over the 10-year mine life, and included in the annual production is about 5400t leucoxene and 9000t rutile.

The project has an estimated resource of

14.42mt ore which contains about 8.2pc heavy minerals.

Ore is mined using conventional open-cut dry mining, and is delivered to the Mining Feed Unit (MFU) within the active mining area, before it is screened and water is added.

The slurry is then treated in the primary concentration plant before a secondary concentration plant to produce the heavy minerals concentrate (HMC).

This HMC is then further treated in a dry mill to produce ilmenite, rutile, zircon and leucoxene.

New offtake agreements

Image Resources entered an agreement with China-based Shantou Natfort Zirconium and Titanium (Natfort) for the sale of the entire

HMC produced at Boonanarring in May 2017.

The two companies reached another agreement in October 2018 allowing for 50pc of HMC production to be sold to Hainan Wensheng High-Tech Materials (Wensheng).

Natfort and Wensheng will each purchase 50pc of the HMC produced at Boonanarring following the transaction.

On November 12 last year, the company announced it had secured new sales agreements with offtake partners, for the sale of a nominal total of 65kt HMC in Q4 2019 with no reduction in zircon pricing.

The company finalised another regular monthly 20kt monthly shipment of HMC that was purchased by its offtake partner, Natfort.

In addition, a sales agreement has been reached with Haninan Wensheng for nominally 45kt over two shipments.

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RIDING THE WAVE

Australian gold producer Regis Resources has topped the year off on a high, meeting its full year production guidance of 340,000oz and progressing new growth and exploration strategies across its tenements in WA and NSW for 2020 and beyond.



First stoping ore at Rosemount is planned for Q2 2020.

EMMA DAVIES

AT the 2019 annual general meeting in November, Regis' non-executive chairman James Mactier told shareholders the year had been a profitable one.

"This year was one of significant achievement and change for Regis and I am pleased to report, another very profitable one," Mr Mactier said.

"Net Profit After Tax of \$163.1m, despite being slightly down on last year, was a commendable achievement.

"Record revenue from increased gold production and a higher realised gold price was offset by increased costs primarily due to increased strip ratios and industry-wide cost pressures."

Additionally, a non-cash write-down of some previously capitalised exploration expenditure was taken.

"Our strong profitability, cash flows and outlook, enabled the board to declare fully-franked dividends for the year totalling \$81m or 16c per share, continuing Regis' industry-leading performance," Mr Mactier said.

"This brings total dividends declared by Regis to \$407m and \$1000 invested in Regis 10 years ago with re-investment of dividends, is now worth over \$12,500."

Highlights for the year included record gold production and strong financial metrics generating industry-leading dividend returns, reserve replacement at Duketon, development of the first underground mine at Rosemount and near-mine and greenfields exploration of drilling 1200m below the Rosemount pit.

Smooth operations

Regis Resources has been performing reliably and is progressing on several future growth-related projects for 2020.

The Duketon Gold Project in WA returned a solid performance in the September 2019 quarter with production of 87,633oz of gold – 22,743oz from Duketon Northern Operations and 64,890oz from Duketon Southern Operations.

This was marginally down compared to the June quarter production of 90,966oz.

The Rosemount underground mine reached first ore in the September quarter and mined significantly above expectations of 10kt of ore.

The planned increased development rate for the mine requires a second development jumbo which has been mobilised and will be put into operation in the December quarter.

The first phase of stope definition diamond drilling was completed in September with drilling concentrated on the upper section of the South Zone.

The drilling results are being evaluated and used for detailed ore development, and stope design with first stoping ore is planned for the March 2020 quarter.

Regis Resources managing director Jim Beyer was confident the satellite pits would supplement existing operations.

"Looking forward we expect reliable performance from the existing Duketon Operations and a gradual introduction of new production coming from Rosemont Underground and new satellite pits," he said.

With the increase in high grade material from the Rosemont underground and currently planned open pits, gold production over the next three years is expected to lift by about 10pc above the current level to about 400,000oz by FY22.

Greenfields exploration

Mr Beyer said the company expected to see results from greenfield exploration work across its Duketon tenements in the new year.

"Our organic growth potential through exploration was given a major boost when the company acquired a large strategic tenement holding across the Duketon Greenstone Belt," he said.

"This acquisition tripled the company's landholding and means that Regis now controls about 90pc of the gold rights in the highly prospective belt."

The previous tenement holding encompassed 194 granted exploration, prospecting and mining leases across 991sqkm, and four exploration licence applications over 227sqkm.

The new expanded holdings result in a contiguous tenement area of more than 3265sqkm.

Regis has begun reviewing the extensive data package including advanced gold prospects and is undertaking a methodical but aggressive exploration program during the December quarter of regional surface sampling, and will commence drill testing the best gold targets as soon as practical.

During the September 2019 quarter, a total of 49,876 drill metres was completed.

This work focused on drilling at depth for extensions to gold mineralisation beneath existing gold deposits at Garden Well South, Gloster, Moolart Well, Baneygo and regional exploration drilling at Murphy Hills, Fisher Well, Matt's Bore, and Little Well.

McPhillamys Project

The 100pc Regis-owned McPhillamys Gold Project in NSW is one of Australia's largest undeveloped open pit gold resources, with the company submitting its Development Application and Environmental Impact Statement for the project in July.

The Definitive Feasibility Study (DFS) is progressing and will be updated to further refine the operating parameters, estimated capital and operating costs and a development timetable (subject to completion of permitting).

Regis continues to progress the water supply agreement and refine the pipeline route access to utilise recycled water from the Mt Piper Power Station and Centennial Mine near Lithgow.

An additional change in scope for the DFS is the consideration in the study of the potential Discovery Ridge satellite project (located 32km away from McPhillamys) where recent drilling confirmed the significant potential of this Project.

Discovery Ridge continues to shape up as a very significant additional value proposition for the McPhillamys Project and work is currently underway on a maiden reserve estimate.

"With the company's transformational McPhillamys Gold Project in New South Wales making steady progress, the outlook for our company is very exciting," Mr Beyer said.

Leadership changes

The year also saw significant change of

leadership and personnel, with Steve Scudamore appointed a non-executive director in May and Jon Latto joining the company as chief financial officer and company secretary in July.

Mr Mactier publicly thanked outgoing personnel Ross Kestel, Mark Okeby, Paul Thomas and Kim Massey for their efforts and contribution.

"Individually and collectively, they made a very significant contribution to the growth and success of Regis in so many ways," he said.

"They have helped lay a very strong foundation upon which we continue to build. Change and renewal is inevitable in any organisation and should be embraced for the new skills, experience, ideas, perspectives and opportunities that come with it."

Lynda Burnett also joined the company as a non-executive director, bringing experience in gold and other metals exploration, both in terms of the underlying science and the management of exploration teams and budgets in Australia and around the world.

"This included an involvement with the discovery of our McPhillamys deposit," Mr Mactier said.

"With our renewed focus on exploration and significantly increased exploration tenure, Lynda's insight and experience will be extremely valuable.

"We continue to invest in growth through significant exploration expenditure and capital investment as well as an active but disciplined business development effort.

We remain focussed and prudent in our operations, financing and strategy.

"We have significant upside exposure to a rising gold price with more than 8m oz of gold in resources, including 4m oz in reserves."

Looking to 2020 and beyond, Regis is in a strong financial position, which Mr Mactier stating was down to Mr Beyers' leadership.

"Significant change and achievement doesn't come without challenge and the Board has been extremely pleased with the manner in which Jim and his team have managed and led Regis this year," he said.

"We look forward to another safe and successful year."

Going the distance

WA

McMAHON Burnett Transport is a privately-owned company that provides freight services to customers across WA.

McMahon Burnett Transport managing director Santo Guagliardo has been involved in the transport industry for close to 40 years, starting with his father in the north west of WA in the 1960s as a driver, and now owning one of the most innovative transport companies in the State.

The evolution of the business to its current form, McMahon Burnett Transport, has happened through good management skills, dedicated staff, and a devotion to customers' needs.

The team are committed to occupational health and safety and continually train personnel to the highest standards.

McMahon Burnett Transport services customers throughout WA and has depots in Kalgoorlie, Onslow, Cue, Mt Magnet, Laverton, Leonora, Wiluna and Leinster.

The team are specialists in all forms of mine freight, and service many major mines in WA, as well as handling oversize, dangerous goods and catering freight.

Recently, the company launched an online booking system, where



McMahon Burnett Transport has launched a new online booking system for its freight services.

customers can place a booking, print consignments, and monitor proof of delivery via their phone.

It's an innovative new system which

McMahon Burnett Transport said has been well received by its existing customer base.

Further information can be found

at www.mcmahonburnett.com.au or by contacting Perth branch logistics manager Dennis Scanlan direct on 0409 445 904.



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MINING INDABA 2020

The 26th edition of the Investing in African Mining Indaba conference will take place in Cape Town, South Africa, at the beginning of February, 2020. The event is planning to be bigger than last year, which saw more than 6000 delegates attend the exhibition, including about 600 investors and more than 1100 mining executives. Emma Davies spoke with head of content Tom Quinn about the showcase, including the latest technologies to be unveiled, coverage of the latest trends and topics to be discussed.

More than 6000 delegates are expected to hit Cape Town for the 2020 Investing in African Mining Indaba Conference.

Q. What are the highlights of the event? What should attendees look out for?

Sustainability has many great touchpoints throughout the mining value chain, so you will find ESG issues in most natural resources topics which are current in the industry and throughout the week at Mining Indaba.

Navigating the legal and regulatory frameworks of many African countries is a topic of increasing relevance, so we are delighted to introduce our General Counsel Forum (GC Forum) at February's Mining Indaba.

Workforce health and safety, of course, is a perennial concern for all mining operators and will be discussed from various perspectives in different Indaba content streams.

Given global growth in demand for lower-carbon electricity, the whole area of battery metals is of immense interest right now and we return with our dedicated Battery Metals Day during the Indaba week.

One of the big growth areas in terms of operating practice and therefore reflected in our Indaba content is the challenges and opportunities presented by the fourth Industrial Revolution.

Pulling the industry into the digital economy is no mean feat, and the pace of technological change is sometimes so fast that it can seem daunting and difficult to get a handle on.

Therefore, we've devoted two whole days to our future-facing Mining 2050 content stream.

Q. Which main speakers do you expect to draw a crowd?



Sustainability, regulatory frameworks, workforce health and safety and the challenges and opportunities of the fourth industrial revolution are all on the agenda for the event.

Anyone who has seen Ivanhoe Mines founder Robert Friedland speak will look forward to his keynote presentation – and unique style – on the Wednesday of Mining Indaba.

Mark Cutifani, CEO of mining giant Anglo American, will deliver the opening industry keynote focusing on the brand of mining, sustainability, the role of technology, and the current disconnect between mining's image and its integral part in building our digitised future in the fourth Industrial Revolution.

We are delighted to welcome, once again Gwede Mantashe, the South African Minister of Mineral Resources and Energy, to give the ministerial welcome to our pan-African and international delegate audience of more than 6000 people.

Given this year's theme on mining and

the digital economy, it is great to be joined by Sabine Dall'Omo, CEO of Siemens Southern and Eastern Africa, and one of the world's top mining executives Bold Baatar, CEO, Energy and Minerals at Rio Tinto, will uncover key updates on their operations.

Q. Mining can be a real driver of development – will this be a key focus for the conference?

It is not wrong to view the natural resources industries of Africa as the engine of the continent's development. But how this abundance of metals and minerals is developed is absolutely key.

There is a tangible change in the way extractive industries are doing business – and are now expected to do business

particularly by the institutional investors and private equity firms which are key to their ongoing capital investment.

ESG investing, that is investing with environmental, social and governance issues in mind, is fast becoming part of the DNA of financial institutions.

In essence, it's a 21st century form of risk management. Investor pressure, motivated by pressure from millions who hold capital or pension funds with them, is now a key driver in the ways in which extractive businesses such as mining, and energy production do business.

It is now necessary for mining companies to have ongoing engagement with their investors and with the communities in which they operate in order to mitigate the risk of investor or community backlash from lack of sustainable practices.

Q. With youth employment on the agenda, do you expect more young people to attend the event this year?

Having a long history in Cape Town specifically and South Africa in general, Mining Indaba recognises the responsibility of mining operators and investors to drive employment in the communities in which they operate.

We will be discussing President Cyril Ramaphosa's YES Initiative and the access points it might bring in the mining supply chain.

It is vital for the event – and the industry as a whole – to attract next generation leaders and fresh thinking, so we curate engaging content, such as our two-day Mining 2050 stream, to speak to the innovative approaches to tech that a younger generation of natural resources pioneers can bring.

We also seek to develop our Young Leaders Forum, which invites both students and recent graduates beginning careers in the sector to discuss ideas and brainstorm challenges with seasoned executives.

It is vital not only to appeal to a young generation, but to tap the vast experience and knowledge held by older Indaba delegates.

Q. What can attendees expect from the young leaders program?

The Young Leaders Program helps supports the industry to identify and recruit the best young talent coming out of higher education who are exploring the possibility of a career in the mining sector.

The program provides a platform for productive engagement between the key stakeholders within the industry, young leaders themselves and high-education institutions.

We will be looking at the role of mining in the energy transition and powering the digital future, as well as strategies for mining to become more sustainable by reducing its carbon footprint.

It is a more informal Indaba format to help ensure the students and young mining recruits are comfortable to raise ideas and questions. There will be many interactive opportunities culminating in an informal lunch where attendees can network with mining companies to discuss best access points for a career in mining.

Q. Who is speaking around emerging technologies and digitisation?

As well as leadership perspectives from tech-focused mining companies such as Resolute Mining and Exxaro Resources, we are excited to bring the future-facing

knowledge from current innovators like Caterpillar Resource Industries Group president Denise Johnson, and Sandvik Rock Drills and Technologies president Patrick Murphy.

Our partners for our two days of Mining 2050 content are the tech incubator Unearthed Solutions and we will hear from Holly Bridgwater, Industry Lead, on the ways in which 4IR is revolutionising the industry.

Increasingly, major mining companies are hiring CTOs and graduates who can bring cutting-edge tech applications to what is traditionally a pretty conservative industry.

Q. What key topics around sustainability will be discussed at the event?

It always strikes me as an odd perspective to wonder whether a company should focus its efforts and resources on sustainability.

It is almost like humans wondering whether we should prioritise oxygen in our day-to-day lives.

By their very nature, mining companies must constantly adapt, innovate and be sustainable within the communities in which they operate, otherwise they will not be operating there for very long. And human capital is at the front and centre of any successful enterprise.

Having the tools and resources to not only employ communities to grow their local and national economies, but to upskill those communities and embed sustainable practices in order to guarantee the ongoing existence of those communities, can only be a positive strategy for a mining company.

South Africa, like several Africa’s countries, is currently struggling with high unemployment and a growing, young population.

It is vital that all stakeholders take part in these ongoing conversations between mining operators, investors, community leaders and unions in order to work collaboratively.

I’m also very pleased to introduce a candid discussion on artisanal mining to the main stage this February, looking at how companies can work with communities to mitigate the dangers of artisanal practices and examining its driving factors.

Q. On diversity and women in mining – do you think the female speakers have a role to play in inspiring the next generation?

Of course! Mining is, by its global nature and often remote operating capability, an incredibly diverse industry.

The days of mining relying on a pick, a shovel, and brute strength were over in the last century.

The problem is not lack of female talent in the mining value chain, the problem is lack of opportunity. We are absolutely committed to helping to change this within the natural resources industry.

We work very closely with Women in Mining to ensure the best female thought-leadership is represented at Mining Indaba.

As head of content for the conference, I am committed to ensuring that increasing numbers of women are given this platform for the industry – and not purely for discussions on gender or diversity – I really want thought-leadership that earns its place on merit, so I am delighted to say we have lots of female leaders at Mining Indaba who primarily share their hard-earned expertise and also happen to be women.

You only have to listen to what people like Vedanta Zinc CEO Deshnee Naidoo



A diverse range of speakers is expected to drive conversations the future of mining and the next generation of leaders.

has to say to know that she is a superb mining executive and an inspiration to both young female and male leaders alike.

Q. Is there anything else you would like to add?

This year our business matchmaking platform has undergone momentous investment and our Investor Relations team has expanded to deliver a faster and cleaner experience.

It intelligently filters through 6000+ attendees to find top matches, resulting in a higher return on time.

We’re excited to welcome everyone to Cape Town on February 3-6.



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MAPLES AND MINERALS

The four-day annual PDAC convention held in Canada has grown in size, stature and influence since it began in 1932, and is regarded as an attendance requisite for the world's mineral industry. Plans are already well in place for the 2020 event.

RAY CHAN

THE annual PDAC Conventions in Canada have been recognised as the premier mineral exploration and mining events for people, companies and organisations in, or connected with, mineral exploration.

In addition to meeting more than 1100 exhibitors, 2500 investors and 25,800 attendees from 132 countries, delegates can also attend technical sessions, short courses and networking events.

The convention, run by the Prospectors and Developers Association of Canada (PDAC), is held each year in Toronto, and is the event of choice for industry stakeholders.

The 2020 conference will be held between March 1-4 at the Metro Toronto Convention Centre, and already a packed program has been planned.

The event kicks off with a networking reception on Sunday, March 1, followed by an opening day reception.

The Keynote Program, Discoveries Of The 21st Century, will start proceedings on Monday, March 2, discussing key tier one deposits which have been discovered and put into production.

Three industry leaders – Mar Bristow (Barrick Gold), Joe Ovsenek (Pretium Resources) and Robert Friedland (Ivanhoe Mines) – will outline how this was possible, what the keys to success were, and what the keys for discovery in the future are.

As well as networking opportunities, Tuesday March 3 will also offer a session on bringing generalists back to gold.

For years, generalist investors have avoided the gold sector, citing poor capital allocation and subpar returns, even as gold prices remained relatively flat.

This session will explore the factors



More than 25,000 attendees are expected at the event.

and metrics generalists consider when evaluating gold equities, as well as a discussion of the role of gold in portfolio diversification.

PDAC president Felix Lee said the “unbeatable” networking opportunities were the main reason for attending the PDAC Convention in Toronto each year.

“Whether it’s making new business contacts, reconnecting with former colleagues, finding the next job, or browsing the latest investment prospects, people are

at the centre of it all,” he said.

“And why wouldn’t they be? Mineral exploration and mining is a vast, international industry with a plethora of personalities—and the annual PDAC Convention is the perfect setting to see it unfold before your very eyes.”

Delegates who register by February 7 save 40pc on fees.

To stay informed of the latest news and information about PDAC 2020, visit www.pdac.ca/convention.

New resources discovery program

INTERNATIONAL

WITH escalating global demand, constrained supplies and shifting global needs, CSIRO has developed a targeted science and innovation program for the discovery and understanding of Australia’s mineral resources.

The Mineral Resources Discovery Program (Discovery) works in collaboration with the minerals industry and other government organisations to overcome global challenges of declining discovery rates and orebody quality, rising production costs, and changing needs.

CSIRO and its partners provide the knowledge, skills and tools to support Australia’s mineral explorers into the future, and can develop solutions from complex projects, big and small.

The Discovery team focuses on exploration under cover and understanding orebody formation specialising in integrated projects – weaving in CSIRO’s in-house expertise with collaborative ventures with industry and research organisations.

Drawing on the diverse skills and experience of more than 5500 staff across Australia, CSIRO has the capabilities to work on bespoke projects and large research programs in its specialised facilities.

The partnerships and links with industry ensure the focus remains industry-directed and relevant, pushing innovation horizons to create new knowledge and next generation exploration technology.



CSIRO thrives when working with its partners on mineral systems science solutions to help target new areas of discovery beneath the cover.

Mapping Australia’s cover

One example of the innovative programs CSIRO is involved with is the Ultrafines+led research and development of geochemical interfaces mapping to characterise Australia’s cover.

In partnership with LabWest and AMIRA International, these programs aim to develop new mineral vectoring

methods, widening mappable chemical footprints and probing deep beneath consolidated and unconsolidated cover that hinders exploration through vast parts of the country.

In addition, new detection methods for delineating the architecture of geological domains or searching for valuable resources including water will help resource Australia’s future exploration efforts.

New tools for Explorers

CSIRO’s Deep Earth Imaging Future Science Platform is working with Discovery to develop new technologies to probe deep under cover and develop innovative ways to explore, using the vast data held by Australian agencies and industry partners.

Through a combination of geophysical techniques, deep geological knowledge, data analytics and machine learning capability, new research and analytical infrastructure are being developed for explorers.

For example, the recently developed Data Mosaic is being used to aid mineral explorers and miners to automate core-logging to deliver greater time to advance their programs, whilst providing reliable data that can be utilised into the future.

In doing so, more accurate geological logs can be used to re-define vectoring tools in exploration programs or help with development of mine planning.

In partnership with Data61, CSIRO’s Rosetta Geosensor project uses supervised machine learning, combined with sensor technology data to translate mineralogical data into geochemistry.

This translation aims to help re-define current workflows in the minerals industry whilst accessing the greatest value out of sensor data that is collected during exploration or mining projects.

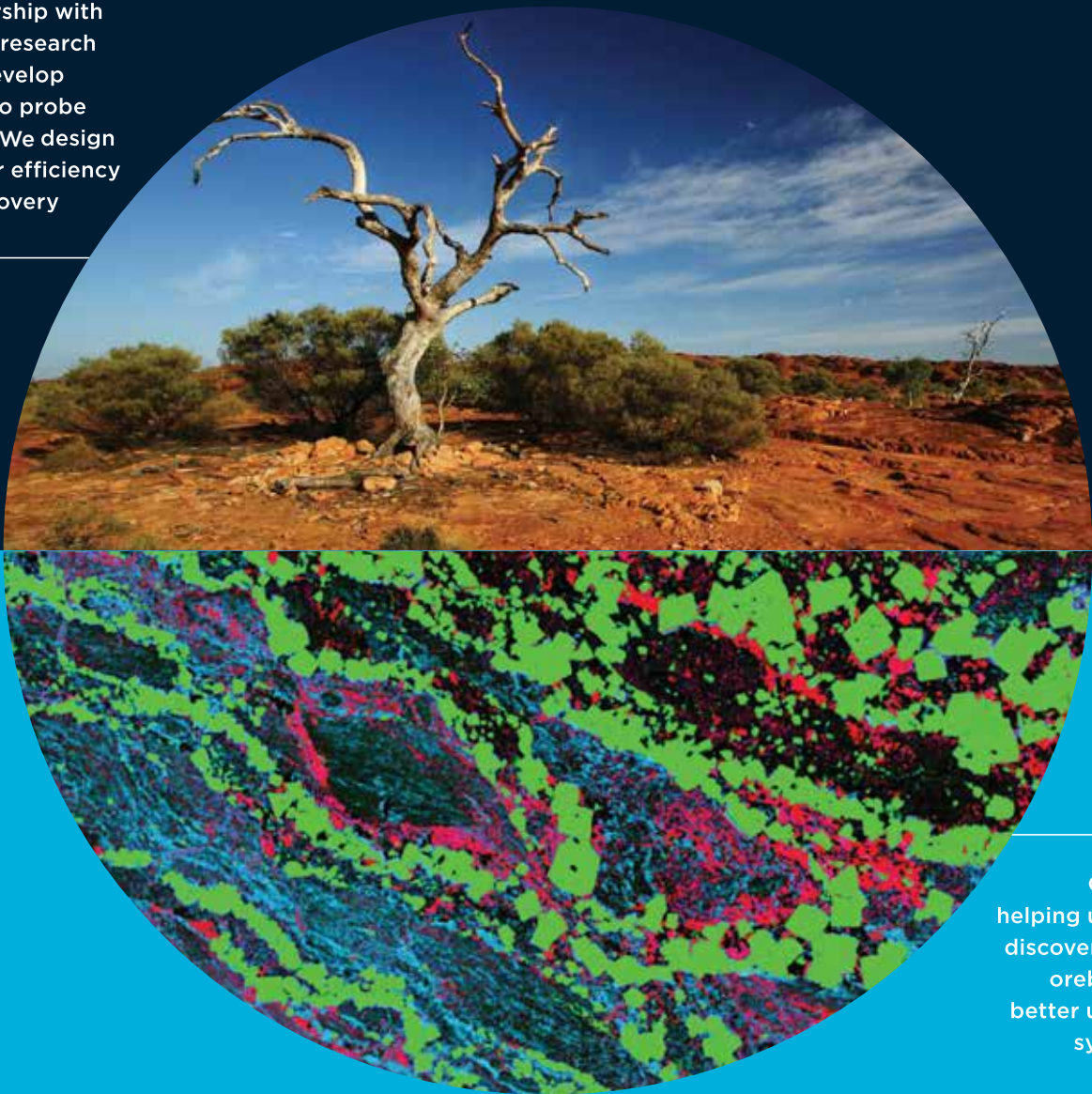
Visit CSIRO at Booth 410 in the Australian Pavilion at PDAC to find out more about these projects and their deep geological knowledge of tectonic processes responsible for ore deposit development.

For more information, visit www.csiro.au/mineralresources.



Delivering innovation to the global resource sector

We work in partnership with industry and other research organisations to develop new technologies to probe below the surface. We design solutions for higher efficiency mining and ore recovery



Our Maia Mapper is helping unlock new mineral discoveries, enhancing our orebody knowledge to better understand mineral systems under cover

CSIRO is Australia’s national science agency with a strong record of breakthrough innovation to create a more productive, sustainable and globally competitive mineral resources industry.

**Come talk to us about our latest innovations
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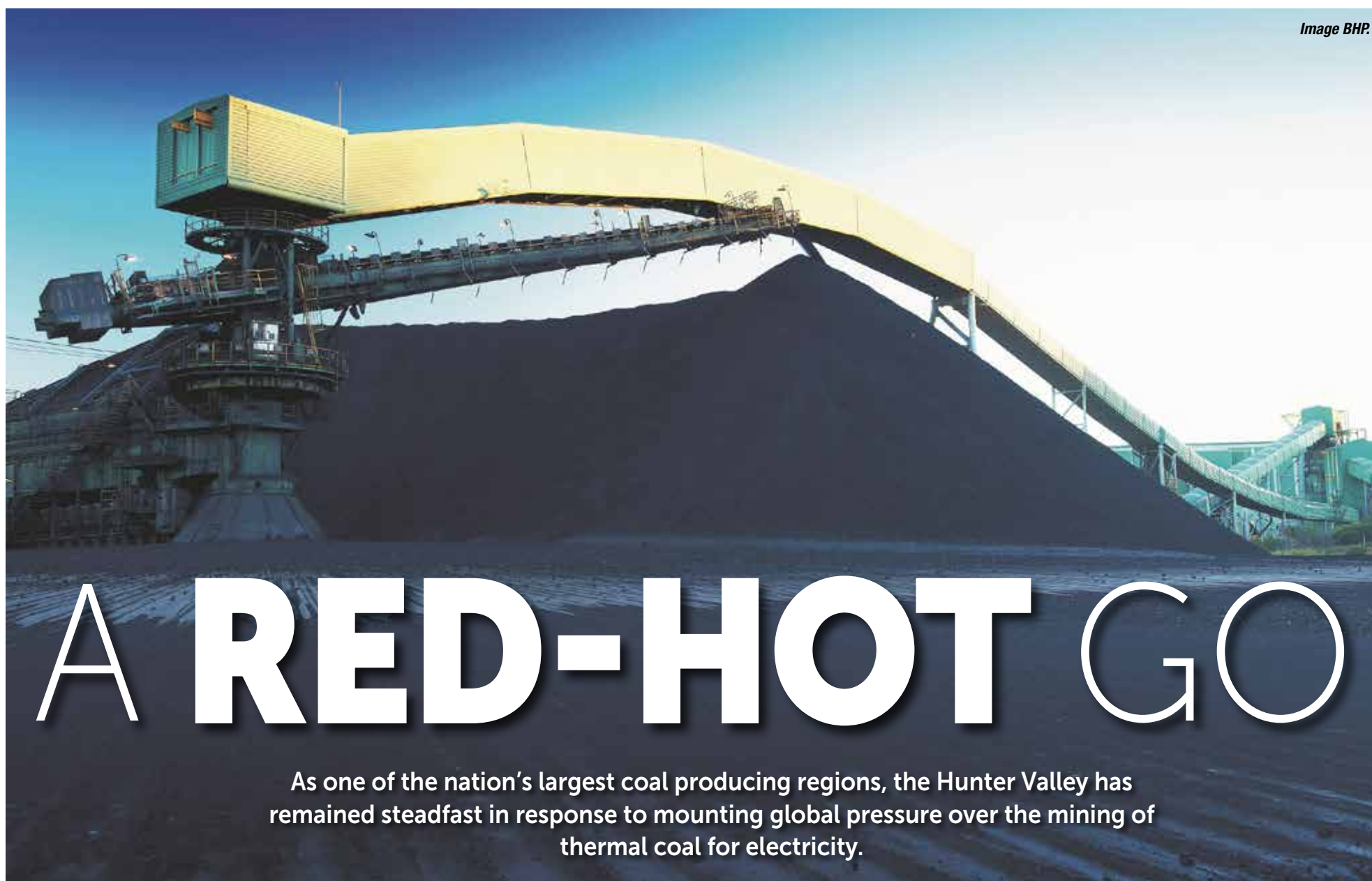


Image BHP

A RED-HOT GO

As one of the nation's largest coal producing regions, the Hunter Valley has remained steadfast in response to mounting global pressure over the mining of thermal coal for electricity.

The Mt Arthur Coal operation is the largest coalmine in the Hunter Valley.

GERARD MCARTNEY

IT'S been a hive of activity in the Hunter Valley over the past few months.

The region's coalfields contain largely thermal and soft coking coal.

Mines near the eastern edge of the basin are spread along the Hunter Valley from Newcastle in the south to Muswellbrook in the north, most of which are open-cut.

Both soft coking and thermal coal products are produced from mines such as Hunter Valley Operations and Bulga.

With the NSW Independent Planning Commission giving United Wambo the green light on August 29, the region will now be bolstered by another massive open-cut pit.

Meanwhile, Mount Arthur has welcomed a new chief executive in Adam Lacey, and the Newcastle Coal Infrastructure Group (NCIG) is expecting a record year of coal tonnage through the Port of Newcastle.

But it hasn't exactly been smooth sailing for the region in recent months, with complaints about air pollution stirring locals to demand action from the Federal and State governments as pollution levels soared over 700pc above the national standard.

And NSW continues to burn, with Whitehaven Coal the first big player forced to lower its guidance due to the conditions created by one of the worst fire seasons on record.

United Wambo

United Collieries, a 50:50 Glencore and Peabody JV, has pushed its \$381m, 150mt, 23-year-minelife United Wambo mine one step closer to production after it was given the go-ahead by the NSW Independent Planning Commission (IPC).

United Wambo will be operated by Peabody, combining the Wambo and United coal mines, which had been under care and maintenance since 2010, to form one 'Super Pit' mine.

The JV partners told the IPC that the

mine would create about 500 full-time-equivalent jobs and could extract about 10mt per year operating 24/7.

In a somewhat unprecedented move, the IPC imposed a first-of-its-kind condition on the mine that says any coal extracted from the United Wambo pit may only be sold to nations that have ratified the Paris Climate Agreement, or have policies in place to reduce greenhouse gasses.

Although the NSW Minerals Council called the conditions curious, it said that the approval was a positive step for the industry as a whole, and for the Hunter Valley's economy.

But, as was expected, the approval was met with backlash, with some community groups raising concerns about noise issues, vibration and blasting, air quality and disruption to biodiversity.

However, the IPC determined that United Collieries had secured land-based biodiversity offsets which protected biodiversity in the locality, and that scope one and two emissions were minimised as far as practicable.

Newcastle Coal Infrastructure Group

The Newcastle Coal Infrastructure Group (NCIG) is expecting the largest throughput of coal tonnage through the coal terminal at the Port of Newcastle for 2019, as production at both new and established mines ramp up, with the operator expecting 57mt, up from 53-54mt from the previous three years.

The NCIG operation, which commenced in 2010, services the Hunter Valley, Newcastle, Gunnedah, Gloucester, and the Western Coalfields of NSW.

Its main customers are Banpu Public Company, BHP, Idemitsu Kosan, Peabody Energy, Rio Tinto, Whitehaven Coal and Yanzhou Coal

Chronic air pollution

In 2019, air quality standards breached the

national standard of PM10 and PM2.5 levels by more than 700pc.

Concerns about air pollution in the valley came to a head on November 18, when a community meeting in Singleton was called to seek action on what residents called 'chronic' air pollution.

Singleton GP Bob Vickers presented information about the deaths in the region caused by air pollution, and local residents joined in to voice their concerns.

Dr Vickers said that action needed to be taken to remedy the situation.

"Air pollution is getting worse in Singleton and it is affecting people's health," he said.

"Close to 90pc of our coarse particle pollution comes from open cut coal mines.

"We're not going to improve this situation unless and until the state government makes the mines act."

However, the State Government claimed the air pollution was a weather issue and not a political one.

It said that the bushfires and drought that had been raging across NSW were two major factors contributing to the poor air quality, however stopped short of commenting on the cumulative affect of dust from open cut mining.

NSW premier Gladys Berejiklian said that her government was taking the matter very seriously.

"The Government always works with parties to ensure good air quality and safety across the state, and of course the Upper Hunter is included in that process," she said.

"Issues affecting health – whether it's air quality, water quality, any other factors that might impact our citizens – our Government takes very seriously, and if there's anything we can do more or better, we will."

A burning issue

The Hunter Valley has also been the scene

of much controversy in recent months, as devastating bushfires spread across the region: activity that has been blamed on climate change, which in turn has been caused by the reliance on fossil fuels, critics have claimed.

The Hunter Valley is the world's largest export basin for thermal coal used in power stations, and the Illawarra escarpment contains Australia's oldest mines for coking coal used in steelmaking.

This region was built on coal, which overtook iron ore to become the country's most valuable export last year.

Electoral votes in the Valley, one of the few parts of Australia where coal is a major employer, were cast heavily towards Scott Morrison's government in the 2019 election.

The government's challenge is to counter opinion that climate change and increasing carbon burnoffs are causing fires, while aggressively trying to revive coal exports.

On a catastrophic fire day for NSW in November, the Liberal-National government had planned to push through a bill to weaken the state's planning laws, in favour of coal and gas corporations.

A snap action outside NSW parliament that day drew hundreds of people from across the state, who made their opposition to the bill known and expressed support for the NSW Rural Fire Service, which is battling the flames with shortages of equipment and personnel due to budget cuts.

Whitehaven Coal was savaged by investors after it was forced to lower its guidance by 7-15pc as a result of the fires, knocking 11pc off its market capitalisation.

The company reported that it could not find qualified drivers for the heavy equipment on the mine, and that business-as-usual had been interrupted by dust, heat haze and smoke.

Raising the bar in forklifts

NSW

SINCE purchasing Hunterlift Trucks in November 2018, Hunter MLA has grown its footprint considerably.

Through the acquisition, the company has welcomed a Mitsubishi product range to its fleet, has added flexibility to provide specific products to suit customer requirements, and expanded its mobile service fleet to cater for increased business throughout the Hunter Valley, Newcastle and Central Coast regions.

The company now boasts 10 service vans with plans to introduce a service truck in coming months to cater for heavy forklift customers.

Hunter MLA's range of forklifts spreads across a vast array of industries from small warehouses through to mine sites, container handling facilities, smelters and more.

The team also has a large selection of electric, LPG and diesel forklifts.

In addition, Hunter MLA offers a full range of parts and accessories to fit any brand of forklift, and has invested in state-of-the-art tools, safety and mine site procedures.

Some of its clients include Thiess, Kaltyre, Weston Aluminum, Tomago Aluminum and Marathon Tyres.

Furthermore, Hunter MLA is part of



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

MLA Holdings, which is a quality-assured company.

This means its operating procedures and safety rules are of the highest quality, enabling the team to form relationships with some of the larger organisations in the

mining and manufacturing sectors.

The experienced team has been based in Sandgate for more than 20 years, providing a stable and reliable service for all its customers.

Australian Mining Review readers in

the Hunter Valley who mention this advertisement below can receive a free safety forklift inspection to ensure their forklifts are in a safe working condition.

The team can be contacted on 1300 166 660 or (02) 4967 4622.





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Saving lives through innovation

NATIONAL

SINCE 1960, the Hi-Vis Group has been committed to keeping workers safe on-site through the introduction of innovative technologies and products that solve the innate safety issues surrounding mine sites.

The company has been intimately involved with the Hunter Valley, and has won numerous awards for its services to the working community, including the 2018 Presidents Award at the Hunter Business Awards, and 2012 Hunter Manufacturer of the Year.

Since its humble beginnings nearly 60 years ago, the company has grown to become one of the country's largest manufacturers of mining, road, safety and specialty custom signage and safety products.

It now employs more than 50 staff, and operates through three sites, with headquarters in the busy Port of Newcastle.

Today, the company continues its legacy, leading the way in the provision of signage and safety-related products in the mining sector, with a product range developed specifically for the heavy-duty environmental conditions on site in Australia and the Asia-Pacific region.

Hi-Vis Group has fostered close working relationships and vendor numbers within most major mining companies across Australia, and has provided innovative, tailored solutions for their sites.

The company has built its reputation on



Hi-Vis Group's head office in Newcastle.

innovation, high-quality products backed by excellent customer service, with the proven experience, knowledge and the support of an engineering team to obtain the best outcomes for each mine site.

Working across both surface and underground operations, and with some of the biggest names in the business, such as BHP, Rio Tinto, Centennial Coal, Glencore, Yancoal, Xstrata, Vale and Anglo American to name a few, Hi-Vis has the distinct advantage of experience.

Significant investment into the research and development of SMART technology has resulted in many of the Hi-Vis Group's products creating even greater safety on site using LED static or flashing lights enabling higher visibility of vehicles and intersections and alerting drivers at greater distances of oncoming vehicles or potential hazards.

All of Hi-Vis Group's signs can be solar powered, remotely programmable using the 3G or 4G network for communication

in remote locations, and can include a full analytics dashboard via a web interface that reports on GPS location, weather conditions, power usage and battery storage.

Hi-Vis Group's LED signs are fully functional 24/7 in all weather conditions and are operated via Hi-Vis Group-developed proprietary software systems.

More information: 1300 857 500.

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WARNING
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LOCATION
NORTH PIT
TIME DATE DAY
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Stratford Coal Severe Weather TARP Status
GREEN - LEVEL 1
YELLOW - LEVEL 2
ORANGE - LEVEL 3
RED - LEVEL 4
STRATFORD COAL

STOP
6N

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Through Innovation*

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RED

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LTI Boards

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WHEN LIGHTS FLASH

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Global support, local service

NATIONAL

TRACING its roots back more than 120 years to the Electric Wheel Company in Illinois, Titan Australia is the only manufacturer with the ability to design, test and manufacture wheels and tyres for the mining sector.

With a nationwide network of sales, distribution and service hubs across NSW, Victoria, Queensland and WA, Titan Australia is the complete solutions provider.

Its dedicated and local team of engineers can provide onsite information and advice with the resources and technical support of an international corporation.

Titan Australia managing director Paul O'Brien said the company's knowledge of the Australian market and global tyre brands is second to none.

"We understand the unique challenges of the Australian tyre operational environment," Mr O'Brien said.

"When you combine our knowledge with our range of tyre products and services, it sets the benchmark for quality service."

Mr O'Brien said that making a difference to its customers' bottom line has always been paramount to operations.

"Titan Australia provides complete customer support service, including tyre, wheel and axle sourcing, management, onsite and offsite service, in-house repair, and certification for wheels by fully



Titan's knowledge of the Australian market and global tyre brands is second to none.

qualified personnel in accordance with applicable Australian standards," Mr O'Brien said.

Titan Australia offers a complete range of wheels, from six inches through to 63 inches in diameter, including fixed patented quick-change mining wheels, welded wheels, adjustable bolted tractor wheels, demountable (spider mount) rim options and clip-on dual applications – and carries a complete axle assembly and spare parts range tailored to suit the needs of its Agricultural clients.

Quick-change rim

Titan's Quick-Change Rim (QCR) solutions comprise various designs, including its patented Outside Vertical Mount wheel system used by Caterpillar as the QCR system of choice on its 793F and 797F ultra-class mining trucks.

"The QCR system is designed to improve mine site productivity by minimising downtime associated with tyre servicing and rotation, and to improve safety for tyre service personnel," Mr O'Brien said.

"It provides an increased crack test interval, longer rim life, improved safety and fewer rim-based remove and install procedures during tyre changes."

This is especially important when considering the unique challenges of the often-harsh Australian environment and climate for mining operations.

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Miners look beyond meat

RAY CHAN
NATIONAL

AUSTRALIAN company Sodexo has partnered with plant-based meat innovator Beyond Meat to deliver sustainable protein alternatives to miners and corporate workers.

Sodexo delivers a unique array of more than 100 integrated services lines including catering, facilities management, concierge services, security, asset maintenance and hospitality services in sectors such as energy and resources, defence, healthcare and seniors, and education.

Following demand from mine workers, Sodexo will deliver Beyond Meat's Beyond Burger, a non-beef patty, to several sites as part of a three-month trial.

The Beyond Burger patty requires 99pc less water and 93pc less land than its beef equivalent, according to a recent Beyond Meat-commissioned study by the Center for Sustainable Systems at University of Michigan.

The burger also generates 90pc fewer greenhouse gas emissions and requires 46pc less energy to produce.

Sodexo Australia food platform director Tim Hartley said the company wanted to deliver workers healthier options and more sustainable choices.

"There has been significant demand from both meat and non-meat eaters to provide more vegetarian options," he said.

"The addition of the Beyond Burger to our menus sparks a great conversation around perceptions on what people like to eat and how society is moving towards a more plant-based diet."

Beyond Meat is America's highest grossing plant-based meat alternative



Don't be fooled. This is not a meat burger.

product company and experienced the highest initial public offering by a US company on the NASDAQ Composite stock market in almost 20 years.

It chose Australia as its first launch country outside the US and Sodexo as its first Australian corporate responsibility partner.

Adrian Gasteviski, Australian director of Future Farm Co, the importer of Beyond Meat in Australia, said this trending movement is seeing plant-based products replicate the complete experience of eating traditional meat, with no cholesterol and much less saturated fat.

"Plant-based products demonstrate the direction of innovation where society can

benefit from products that finally taste more like those we are used to eating, but deliver greater health and environmental benefits than an animal meat-based diet. Ultimately, it's better for us and better for the environment," he said.

The Beyond Burgers have been engineered with a similar composition to red meat, beginning with pea protein isolate, canola oil, refined coconut oil, cellulose from bamboo, and potato starch.

Trace amounts of beetroot give a meaty red colour while coconut oil ensures mouth-watering juiciness.

Further, the Beyond Burger packs 20g of plant-based pea protein and has no cholesterol, no genetically modified

organisms, soy or gluten.

"A common misconception is that plant-based products have a long list of ingredients, compared to animal meat," Mr Gasteviski said.

"These products have the same molecular make-up as animal products, a combination of fats, proteins, carbohydrates and water."

Sodexo looks to incorporate more Beyond Meat products, such as the Beyond Sausage, to sites in the future.

Sodexo's decision to introduce the product aligns with the company's Better Tomorrow 2025 corporate social responsibility road map, with a key goal being sustainability.

These boots are made for mining

RAY CHAN
MELBOURNE

A NEW waterproof boot that offers both comfort and safety is gaining popularity at mining sites.

The Crawford boot, designed by podiatrist Penny Crawford, offers a footwear solution for Australian miners that answers many of their problems.

Her award-winning gumboot has a specially designed insert that ensures the boot fits without any looseness, and is waterproof.

After working in regional NSW for almost 30 years, Penny has treated numerous foot and ankle issues as a result of miners, primarily underground workers, wearing unsupportive boots.

"A typical gumboot just doesn't fit. And the Crawford boot addresses that issue with my WedgeTech system, an insert in different sizes, that sits in the pockets at the front of the boot," Penny said.

"The WedgeTech insert makes your foot more stable and provides a personalised custom-fit within the boot. This means there is no foot slip and no risk of your foot



Penny Crawford and the waterproof boots.

pulling out even in the wettest conditions."

The boot, which has been trialled in mines in NSW, SA and WA, has been given the tick of approval by miners and the industry itself.

The product scooped the NSW Minerals Council's Health Excellence award earlier this year after an overwhelming response from workers at Whitehaven Coal's Narrabri mine.

After a six-month trial, 24 out of 25 participants recommended the Crawford boot over other available footwear.

A year later, three quarters of those original participants were still wearing the Crawford boot, where other boots would have worn out after four months.

The Crawford boot is made using 23 separate pieces of rubber and is built with the miner's needs first and foremost.

A concept that was born out of concern for footsore miners has become a booming enterprise that has taken Penny around Australia and into Asia to establish a manufacturing base.

"It has been an incredible journey and one that hasn't finished. The Crawford boot will continue to evolve and adapt to other industries," she said.

GOLDEN CELEBRATION



Leading the parade this year was the 2019 St Barbara's Naming Rights Sponsor Topdrill. For almost 15 years Topdrill has and remains proudly a privately owned, operated and local Goldfields drilling company.



This year's elf was Gidji maintenance supervisor Gavin Grljusich, who stood about 7m high on the platform of a 793 CAT Truck. The truck driver is Greg Smith, chosen after being recognised for his length of service and dedication to KCGM over the past 12 years. A CAT 793 truck weighs about 160t or 410t when fully loaded and can carry up to 250t. *Images: Madison Studios Photography.*

RAY CHAN NATIONAL

A 793C haul truck rumbling down Hannan Street in Kalgoorlie-Boulder provided a fitting, awe-inspiring finale to the 20th annual St Barbara's parade.

The annual event draws in big crowds each year to honour the patron saint of mining, St Barbara, as well as the mining sector as a whole.

The Gold Industry Group (GIG) brought West Coast Fever netball stars to the parade, alongside other GIG members Northern Star Resources, Gold Fields, SMS Mining Services, Saracen Mineral Holdings, Norton Gold Fields and Evolution Mining.

KCGM displayed a NAIDOC-themed haul truck, with truck tray artwork commissioned by local indigenous artist Jason Dimer and his family earlier this year.

Other entries included a 992K loader, force water cart and a newly-purchased Mining Legends R2900 Charity loader.

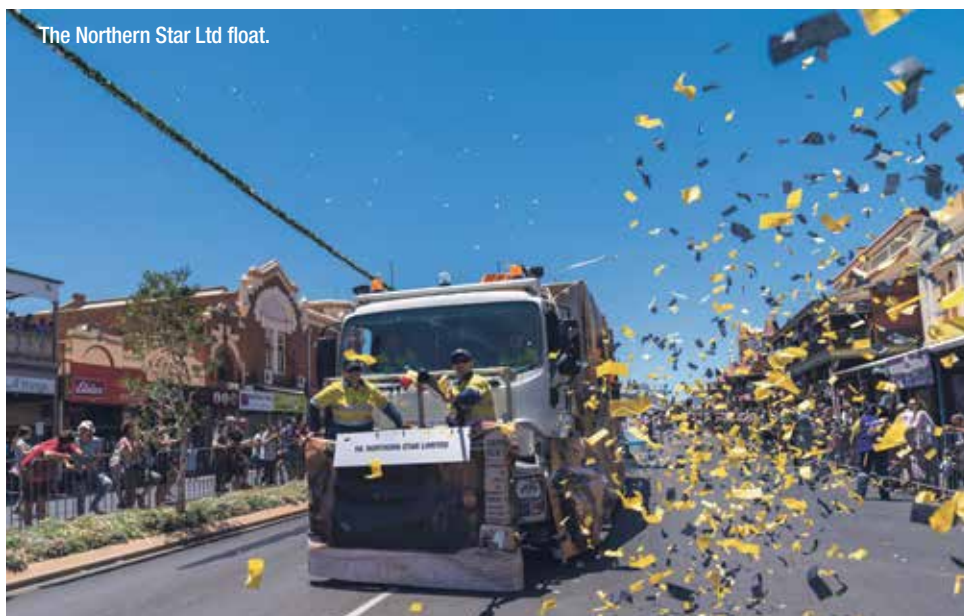
As the longest-standing KCGM employee, maintenance supervisor Gavin Grljusich from Gidji rode at the front of the 793C haul truck, which was driven by Greg Smith, who started at KCGM in 2007.

KCGM general manager Cecile Thaxter said the company's employees, business partners and the community had played a significant part in its history and it was fitting to match its 30th anniversary celebrations in conjunction with the 20th year of the parade.

This year's event was the largest parade yet, with more than 70 floats entering. The parade celebrated its 20th year since inauguration in 2019.



The Northern Star Ltd float.



Waru Dancers are a local Wangkatha dance group who recently started performing traditional dancing in Kalgoorlie-Boulder.





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The future of mine rehabilitation

NATIONAL

IT'S a well-known fact that mining has been a significant primary industry and a major contributor to the Australian economy since the 1800s, with more than 150,000sqkm of the country's land surface directly impacted by mining activity.

There is always much excitement when new projects are announced and operations commence but it's what happens to the land when the resource is extracted, the machinery is switched off, and the trucks roll out that has been a major focus for WA technology start-up, Decipher.

Owned and backed by major Australian conglomerate, Wesfarmers Limited, Decipher's goal is to accelerate the responsible, sustainable and productive management of the earth's resources.

Decipher chief executive Anthony Walker said there are a significant number of abandoned mines across the country, and with a mining footprint that increased significantly in WA through the 2000s, there is going to be a huge increase in mine closures in 10 to 20 years' time.

"We saw the opportunity to apply technology that has been used in the agriculture sector and have invested in the development of an innovative mine rehabilitation software solution, DecipherGreen, that could revolutionise the task of mine rehabilitation, closure and ultimately improve the rates of relinquishment of land – either back to Government or to another organisation for use," Mr Walker said.

Based on strong underlying science, DecipherGreen is backed by regulatory technology, with satellite derived earth observation data, a central repository for historic data, a reporting suite and corresponding environmental evaluation.

"It enables us to provide clients with the data and insights they need to ensure they're meeting environmental obligations and compliance," Mr Walker said.

"As importantly it provides the information they need to plan for the closure and rehabilitation of their sites in a way that has a positive impact on their sustainability and social license to operate, as well as the company's bottom line."



Mine rehab before and after.

Mr Walker said it was also imperative for the platform to be user-friendly, so every aspect has been designed with the user in mind.

"We worked with a number of stakeholders and researchers to develop DecipherGreen and are getting excellent reports from the range of clients who are currently trialling the platform," he said.

"It has been a very rewarding process and it's been exciting and encouraging to see a cultural shift in the industry in recent years with an increased appetite for collaboration by industry, research bodies and Government in this space."

To leverage that appetite, Decipher has signed on as one of 50 partners supporting a bid for the establishment of a national Cooperative Research Centre for Transformations in Mining Economies (CRC-TiME) in WA, joining the likes of Alcoa, BHP, Rio Tinto, the WA, Queensland and Northern Territory Governments, as well as researchers from eight universities and the CSIRO.

CRC TiME chief executive designate and associate professor Guy Boggs is part of the bid team and outlined the potential benefits.

"The CRC-TiME would bring scale and coordinated investment to the world class research being done in Australia, ultimately delivering transformational change to mine closure," Dr Boggs said.

"Over the next decade we believe we would see a reduction in mine abandonment, an increase in relinquishment and an increase in the diversity of post-mining land uses. It also presents significant export opportunities for Australian companies."

Minerals Council of Australia chief executive Tania Constable agrees that mine closure, relinquishment and the transformation of regional economies across the life cycle and post mining are important issues for the industry.

"Significant progress has been made through individual research programs and investment from businesses and we

believe there are substantial benefits to be reaped through a coordinated, strategic approach that would be delivered through the CRC-TiME," Ms Constable said.

"There is no doubt it is a time of great opportunity for the mining industry – where the enhancement and improvement of the end-to-end life cycle of mines is going to advance the future for more successful post mine communities across Australia and around the world."

You can find out more about DecipherGreen and access a free demo at: <https://www.decipher.com.au/deciphergreen/>

You can also download Decipher's comprehensive guide to mine rehabilitation and relinquishment covering everything from samples, government involvement, legislation underway, regulation by state and case studies at:

<https://www.decipher.com.au/mine-rehabilitation-guide>.



Decipher's innovative mine rehabilitation software provides clients with the data needed to ensure they are meeting environmental requirements and compliance



The platform is user-friendly and is being trialled across industry and government.

Award-winning groundwater treatment

NATIONAL

FORTESCUE Metals Group's Cloudbreak mine site has won national recognition and awards from the Australian Water Association for its advanced groundwater management scheme.

With a capacity of 25 gegalitres of water recharged each year, the Cloudbreak Managed Aquifer Recharge Scheme is one of the largest and most complex in Australia.

The scheme, first established in 2008, is an innovative approach to mitigating environmental impacts related to surface discharge and dewatering drawdown, while also conserving water resources for future mine water supply.

Iron and manganese removal play an important role in the management of the Cloudbreak mine site.

The water treatment plant uses DMI-65 for treating groundwater with elevated levels of iron and manganese to meet Australian drinking water standards.

DMI-65 is an alternative to costly reverse osmosis (RO) processes.

Fortescue water supervisor Mark Botica said the DMI-65 consistently proves to be effective and very efficient.

"The DMI-65 media used in this treatment plant consistently reduces iron and manganese to ultra-low levels," Mr Botica said.

"After filtration through the DMI-65,



The DMI-65 filter media won a national award for water treatment at FMG.

manganese levels went from 0.939 mg/L to 0.02mg/L when mixed with our other potable water supply."

The scheme to date has been so successful that it won the National award for Infrastructure Project Innovation at the Ozwater11 conference, and also the Western Australian Water Infrastructure Innovation Award in 2010.

The DMI-65 has been tested in applications for reducing manganese levels in excess of 2ppm down to less than 0.01 ppm.

Based on Australian experience in the mining and municipal drinking water industries, the DMI-65 is expected to have a lifespan of up to 10 years of continuous use.

FMG not only uses the DMI-65 water filtration media at Cloudbreak, but also at the Christmas Creek and Solomon mine sites, and is being considered for the new large Eliwana project in the north west.

For more information visit: www.dmi65.com.

A photograph of a large industrial steel casting facility. Molten metal is being poured from a ladle into a mold, creating a bright, glowing pool of liquid. Several workers in protective gear are visible in the background, monitoring the process. The facility has a high ceiling and large structural beams.

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Wet prime pumps for mining

NATIONAL

MINES, quarries and construction sites deploy portable diesel-powered trash pumps to handle excess dirty water.

There are two types: wet prime pumps, where water is added to the pump chamber to prime the unit, or dry prime units which use a vacuum pump to assist with priming.

The huge advantage that wet prime trash pumps have over dry prime is their simplicity.

They don't require fancy priming apparatus in the form of complex compressors or vacuum pump systems.

Conventional dry prime pumps use an induction style system not designed for trash handling.

Wet prime trash pumps are one of the easiest pumps to set up, use and maintain.

With fewer moving parts, they are also the most reliable.

To transfer typical mine site or quarry water, industry experts recommend pumps capable of handling silt and sand laden water without "choking".

Wet prime trash pumps are designed to handle solids in suspension, and that means big open "non-clog" styled impellers.

The ability to handle solid-laden liquids including flood water, slurry, and even effluent with solid concentrations up to 25pc of the liquid volume, differentiates them from the rest.

Aussie Pumps product manager Brad Farrugia said that the pumps can deliver flows of up to 6000lpm and heads as high as 47m.

"A lot of dry prime pumps are used for



Aussie Pumps' wet prime MQ600 in action.

site dewatering because operators don't understand how simple the wet prime principle is," he said.

Wet prime pumps require the pump cavity to be filled prior to starting for the first time.

The pump will subsequently self-prime as long as there is water above the impeller, and it is this simplicity that makes these pumps so popular.

"Trash pumps have a lower investment

cost and lower maintenance costs compared to vacuumed primed pumps," Mr Farrugia said.

Dirty water is extremely abrasive, which is why Aussie's range of trash pumps has hard-wearing internal components.

They feature high grade SG cast iron impellers and volutes plus silicon carbide mechanical seals for abrasion resistance, and wet prime pumps can last 20-30 years with regular maintenance.

Australian Pumps produce an "Aussie Pump Smart Guide" that not only provides full technical information, weights, dimensions, etc. on the full range of engine drive pumps, but also shows performance curves that enable the right pump for the job to be selected.

Further information on Aussie's wet prime range of Mine Boss transfer pumps and free copies of the Aussie Pump Smart guide is available from Australian Pump Industries at: www.aussiepumps.com.au.

Hydraulic pump breakthrough

NATIONAL

AUSTRALIAN Pump Industries has reported a huge market response to the release of its new GMP hydraulic range of self-priming pumps.

The breakthrough in using lower capacity hydraulic motors enables vehicles and plant with smaller sealed systems to benefit from the advantages of these installations.

The new hydraulic motors use only 22cc of hydraulic oil per rev but compensate with a higher 150 bar pressure.

This means that more trucks and plant can now use their existing hydraulic system to drive the pumps.

Tanker manufacturers and drill rig operators have been quick to convert to the compact pumps with their clear advantages over conventional engine drive alternatives.

Aussie Pump business development manager, Albie Bester, said that with smaller footprints and flexible installations, the pumps also deliver major cost and time savings on service.

"In remote, dry locations it can be a constant battle to keep engine drive pumps from dusting," he said.



The GMP hydraulic drive heavy duty semi-trash pumps have revolutionised the market for tanker and drill rig pumps.

"Hydraulic drive pumps are far more robust and require virtually no maintenance."

The company claims that going hydraulic has huge benefits for drill-rig and tanker operators in the mining industry.

Hydraulic power means an easy installation in tight locations.

When this is added to Aussie Pumps' famous design flexibility, drive shafts are eliminated with hydraulic hoses transferring power to the pump.

All feature open, non clog-style impellers and are classified as "semi-trash" design.

They self-prime through a vertical lift of 6m and come with a front-mounted cleanout port which means debris can be removed from the pump body without disassembly of suction or discharge lines.

The pumps come with heavy-duty cast-iron foot mounts and are mounted on skids or rails, depending on the size.

A heavy-duty bell housing provides the mounting place for the hydraulic motor.

Casappa gear motors were chosen for their reliability, low cost and rugged design.

The motor is protected from the pumped

liquid by heavy-duty silicone carbide/alumina mechanical seal faces with Nitrile rubber elastomers.

Options of tungsten carbide with Viton are also readily available.

The pumps feature excellent flow/pressure characteristics.

The standard semi-trash pumps offer the ability to handle spherical solids of up to 39mm.

Mr Bennet said they can push up to 2200l per minute and offer heads as high as 55m.

"Our experience with tanker operators is that they love the compact design and dust free closed circuit," he said.

"The elimination of small petrol or diesel drive engines not only saves fuel and space, it also dramatically cuts maintenance costs and downtime."

The company is working on developing 316 stainless steel and even nickel aluminium bronze versions of the same product.

These will be offered to the mining industry for applications where very corrosive liquid is required.

"Our prices for hydraulic drive pumps, all built to ISO 9001 certification, are very reasonable compared to diesel drive," Mr Bester said.

Further information including free technical data is available from Australian Pump Industries or authorised distributors throughout Australia.

For further information contact Helen Mahoney on 02 8865 3500.

Corrosion protection and control since 1978

NSW

CCMP has been operating since 1978, providing corrosion protection applications to mining specifications for both new and refurbished steelwork.

The company is accredited with the Painting Contractor Certification Program (PCCP) for abrasive blasting, shop and site application of liquid, thermal metal spray and intumescent coatings.

CCMP offers a full cost-effective service to clients, including transportation with their own transport fleet.

Its success is a result of a strong, experienced management team, including National Association Corrosion Engineers (NACE) certified personnel with many years' experience in the corrosion protection industry.

This has led CCMP to become a highly regarded and dependable company with friendly professional service that its long-term customers value as one of its key points of difference.

CCMP managing director Peter Way has worked in the steel and protective coating industry for more than 35 years.



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

He is involved in all aspects of business production with a service commitment to existing clients.

As well as conventional wet spray coatings, CCMP is one of only a few companies that has the capacity and latest equipment for the application of thermal arc spray of zinc and/or aluminium for cost-effective life cycle protection of clients' critical structures and assets.

In addition, CCMP has the ability to apply high build sacrificial coating with exceptional long-term durability and low maintenance.

CCMP is also a licensed applicator of Speedliner, a low VOC thick polymer (92 shore A hardness) coating with high tensile strength (up to 7500psi) and super high abrasive wear resistance.

Ideal for mining and marine

applications, the coating is super hard wearing, impact resistant, with the ability to be textured to provide a non-slip coating to Australian standards.

CCMP is conscious of the critical constraints of the mining community with regard to time, quality and safety, and strives to satisfy clients in this demanding industry.



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Protection from overvoltage interference

NATIONAL

PIPELINES operate under high pressures – if they are additionally loaded, the pipeline material (for example, steel) quickly reaches its limit.

In extreme cases, heavy corrosion can cause failure in the pipeline, resulting in leakage which may cause enormous material and environmental damage.

Therefore, the condition of the pipeline must be continuously monitored during operation.

In particular, any kind of corrosion must be immediately spotted throughout the complete pipeline.

Passive corrosion protection is achieved by coating and painting the pipeline.

However, it is not sufficient since even small defects in the coating quickly cause local corrosion effects (electrochemical corrosion) in the pipeline.

Moreover, alternating current (AC) corrosion can occur as a result of AC voltage interference.

Active cathodic corrosion protection must therefore be combined with passive corrosion protection.

Cathodic corrosion protection requires that the pipeline is continuously monitored.

To this end, the voltage level along the pipeline is detected at the relevant test joints and adapted to the intensity of the protective current, if needed.

In addition, sudden pressure drops (leakage) are identified by continuously measuring the pressure.



Protect your pipeline against overvoltage interference with IPD and Hazcol.

Quantity measurements are also frequently carried out to compare the quantity at the beginning of the pipeline, with the quantity at the end of the pipeline, and trigger an alarm if a difference is identified. In order to specifically protect these high availability measuring systems, DEHN offers protection solutions for use in potentially explosive atmospheres which are certified according to ATEC and/or IECEx.

Due to the extended surface of pipelines, there is a high risk of lightning effects and

overvoltage interference: for example, interference caused by nearby high-voltage and railway systems.

Since the pipeline is galvanically connected to the cathodic protection rectifier, lightning and surge protection measures are required to discharge all overvoltages.

Understanding overvoltage interference is a specialised area. IPD has partnered with Hazcol – authorised DEHN installer in hazardous areas.

Hazcol specialises in lightning protection

and static electricity control systems.

For a coordinated solution, please contact IPD or Hazcol.

For more information visit www.ipdgroup.com.au and www.hazcol.com.au

IPD/DEHN and Hazcol will be presenting at the upcoming SELP 2020 (Static Electricity and Lightning Protection) Conference held in February in Melbourne.

For more information and to purchase tickets visit www.cselp.com.



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Protective packaging solutions

NATIONAL

AUSTRALIAN Inhibitor provides unsurpassed protection from corrosion to all ferrous and non-ferrous metals and alloys.

Volatile corrosion inhibitor (VCI) form a physical hydrophobic layer that prevents water and moisture directly contacting the metal surface - protecting products on the shop floor, in storage and in the field.

Australian Inhibitor general manager Mark Clydesdale said the company takes immense pride in offering the best product packaging solutions in Australia.

“Our range of materials, VCI corrosion prevention technology combined with corrosion preventive coatings allows us to provide tailored solutions to protect critical assets,” Mr Clydesdale said.

“We provide innovative preservation solution for short to long term shipping and storage of critical spare parts.

“We have decades of experience and possess the resources to cater to your various packaging requirements.”

Australian Inhibitor has been at the forefront of developing packaging solutions for more than 60 years, receiving prestigious Global Awards for Packaging Materials on three separate occasions - 2006, 2011 and 2013/2014.



Volatile corrosion inhibitor technology protects metals from moisture.

“These awards are the result of rigorous laboratory testing with a focus on a wide range of industrial applications and industries including auto, engineering, mining, defence and arts,” Mr Clydesdale said.

“We continually expand our product range and capabilities to offer complete packaging solutions to include cardboard cartons, timber pallets, speciality tapes and heavy duty shrink films.”

Australian Inhibitor also has a full time industrial designer on the team, utilising the latest 3D CAD technology.

“We are well-placed to offer our clients with products that provide unmatched protection,” Mr Clydesdale said.

Case study

Mr Clydesdale said the company recently vacuum-sealed, using the VCI Ferro Foil, a 16m, 60t U2 power generator rotor being shipped for maintenance and repairs.

“This was a very time sensitive project that required a fast turnaround time for materials and our preservation team to be onsite,” he said.

“Our preservation team provided a wrapping and vacuum sealing solution to prevent any corrosion issues during transport and shipping.

“This allowed the client a quick changeover for a critical part that required repairs and maintenance.”

Australian Inhibitor is continually working with many projects to provide protection from corrosion for critical spare parts during maintenance shutdowns, storage and shipping.

“We can provide design and engineering solutions using the latest technology and materials,” Mr Clydesdale said.

Australian Inhibitor has announced a new joint venture for innovation, with 3D Counter Point.

The new scope of services includes design, rapid proto-typing, concept models, functional parts and jigs and fixtures.

For more information on packaging solutions for your project visit: www.australianinhibitor.com.au.



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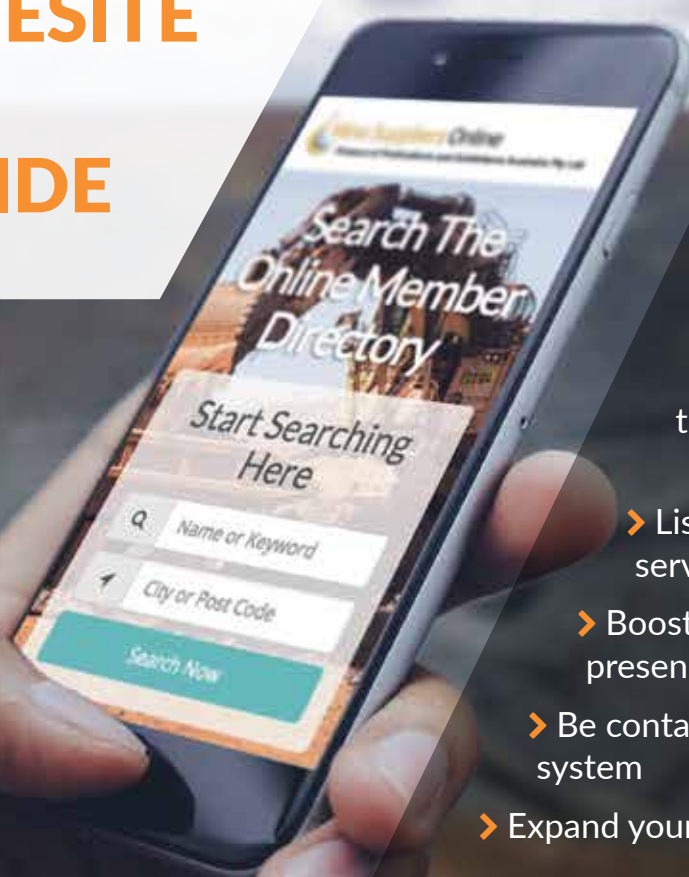
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via the conference website.
See also www.corrosion.com.au



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Pest management made easy

NATIONAL

ANIMAL Pest Management Services (APMS) has a strong track record providing feral animal pest control services to the Australian mining industry.

Established in 1999, the business, through innovation and industry leading technical skills, has grown into the largest vertebrate pest control company in the country, conducting operations nationwide, with established offices in Bunbury and Perth.

APMS managing director Mike Butcher has more than 38 years' experience in managing pest animals, having spent 18 years with the Agriculture Protection Board (APB) and Department of Agriculture (now DAFWA).

Since founding his business, Mr Butcher and his team have baited hundreds of farms/mine sites for rabbits, trapped thousands of feral cats and foxes, trapped thousands of wild dogs and laid many tens of thousands of wild dog and fox baits using every type of bait that is manufactured across Australia.

Its services include trapping, capture and relocation of fauna, shooting and poisoning programs, consulting and training, fauna surveys, kangaroo culling, radio and GPS tracking of fauna and feral animals, bird control and management, auditing of animal



APMS specialise in feral animal pest control and native wildlife management.

welfare in culling programs, risk management and more.

All APMS staff are trained by Mr Butcher and also undertake at least 16 Nationally Accredited Units of Competency with the Certificate III in Vertebrate Pest Management, an essential part of the training APMS

staff to complete.

Today, APMS has seven full-time staff in its two offices and has a considerable amount of resources for all the expected and unexpected tasks its requested to perform, from surveying native fauna on mine sites through to large scale wild dog, feral cat and fox

control programs for the protection of endangered native fauna in the desert.

All operations staff are licensed and APMS have comprehensive public liability and professional indemnity insurance.

More information on APMS services can be found at: www.animalpest.com.au/.

SAY GOODBYE TO PESTS TODAY

Animal Pest Management Services is the largest vertebrate pest control company in Australia.

During the last 20 years, we've baited hundreds of farms for rabbits, trapped thousands of feral cats and foxes, trapped thousands of wild dogs and laid many tens of thousands of wild dog and fox baits using every type of bait manufactured in Australia.

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- Consulting
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🌐 www.animalpest.com.au

ANIMAL PEST
MANAGEMENT SERVICES
(08) 9726 2537



Zero harm minimal interference

QLD

COALFIELDS Pest Control is one of Central Queensland's largest family-owned and operated pest control companies, with a focus on professional, proactive management of on-site pest problems.

As the weather heats up in Central Queensland so do the pests.

Cockroach, spider, ant, mosquito and termite numbers increase this time of year.

When asked about the pest problems minesites face, Coalfields Pest Control managing director Monty Fitzgerald said that a proactive approach is required to stop small issues becoming major problems.

“Currently there are worldwide concerns for the increasing cockroach populations, and this is something the pest industry is currently focused on,” he said.

The company has also noted local reports of mosquito-borne dengue fever infections in Queensland, with recent cases no longer limited to returning travellers from Asia.

The risk posed by these mosquitoes to the Central Queensland area is significant, with the first case of locally acquired dengue fever in more than 10 years recorded in May 2019.

Locals have been struck down with symptoms of the dengue infection, which can include a rash, fever headache, joint pain, vomiting, diarrhoea and abdominal pain.



Coalfields Pest Control offers on-site pest control.

There are a number of effective treatments for mosquitoes as seasonally required, including thermal fogging, mosquito growth regulators, wet misting and CO2 trapping.

Local to the coal fields of Central Queensland since 2002, Coalfields Pest

Control services more than 20 mine sites and more than 20,000 accommodation village rooms on regular maintenance programs.

“Our business’ focus is on providing safe, environmentally sustainable professional services to ensure the safety of our staff and

yours,” Mr Fitzgerald said.

Coalfields Pest Control services all areas of the Bowen and Galilee basins.

More information: (07) 4982 7000
Email: admin@coalfieldsp PestControl.com.au.



PROFESSIONAL PEST MANAGEMENT

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- Rodent control
- Termite control
- Fly control

All of our products are carefully selected to ensure maximum effect on pests, while adhering to our Zero Harm policy for clients and the environment.

We are committed to providing the very best quality service for all of our clients first time, every time.





All employees at Goldfields Pest Control are trained, licenced and insured to comply with relevant Health Department requirements.

Best in the bug business

WA

ONE of the original pest control companies registered with the WA Health Department in 1974, Goldfields Pest Control Services is committed to the safe management of problem pests and weeds regularly found within the residential, hospitality, real estate, construction, mining, commercial and industrial sectors of the Goldfields and vast surrounding areas.

Goldfields Pest Control Services director John Rees said the company is a locally owned and operated family business dedicated to providing safe and environmentally friendly pest and weed management solutions.

“Our goal is to be the leading pest and weed management provider throughout the vast Goldfields area with a commitment to providing reliable, professional, safe and effective pest and weed management solutions which are

carried out by staff who value honesty and integrity,” Mr Rees said.

The company has a reputation for providing honest advice and recommendations, with long term mining clients including Independence Group, BHP, KCGM, Gold Fields, Saracen Gold Mines and AngloGold Ashanti Australia.

Mr Rees said the company services all areas of the Goldfields including Kalgoorlie, Boulder, Esperance, Eucla, Norseman, Kambalda, Coolgardie,

Leonora, Laverton, Leinster, Wiluna, Warburton and all areas in-between.

“During the past 30 years we have been fortunate enough to form lasting business relationships with many leading firms and government departments and agencies throughout the Goldfields,” he said.

“We pride ourselves on providing a professional pest and weed control solution to our valued clients.”

For more information visit: www.localbugger.com.au.

GET YOUR LOCAL BUGGER



The Goldfields is surrounded by the most beautiful bushland in Australia! Unfortunately, that means we are surrounded by a huge variety of pests & weeds.

Goldfields Pest Control Services is a locally owned and operated family business dedicated to providing safe and environmentally

friendly pest and weed management solutions.

- General pest management treatments
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- Mine site pest & termite management programs

Services also include commercial, hospitality and residential general pest management, weed management and termite treatments.

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GOLDFIELDS
PEST CONTROL

Fluid power cuts emissions

RAY CHAN
INTERNATIONAL

LEADING hydraulics company Mathers Hydraulics Technologies (MHT) presented its world leading technologies at this year's ExCon 2019, the largest mining and construction equipment conference in South Asia.

Held in Bangalore, India, in December, the event hosted global OEMs (Original Equipment Manufacturers) and technologists who shared latest developments to improve safety, health and performance.

Demonstrations were run by managing director Norm Mathers and leading consultant Phillip McCluskey, formerly global head of research at Caterpillar, along with collaborator Michael Gust, former Eaton Fluid Power vice-president.

MHT's technology is currently being validated and tested for commercial application with Indian hydraulics company, Yukon Indian Ltd.

The technologies

Steel Safe Fluid Power (SSFP) is a flexing steel piping technology used in engines which replaces rubber hoses.

In a bus engine fire, hoses perish quickly and add an explosive

combustible accelerant that over the last 18 months, has killed more than 150 passengers in six bus fires around the world.



The Mathers technology dramatically reduces the amount of diesel emissions.

In construction and mining equipment, SSFP eliminates hose rupture that can drop heavy loads leading to accidents and halt production.

It also eliminates dangerous and highly expensive outcomes of rubber hose failures.

The SSFP design incorporates a dual sealing system with electronic monitoring of the primary seal for early warning whilst allowing production to continue until a production break allows service.

In engine bays, it incorporates a

thermal expansion seal to prevent explosive gas, oil or fuel escape in the event of a fire.

SSFP is vital for engine bays of buses, trucks, cars, ships or submarines, protecting them from huge fires or even explosions, while discussions with fire and safety departments are in progress in Australia.

Stop Start Motor technology reduces diesel emissions and fuel wastage by turning engines off when idle and thereby reducing emissions of fossil-fuel, diesel vehicles significantly in heavy traffic conditions.

In his previous role at Caterpillar, Dr McCluskey tested similar technologies on Caterpillar's machines in an effort to improve efficiencies.

Using electronic cylinder positioning control, accumulator wasted energy capture and engine management when applied

to excavators, Dr McCluskey's research found that storing 12pc wasted energy into accumulators saved a significant 40pc diesel usage on a machine.

MHT's Hydraulic Transmission technology is capable of capturing regen energy to reduce carbon diesel emissions for either on or off highway vehicles including buses accordingly.

Under India's proactive research programs, production research has commenced and introduction is anticipated during the next three years.

Herculean hauling heritage

NATIONAL

THE Hercules beetle is a species of rhinoceros beetle native to the rainforests of South America.

Not only is the beetle the longest in the world, measuring up to a whopping 18cm in length, it's also talented weightlifter.

Although stories have said that the creature can carry up to 850 times its weight on its back, studies of similar beetles have shown that the figure is closer to 100 times its weight.

Still not a bad effort.

Much the same as the beetle it shares its name with, DT Australia's Hercules dump body has been helping OEM trucks to carry more due to its lighter weight for nearly two decades.

DT Australia general manager Glenn Brearey said that the company has options for bodies that are up to 10t lighter than competitors with comparable floor thicknesses.

"Decreased body weight means an increased payload potential, which enables a mine site to either haul the same amount of material using fewer truck hours or haul more material with



The Hercules dump body in action.

the same number of truck hours," he said.

"Either way, the operating cost per tonne is dramatically reduced."

While lighter in weight, Mr Brearey is quick to point out that lighter does not mean weaker, with Hercules bodies performing in numerous high-impact and high-abrasion environments for

well over 50,000 operating hours.

Not only does the patented curved design allow for the body to absorb impact thereby increasing durability when compared to standard bodies, it also improves operator comfort.

Dave White, business development manager at MacKellar Mining, a 20-year client of DT Australia, says that the robust design, lighter weight and increased capacity is a huge selling point for its customers.

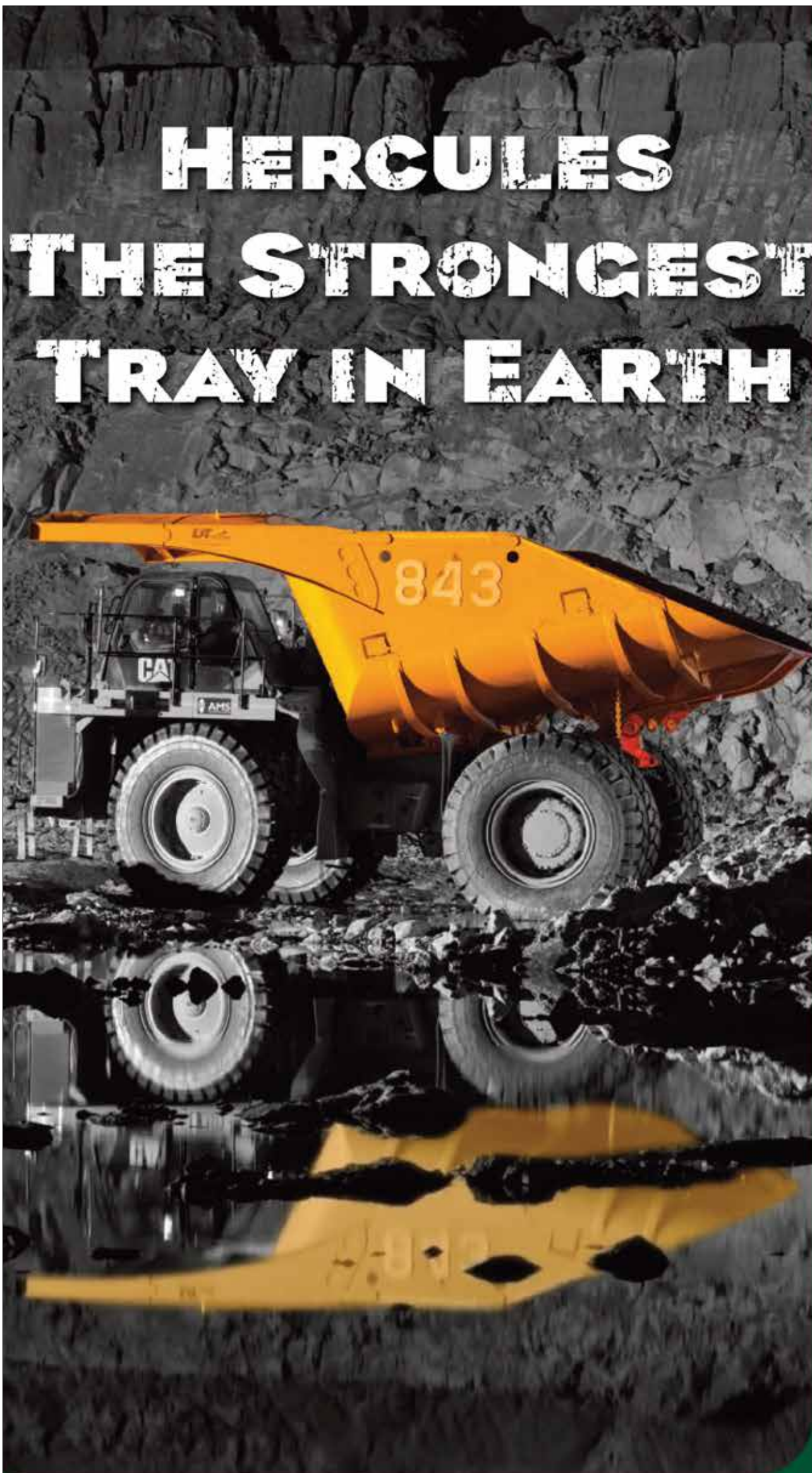
"With MacKellar Mining being in the market of offering dry hire as well as mining contracting services, the DT Australia Hercules body allows us to deliver more value to our clients by holding additional payload or by providing production at a lower cost," he said.

"It all comes back to continually delivering value to our clients such as Glencore, BHP, Middlemount Coal, Sojitz, and Batchfire, just to name a few."

On top of this, Mr White says that Mackellar Mining has always been impressed with support relating to repairs, technical assistance in the field regarding strengthening packages and wear liners as well as technical assistance during tender bids and evaluations.

The Hercules body set the standard that all others are now trying to achieve, however this is not a design that was developed overnight.

It has been refined and evolved over the past 25 years to become the product it is today with more than 1000 DT Australia Hercules bodies currently operating in all types of conditions around the globe.



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Adaptable workforce accommodation

NATIONAL

RD Southern was just 17 years old when ATCO was originally founded as Alberta Trailer Hire in Canada in 1947.

With initial revenues of \$1077 and 15 utility trailers, RD Southern and his father, SD Southern, set a bold course to service Alberta's booming oil industry.

Seventy years later, ATCO is a diversified \$23b enterprise with thousands of employees worldwide providing innovative and integrated solutions in structures and logistics, electricity, pipelines and liquids, and retail energy.

That said, at its core it is still a business built around servicing the needs of its customers.

Whether you need a workforce village in remote WA, or a temporary office in the city, it should be flexible, scalable and economical.

ATCO recognises that the size of teams, duration of projects and the nature of scope can vary.

ATCO specialises in providing flexible infrastructure that meets your needs both now and in the future.

As a modular building pioneer with more than 70 years of experience in innovative design and manufacture, ATCO can adapt as your project does.

From relocatable site offices to workforce housing and complete village facilities, ATCO's industry-leading capabilities, dedicated workforce and longstanding commitment to quality,



ATCO is always there. Anywhere.

ensure each building solution is built quickly, built to specifications and built to last.

ATCO business development manager Aaron Francis said the company had seen a vast change in the way accommodation villages were viewed in recent years, with a shift towards healthier lifestyle options and brighter more inviting facilities.

The focus has shifted towards providing a variety of activities for workers after the

work day has finished.

"The days of finishing work and either heading back to your room or to the wet mess have passed with companies now offering a much wider range of facilities and activities to keep their workers comfortable and entertained whilst working away from home," Mr Francis said.

With inhouse design and engineering specialists, ATCO is well placed to ensure

the right blend of comfort and practicality are achieved in your next project.

Comfortable and spacious living quarters, dining, and office facilities are built with durability, longevity and extreme climates in mind.

No matter the size of your requirement, ATCO has the best modular solution for your next project.

For more information visit: www.atco.com.

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- Reduced wastage and improved quality
- Flexibility in design with the ability to relocate, decommission and re-purpose



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Portable structure firm makes a splash

NATIONAL

SPLASH has supported the international mining industry from Australia since 2003.

Splash is known mostly for the supply of portable fabric domes and relocatable buildings, which it has distributed as far away as Africa.

In 2020, Splash will hand back retailing operations to its longstanding Chinese partners who will continue the global business as normal.

Splash however will focus more on special projects for Government and major enterprise, plus the furtherment of European and Australian products and services, particularly those of social environmental benefit.

Fabric structures

Splash spokesperson Pauline Douglas said turnkey solutions (container covers, fabric domes, industrial tents) will remain available from the company's website (www.splashstructures.com), to be serviced by China direct and shipped to any country in the world.

"Our custom design services now include European engineers and factories, and we have plans to reintroduce Australian manufacturing utilizing state of the art cutting and modelling facilities," she said.

Air arches

Splash Arch Shelter will introduce many new innovations, including air arches, extraordinary inflatable buildings that are as robust and fire safe as any solid structure.

There are so many benefits to inflatable concepts, including the ease of shipping and the speed of installation.

Ms Douglas said these types of structures will be the preferred choice of space construction.

Air cranes

Splash will be supporting the furtherment of air cranes, massive floating structures that will be able to hover and lift up to 1000t in weight.

"Apart from the obvious usefulness to mining, road construction, telecommunications, electricity and military, we are proposing these structures be deployed for bush fire prevention and emergencies to distribute desalinated water in a more efficient way, like rain, ideally before the problem occurs," she said.

"We look forward to supporting your projects in the coming year."

More information: 1800 900 322 or +61 479092881.



Air arches will offer significantly easier shipping and faster installation options.

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Less pumping means less spending

NATIONAL

AUSTRALIA'S largest provider of portable toilets and sanitation solutions, Formit Services, has recently increased its production of all its waste storage tanks due to growth across the mining and infrastructure sectors in Australia and abroad.

Recognised as the market leader in waste tanks due to its production capability, and its certified lifting system for the larger 4000l and 6000l units, Formit waste tanks are the optimum solution for mine sites and the needs of employees and contractors.

Larger capacity waste tanks for remote areas means more flexibility with pump-out requirements. Less pumping means less spending.

Formit Services has designed, refined, and certified its range of portable waste tanks specifically to carry the weight of the larger ablution blocks now being used on most large-scale sites.

Add to this the fork pockets and lift points which ensure the units can be moved with relative ease around most sites, and Formit waste tanks really do become the only choice.

The waste tank range consists of 2000l, 4000l and the 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 a plastic tank is not only



Australian-made waste tanks for Australian-made conditions.

lighter but also provide 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 supplied by leading portable building manufacturers

and hirers throughout Australia.

With distributors based in WA, Qld, NSW and VIC, Formit Services offers an Australian-wide distribution network.



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
- Locator and Lift lugs on 4000 and 6000 litre models
- Drag Hook and Skids on all models
- Heavy Duty Polyethylene Tanks — WILL NOT CORRODE
- Access / Pump Out Ports on all comers

Benefits of weather monitoring

NATIONAL

WEATHER data plays a critical role in planning and operational decision-making for any mining or construction operation.

Having access to accurate data will enable site managers to be ahead of any major weather disruptions, whether that be stormy weather on its way, rising temperatures or heavy winds.

Considering site-specific weather data in air quality, acoustic and water modelling applications, or as an input to dust mitigation procedures, provides an opportunity to make more timely decisions and ensure operational uptime is optimised.

Weather monitoring includes factors such as wind, temperature, rainfall and solar radiation, while parameters such as sigma theta and stability categories can be calculated.

Environmental monitoring specialist Novecom designs, builds and installs purpose-built and packaged weather monitoring solutions across projects nationwide.

Its team will work with clients to understand their application, and design a monitoring solution that is robust, cost-effective and most of all what the project needs.

The systems provide easy to follow metrics and visual displays, can be configured according to individual requirements, and can be viewed in real-time via a cloud-based web repository, sending notifications via SMS or email.



Weather monitoring is made easy with Novecom's state-of-the-art solutions.

Best of all, it frees up operational capacity to improve efficiencies.

Novecom currently operates more than 100 weather monitoring installations throughout Australia and

overseas, delivering quality real-time time data and automated reporting.

The company's engineers and technicians support all products, either remotely or onsite depending on a

client's needs.

More information can be found at www.advitechgroup.com.au/smart-systems/sensor-networks/weather-monitor/.

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Specialist equipment you can trust

NATIONAL

RAPID Spray has been manufacturing water trailers and tanks for the mining industry for more than 20 years.

Headquartered in Singleton, in the heart of the Hunter Valley mining scene, Rapid Spray recently launched the PolyMax range: a dedicated range of trailers and skid units dedicated to applying liquid polymer emulsions.

Polymer emulsions are high-tech bonding agents specifically engineered to bond soil particles together and maintain control over dust for long periods of time.

Many mine sites are beginning to see the benefits and water savings of using polymer-based dust control agents for applications from haul roads to stockpiles.

The requirement to conserve onsite water due to drought conditions has continued to drive the adoption of this technology.

Issues such as the sticky polymer clogging the pumps and the nozzles occur when equipment hasn't been designed specifically for polymer spraying, making it a constant struggle for many companies to find a way to reliably and efficiently apply the products.

It is for this reason that Rapid Spray has



Rapid Spray recently launched the PolyMax range.

designed the dedicated PolyMax range: a full polymer emulsion spraying solution that is reliable, efficient and removes the worry of clogged pumps or nozzles.

Rapid Spray general manager Russell Firth said many operators had tried using standard water delivery equipment in the past with disappointing and unreliable results.

"That's why we have developed the PolyMax range; to give teams who don't have time to waste, equipment that won't waste time," he said.

The PolyMax range utilises oil-backed

diaphragm pumps and tank agitation systems to ensure consistent product delivery through either handheld nozzles, batter sprayers or pressure bars when needed for larger area coverage.

A customised 1100 Puma PolyMax trailer recently delivered to a large Tier 1 contracting firm also featured an on-board safety hand wash system and dedicated 70L flush tank to make cleaning pumps and nozzles incredibly easy between material changes.

Flushing the tank and lines so there is no

leftover residue ensures ongoing reliability and safety.

Working from a base of proven tough chassis and tank designs, the Rapid Spray team can build any polymer spraying solution in capacities from 800L to 15,000L to suit any site's needs and specifications.

With a dedicated mining solutions team, ISO9001 certified and capable of delivering to MDG15 specifications, Rapid Spray can offer complete confidence to its clients in their next investment in dust control.

MORE INFORMATION: Rapid Spray | 1300 901 504 | Stephen.thompson@rapidspray.net | www.rapidspray.net

MANY OPERATORS ARE USING POLYMER EMULSIONS TO CONSERVE WATER AND CONTROL DUST

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Steer your maintenance crew in the right direction with TED's new steer idler attachment.

Making maintenance safe and easy

NATIONAL

NIVEK Industries' Track Elevating Device (TED) originated as a tool to help mine maintenance personnel safely remove and replace belly plates on heavy equipment.

This ingenious machine is fully mobile, remotely operated, powered by a rechargeable battery and able to lift up to 800kg safely.

Given the widespread uptake of TED at mine sites across Australia, it is little wonder that both the Nivek team and their clients are constantly thinking of new applications for this tough, yet nimble, platform.

The latest development, requested by one of Australia's biggest mining companies, is the Steer Idler attachment, which was specifically designed to remove and replace steer idlers on ultra-class dump trucks.

Typically weighing around 380kg, the massive steer idlers must be supported at exactly the right angle and position to enable them to be safely removed and then accurately aligned for reinstallation.

In the past, this presented logistical challenges and safety risks for maintenance crews as blocks, jacks, straps and considerable manual handling were frequently used in an attempt to line the component up correctly.

With the new Steer Idler attachment for TED, this is all achievable by a pivot adjustment handle, and TED's remote-control activation.



Stay at the cutting edge of safe maintenance with TED and CCET. Cutting edges are clamped into position at the correct angle for safe and easy removal and re-installation.

TED's Cutting Edge tool has been on the market for some time now, however the new Corner Cutting Edge Tool (CCET) offers greater flexibility.

Specifically designed for corner cutting edges at all stages of wear, the CCET has height adjustment support pins and can mount to a pitch adjustment module to fit with blades sitting at various angles.

The CCET is equipped with bolts that securely clamp the cutting edge prior to removal or reinstallation.

The best part is that, because the CCET bolts to the TED's top platform, Nivek's award-winning LA40 Lift Assist Arm can also be utilised to support the rattle gun used on the cutting edge bolts – minimising operator risk and fatigue while improving efficiency.

Also new in Nivek's ever growing range is the Front Jib attachment.

This front-mounted attachment was designed to manoeuvre awkward objects from above – just like a track-driven engine crane, but with the benefits of being low profile, taking the weight

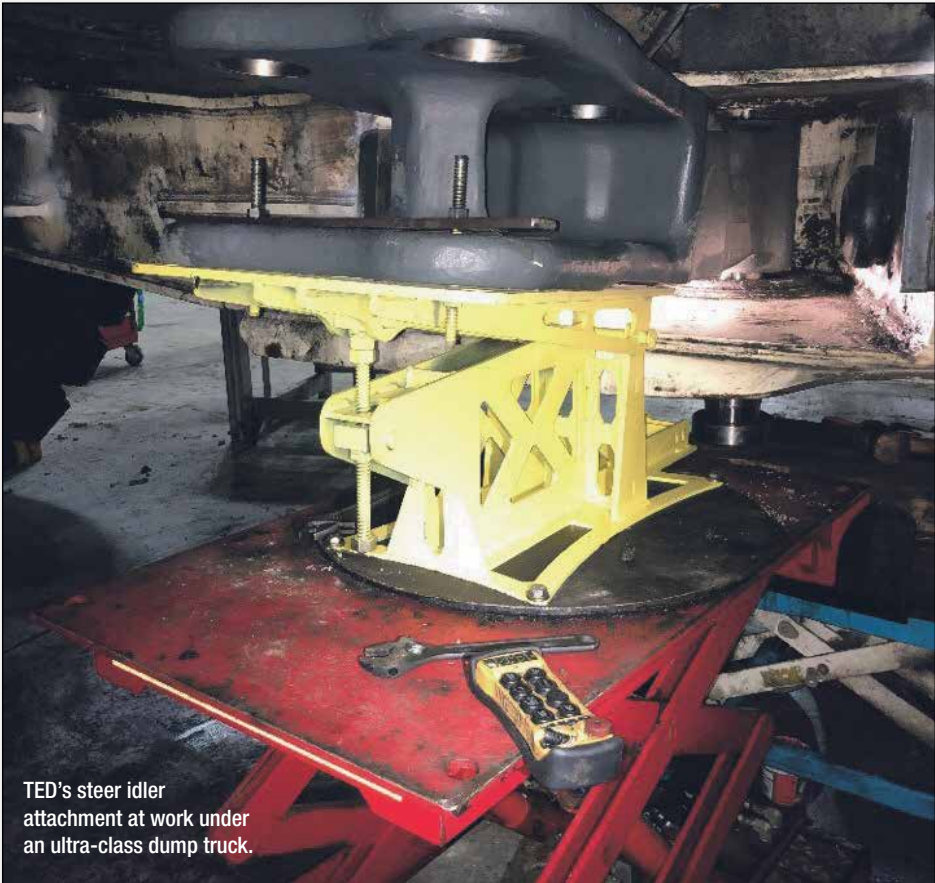
where overhead cranes can't access.

Three different extension lengths add to the versatility of the Front Jib attachment.

A final addition to the line-up harks back to TED's roots – the Front Belly Plate Cradle was developed to secure the angled front belly plates of a D11, making removal and reinstallation even simpler, quicker and safer with TED.

The company has received plenty of accolades for its innovative designs and industry collaboration; this year alone receiving the HMA Board Award in October, also winning the





TED's steer idler attachment at work under an ultra-class dump truck.



Low profile power and versatile lifting wherever you need it. TED's jib attachment can lift up to 200kg or 400kg with the counterweight attachment.



Changing the front belly plate on a D11 has never been easier or safer, thanks to TED's new purpose-built Front Belly Plate Cradle.

Excellence in Export of Manufactured Goods section, taking out Finalist in Mining Prospect Awards in the Safety OHS category, and even being named as a finalist in the Premier's Export Awards for Minerals, Energy and Related Services.

There's even bigger things slated for 2020 with more useful attachments for TED due for release, some additions and upgrades to the Lift

Assist system, and even a brand new machine.

So, keep an eye open for more quality, Australian-made innovations just around the corner.

If you'd like to achieve more with your TED, or collaborate with Nivek Industries in creating a solution for your maintenance problems, get in touch with the Nivek team.

MORE INFORMATION: Nivek Industries | 0418 517 359 | sales@nivekindustries.com.au | www.nivekindustries.com.au

Belly Plates - just the beginning for Nivek's TED

Remote controlled • All-Terrain • Safe • Australian • Award winning

Safely remove and replace:
Belly Plates • Steer Cylinders
Steer Idlers • Cutting Edges
Y-links • Ball Caps • Sumps
Pumps • Sound Suppression
Strut caps

TED fitted with the Corner Cutting Edge Tool and Lift Assist 40 tooling manipulator arm.

TED is revolutionising maintenance practises on minesites across Australia. Recent innovative additions to the attachment range have multiplied TED's safety and efficiency applications.



Nivek Industries
0418 517 359
www.nivekindustries.com.au

WA service agent & reseller
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www.equipmentplacement.com.au

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Safeguard your assets



This board had not been inspected before. A contactor failed (luckily it did not cause a fire) due to the way it was wired.

NATIONAL

ESTABLISHED in Victoria 2013, Thermospec is the one-stop Australia-wide thermal imaging specialist.

Operating only the best quality German-made Testo 885 thermal cameras, the qualified thermographers bring decades of experience as A-grade electricians - taking care of the whole job, start to finish, every time.

Thermospec director John Tarenidis said the company can tailor its thermography services to best suit the client's business to help minimise risks.

"We offer a range of thermal imaging inspection services to scan your electrical and mechanical equipment," Mr Tarenidis said.

"We can safeguard your assets and eliminate costly downtime by providing a range of non-destructive thermography options to help you identify and resolve future problems.

"By taking action now, you increase production and safety, saving you money."

Electrical

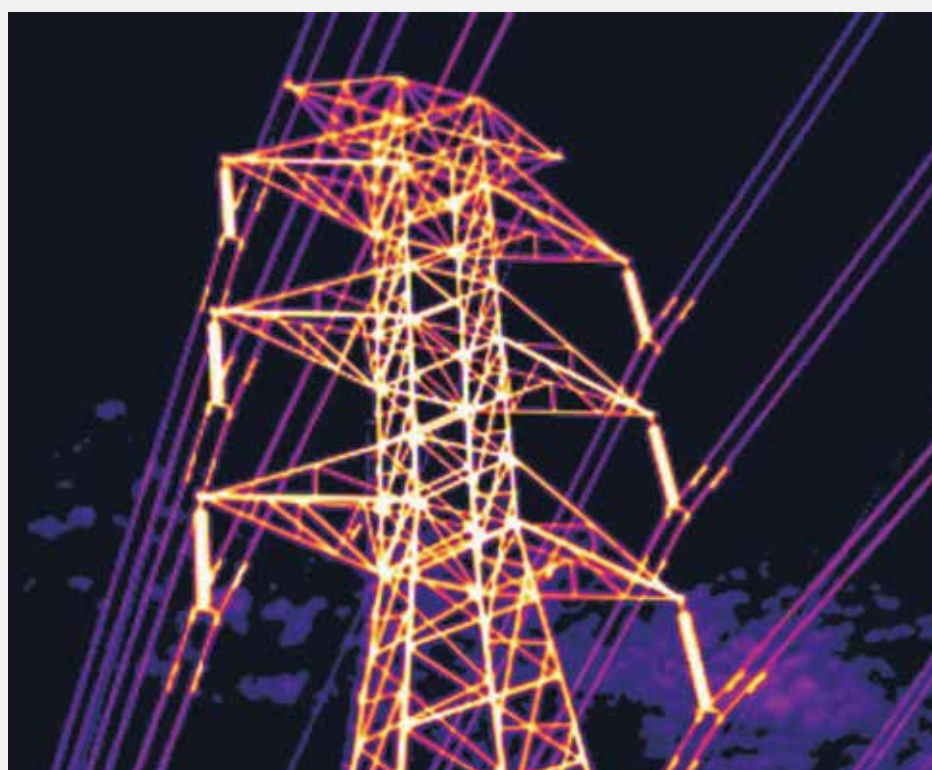
Thermospec thermal imaging services are designed to detect potential faults early, before they become problems.

"Once identified, we can help you rectify known issues," Mr Tarenidis said.

"This gives you the confidence to move forward, avoid costly downtime and futureproof your business."

The company specialises in personalised preventative maintenance for switchboards, power distribution, transformers, HV lines, capacitor banks, generators, and circuit breakers.

"The majority of the work we do around electrical switchboards is looking for fire hazards



Thermal scanning is non-evasive: meaning checks can be done while equipment and machinery are running.

and potential breakdowns," Mr Tarenidis said.

"I see them every day: you get some electrical connections which are critical, so hot you can see how bad it is with the naked eye - let alone with the camera."

If a switchboard hasn't been inspected, it can fail, burn and melt, causing extensive damage and downtime.

"We look at switchboards, but we also look at mechanical, motors, gear boxes, anything to do with rotating - bearings, conveyor belts - all those kinds of components," Mr Tarenidis said.

"We're happy to tailor our services to meet any other electrical requirements."

Mechanical

The added advantage of thermal imaging over scheduled maintenance stoppages is that non-invasive checks can be done while equipment and machinery is still running.

Mr Tarenidis said that more and more mining operations are using thermography to complement existing preventative maintenance.

"With Thermospec thermal imaging you can test your mechanical services quickly and

efficiently with no loss of productivity," he said.

"You don't have to stop for maintenance now, and you're less likely to break down in the future.

"Once we've identified any problem areas, you can prioritise your future maintenance planning based on the urgency and/or frequency required."

Thermospec offers preventative maintenance for motor misalignment, electric motors, gear boxes, bearings, belts and boilers.

Benefits of thermography

The thermographic camera can detect minute differences of temperature on the surface of anything.

"If you scan a conveyor that's got hundreds of rollers on it just by taking a few minutes to walk down the line, you can pick what bearing is failing - or what bearing is hot - because that bearing is potentially going to fail," Mr Tarenidis said.

"In the worst case it can potentially get so hot where it melts into the belt."

The technology is multidisciplinary and complementary to preventative maintenance solutions like vibration analysis.

"It's also an extremely quick process," Mr Tarenidis said.

"To set up vibration analysis takes time and you can only work on one machine at a time, whereas the camera can scan across multiple machines and pick up a lot of information.

"Plus the person performing a thermographic inspection can also be doing the switchboards, as well as look at the motors and the gearboxes and within minutes pick up if there are any issues."

It's also non-destructive - there's no downtime as you don't have to turn the machines off.

"In fact, you need everything on – you need electrical switchboards loaded, you need motors and gearboxes loaded," Mr Tarenidis said.

"And you can scan a lot in the same day.

"Depending on the size of the switchboard, it might only take five to 10 minutes depending how many faults you find."

Case study:

Recently Thermospec was able to save a client hundreds of thousands of dollars by picking up an issue before failure occurred.

"It was a major terminal in Victoria where fuel was transferred off the ship and to a pumping station 9km from the terminal – so there's a 9km pipeline," Mr Tarenidis said.

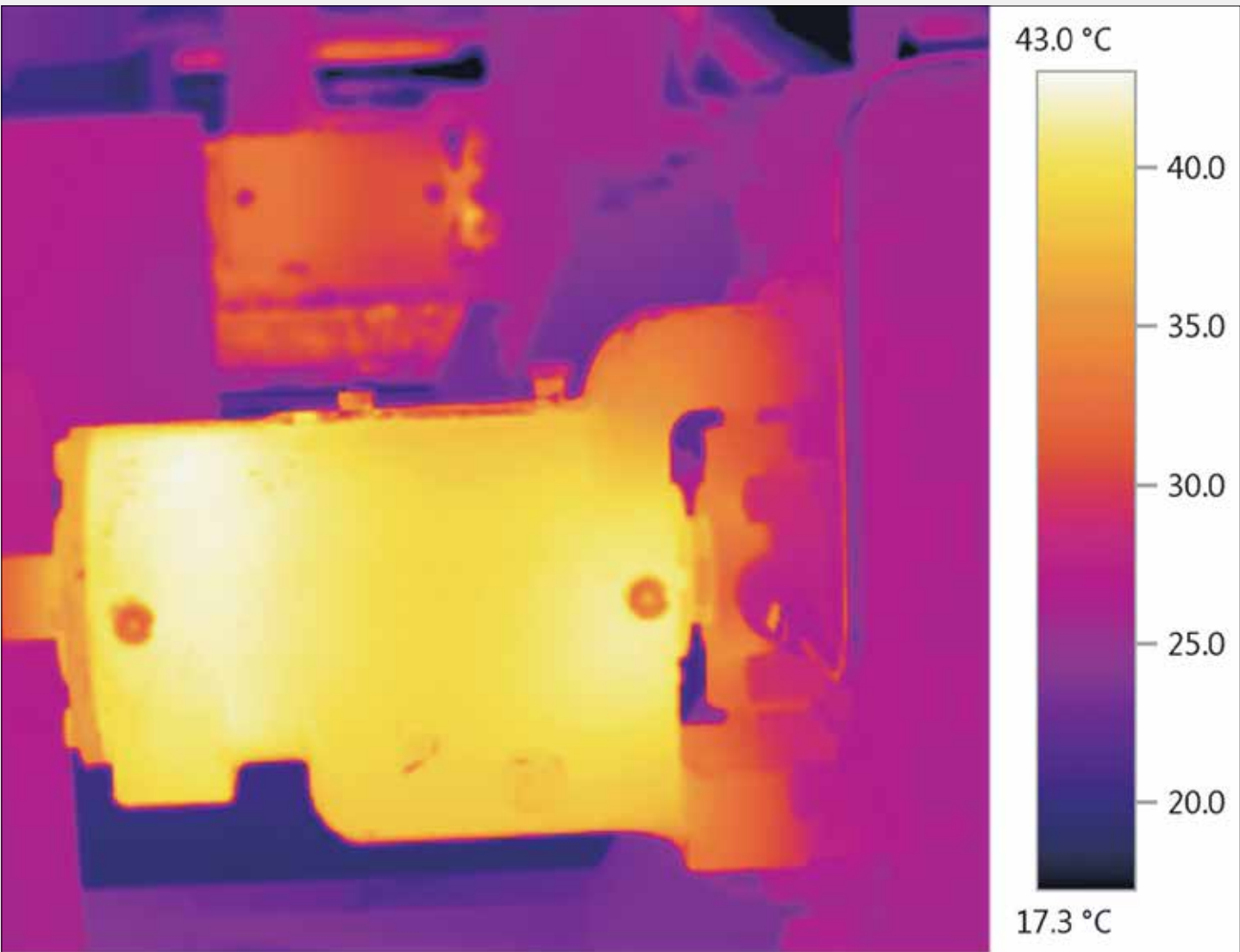
"The two tandem booster pumps work hard, pumping 1m litres an hour, and upon inspection one of the gearboxes was running 12 degrees hotter than the other one.

"Although it wasn't critical – it wasn't going to explode right there and then – that's an issue because one gearbox is hotter than the other."

Luckily, spotting the issue meant the client was able to send a mechanical crew in to fix the problem before the next ship arrived.

"For the gearbox to fail, that's tens of thousands of dollars per hour the client would lose," Mr Tarenidis said.

"So, they were very happy we picked it up."



One of two mechanical pumps at the booster station of a fuel terminal. The pump in the foreground is running hotter than the second pump in the background. Both pumps are identical and doing the same amount of work. These pumps are critical to their operation, and if they were to fail, would cost the client \$10,000+ per hour in down time.

MORE INFORMATION: Thermospec | 0402 477 074 | john@thermospec.com.au | www.thermospec.com.au

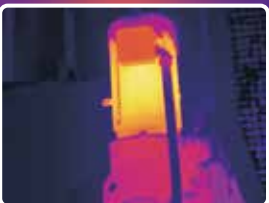


Thermal Imaging Specialists

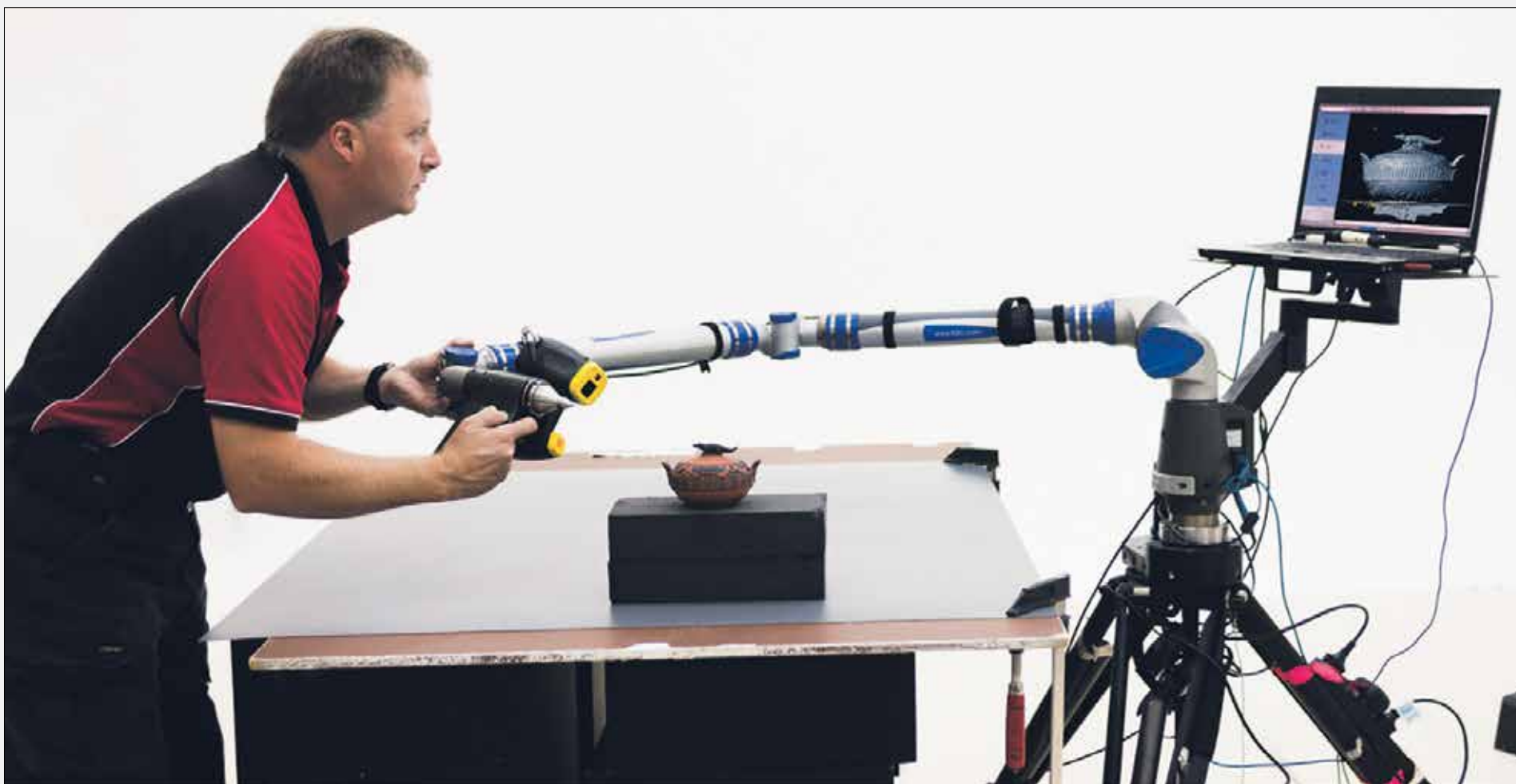
Thermal imaging gets you beneath the surface, so you can identify potential problems before they occur.

At Thermospec, we tailor our thermography services to best suit your business, to help you minimise risks for electrical and mechanical systems.

By taking action now, you can increase production and safety and save money.



John Tarenidis | 0402 477 074 | john@thermospec.com.au | www.thermospec.com.au



WYSIWYG 3D brings more than 10 years' experience in 3D scanning across numerous and diverse markets.

Precision paving the way

NATIONAL

3D scanning is revolutionising the way that mine operators manufacture parts and tools.

WYSIWYG 3D is an innovative engineering company that specialises in 3D measurement.

The company has built a reputation around the experience and knowledge it brings to the table – for every job.

It is at the forefront of the latest technology across many industries and specialises in the 3D scanning of mining equipment and processing plants.

WYSIWYG 3D was founded in 2003 as a multi-disciplinary firm of professional engineers, all who brought a wealth of knowledge and expertise in all aspects of 3D laser scanning, 3D measurement, and 3D inspection and analysis services from their various fields.

The company's range of laser scanning technologies are a combination of both

laser and structured light scanners, including portable co-ordinate measuring machines (CMM's) which are capable of scanning the small, detailed parts, to terrestrial scanners which are used for much bigger items such as mining buckets, underground chamber volumes and washeries processing plants and equipment.

The company also provides vehicle mounted scanning, 3D printing services and licenced drone pilots.

WYSIWYG 3D business manager Leanne Rolton said that the company's range of equipment means it can 3D-scan processing plants, mining equipment, and just about any other component on the mine site.

"We have the technical skills and more than 17 years' of scanning expertise to deliver accurate and complete data from design to manufacturing," she said.

"It's all in the details – providing bespoke solutions for complex and detailed parts and environments."

From a technical perspective, the team of engineers and their 3D scanners can do just about anything, and their techniques provide accurate data that is minimising the need for site visits, rework or downtime.

This data can be delivered as point clouds, 2D drawings or complete 3D models ready to be integrated into the workflow.

With accuracy within 0.3mm-2.0mm, and accurate data ready for design, inspection, and construction of 3D printing for marketing and prototypes, manufacturing can be done offsite and guaranteed to fit the first time.

This means installation time is reduced and costly mistakes are avoided.

"If you need to repair, alter or make a new part 3D scanning can make the process faster and more accurate than traditional trial and error approaches," Ms Rolton said.

"3D scanning an existing part creates an accurate computer model while minimising the time the machine is out of production."

So, when a client was designing a new

attachment piece for its existing machinery, they called in WYSIWYG 3D to help.

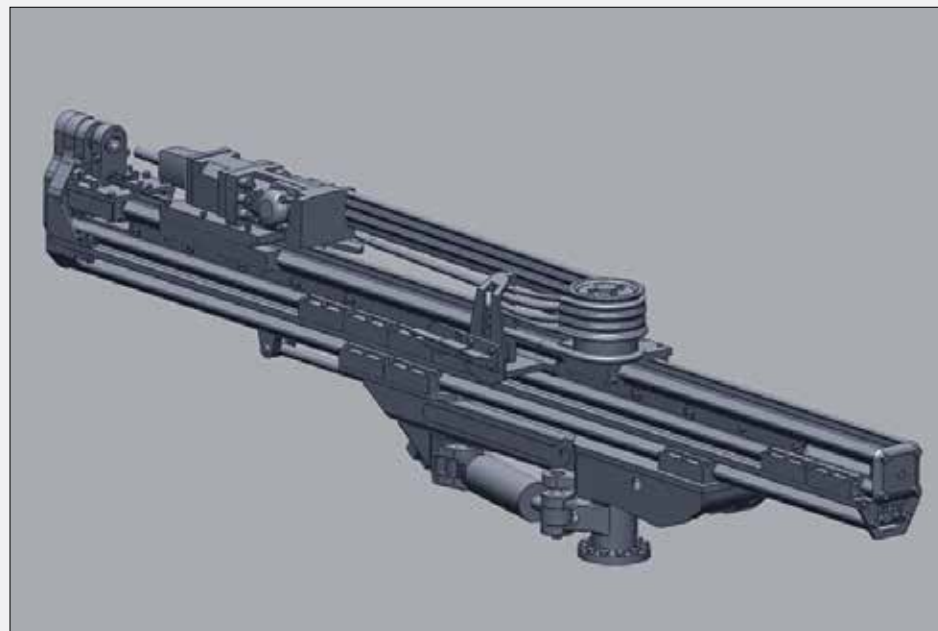
Traditional measuring methods would take weeks of work and still not be able to provide the same level of accuracy as 3D scanning.

This meant there was a real risk of manufacturing incorrect parts which would cost thousands of dollars and waste a lot of time.

WYSIWYG 3D engineers were able to capture the roof bolter with three different scanners in more than 32 different positions and two configurations which ensured the complete coverage, detail and accuracy required.

Each component was remodelled and included all bolt positions which meant the new attachment could easily be designed and built to ensure it was accurate and that it would fit exactly – first time.

The CAD model was supplied in an assembly as separate parts which made the file easier to work with, and the files were delivered as a STEP model for importing.



WYSIWYG engineers captured the roof bolter with three different scanners in over 32 positions and two configurations to ensure complete coverage, detail and accuracy.



Scanning the cutter head and each of the more than 140 picks.

Another satisfied customer was Sevoic Engineering, which needed its mining cutter head scanned, as it needed to re-lace the cuttings picks and change the spacing from 70mm to 40mm.

Sevoic had had trouble in the past with service providers and could not afford to put \$300,000 on the line, should the remodelling go wrong, so it reached out to WYSIWYG 3D to capture and remodel the existing cutter head.

With the information available, WYSIWYG 3D was able to use the helicoidal pattern of the picks – through a process called re-lacing – to change from 70mm to 40mm.

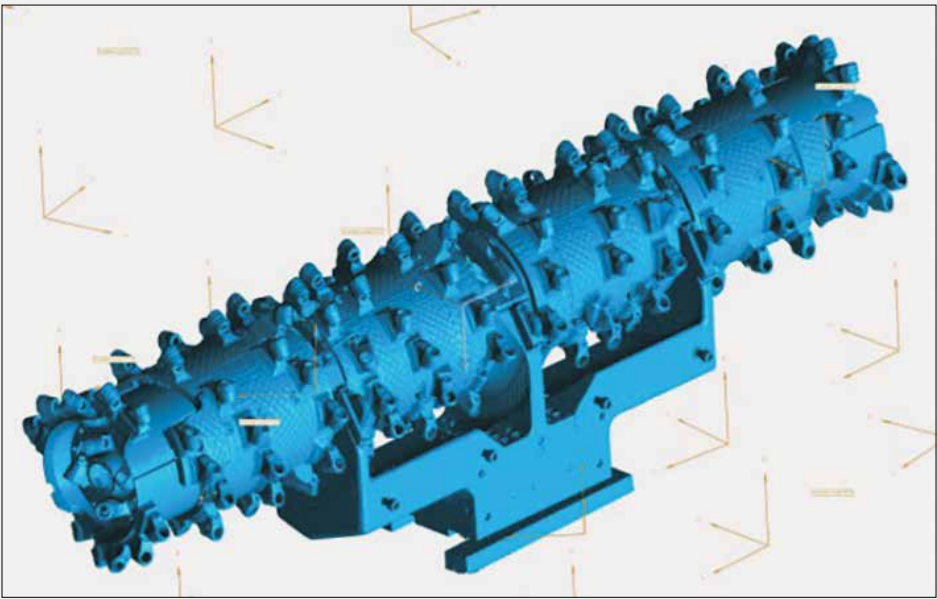
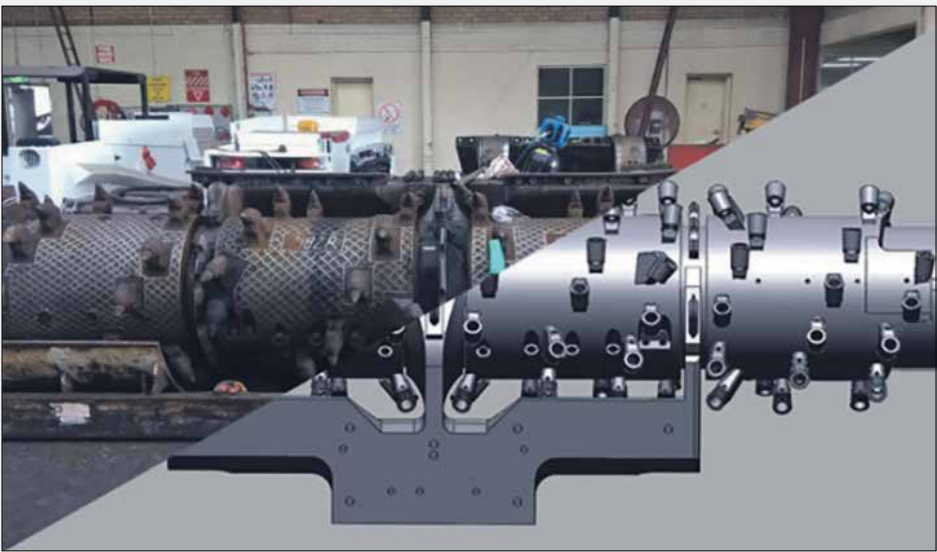
WYSIWYG 3D scanned the cutter head in its entirety and captured every single one of the more than 140 picks.

The picks had a slightly incremental angle that had to be kept, so accuracy was crucial.

The company was able to accurately model each individual component of the machinery, so that each could be manipulated independently.

As well as 3D scanning, WYSIWYG 3D also offers geomagic training, digitisation and probing, 3D printing, cyber scanning, visualisation, vehicle mounted lidar scanning and reverse engineering services.

It has the largest range of scanners Australia-wide, and the scanners have been used in everything from single teeth, coins, movie sets, cars, streets, aircraft, houses, mining complexes and machinery.



MORE INFORMATION: WYSIWYG 3D | 02 9153 9974 | info@wysiwyg3d.com.au | www.wysiwyg3d.com.au

WHAT YOU SEE IS WHAT YOU GET

- Australia's largest range of 3D scanners
- Over 15 years scanning experience
- We can scan anything from a single tooth and coins to aircraft, stadiums, racetracks and entire buildings
- Engineering and manufacturing advice from inhouse engineers

- Mobile scanning technology with up to seven different scanners for any application or industry big or small.
- CAD models exported in file types such as STL, STEP, IGES that directly import into industry standard packages such as Solidworks, Pro Engineer, Maya, Catia and Rhino.



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3D to the power of three

NATIONAL

NOT all 3D scanners are the same, and not all marketing material can be taken at face value when selecting the right 3D scanner for the job.

That is why it is important for any business to ensure they receive expert advice and guidance when it comes to the selection of scanners.

It is important to look beyond the marketing brochures, hype and aesthetics of design in order to assess the functionality and purpose of a scanner.

Before purchasing a scanner, businesses should always request demonstrations to see the device in action, and they should obtain scan data from their own objects to compare scanners and software processing to establish a base for comparison.

Ideally, a full-service scan job is the best possible way to test a scanner.

This allows for full workflow results and time taken, rather than a test or demo.

As one of Australia's first 3D scanner providers and operators, Qubic has the knowledge, the experience and the range to supply businesses with industry-leading advice and first-class service.

Qubic can provide complete solutions for hardware and software that can integrate with existing customer software, and can provide scan services to benchmark and compare scanners prior to purchase which ensures the solution works.

Qubic director Ben Tam spoke with the *Australian Mining Review* about some of the pit falls of uninformed scanner selection and has provided a hardware and software review for readers to make more discerning choices.

Marketing sells products, not facts

Often, the specifications in marketing material won't tell the full story, as it will claim accuracy stats based on best-case scenarios and not take into account the ever-varying field conditions.

Manufacturers use different test methods, especially for terrestrial scanners, and the overall accuracy deteriorates when scans are built that are larger than the instant field of view of a scanner.

The error per meter is often greater than that claimed in the marketing material.

Noise levels in handheld scanners are not usually stated in specifications, meaning that high noise levels often result in poor resolution for the final scan and negates high-resolution specifications.

When presenting screen shots of 3D



Qubic has the knowledge, the experience and the range to supply business with industry-leading advice and first-class service.

Surphaser Scanner.



capabilities, marketing material often show point clouds to make images sharp and clean, further hiding the noise and other issues with the scan data.

Meshing data is the best way to assess scan quality.

Tracking and self-alignment of handheld scanners can be done in a number of ways.

Scanners can use shape or graphic/texture contrasts to self-align, or target stickers – black and white photogrammetry dots – can be used (preferably on flat surfaces as target stickers on curved surfaces can introduce additional errors).

It is important to note, however, that regardless of the alignment method, overall error will increase as larger areas are scanned.

What scanner for what job?

Terrestrial scanners are ideal for large zones and site scans where the accuracy of 1mm over a zone larger than 3m is required.

That could be conveyor sections, full-size trucks and trays or crusher and transfer chutes.

Often using a combination of scanners is the best way to achieve effective results.

By using large, terrestrial scanners for bigger zones and the handheld models on smaller zones, large amounts of detail and complex areas can be captured faster and more accurately.

Mr Tam said that there is no one-size-fits-all approach to scanners, and that each scanner has its own strengths and weaknesses.

"One scanner can't do everything and guarantee accuracy," he said.

"Qubic can tailor the ideal in-house scanning combination and even bring in external specialists.

"We would really encourage anyone to come in store, or at least contact us to discuss what they need from scanners and we can provide at a bare minimum some guidance and advice.

"It's so important to look beyond the marketing material."

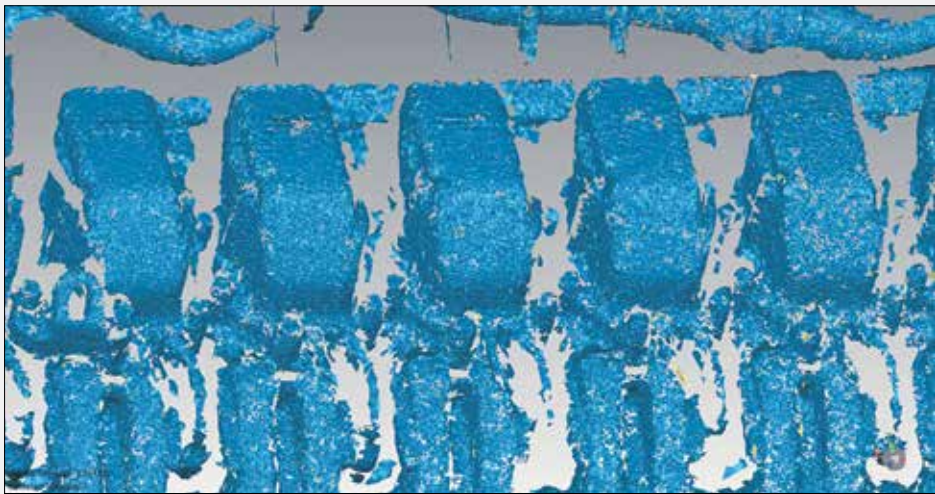
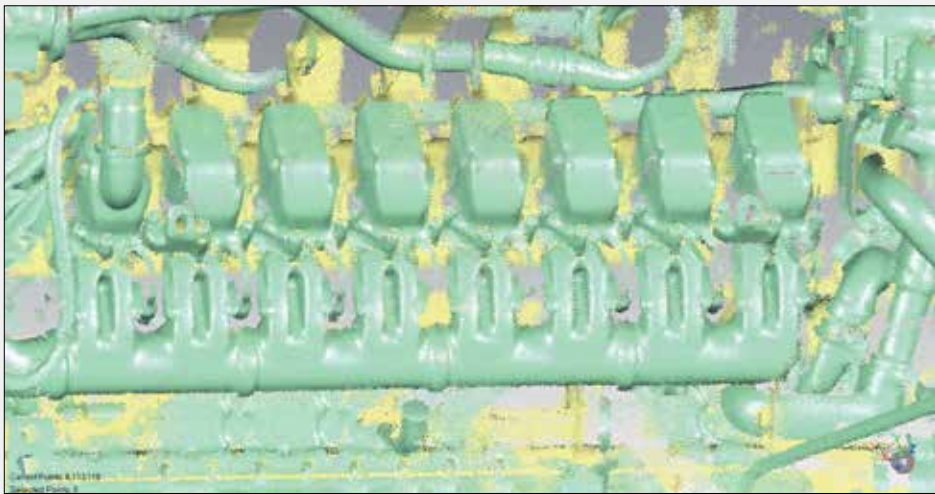


To achieve the best results, a combination of handheld and terrestrial scanners works best on large, complicated projects.



The Artec Leo.





Survey grade scan data looks good as point cloud (left) but noisy when shown as a mesh (right).

Artec scanners

These scanners have fast software and can obtain high-resolution data with ease.

Both the software and the scanners can produce full colour 3D images for sales and marketing materials.

The software can import 3D data from CAD or other scanners in order to work with Artec scans.

The Artec Leo is the most portable Artec scanner: it does not require a computer for scanning, and the onboard screen means there are no cords needed to give cable-free scanning.

This allows users to maintain three points of contact at all times when climbing on equipment, and the resolution and accuracy is suitable for metal fabrication, wear analysis and brown space visualisation.

The Artec EVA is a medium-resolution scanner with a one-metre range and 60cm-deep scanning, and is ideal for fast, textured and accurate 3D models of medium-sized objects.

The Artec Space Spider is a high-resolution scanner that is perfect for capturing the fine details of components such as bolt threads and small machined parts.

All of the Artec scanners can be used in conjunction with one another to obtain the best results, and many mine operators and mine services have used the Artec scanners, such as Westrac, Harness Master Wiring Systems, WYSIWYG 3D, and many others.

Surphaser engineering grade terrestrial scanners

Surphaser scanners will give the highest level of accuracy and the lowest noise of any terrestrial scanner on the market.

It is used by both Airbus and Boeing because of its accuracy and resolution in comparison to survey-grade scanners.

It comes in various models from 2.5m to 140m range, and it is suitable for wear analysis and reverse engineering of large items with sub-millimetre accuracy.

Surphaser has also rebranded one model as the Artec Ray for use directly inside the Artec software.

A walk while you scan mobile system called SurphSLAM is also available.

The SurphSLAM software was developed by CSIRO – allowing operators to walk while they scan and cover large volumes quickly.

Geomagic DesignX software

This reverse engineering software is the most comprehensive on the market.

It can combine history-based CAD with 3D scan data processing to create feature-based, editable solid models compatible with existing CAD.

The software outputs history-based models directly to Solidworks, Inveontor, NX and Creo.

Geomagic ControlX

This is a professional metrology software that lets you capture and process the data from 3D scanners and other devices to measure, understand and communicate inspection results to ensure quality everywhere.

Mesh2Surface

Mesh2Surface is an affordable solution for cost-effective reverse engineering.

It can convert most scanned objects into professional CAD models and extract geometric features with best-fit algorithms, draw 3D sketches directly onto reference mesh and build surfaces.

Coastal Engineering – a case study

Coastal Engineering and Belting (CEB) is a diversified manufacturing business located on the North West coast of Tasmania.

The company services a wide range of industries but specialises in hard rock mining and the wider mining support infrastructure with customers countrywide.

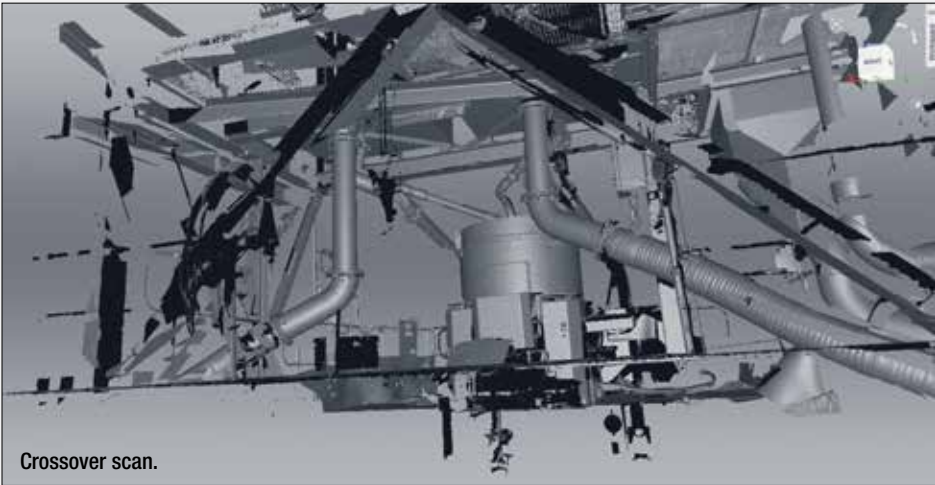
After consultation and taking the company's requirements into consideration, Qubic recommended the Artec Ray scanner.

The company has been operating the scanner for six months with huge benefits seen in accuracy of quoting and reduction in rework on site.

An accurate 3D scan can be referenced later for any number of extra dimensions that the estimator may have neglected to run a tape measure over on site, cutting out any repeat visits and ensuring that quantities can be as close as possible allowing for a competitive quote.

The ability of the scanner to capture irregular geometry accurately is also making previously unfeasible jobs accessible to CEB.

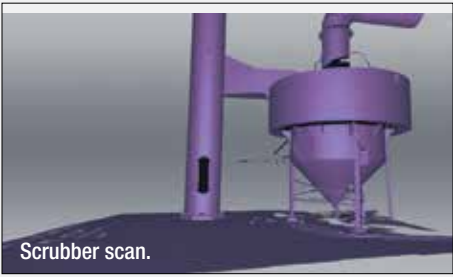
Modifications to existing pipework such as the crossover install pictured would have been a nightmare to accurately measure angles and flange orientations by hand and re-work would have been almost guaranteed but with the scanner, new



Crossover scan.



Crossover scan.



Scrubber scan.



Scrubber scan.

components can be drawn up which will accurately bolt up to the existing flanges.

Another example of this accuracy is a scrubber (pictured) which was duplicated with accuracy to the degree that the complete and painted new assembly was able to be dropped straight in onto the same concrete anchors that had held down the old unit.

This almost total elimination of on-site rework results in significant savings.

CEB provides a wide variety of service parts and wear consumables for various mining equipment.

Downtime on this equipment is costly to the operator, so if CEB is able to offer a component – such as rebuild parts for the bucket pictured – that are guaranteed to fit first time, the company was able to save its customers time and money too.

For CEB, understanding of the capabilities of the technology has opened up applications that hadn't been anticipated when the decision was made to purchase the scanner.

As an example, CEB was contracted to complete a scan of an underground mining truck that had been involved in a significant collision to check that the frame was still straight prior to money being spent on replacement parts.

In a similar vein, the scanner is able to be used in a QA application.

During assembly, if something isn't fitting up correctly in a complex weldment, a quick scan overlaid with the original 3D model quickly identifies where the as built component deviates from the design.



Precision in everything

The Absolute Arm 7-Axis delivers tactile probing and laser scanning.



The Handyscan 3D is the perfect portable way to acquire 3D measurements.

NATIONAL

HI-TECH Metrology was founded in 1992 and, with an ever-growing range of technologies, is a now a leader in metrology and portable scanning solutions to the mining, oil and gas sectors.

The company's extensive range of equipment, including tactile CMM, portable arms, laser trackers and laser scanners – combined with a complete array of support services available throughout Australasia – enables tailor-made solutions incorporating hardware, software and engineering for virtually any measurement of a reverse-engineering task.

Hi-Tech Metrology general manager, Craig Leckie, said the company can assist clients whether it's a capital equipment purchase, support of existing equipment, or the provision of contract measurement services.

"We strive to provide world-class metrology solutions and services that enable our customers to achieve enhanced business outcomes in terms of quality, productivity and innovation," Mr Leckie said.

Reverse engineering

Mr Leckie said the company's clients in the mining sector usually look to either reverse engineer a product or inspect a product relative to the manufacturing principle that's been put in place.

"Quite often they'll have a component fail in the field, so that's when reverse engineering is useful," Mr Leckie said.

"They scan the broken or damaged component and that scanned data is put into a CAD system, a CAD model is generated and then the component or part can be recreated."

Not only can the cost of new equipment from the manufacturer be prohibitive, but often they may not carry the stock or be able to supply it quickly to remote areas – and that's where reverse engineering a part can save time and money.



The Go! Scan Spark can seamlessly be integrated into existing 3D modelling software.

"The cost of downtime, per minute, per hour is significant so the speed at which a client can scan and recreate the component is vital," Mr Leckie said.

Beyond replacing failed parts, clients can also use scanning equipment for preventative maintenance, to complete a trend analysis of how the part is wearing over time and plan to change it out prior to failure.

"We have many popular portable products for mining applications," Mr Leckie said.

"The Creaform Handyscan 3D, Go!Scan Spark, Metrascan 3D and Hexagon Absolute Arm series are all portable metrology-grade 3D scanners that are perfect for mine sites where needs for different resolutions and volumes vary."

Hi-Tech Metrology's range of products from industry-leading manufacturers like Creaforms and, Hexagon MI Manufacturing and other world renowned products means the company can supply the best solution for client's needs.

"Our equipment can cater for just about every application - even inspecting a part to ensure it will fit before shipping it to site and stopping critical equipment, only to discover that the part actually will not fit. Quality scanning equipment pays for itself time and time again by preventing unnecessary downtime," Mr Leckie said.

"It's not just one size fits all – we work closely with each client to determine the best equipment for each specific task."

Contract measurement

"While we provide products to the market, not everyone chooses to purchase their own equipment – so we provide contract measurement as well as training services," Mr Leckie said.

"Our services include both in-house and on-site measurement tasks, analysis, reporting and 3D modelling etc, using an array of the latest metrology equipment."

This can include textual metrology reports, graphical reports to 3D CAD, PPAP reports, decimated and 3D surface data. and fully reverse engineered 3D CAD models.

"Our clients are seeing the value of outsourcing the specialist task of dimensional measurement and collecting as-built information in order to document their facilities and existing products," Mr Leckie said.

The skills, experience and expertise of the projects team at Hi-Tech Metrology enables customers to ascertain quickly and efficiently the key data sets for projects – allowing them the time and the resources to perform the ensuing analysis tasks, and if required, take corrective actions in order to improve their business performance.

Mr Leckie pointed to a recent example of an auto manufacturer that went from four weeks trying to develop a prototype, part to four hours with the help of Hi-Tech Metrology.

"The client can now scan the engine bay to create a digital image, so they know the exact dimensions and the exact location of all available mounting points for their aftermarket hardware – it takes the trial and error out of it," he said.

"A new part can then be designed to fit these parameters and 3D-printed.

"When everything fits perfectly, that part can be put into production, saving weeks of prototyping work. The same technology and systems can be applied to provide higher quality parts for mining applications in far less time.

"Our equipment is perfect for complex applications when it comes down to sub-millimetre accuracy."

Oil and gas applications

The HandyScan 3D and Go!Scan Spark are also extremely effective for non-destructive testing of pipes.

"When you're looking for corrosion in pipelines our equipment is perfect because we can scan the pipe for preventative maintenance and condition reporting," Mr Leckie said.

"We can measure exactly how deep the external corrosion is penetrating and we can even take an ultrasound data of the internal wall thickness of the pipe can be entered it into our software and calculate a cross section using the two data sets.

"It's also incredibly quick when you have kilometres of pipes to inspect."

In addition, the data collected is entered into a database in real time, with absolute data reference points. That removes the human factor and allows specific areas of the pipe to be re-checked or repaired as required.

Training and maintenance

Hi-Tech Metrology also offers a wide range of training packages and programs for new equipment installations as well as courses designed for on-going skills development and new employee training.

In addition, there are custom-tailored training packages on CMMs, vision systems, portable



The Metra Scan 3D is suitable for the lab or on the shop floors.

arms, laser trackers and scanners designed to meet specific needs.

"We can also recalibrate your measuring machines to ensure they remain accurate," Mr Leckie said.

The company can even maintain the metrology software to provide customers with an easy and efficient maintenance system with which to access the latest versions of each software product.

"Our wide range of products and services mean we can solve your problem, not matter the size or your budget," Mr Leckie said.

"We strive to supply the most cost-effective and efficient solution for our clients."

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Accuracy on any plane

NATIONAL

ADAM Technology specialises in innovative, precision measuring systems for remote 3D measurement using digital photogrammetry.

The company has spent the past 25 years developing photogrammetric systems, culminating in its 3D Dynamic Measurement (3DM) Analyst software, which is now used all over the world by surveying companies, mapping organisations, geotechnical consultants, mining companies, universities, government departments, and many others, for applications as varied as denture wear measurement, dinosaur footprint modelling, geotechnical analysis, and aerial mapping with UAVs.

The remote sensing technology is unique in that the accuracy is highly customisable compared to laser scanning, where the accuracy of the equipment is fixed and pre-set at the manufacturing stage.

ADAM Technology managing director Jason Birch said almost any accuracy can be achieved with photogrammetry.

"If you think about making a 3D model of a \$1 coin, you can take photographs where every pixel on the image represents a few square microns on the coin," Mr Birch said.

"That is going to be far more detailed and far more accurate than if you photographed the coin from a kilometre away with the same lens and every pixel represented 10 cm.

"The accuracy of photogrammetry is directly related to how big the pixels are on the surface as well as the relationship between the camera

positions, and the size of the pixels on the surface can be easily adjusted using the distance of the camera and the focal length of the lens.

"It's relatively straightforward just using off the shelf cameras and lenses to achieve accuracies that even the best laser scanners would have difficulty matching."

Because the technology is based on photography, it has a wide range of applications for mining operations.

"All you have to be able to do is have at least two images from at least two different locations," Mr Birch said.

"If the scene is not changing, like a typical pit wall, then you can just use a single camera and move it around.

"If the thing you're taking photos of is actually changing in real time, then you would have two or more cameras and trigger them simultaneously so you capture it at the same time in each camera and then you can create a 3D model."

Aerial applications

ADAM Technology pioneered the use of UAVs for aerial photogrammetry in the mid- to late 2000s. For mine stockpiles, using a drone or UAV that can fly over and capture images from above is far simpler and more cost-effective than other approaches.

For much larger areas, like exploration for a potential open pit mine, a conventional aircraft can be more cost-effective than a drone – but the technology is both accurate and efficient regardless

of the areas photographed.

"For example, a stockpile that's 1 km long by 350 m across, to fly that stockpile takes around 12 minutes and to process the images around 7-8 minutes – so 20 minutes in total to do a stockpile that's a third of a square kilometre," Mr Birch said.

"It's actually very fast, and the quality of the data is actually very high compared to other technologies."

Mr Birch said the typical accuracy for UAV projects is between 20-50 mm.

"For a drone flown at 120 m altitude, travelling at 36 km an hour, you can capture a few hundred images in very little time and achieve 20-30 mm accuracy without much difficulty at all," he said.

"For something like a stockpile that is drawn down from below creating inverted cones, you really want a vantage point that is above it; flying over it to collect all that data is far simpler than doing it from the ground."

A customer of ADAM Technology previously had been using a laser scanner for stockpile volumes, but with UAV photogrammetry they were able to save a considerable amount of time and money.

"It took them 12 set-ups with the laser scanner and three and a half hours in the field to capture the data, compared to about 6 minutes of flying the UAV and 10 minutes of processing," Mr Birch said.

"Even after that the laser scanner still had to do three hours of post processing to try and stitch all the scans together to come up with the stockpile volume – whereas we had it 10 minutes later."

One of the issues the process exposed was that stockpiles are actively changing, with material being added and subtracted during that three-and-a-half-hour window with the laser scanner.

"The UAV was able to show the stockpile snapshot at a particular point in time," Mr Birch said.

"Especially with the UAV being able to quickly and easily acquire data – it's quite straightforward to achieve high accuracy relative to any terrestrial laser scanning method."

Terrestrial use

For mapping a pit wall for structures for geotechnical analysis, the preferred photogrammetric method would be to stand on the opposite side of the pit

wall with a camera that has a long focal length lens and take high resolution images across the pit.

"It's a very efficient way of capturing images via image fanning," Mr Birch said.

"When you take your photos looking out across the pit, it's convenient to be able to take a whole bunch of images from one location to merge them together, and then process those as if you had a very high megapixel camera.

"You're basically taking a panorama, except it's photogrammetrically correct."

The 3DM software then calibrates the images and the resulting merged image is accurate to 0.1 or 0.2 of a pixel – compared to consumer grade panoramic software which usually has large offsets between images.

"Quite often you get images that are 100-500 megapixels in size from each station, so it gives you the benefit of having a very high megapixel camera without having to buy a camera that actually doesn't exist," Mr Birch said.

"For terrestrial cases the main benefit compared to some of the other technologies is that not only do you get the high-quality 3D data, but you also get a high-resolution image that's draped over it."

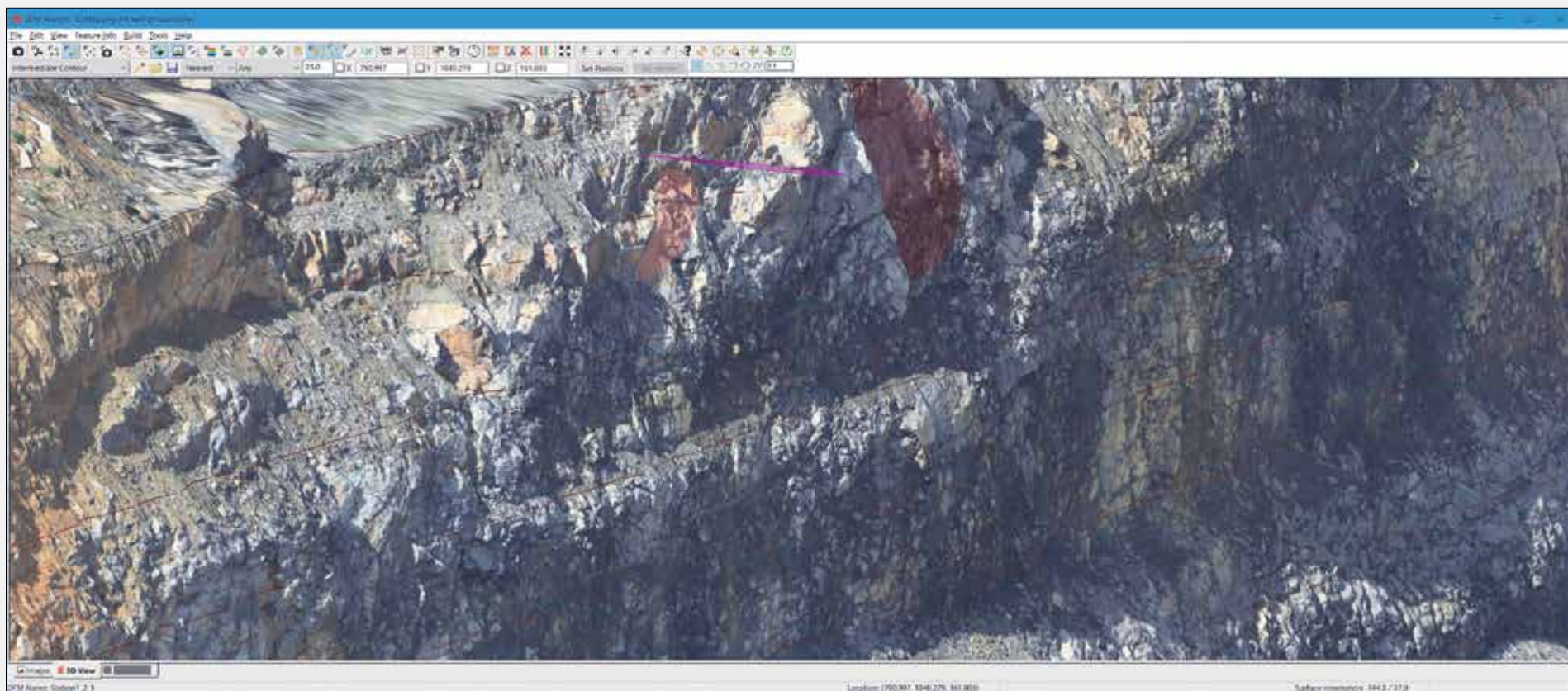
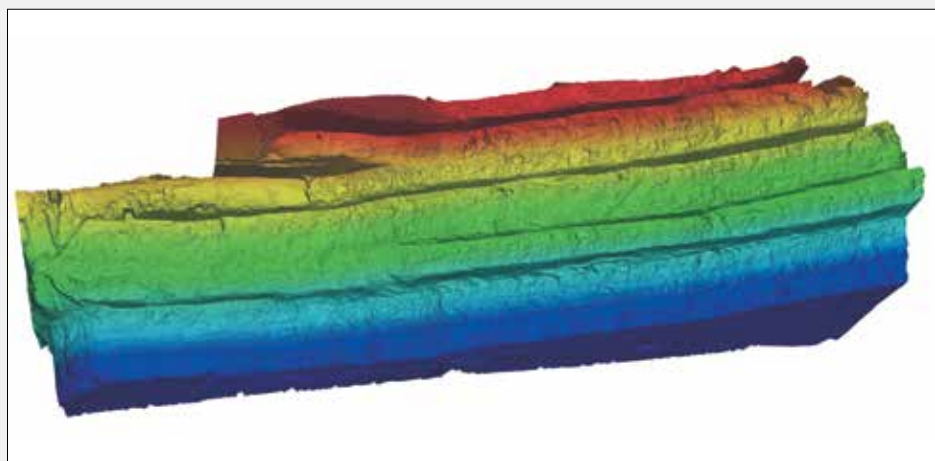
This is particularly suited to geotechnical analysis where structural mapping and being able to see fractures in the surface is vital.

"[With the software] you can pick up points along the 3D image and create a feature that represents the orientation of that structure as it's passing through the rock – based purely on the crack you can see on the surface," Mr Birch said.

"Most laser scanners don't have a camera attached, and the ones that do have a camera generally use something like a 20 mm lens that results in very large pixels. Instead, we'd be using a 100-200 mm lens, so we'll get 10-20 times the level of detail in the image than what the laser scanner would be capturing.

"This means you can see much smaller features, much finer fractures in the rock than what you would see from the laser scanner image.

"Of course, if someone already has a laser



Photogrammetry is the science of using 2D images to make accurate measurements and models in 3D.



scanner then it's natural for them to want to use it and so to help them, we've released a new mapping product specifically designed to work with laser scanner data, and will shortly be releasing a new tool to add high-resolution images to that data.

"For the same reason we have also released another version of the mapping product to work with data from 3rd-party photogrammetry packages."

Underground field work

In recent months ADAM Technology has added software to support third party stereo cameras for underground mapping, because many sites have already invested in the equipment.

"We wanted to add support for them because they were taking the photos, but they weren't processing them in the software that they had because it was too slow," Mr Birch said.

"We added support for that hardware so that users could use our software with the hardware - without having to replace any equipment."

The software is completely general and supports any workflow, however ADAM Technology have designed their own equipment and a matching workflow that can be easily replicated, especially under pressure.

"When they're underground normally they have to take the photos in-cycle - there's somebody who's at the face before them and somebody waiting to come in after them and

everyone is impatient - so when they're at the face taking the photos, they need to be able to get in there, do it quickly and reliably and get out again without having to worry that they missed something because they'll never get a chance to do it again," Mr Birch said.

ADAM Technology recommends having a single camera that's put in four different locations.

"You take a total of 16 images in a specified configuration and from that you can process and create a million points per round in about three minutes on a laptop," Mr Birch said.

"That data will be accurate to about 4 mm and the pixel size on the surface is about 2 mm and that's usually enough detail for structural mapping and thanks to the accuracy it can also be used for

shotcrete thickness, surveying, and ground control, maximising the value of the effort put in to capturing the images in the first place."

From A to Z

ADAM Technology prides itself on the ability to service clients no matter if they require the full scope of work or just a hand processing the data.

"Some customers only need a project done once in a while, so for those customers we can actually send someone on site to do the photography, and process the images, and deliver the final result," Mr Birch said.

"The next step beyond that would be for the customers to get their own camera and do their own photography and send us the images which we then process and deliver the result.

"The next step beyond that is the customers who do it often enough that they lease the software on an ad hoc basis so they can do everything themselves.

"And the step beyond that would be customers who do it often enough that its worth owning everything and just doing everything in-house - so they buy the software, buy their own camera equipment and do everything - so we train those customers. Most customers are in the final category but we have customers of each type, and quite often customers start in the first category and gradually move towards the last."

Regardless of the requirements, ADAM Technology can cater for customers across the whole spectrum of mining operations.

MORE INFORMATION: ADAM Technology | 08 9479 5575 | Sales@adamtech.com.au | www.adamtech.com.au

3DM ANALYST

The Ultimate 3D Surveying & Mapping Tool

Contact ADAM Technology for fast and accurate aerial, terrestrial and underground photogrammetry modelling software for mining and civil engineering applications.

Reduce measurement and documentation risk with 3D scanning

NATIONAL

WHEN accurate measurement or reverse engineering of a complex structure is required, manual measurement methods can't be relied on.

3D laser scanning is a non-destructive, highly accurate spatial data capture technology using fast laser and high-resolution photography, and Scan Hub has proven to be the expert in providing cost-effective, precise 3D laser scanning, CAD modelling and 2D fabrication documentation services that ensure accuracy down to the millimetre.

The Scan Hub team has more than 20 years' combined experience in managing diverse and complex scan and documentation projects across Australia, with the skills and capability to effectively manage local and national clients.

Scan Hub chief executive Terry Robinson said the team can capture environments and objects efficiently and accurately with the latest scanning equipment and software technologies.

"We capture reality in 3D and we're helping to transform the world into a digital landscape," Mr Robinson said.

"The scope of applications for 3D laser scanning and CAD modelling is many and growing.

"The built environment and objects can be scanned with millions of 3D points in minutes and stored as a 3D point cloud with millimetre measurement accuracy.

"Traditional surveyors pick up hundreds of accurate points, we pick up millions of points that are millimetre accurate."

Normal surveying methods can't be used within a complex structural environment such as a coal processing plant or a ship's engine room.

Manual measurements and fabrication documentation based on those measurements is full of risk.

Human error can lead to measurements being forgotten or missed and the drafting team may make assumptions based on the incorrect measurements, which lead to expensive mistakes down the line.

"By engaging a laser scanning operator like Scan Hub, you're using technology that basically captures everything within the defined area that the client wants captured; and it's brought back to the office so that it can be viewed in 3D, measured in 3D and drafted in 3D," Mr Robinson said.

"Nothing falls through the cracks because if there's any important areas in a particular structure, we make sure we got those highlighted to us by the client while on site.

"We concentrate on features to make sure we capture it from various angles to build up the complete picture in 3D for drafting."

The data collected with 3D scanning also allows mining operations to significantly reduce costs overall – and reduce the risk of something not fitting or clashing during construction or installation.

"Scan Hub will save you time and money by scanning your fixed plant, objects, site, pipes, mobile plant or machinery with highly accurate 3D laser scanning," Mr Robinson said.

"Our Australia-wide services team have the right tools and know-how to scan and model from 3D point clouds.

"We'll help you avoid costly mistakes."

Reverse engineering

Mining operations can also greatly reduce the risk of error-prone manual survey measurements with reliable 3D models for reverse engineering, documentation, design, reconstruction, maintenance and 3D visualisation.

"Scanning a complex structure and reverse engineering back to fully dimensioned "shop" drawings is nearly impossible to do by manual methods," Mr Robinson said.

"Picture a coal processing plant which might be a steel structure four storeys high and full of pipes and valves.

"Going in and manually measuring with rulers, or tapes or laser pointers would take months and they would still get it wrong.

"Often we see measurement mistakes that get propagated all the way through to the fabrication drawings and then something gets made and it

actually doesn't fit – so it's a very expensive exercise at that point."

Scan Hub simplifies this process.

Recently the company was able to provide precise structural measurements of a client's coal slurry tank feed structure that was more than 40 years old, with no reliable documentation available to recreate any components of the tank.

"Once our site work was done and the data collected to create the 3D CAD model, we created a 30-40 page fabrication documentation package showing basically every steel piece, every welding joint – all the things needed for somebody else to manufacture a new structure identical to the old one," Mr Robinson said.

"Not only were we able to reduce surveying and measurement costs, but also the CAD drafting process and documentation."

Mr Robinson said the 3D laser scanner doesn't lie, and it doesn't make mistakes about the dimensions, so there's a much lower risk of making mistakes and the human error that occurs through manual methods.

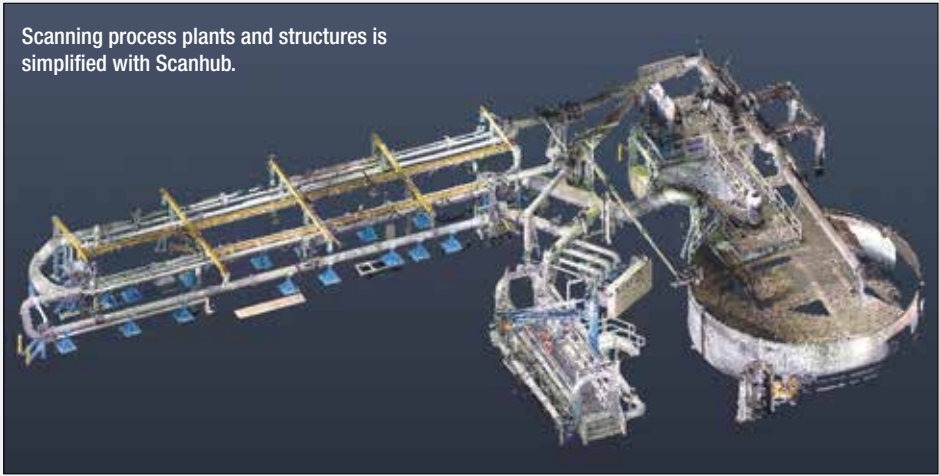
"Our 3D laser scanning captures everything within the defined area," he said.

3D scanning can capture existing structures, machinery, pipes, vessels, framework, plinths and highlight any potential clashes where new equipment may interrupt existing pipes and structures.



The data collected by Scanhub can be viewed in 3D, measured in 3D and drafted in 3D so nothing falls through the cracks.

Scanning process plants and structures is simplified with Scanhub.



This is also a much faster process than manual methods and Scan Hub offers the smooth and reliable integration of existing conditions and construction progress into CAD/BIM software.

"While much of our work is in scanning a building structure, process plant, and industrial objects and sites for measurement and modelling, we also scan objects for manufacturing and reverse engineering," Mr Robinson said.

"Through the use of laser scanning technology, Scan Hub captures information about any object in a point cloud file, while our team can transform the 3D scanned point cloud data into output formats that are the foundation for virtual walkthroughs, product and structural design, as built documentation, visualization, and analysis as well.

"We can use the data to create deliverables that are useful to architects, designers, engineers, draftsmen, maintainers and contractors."

The turnaround is also far quicker than manual methods; the 3D scanning can be completed during

outages or downtime and the 3D modelling work is done offsite.

"Most mine sites have very limited outages, and we can get in there and do our thing during fairly short time windows; as long as the client can clean the area up for us or have it in a prepared state for us to scan, we can then do our job quickly," Mr Robinson said.

"The rest of the work is done in our offices and within 24 hours the client receives the scan data.

"Usually it takes a further two to three weeks to create the 3D model for drafting purposes."

Mr Robinson said that Scan Hub prides itself in its expertise and accuracy through the entire process from start to finish.

"Our staff are Australia's leading experts in 3D laser scanning and modelling," he said.

"Our strong project management capability ensures we meet budget on time delivery for all our clients."

How does it work?

The 3D point cloud captured by multiple scanning positions is a precise spatial data representation of the scanned area.

It can highlight:

- Differences to as-built documentation
- Angles in three dimensions
- Diameters
- Lengths
- Spacing
- Potential clashes
- Space for new or replacement pipes and equipment

3D laser scanning not only picks up every detail the scanner can "see", but can also capture high resolution 360 degree panoramic colour 3D overlay photographs which significantly improves remote inspection and modelling work.

The photographs are overlaid with the point cloud so the viewer or CAD operator can quickly switch between the two.

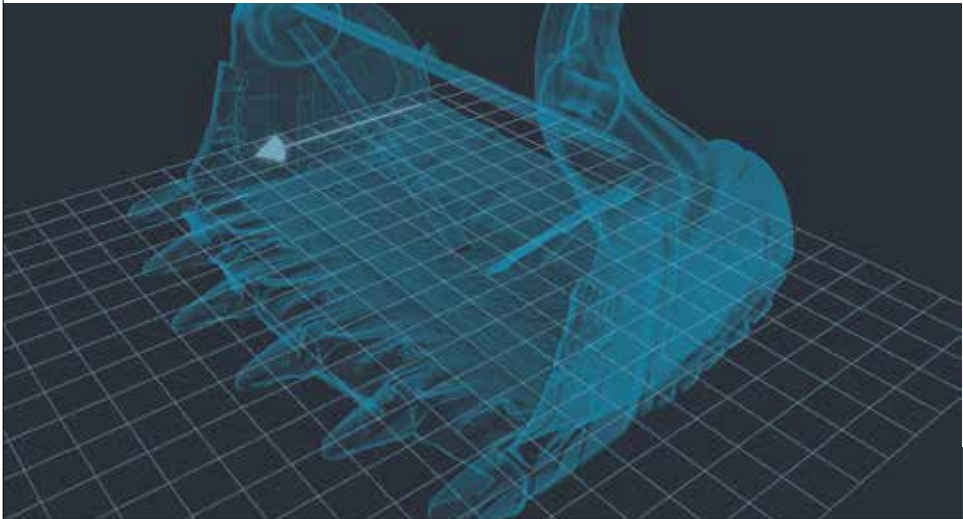
The resulting 3D point clouds, high resolution images and 3D model forms the baseline for not only the immediate work to be performed but future works not anticipated in the present.

The baseline is also important for before and after analysis to assess the work done.

MORE INFORMATION: Scanhub | 1300 903 240 | terry@scanhub.com.au | www.scanhub.com.au



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The Trelleborg Brawler Soft Ride is changing industry expectations around the use of solid OTR tyres.

The Trelleborg difference

INTERNATIONAL

MINING needs tough equipment that won't fail under pressure or rigorous workload.

During the service life of a machine, a mining operator might spend as much as the full purchase price of that machine on replacing tyres.

They are a critical part of the mining machinery and they are exposed to some of the toughest conditions including exposure to rocky debris, sharp-edged walls, high load capacities and the extreme heat of the Australian outback.

That is why Trelleborg developed its Soft Ride series of solid OTR tyres, designed specifically to suit industry needs and conditions.

The 'fit and forget' concept of the Brawler Soft Ride tyre will reduce downtime in maintenance and reduce cyclic stress on equipment normally associated with traditional solid tyres.

The company's Brawler Soft Ride solid tyre is the perfect choice for mine operators looking to maximise their production while cutting downtime and service costs for their mining equipment.

The tyre has re-defined what operators can expect in terms of comfort and what machine owners can expect in terms of equipment longevity from using solid OTR tyres.

The machines used by the Australian mining industry are diverse and expensive and the tyres that protect those machines need to be the latest technology.

Whether it's loaders, skid steer machines, graders, telehandlers or mobile material handlers, the Brawler Soft Ride can provide a cost-effective solution to any mine.

Trelleborg sales director Paul Hansen said it was a product with many diverse solutions across many faculties of the mining industry.

"We also custom-make Brawler tyres for underground machines," he said.

The purpose-designed 'Soft Ride' compound,



The unique elliptical apertures collapse into circular holes under load, maximising the deflection and shock absorption.

together with the unique elliptical apertures mean the Brawler is carving out a new space in the mining sector, as it has already done in the waste and recycling industries, as mine operators look for new ways to cut downtime and improve the efficiency of their machines.

In comparison to the competition, the unique design of the Brawler HPS Soft Ride offers significantly reduced vibration for both the operator and the machine, to give ride comfort equivalent to a foam/solid filled pneumatic L5 tyre, while delivering the durability and toughness of a OTR solid.

This demonstrates Trelleborg's commitment to offering radically improved operator comfort as well as helping to extend equipment life.

Mr Hansen said that the tyre has been specifically developed to reduce the stresses associated with equipment that uses the tyres as 'suspension'.

"Reduced stress on operators means a better 'office' to operate in and reduced stress on equipment means less downtime due to component fatigue and other failures associated with a 'hard ride' in a demanding environment," he said.

By having an independent testing company fit vibration measuring devices to the seat and to the

machine, Trelleborg was able to quantify a 35pc reduction in vibration, measured against three ISO standards.

This directly translates to cost savings associated with machine wear-caused vibration, operator efficiency, and a longer tyre life that reduces the need for maintenance and downtime.

Why choose Brawler?

The Brawler comes in two options for most sizes: the HPS is designed to be pressed onto a standard flat-based multi-piece wheel, while the HD is a tyre that has been moulded onto a steel band.

The centreplate is designed to be bolted into the Brawler wheel and then bolted onto the specific machine.

The benefits with HD is that no pressing is required (so there is no downtime whilst wheels are away getting new tyres fitted).

Should machines be changed out due to major machine issues or replacement, the centreplate can be changed to suit the new machine (as long as the original tyre size on both machines was the same).

Mr Hansen said that it all translates into better efficiencies – for both the operator and the machine – and these efficiencies save money.

“The Brawler is easily identified by the elliptical aperture holes in the sidewall,” he said.

“The cushion rubber compound significantly increases deflection and shock absorption, while the elliptical apertures compress into circular apertures; and when combined with the purpose-designed cut resistant tread compound, the result is a solid tyre that is very tough, but much less stiff than its competitors.”

The Brawler Soft Ride is the culmination of a rigorous research and development program and was field-tested over a two-year period at various facilities around the globe including Australia, Asia, America and Europe.

Segment manager specialty-mining, waste and recycling at Trelleborg, Ditri Zweistra, said that despite the varying geographies and climates, the response from operators and site managers was always the same: “We don’t

want to switch back.”

“Our investment in this process and time spent with customers to understand and solve their key issues is what we at Trelleborg call ‘applications expertise’” he said.

“Solid tyres mean no punctures or downtime and maximum uptime for equipment.

“It is exciting to know that there is a tyre out there that can provide a solution to many problems found on a mine site.

“By having respondents talking direct to us we can tailor a tyre/solution to overcome their issues.”

Customers get all the advantages associated with durability for a solid tyre, while also reaping the benefits of a much more comfortable ride, no loss of load index, and an increase in operator efficiency – even at higher operating speeds.

“The best way to see the difference is to see it for yourself, but the second best way to do it is to view the Brawler Soft Ride promotional video on YouTube,” Mr Hansen said.

Trelleborg Wheel Systems is a leading global supplier of tyres and complete wheels for agricultural and forestry machines, materials handling, construction vehicles and other specialty segments.

The company offers highly specialised solutions to create added value for customers and is partner of the leading Original Equipment Manufacturers.

Brawler HPS Soft Ride



-  **ANTI VIBRATION CONSTRUCTION**
Enhanced driver comfort
-  **CUT RESISTANT COMPOUND**
Damage protection
-  **ELLIPTICAL APERTURES**
Increased deflection
-  **ULTRA DEEP TREAD**
Extended service life

Why choose Soft Ride?

-  **MAXIMUM VALUE**
Reduced operating cost per hour
-  **MAXIMUM UPTIME**
Increased productivity, maintenance free
-  **INCREASED SAFETY**
Reduced driver exposure to vibration
-  **REDUCED IMPACT**
Protecting people, protecting assets

MORE INFORMATION: Trelleborg | +65 6662 8268 | www.trelleborg.com.au

Tough Jobs Soft Ride

BRAWLER SERIES

-  **ANTI VIBRATION CONSTRUCTION**
-  **CUT RESISTANT COMPOUND**
-  **ELLIPTICAL APERTURES**
-  **ULTRA DEEP TREAD**



Brawler HPS Soft Ride tyres are designed to perform in mining and tough recycling and waste management applications while providing the most comfortable ride within the Trelleborg Brawler range.

The Soft Ride compound combined with Brawler’s unique elliptical sidewall apertures delivers higher shock absorption and reduced vibration ensuring the best possible protection for operators and machines.

Brawler HPS Soft Ride - Delivers the toughness of a traditional solid tyre and a ride comfort equivalent to a filled pneumatic tyre.

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The best in the business

Rammer has an authorised dealership in every state and territory.

NATIONAL

FOR more than 40 years, the Rammer name has been synonymous with state-of-the-art rockbreaking solutions.

The company offers a comprehensive range of powerful, productive and durable hydraulic attachments suitable for carriers in the 0.6t to 120t operating weight class.

Rammer's rockbreakers, booms and the revolutionary RD3 remote monitoring device have cemented the company's position as the go-to rockbreaker solutions provider for the Australian mining industry.

The Australian Rammer dealership network offers a full range of Rammer rockbreakers, boom systems, tools, spare parts and specialty products for demanding applications such as primary and boulder breaking, tunnelling and trenching.

With authorised distributors in every state, territory and also in PNG, Rammer offers factory-approved maintenance and warranty services to keep rockbreakers doing what they do best – turning big rocks into little rocks.

The team is truly the engine room of any successful business, and Rammer's Australian distributor network has been delivering its high-quality, industry-leading service, support and product knowledge to the mining industry in every state and territory.

Hydraulic rockbreakers

Rammer was the first company to offer large and heavy-duty hydraulic rockbreakers for the tough conditions of the Australian mining industry, and there is a Rammer rockbreaker for virtually any breaking application requiring a boom-mounted percussive tool.

Whether it be a compact rockbreaker



Rammer rockbreakers are designed for the toughest conditions the mining industry can throw at them.

for a mini excavator to an extra heavy-duty rockbreaker for excavators between 27-120 tonnes, Rammer has a reliable, low maintenance and easy to fit rockbreaker.

The rockbreakers are divided into two classes, the excellence line and the performance line.

The excellence line is Rammer's flagship line and has been serving customers around the world for more than 40 years.

Starting at the compact range which can be mounted on a mini excavator or skid-steer loader, they are perfect for rental and multiple carrier applications.

The small range are heavy-duty work horses for carriers between 1-1.5t.

The medium range is suited for more heavy duty applications.

Both are fitted with membrane-type accumulators to assist with power strokes, whilst

providing protection against hydraulic spikes, and they have field replaceable lower tool bushing and a low maintenance design which ensures optimum rockbreaker uptime, higher availability levels and a reduced owning and operating cost.

The largest models in Rammer's rockbreaker range, the flagship Large Range, brings together all the key features into one large, powerful, durable and reliable package.

The rockbreakers are fitted with pressure control valves to ensure that every blow is delivered with maximum power, while an optimised piston design transfers blow energy efficiently for optimum breaker performance.

The scaler range was developed specifically for the removal of loose material from the lining of tunnels.

This is an important process, and Rammer aims to ensure a safer working environment for both personnel and equipment working in this harsh environment.

Scaling is one of the most demanding applications for a small rockbreaker: rather than working at the optimal 90° angle to the target material, scaling the working angle can be anywhere between 5-175°.

Rammer's range of scaling rockbreakers are unique amongst other small rockbreaker ranges as they come equipped with channels and piping for grease (for automatic greasing), air (for protecting the rockbreaker's external parts against dust) and water (for environmental dust suppression).

The performance line of Rammer rockbreakers are the everyday breaking solution.

The rockbreakers use nitrogen piston accumulators and have a second pressure-dampening membrane type accumulator.

This proven technology gives the performance line an excellent power-to-weight ratio.

Booms - making the right choice

Choosing the right boom-mounted rockbreaker for the job is only part of the process. The selection of the boom is also paramount to getting the job done right.

To select the correct boom system, the needs of both operators and maintenance personnel should be taken into consideration.

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.

Rammer has 10 types of boom options that can accommodate any rockbreaker, and any application.

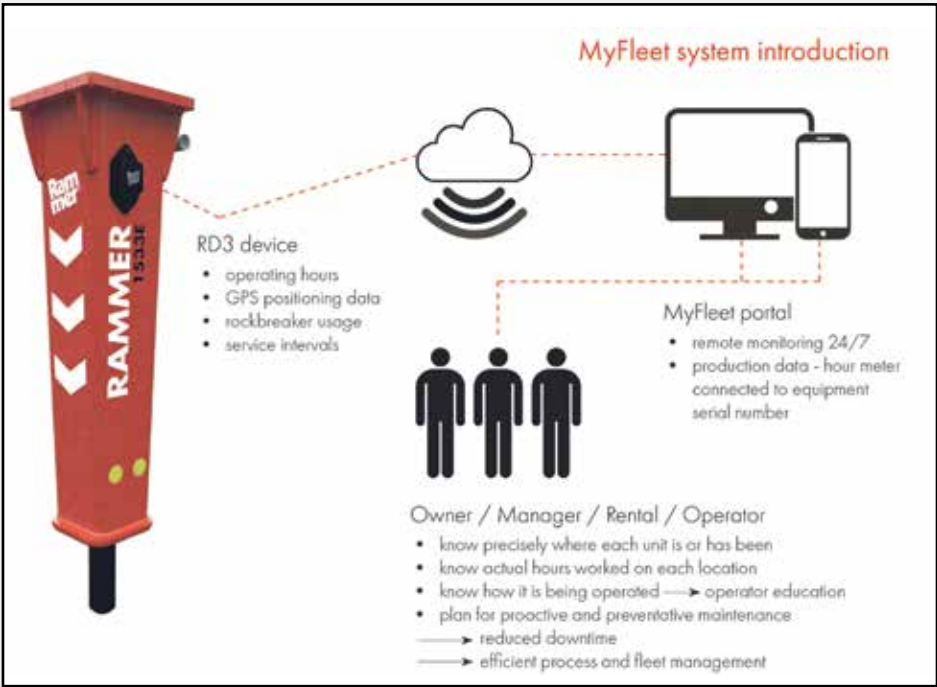
These include the C series that is ideally suited for lightweight applications, through to the ultra-heavy-duty XL series that gives superior reach and high breaking power, and include applications for gyratory crushers in mines and quarries and grizzlies in mines, and which feature round boom pedestals for even stress distribution in the foundation.

And the G series is specifically designed for underground applications.

With a low profile, and a long horizontal reach, this compact boom is ideal for grizzly applications, mobile breaking and scaling.

Rammer booms can also be fitted with the BoomSafe technology which increases the speed and precision of a boom, while preventing the possibility of collision.

Tried and tested in the Pilbara, this is the most reliable and cost-effective rockbreaker boom automation and remote operation system available on the market.



RD3 and MyFleet

Big data is everywhere. It has the ability to improve the operation and monitoring of just about every bit of equipment on the mine site or in the quarry. It is a tried and tested way to cut downtime, proactively maintain equipment to avoid expensive repairs and to improve the overall productivity of assets. That is why Rammer developed the RD3, the first cloud-based monitoring device for hydraulic rockbreakers.

The device attaches to the rockbreaker and then reports detailed information in real-time back to the customer. By using advanced electronic sensors,

the impacts and stresses on the rockbreaker, operating hours, service intervals and the GPS locations of the product are converted into data that can be used for predictive and preventative maintenance. Simply by logging into the MyFleet platform, customers can see all the data recorded by the RD3. The rockbreaker work hours show MyFleet users the total time the rockbreaker has been engaged in rockbreaking, and the real-time hour meter ensures a higher re-sale value as the actual work hours are known. Using cloud-based software, customers can remotely monitor rockbreaker usage and provide operator education when needed in order to avoid maintenance costs due to premature failure.

This can be especially important when considering one of the most common causes of rockbreaker failure, which happens when an operator continues to hit the trigger button, forcing to keep the piston striking for extended periods of time. By correcting the operator's practices through remote monitoring, operational optimisation can reduce the chance of rockbreaker failure and unscheduled downtime. Contact your local authorised Rammer dealer today.

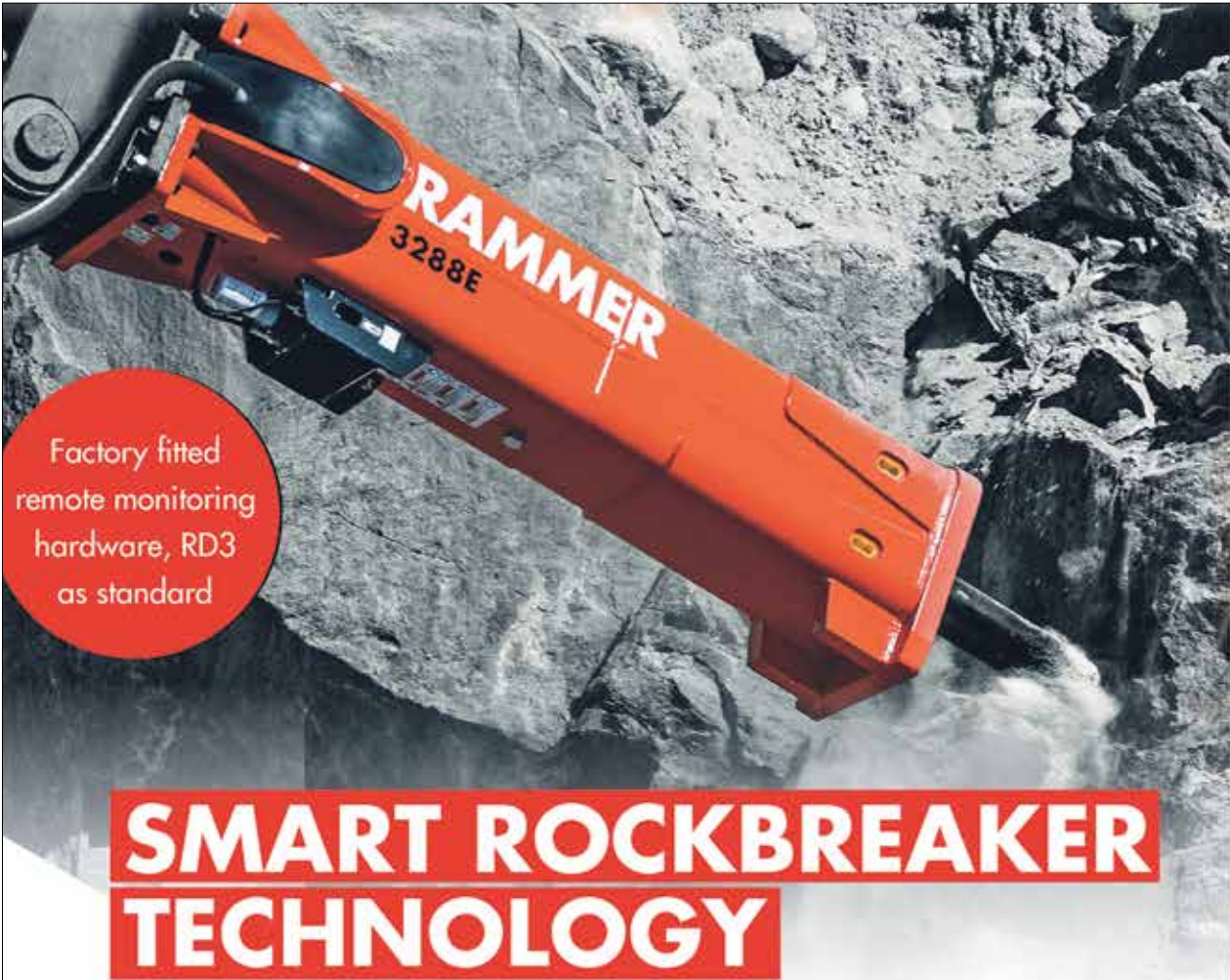
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www.groundtec.com.au

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www.walkershammers.com.au

Total Rockbreaking Solutions in WA:
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www.totalrockbreaking.com.au

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www.renex.com.au



FEATURES

- remote monitoring
- idle blow protection
- membrane accumulator
- fixed blow energy
- vidat tie rods
- ramvalve
- automatic lubrication

BENEFITS

- real-time data on operation
- reduced breaking times
- lower cost per tonne of material broken
- protection against premature failure
- longer tool life
- simplified maintenance
- reduced downtime

rammer.com



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Proof is in the data

Proof Engineer's Road Condition Monitors are bringing big data to road maintenance.

NATIONAL

BIG data is the new frontier of the modern mine site.

It is fast becoming the competitive advantage in the never-ending struggle against inefficiency on site, and the breakthroughs that big data can give us have been breathtaking.

Predictive maintenance through real-time monitoring is perhaps the single biggest area for efficiency improvement in the Australian mining industry, and haul roads are no exception.

During the average service life of a haul truck, it will need tyre replacements that will equal the value of the truck, due to the extreme load placed on tyres and the damaging conditions of roads.

Haul road maintenance has long been a tedious job that requires manual inspection and a lot of guesswork, so it was only a matter of time before engineering companies started looking to develop state-of-the-art tech for haul road quality control.

Proof Engineers has developed a system that takes the guesswork and expensive labour out of road maintenance.

The Road Condition Monitor (RCM) is an innovative, on-board road monitoring system that records and translates road condition data, without the need for an expensive, comprehensive communications backbone on the mine site.

The system has been specifically developed for tough mining conditions by Proof Engineers in direct response to industry need, and has the ability to reduce maintenance requirements, improve operational efficiency and autonomously monitor road conditions.

How it works

Once installed onto the vehicle, data is wirelessly uploaded in real-time and displayed

on the site's secure platform.

Algorithms then calibrate and normalise data for true road conditions and prioritise maintenance scheduling.

The RCM is fitted with advanced sensors that map out the road quality, displayed in a simple colour code: from green signifying good quality sections of the road, yellow signifying satisfactory road conditions, orange where maintenance is required for medium-to-high rolling resistance, to red highlighting areas that need urgent maintenance or potential redesign.

By measuring the vibrations of deteriorating roads, the advanced algorithms of the RCM are able to convert vibrations into readings which then generate a user-friendly "road score".

This score is used for site benchmarking, which in real-time, gives a quantifiable and objective assessment of road and pit conditions.

By using big data, the RCM is able to prioritise and target trouble areas on the maintenance schedule.

This achieves an improved running surface and drainage, and it reduces the overall rolling resistance on haul roads ultimately resulting in lower operational costs and a lower cost per tonne hauled.

How do you use it?

The RCM system is user-friendly and requires minimal training.

The 12/24v powered RCM units are installed onto haul trucks, water carts and light vehicles.

Numerous vehicles are fitted with the units and this ensures a more accurate and adequate live coverage of the roads at any given time.



Proof Engineers engineering and technologies manager Jordan Handel.

The RCM units are self-calibrating and do not need complicated or detailed site setup.

Once installed, the units will start recording and uploading data instantly, and the online management platform can be accessed via the web by using a password-protected login system.

This system is designed with ease of use and flexibility as the main objective.

With minimal training, the system can seamlessly integrate into any existing operation.

It can also be customised to meet site requirements needs and objectives.

WHY USE IT:

- Lower cost per tonne hauled
- Improved production efficiencies
- Optimisation of maintenance scheduling
- Increased tyre life
- Lower operating costs and fuel consumption

The Proof difference

Proof Engineers is an Australian-based company with global projects and decades of experience in the civil and mining industries as owners, contractors and consultants.

The team's broad mix of disciplines range from the practical, hands-on site personnel through to research and design engineers.

The company believes that road construction and methodologies are just as important as design when it comes to the performance of a haul road, and that there are five steps for achieving any road maintenance goal: site evaluation, design and stabilisation, site-tailored construction and training, maintenance and monitoring and reporting.

Proof Engineers excels in systems that help improve production for the mining industry.

The company improves operational efficiencies – specifically through haul

road design, construction management, maintenance programs and monitoring solutions.

As well as being the leaders in haul road maintenance, Proof Engineers operates a Haul Road Development Program (HRDP) that designs haul roads by combining the best available materials for the job with construction practices to help mines drastically reduce their maintenance costs, while improving operating speeds and wet weather recovery.

Proof Engineers also specialises in dust monitoring systems.

Using a state-of-art mobile dust monitor called the Dustective, the company can measure dust emissions on roads and other sources.

The team at Proof Engineers can audit any mine site for environmental compliance and/or evaluate the performance of dust control measures.



The Road Condition Monitor is small enough for any vehicle.

MORE INFORMATION: Proof Engineers | 07 5522 0855 | info@proofengineers.com.au | www.proofengineers.com.au

REAL TIME MONITORING OF ROAD SURFACE CONDITIONS

The Road Condition Monitor (RCM) system is used by mine sites to monitor road conditions, prioritise maintenance works, improve operational efficiencies and lower the cost per tonne hauled.

Poorly maintained roads have a wide range of negative effects - but by implementing the RCM system, mine sites can expect:

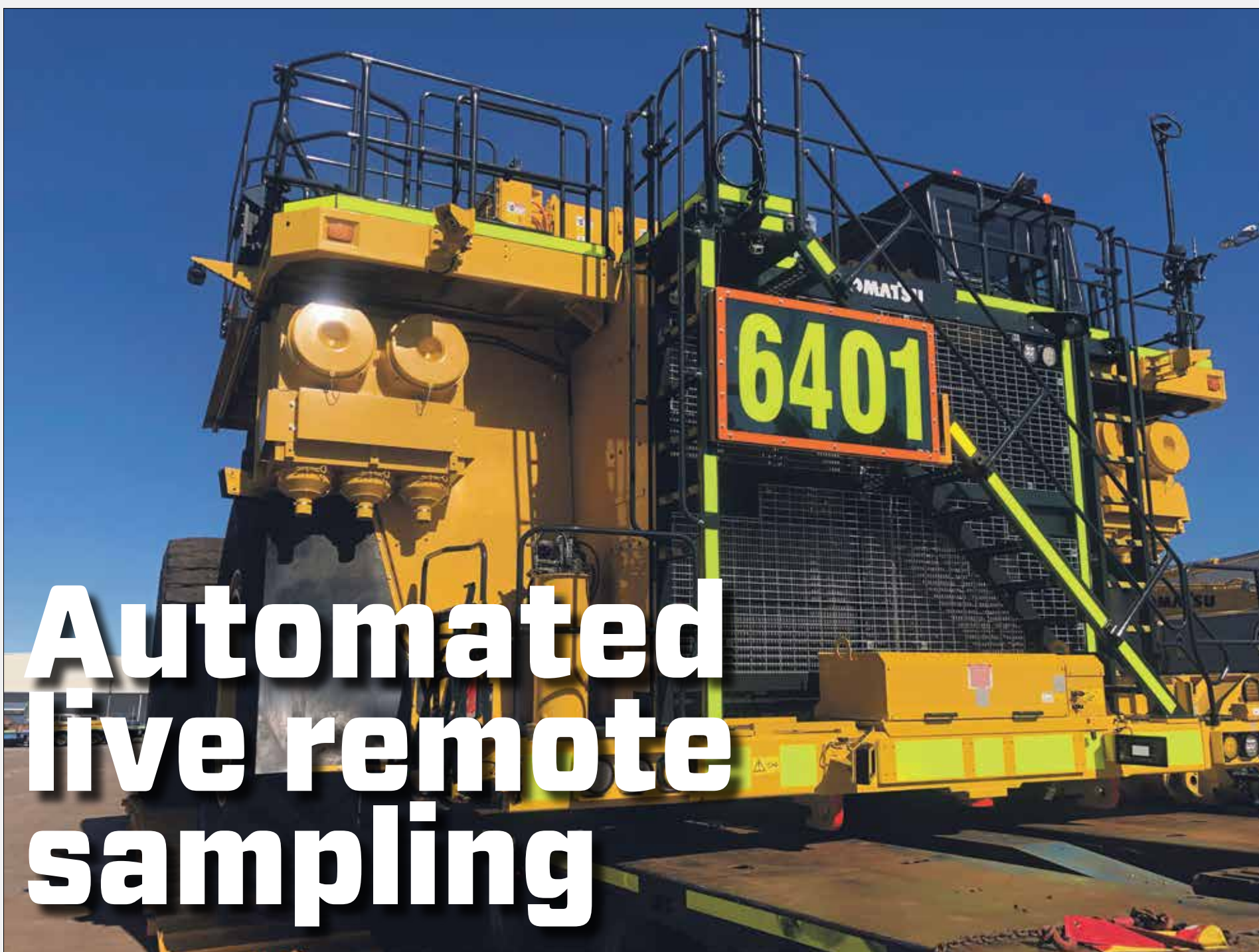
- A non-subjective method for maintenance allocation
- Improvements in cycle times
- An increase in tyre life
- A reduction in operating costs & fuel consumption
- Improvements in operational safety
- Improvements in wet weather recovery
- A lower cost per tonne hauled



CONTACT US

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The CareTaker ALRS can be retrofitted to any vehicle.

NATIONAL

EQUIPMENT Placement's patented CareTaker ALRS design has been developed specifically to address the ongoing issues associated with fluid sampling methods, and to remove safety hazards for operators and service personnel.

Equipment Placement co-founder and director Brian Bondi told the Australian Mining Review that there has been many variants of the project since its conception, but that it was product developer Jason Bondi who took the theory behind the objectives and transformed the product into the CareTaker ALRS.

And now, after more than one year of field testing, the CareTaker ALRS has hit commercial production and is hitting every target the Equipment Placement team set.

The concept was designed by Fluid Transfer Technology, which is a JV company specifically registered for the research and development of new innovative products to suit the ongoing demand in the mining industry for increased automation and higher standards of safety.

Fluid Transfer Technology has three equal partners, Brian Bondi, John Bondi and Luke McInnes, all of whom had some level of input into the concept and functionality of the product.

Product development was handed over to John's son, Jason, who developed the ALRS into a commercially acceptable product.

How it works

The CareTaker ALRS has a sample control unit placed inside the operating station for safe



Live samples are sealed in containers without any human interaction.

initiation of a live oil sample, and a remote sample station placed in a convenient location that can be accessed when the machine is isolated.

Sampling is carried out using three simple steps.

Firstly, the unit is purged with fresh fluid, then a measured amount of fluid is collected in the sample chamber, before the sample chamber discharges the sample into the sample bottle.

The bottle is then sealed so that there can be no interference with the sample between testing and the lab, and this is one striking point of difference as it is just one more instance where human interference can no longer damage the

integrity of oil samples.

Equipment Placement product developer Jason Bondi said that the unit could be mounted anywhere on the machine and plumbed into the fluid that needs sampling.

"To sample engine oil, we take a feed from a pressure line and a return line to the engine's crankcase. The controller is located inside the operator's station, inside the machine and out of harm's way," he said.

"We like to think that, to the best of our knowledge, there is nothing comparable on the market.

"There may be products that offer a similar

type scenario, but in our opinion they would not provide the same accuracy and the same result.

"There are other products, but they still require manual handling to sample the oil.

"There's not another system where you can sit in the cabin and take samples."

Not all samples are the same

Brian Bondi said that there were two major reasons for developing the product.

"Firstly, there is a lack of consistency when taking a manual oil sample which results in a lack of confidence in the actual sample being an accurate representation of the relevant compartment," he said.

"Lack of consistency would then bring other factors into play such as the environment, atmospheric conditions or poor sampling techniques, meaning maintenance departments would get the samples but could never be confident of the results.

"You could take 500 samples per week on a site and it wouldn't be uncommon for 200-300 of those actually being deemed compromised and therefore disregarded."

This means sampling is a highly expensive and inefficient process.

Poor samples and bad sampling techniques were the first problem, but the second problem was equally important – taking live samples.

Live sampling is widely acknowledged as the best method for oil sampling, however due to safety risks, most mining companies steer well clear of the method to the detriment of sample quality.

Mr Bondi said that most non-live testing regimes ensure no workers can get within the footprint of an operating machine to carry out testing.

"Our system is remote or semi-remote depending on the needs of the client and it can be configured in any number of ways to suit clients' needs," he said.

"Safety is paramount on the mine site, and mining companies will look at safety first. Sampling will always come second."

Why take live samples?

Live samples are simply better because they are more accurate, and they give a more accurate representation of the oil when it is in operation, meaning the analyst knows that the sample is representative of the component.

When a live sample is taken from a fixed point in the engine, any contaminants detrimental to the component are suspended in the oil and therefore suspended in the sample.

Whereas when a sample is taken from a machine that has been turned off and allowed to settle, the oil has cooled down and some of the particles that would be detected in the live sample would no longer be suspended and therefor 'non-representative'.

Mr Bondi said that the other reason is that oil samples must be taken from the same spot every time to ensure consistency.

"Common practice is to remove a cap from a reservoir or a dipstick from a dipstick tube and insert a plastic tube connected to a vacuum pump to extract a sample," he said.



The easy-to-access sample box.

"The problem with this process is that it is near impossible to take the sample from the same point each time especially given that it will be done by multiple personnel therefore giving inconsistencies straight away.

"Invariably this will lead to inaccurate samples, as the tube will take oil samples from the top, sometimes from further down, sometimes you run the tube along the edge of the component and pick up debris, and this is yet another issue with sampling techniques that needs to be addressed."

What's next?

The ALRS CareTaker has been going from strength to strength since its commercial

launch in September.

The sales and marketing of the product will initially be through Equipment Placement Sales and Services, with the view to expanding distribution networks from 2020 onwards.

Interest has been shown offshore with EPSS receiving its first order from a South American Komatsu dealer.

While the company is vigilant for any teething problems that might arise, it is also looking to the future and to the full automation of the system.

Jason Bondi said that his focus was on developing the system for fully autonomous trucks which would not need any human interference at any stage.



Live sampling can now be done remotely and consistently from one point.

"Right now, we're working on different control methods," he said.

"At the moment it's a simple control method with a push button inside the cab, but we're working on having a HMI feedback interface screen that will automate the process further and remotely operate the system.

"Those sorts of developments will become more prominent.

"As more and more autonomous trucks enter the mining industry, the autonomous trucks will have an autonomous live sampling unit and the sampling will be automated to the point where the oil sample can be initiated from a remote location.

"We're aiming for this to be ready mid-2020."

MORE INFORMATION: Equipment Placement | 08 9479 4988 | sales@equipmentplacement.com.au | www.equipmentplacement.com.au

**EQUIPMENT
PLACEMENT**

☎ **08 9479 4988**

✉ sales@equipmentplacement.com.au

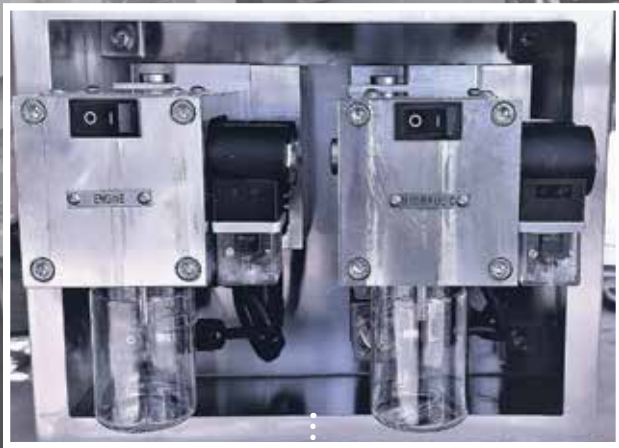
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**SAFE, LIVE,
ACCURATE**

This Australian designed and manufactured patented technology can drastically improve the accuracy and safety of oil sampling methods on site.

ALRS CARETAKER REMOTE SAMPLING

- Limited exposure to atmosphere
- Improved sample quality
- 100% representative for accurate trending
- Eliminate service personnel from accessing live equipment
- Autonomous ready





Gulf Western Oil head office.

Uncompromising quality

NATIONAL

GULF Western Oil knows that the mine fleet is the backbone of the operation.

Without a reliable fleet, the mine stops.

Today, heavy-duty diesel engines are more expensive, more technically advanced, and require more specialist knowledge than ever before.

They also have ever-increasing oil-drain intervals.

That is why Gulf Western developed the Top Dog Indestructible 15W-40.

The product meets the majority of modern engine manufacturer specifications and has been designed to exceed the requirements of API CK-4 – the latest heavy-duty diesel engine oil classification update from the American Petroleum Institute (API) in 2017.

Top Dog Indestructible has been formulated using the indestructible additive technology to keep engines cleaner, use less fuel, and to last significantly longer than its competitors.

The product also meets the specifications of modern and older engine manufacturers and OEMs, making it the perfect choice for a mixed fleet/universal engine oil.

It is backwards compatible with API CJ-4 and CI-4 engine oil specifications, and it is suitable for heavy duty diesel engines that are fitted with Exhaust Gas Recirculation (EGR) systems and engines fitted with Diesel Particulate Filters (DPF) or AdBlue (SCR Selective Catalytic Reduction).

Top Dog Indestructible has been proven to increase fuel economy through reduced friction and extend drain intervals compared to earlier generation API grades.

It has vastly improved oxidation control, and is suitable for ERG engines, and its low SAPS formulation offers suitability for DPF.

The product also offers improved detergency and dispersancy, better discrepancy compared to its conventional API CK-4 and CJ-4 counterparts.

Its specifications result in cleaner engines with increased service life, which translates into overall increased stability and decreased oil consumption.



The drum line.

This all contributes to the most pertinent advantage for switching to Top Dog Indestructible – it will save money by increasing service life and reducing downtime.

Top Dog Indestructible 15W-40 gives advanced levels of engine protection, well beyond API CJ-4 and API CK4 specifications, and many other heavy-duty diesel engine oils.

The Aussie choice

More than 30 years ago, Peter Vicary and his two sons, Ben and Andrew, started Gulf Western Oil with the sole purpose of creating an oil for the demanding conditions specific to the Australian market.

Since then, Gulf Western Oil has become the standard in the field.

The company prides itself on using only the highest-quality virgin base oils and the most technologically advanced API-approved additive systems that allow the company to retain some of the highest OEM approvals in the market today.

From humble beginnings as a company that blended lubricants for local markets, Gulf Western Oil has established a distributor network throughout every Australian state and territory, and has an international presence in New Zealand, Fiji, New Caledonia, Tahiti, Vietnam, Tonga, Samoa, Kiribati, Christmas Island, Papua New Guinea, and the Pacific Rim.

FAST FACTS

Top Dog Indestructible 15W-40 meets the following international performance specifications:

- API CK-4 / CJ-4 / CI-4
- Caterpillar ECF-3
- Ford WSS-M2C171-F1
- Cummins 20086, 20081
- Detroit Diesel DFS93K222, 93K218
- Mack EO-O Premium Plus
- Mack EOS-4.5
- Volvo VDS-4.5 / VDS-4
- Renault VI RLD-4, Renault VI RLD-3
- ACEA E7(16), E9(16)
- Mercedes Benz 228.31
- MAN 3575
- Deutz DQC III-10 LA
- JASO DH-2





Gulf Western Oil can assist large organisations in lowering maintenance costs, providing less equipment down time and offering extended oil drain intervals using innovation that is customised for your business.

For more information, please contact us -

Free toll: 1800 248 919 | Email: sales@gulfwestern.com.au | Website: www.gulfwestern.com.au



Force 360 continues to provide industry-leading safety equipment, certifying to Australian and New Zealand standards, as well as European standards.

The point of difference

NATIONAL

As a market-leading designer and manufacturer of personal protective equipment, Force360 is at the forefront of delivering innovative products to various industries around Australia.

An essential part of ensuring wearer safety is to certify all products to their relevant standards, as this validates the claims made by a manufacturer.

Force360 has set a new industry benchmark by certifying its entire range of hand protection, to not only the current Australian and New Zealand hand protection standards, but also the current European hand protection standards.

This dual certification claim consolidates its position in the safety industry and has resulted in many major end users relying on its products throughout key projects.

AS/NZS 2161 is the overriding standard for hand protection in Australia and New Zealand.

Australian Standards usually adopts the European Standards as its own; for example, AS/NZS 2161.4 is word for word the same as EN407:2004.

However, in the case of mechanical performances there is now a difference between AS/NZS 2161.3 and EN388:2016, as the Australian Standard continues to use EN388:2003.

The discrepancy in standards means abrasion, cut and impact testing results can vary as they are tested in different ways.

By way of example, Force360 gloves may be marked 'Cut Level 5' and 'Cut Level F': this is because under AS/NZS 2161.3 the cut resistance is tested and measured using the Coupe test method and scored 1-5, whilst under EN388:2016 gloves are tested and cut resistance is measured using the ISO 13997 test method and scored A-F.

Force360 has adopted the position of certifying its hand protection to both standards, as both are current, and both are relevant.

The most important difference may not be the variation in the testing methods as such, but rather in how these tests are scrutinised and validated.

AS/NZS 2161 itself says that one stark difference lies between the way the Australian market and the European market sell gloves under either standard.

"There are no Australian or New Zealand legislative requirements that compel manufacturers to submit their products for testing and certification by accredited testing authorities," it says.

"Not all manufacturers may consistently follow this process for the products that they market outside the EU.

"In Australia, glove manufacturers can undertake their own testing and issue their own compliance statements."

Private Brands general manager Jason Kearney said that the only way to ensure the highest level of protection for its glove wearers was to certify them to both standards.

"In Australia gloves can be sold as compliant to Australian and/or European standards," he said.

"In Europe under EU PPE Regulation 2016:425 it is legally mandated that glove manufacturers certify their PPE products, so they are safe for their intended applications.

"All products designed to protect against medium level risks described by the EU as Category Two, and high risk described by the EU as Category Three, are subject to mandatory testing and certification by accredited testing authorities and notified bodies".

Essentially this means that all product claims – including cut resistant performance scores – are not only tested in accredited laboratories, but also validated by a notifying body.

Furthermore, gloves must be periodically tested, and the manufacturing facilities must undergo annual surveillance auditing to ensure consistency and quality.

The product must also be exactly the same as its Declaration of Conformity in every way and have correct instructions and markings.

In the case of Force360, BSI Benchmark has been entrusted with this certification.

Mr Kearney said that the best way to ensure products are certified is to look at the back of the hand print, insert sheet and/or packaging.

"All should have a notifying body number or logo as well as the accompanying license number the notifying body issues the manufacturer"

Can you get a safer glove than Force360?

The answer is no.

Force360 firmly believes that certifying a product is best practice.

Self-declaration or compliant claims are simply not reliable and can have serious safety implications for all stakeholders, so they should not be trusted or accepted.

By engaging a notifying body to validate claims and certify glove performance to both hand protection standards, Force360 believes its gloves are the most scrutinised and ultimately the safest in Australia.

Certification is not proof that a business has 'passed a test', it's proof that a business is constantly maintaining the highest of standards, a feat that demonstrates a deeper commitment to going above and beyond.

It is an ever-ongoing process and Force360's point of difference.



We give an **F!**

- ▶ Graphene - the world's strongest material, 300 times stronger than steel
- ▶ Highest rated cut resistance - Level F
- ▶ The lightest and most comfortable cut resistant glove available
- ▶ Liquid and oil barrier protection
- ▶ Extended wear with up to 15,000 abrasion cycles
- ▶ Contact Heat Level 1 and 2 for handling hot objects
- ▶ Touch screen friendly
- ▶ Entire range is certified by BSI Benchmark to the latest Australian and European Standards



Performance Standards*

EN388
2016



4X43F

EN388
2003



4543

EN407



X1XXXX



Dual Certification



2797
CE 719275



Australian Standard
AS/NZS 2161.2:2005
AS/NZS 2161.3:2005
Lic. BMP 719027

**Performance standards based on GPR504*

To view the complete range visit GraphexGloves.com

CUT LEVEL
F
CERTIFIED



The pump experts

Toolkwip prides itself on the ability to select the perfect pump for the job.

NATIONAL

THE design of pumps and dewatering systems are a major part of mining projects but often put on the backburner and overlooked because it can be quite a daunting task – but with the right team the process can be simplified.

Toolkwip marketing and product manager Jim Garrett said the company takes the stress away from dewatering projects.

“We don’t pretend we know it all, but the company has been doing this for more than 25 years,” Mr Garrett said.

“We work with each client to find the best pump to suit their requirements.”

One of the major aspects of choosing the right pump is water quality.

“It’s paramount because the water quality dictates the metallurgy that we use inside the pump,” Mr Garrett said.

“Pumps can be made from all different materials and alloys, from cast iron to ductile iron to white iron, to duplex stainless-steel, stainless-steel, and various polymers.

“We can even do internal coatings and plating depending on the severity of the water being pumped.”

Typically, across a lot of WA, the Hunter Valley and Queensland, there is a lot of saline water, and cast iron and saline water do not mix well.

“We look at different metals to get a longer lasting solution,” Mr Garrett said.

“We also look at the overall package, right from the foot valve, the bottom of the suction line, through to the outlet point.

“We look at all components right across the board and as a whole package before we specify the pump.”



Dewatering teams can rely on Toolkwip’s 25 years of experience.

Avoiding pump failure

One of the most common causes for pump failure beyond corrosion is mechanical seal failure.

This could be due to cavitation, corrosion (chemical attack) or abrasion (grit and suspended solids in the solution being pumped) or even the pump running dry, which can lead to costly repairs and thousands of dollars per hour in downtime.

Mr Garrett said this is one of the reasons why Toolkwip works with a lot of Selwood dewatering pumps.

“The mechanical seal in these pumps is actually immersed in an oil bath, meaning it

can run in SNORE operations – where it’s getting some water, some air, some water, some air,” he said.

In a traditional pump when it starts sucking air, the mechanical seal can fail very quickly, resulting in costly repairs and downtime.

“Whereas with the oil-filled seal chamber, the oil lubricates the seal while there’s no water there, which means you can get away with extended periods of dry running,” Mr Garrett said.

The centrifugal style pumps used are also fitted with a diaphragm priming system – which works on the air displacement principle.

“The diaphragm pump evacuates the air,

sucks it out of the suction line and then when the water comes up into the pump volute, a ball float is pushed up and shuts off access to the air pump,” Mr Garrett said.

“Then the centrifugal pump takes over and pumps the water – and vice versa when the water level drops and the centrifugal pump is no longer pumping water, the float drops, and you’ve got full vacuum straight away.”

Mr Garrett said it’s a popular priming system because it is moisture tolerant and there is no potential oil mist expelled.

“It’s a more environmentally friendly option with no coalescing filters required and the absence of any possibility of oil mist being expelled,” he said.



Fitted with a diaphragm priming system, the pumps can work efficiently in wet or dry applications.

The impact of pipe sizes

How far a liquid is pumped can directly impact the pump needed because friction losses come in to play.

"Often we see people running the pipeline before talking to the pump people," Mr Garrett said.

"They might run something like a six-inch pipeline across two kilometres and when we turn up, we've got to use a higher head pump to get the same result as using a smaller pump on an eight- or 10-inch pipeline instead."

Enormous gains in flow rates can often be gained with a smaller pump simply by increasing pipe diameter.

"I always advise people to look carefully at pipe size and consider the cost of upsizing your

pipes and using a smaller pump," Mr Garrett said.

"Not only will the pump cost you less, but your ongoing maintenance, diesel costs and electricity costs can be significantly lower."

Mining operations also need to consider any solids or particles that might be in the water because this directly impacts the wear rate and metallurgy of the pump used.

"It's also important to consider pump clearance tolerances," Mr Garrett said.

"Some six-inch pumps will handle as little as 30mm of solids going through them, but with other pumps like the Selwood S150 (which is a true vortex style centrifugal), the six-inch pump will pass four-inch solids or 100mm of solids straight through."

Mr Garrett said this is because, rather than the fluid going through the impeller, Selwood's



The recessed impeller in the S150 pump allows 100mm of solids to pass straight through.

impeller is recessed into the back of the pump housing.

"That's why it's called a vortex, the centrifugal force passes the liquid through the pump in front of the impeller," he said.

"It may use a bit more fuel than some other pumps, but you can very quickly make up the difference, saving a fortune on wear rates and associated breakdowns in the long run."

Smart pump technology

The mining industry is becoming more and more automated and so too are pump systems.

Toolkwip fits 3G or 4G control panels on equipment so dewatering teams can remotely log in, turn the pump on or off, check its location with GPS and even check the pump speed.

"You can add all sorts of parameters, monitor pump performance, see if its running low on fuel – it doesn't quite cook your lunch for you, but it does just about everything else," Mr Garrett said.

"Automation has to be very carefully implemented and your systems have got to be set up to cope with it, but I like to think we're leading the industry forward in that space by having these panels in there, combined with a pump that can run dry, because you can set it up so you don't have to have someone standing by the pump."

"The expensive component of paid labour is removed, and the pump can still be monitored 24/7."

Sustainability focus

Mr Garrett noted that Tier 4 emissions approved engines will only become more prevalent in future – particularly with Europe, UK and the USA already legislating for environmentally-conscious engine manufacture.

"We've already started building some models with engines approved to Tier 4 emissions and we're also looking at high efficiency electric motors run by a generator," he said.

"I think that's going to change the dewatering scene in the coming years, as efficiency is going to be a key focus."

"Like it or lump it, whether the mine manager believes in climate change or not, as annoying as they may find it, the facts are that it's going to be more widely enforced as time goes on – not less – so we're going to have to start looking at how we can make these engines more compliant."

MORE INFORMATION: Toolkwip | 03 8805 0500 | www.toolkwippumps.com.au

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Ultraflow stainless steel submersible pumps



General Pump Company has a range of submersible pumps for the harshest conditions.

NATIONAL

GENERAL Pump Company is the leading Australian-owned, commercial and industrial pump provider.

Family-owned and managed, the business has grown extensively over more than four decades from a small pump supplier in Sydney to a company that services a wide range of clients all over the world.

General Pumps sales manager, Tim Crutcher, is proud of the products the company has developed.

"Our class-leading Ultraflow products offer solutions for a broad range of pumping problems," Mr Crutcher said.

"From very large high flow submersible pumps, heavy-duty dewatering submersible pumps to vortex, pressure and grinder pumps, we provide the most comprehensive range of submersible pumps available."

The company's active involvement in the design, manufacture and after-sales maintenance and servicing of its pumps sets it apart from other suppliers.

Submersible pumps

As the name suggests, a submersible pump can be fully submersed into liquid without the liquid entering the motor or control section of the unit – so they are well suited to mining applications.

The Ultraflow Drainage series of submersible pumps are suitable for site dewatering, basement and sump drainage, water transfer and stormwater management.

"Our extensive range includes large dewatering pumps and stainless-steel submersible pumps," Mr Crutcher said.

"For the mining sector we specialise in providing heavy duty dewatering pumps, stainless steel pumps and wastewater pumps. Where liquids have unstable or variable pH levels, the Ultraflow stainless steel pumps are a great option for these applications.

For sewerage and greywater transfer from mine camps, the Ultraflow sewage grinder



Ultraflow submersible pumps cater for heavy duty mining applications.

pumps, sewage cutter pumps & wastewater vortex pumps are an excellent solution – this has been proven in many mine camps in Australia & overseas"

The Ultraflow heavy duty dewatering pumps are used in many diverse applications including pit dewatering – they can be lowered into the pit or suspended under pontoons.

"They can also be installed in a tank or dam and used to fill up large water tankers very quickly.

"The Ultraflow dewatering pumps are also used quite extensively for truck wash and wheel wash applications – which all drain into a sump," Mr Crutcher said.

"They get a lot of sand, grit and abrasives and oils mixed up in together which our pumps are tough enough to handle."



"We can submerge the pumps up to 30m deep.

Ultraflow submersible pumps can achieve flow rates of up to 30,000l/min with centrifugal pump series, and up to 70,000l/min with axial flow pump series."

Mr Crutcher said there are many different types of impellers used in submersible pumps including open and closed centrifugal impellers, semi & full vortex, axial flow, turbine, single channel, cutter, grinder, helical rotor, chokeless, and non-clogging types.

"With many different options, the right impeller can be selected for the type of liquid being pumped," he said.

There is also the added advantage that the pumps never need to be primed, the motor is kept cool by the surrounding liquid and the liquid also



dampens any noise created by the pump.

All the submersible pumps are electric and General Pump Company can apply a range of coatings to the wear surfaces to protect against corrosion including: ceramic impregnated epoxy, silicon carbide impregnated epoxy, and tungsten coatings, which extend the life of the pump considerably when used for pumping liquids with concrete fines and the abrasive solids often found in sludges and slurries.

The Ultraflow stainless-steel pumps are available with three different styles of impellers: open, vortex and single channel.

"It's quite a unique product, and we stock them up to 11kW in Australia," he said.

"All these pumps can be used for wastewater applications with heads up to 55m and flow rates around 2300l/min.

"They're also quite tolerant to mild chemicals, salts and the varying pH levels found in wastewater."

Pumping stations

General Pump Company offers a range of Ultraflow sewerage cutter and grinder pumps which can be installed in a pumping station for mine camps.

"We all know that sewage, stormwater and wastewater cannot flow uphill without being pumped," Mr Crutcher said.

"There are many situations where sewage, stormwater and wastewater cannot drain away and must be transferred to a higher point, whether it be to a sewer main, stormwater pipe, easement etc."

"Our packaged pumping stations are an efficient solution where traditional gravity-reliant sewage and stormwater systems are not possible or are unavailable."

Ultraflow pumping stations generally include a reinforced fibreglass pump well, up to four submersible pumps, internal plumbing and valves, an electrical control panel and level switches.

There are many optional extras available that can be added to a pumping station – a guide rail system can be fitted to easily and safely install and remove the pumps from the pump well without personnel having to enter it or expose themselves to the liquid inside.

Systems are available that have an intelligent operations capability that allow clients to monitor the pump station performance remotely via the internet – allowing for early detection of any potential problems, bringing peace of mind to owners and operators.



Pump stations are available for sewerage, stormwater and wastewater applications.

"For mine camps, the pumping stations can collect sewerage and discharge it through to a treatment plant or another mine camp some kilometres away," Mr Crutcher said.

"This includes greywater, all the drainage from a campsite, trade waste disposal – essentially most liquid wastes."

Multiple applications

General Pump Company stocks a huge range

of submersible pumps, including sewage cutter, sewage grinder, positive displacement grinder, drainage, large drainage, heavy duty dewatering, vortex, axial flow, all stainless steel and more.

"With so many different types to select from, we are sure to have the right submersible pump for you," Mr Crutcher said.

Ultraflow has also become a highly respected and trusted brand in the pump industry with demand for the products growing consistently and continuously for more than 20-years.

"Ultraflow pumps, pumping systems and associated accessories have been designed, manufactured, and tested using the wealth of 'hands on' experience gained since General Pump Company began in 1975," Mr Crutcher said.

"Our many years of experience in the pumping industry allows us to provide you the exact pump or service you need, at a price you can afford," he said.

MORE INFORMATION: General Pumps | 1300 662 787 | sales@generalpumps.com.au | www.generalpumps.com.au



**High Quality**

**Superior Reliability**

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**Fully Supported**





General Pump Company has been providing solutions **since 1975**. We are proud to be a trusted stockist of Ultraflow Submersible Pumps and Ultraflow Packaged Pumping Stations.



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Diesel driven stainless steelpumps are perfect for corrosive environments.

A bolt from the blue

NATIONAL

BLUE Hire is a pump hire and project specialist, servicing the needs of industry, mining, marine and agriculture throughout WA.

With customised pump solutions from construction standpipes to diesel-driven stainless-steel acid pumps, the company has all the heavy-duty equipment you need.

Blue Hire director Byron Ynema said while the company offers both diesel and electrical pump hire options, it specialises in diesel-driven stainless steel pumps suited for corrosive mining applications and environments.

"Our equipment is reliable and can be adapted to any project requirements," Mr Ynema said.

"If a client has a feed pump that runs from a dam to a plant and the equipment fails, for whatever reason, we'll come and put in machinery matched to that same duty.

"Reliability is a huge factor these days – you can't have gear breakdown and run around trying to fix it – it's got to be working all the time.

"So, we make sure that all our gear is already at a high standard, so that when it leaves our yard, the clients know they're going to get equipment that's going to work."

The company's diesel-driven equipment includes more than 50 Sykes pumpsets, mine pit dewatering pumps, high flow, high head water supply, industrial process backup systems, standpipe pumps, turkey's nest alternatives and slurry pumps – all available on either skid or trailer mount, and between 50-600hp.

"Depending on the application, we can change the specifications to suit," Mr Ynema said.

"Recently a BHP site had no power to its cooling towers, so we put in about 1200hp all up to supply



Blue Hire remanufactures pumps to include an automated 'smart panel'.

the cooling towers about 1000l/s at 50m head.

"We also have our XH200 models that can deliver 200l/s at 180m head or the MH300 that will deliver over 500L/s.

"All hoses are specced to suit each application and we will advise, based on our experience, the most efficient fittings and configuration to deliver the best result for our client.

"For example, in slurry applications, we have to calculate flow rates and pipe diameters to take into account settling velocities to keep solids suspended in the liquid for complete transfer.

"We can tailor equipment to suit and to be technologically smart, our systems are capable of ramping up or down as your project needs change."

Smarter equipment

Blue Hire specialises in the remanufacture and rebuilding of pumps that are fully remote



capable, GPS tracked, and automated, allowing companies to remotely check in on them and even integrate them completely into a site-based telemetry system - running it like a process pump on site.

"All of the machinery that we build today has a smart panel and, in reality, we don't even begin to use what they're fully capable of," Mr Ynema said.

"We build big stainless-steel pump heads which are a lot better for corrosive environments and a lot longer-lasting in the saline water that we find on the bottom of a lot of the mine sites below the water table.

"And we also can build in electronic pressure sensors and electronic flow meters which are bolted onto and plumbed into the smart equipment."

The main benefits of the smart pumps include setting up specific parameters to ramp up or down and respond to error signals.

"It's all about controllability and accountability," Mr Ynema said.

"Some of our machines have burnt millions of litres of diesel and if you can shave 10 or 20c off by smarter equipment that is more efficient, and well, that's a lot of money saved."

The inbuilt controls mean the pumps can idle or cut off completely and then ramp back up as operational requirements increase.

"This ability is especially important considering the cost of fuel, because most of this equipment runs 24-hours a day, seven days a week for years on end," Mr Ynema said.

"It pays for itself in a heartbeat and saves sites money in the long run."

Mobile dewatering equipment

Blue Hire also utilises a modern range of pumps to undertake surface dewatering operations throughout WA.



Trailerised pumps allow for mobile pit dewatering.

Surface dewatering is the removal of groundwater from the pit floor or sumps to facilitate safe and dry mining operations.

“We have a couple of contracts with sites where we do all the pit dewatering,” Mr Ynema said.

“On smaller mine sites the pumps come out every blast and go back in after every blast, because you can’t have permanent infrastructure at the bottom of the pit.

“Consequently, a lot of our pumps are trailerised, so clients can just pull it in and out as required.”

The company offers the full service of mobilisation, installation, operation, fuelling and ongoing maintenance and monitoring of these

systems, to ensure they are operating perfectly and letting the client get on with their job - mining.

Endless applications

Blue Hire also maintains a number of specialised excavator and crane-mounted slurry pumps, as well as long reach excavator hire for cleaning ponds, lakes, process dams, stormwater drains and marinas.

In the oil and gas space, Blue Hire offers bulk water hydrotesting operations of pipelines and vessels throughout the state using specially modified water-winning pumpsets, in addition to high pressure squeeze pumps to deliver quality hydrotesting operations to clients.

“We are one of the most experienced



hydrotesters of large diameter, long length HDPE pipeline systems,” Mr Ynema said.

“We bring in depth and real-world knowledge to the table, filter the complexities of testing and get on with the job.

“In addition, we have high flow pumping systems and filter sets to ensure that once tested and proven, the pipeline is fit for operation straight away.”

Blue Hire has the equipment and expertise to provide clients with smart and efficient solutions for their pump, dredging and dewatering needs.

“We have experience across a range of sectors, and you can rely on Blue Hire to help you achieve your outcomes in the most efficient way possible,” Mr Ynema said.



Blue Hire can customise pumps for any application.

MORE INFORMATION: Blue Hire | 0400 093 338 | byron@bluehire.com.au | www.bluehire.com.au





BLUE HIRE

Blue Hire is a West Australian owned and operated business, committed to providing a unique range of pumping solutions, as well as other speciality hire equipment for a diverse range of applications.

Our custom built, heavy duty diesel pump sets are built to high standards for the industrial, mining, engineering and marine industries. The equipment can be modified to suit individual projects as required.

We specialize in project works requiring customized solutions to any pumping application. This includes mine dewatering, hydrotesting, oilfield services, offshore pumping operations, industrial process integration and specifically not off the shelf applications.

We are a dedicated and experienced team, with a strategic range of equipment available. We here to support and attend to our clients requirements and help with emergencies if they arise.

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Protection from arc faults

NATIONAL

AN arc fault can be spontaneous, due to a breakdown of the conductors phase to phase or phase to neutral; ground or inadvertently bridging electrical phases; or contacts with a conductive object.

The result is a sudden release of electrical energy (incident energy) through the air and a massive electrical explosion.

The arc flash is the blinding light and intense heat that can result.

In the arc it could be many thousands of degrees in temperature more than four times hotter than the surface of the sun, and in the plasma cloud (ionised gas) that erupts, it could reach around 5000°C.

The arc blast is the pressure wave that contains toxic hot gases, with smoke, molten metal and flying debris ejected in the blast.

Injuries can include minor to third degree burns, blindness, hearing loss, severe lacerations, cardiac arrest and in the worst case be potentially fatal.



An arc flash can be many thousands of degrees and cause injuries from minor burns through to severe lacerations and even blindness.

Incident energy and personal injury is increased by any or the combination of any of the following factors:

- higher fault currents
- longer protection clearing times
- shorter distances from the arc fault

In the general course of work, electricians are required to perform a variety of tasks in a single day.

If the task involves working near energised parts, a risk assessment should be completed and appropriate control measures implemented before starting the task.

Where possible, evaluating and eliminating the risk entirely is always the best course of action.

Control measures taken could be, for example, shutting down an entire switchboard to avoid working near energised parts.

Incidents of arc faults do continue to happen and are a real risk to workers performing live testing, fault finding or inadvertently working near exposed live parts.

These may be caused by inexperience, the site or equipment to be worked on could be unfamiliar, boards can be incorrectly marked, fatigue, the entry of unauthorised persons, time pressures or any number of unforeseeable hazards.

Electrical factors can also contribute, such as incorrect isolation of circuits, faulty test equipment, undischarged capacitors or unidentified energy sources.

One product worth considering is the EFO PU240 battery-powered proving unit that

outputs a simulated 240V AC waveform to provide a safe and reliable method of checking the correct functioning of multi-meters; and two-pole voltage indicators before and after use as advised in the Safe Working Practice guidelines for electricians.

When "proving for dead" it is an essential part of the workers' procedure that test equipment is operating correctly.

Mechanical factors may be present, such as the unplanned movement of equipment, falling objects or trip hazards.

Personal protective equipment (PPE) is the lowest in terms of importance in the hierarchy of arc flash control measures (i.e. elimination, substitution, isolation, engineering, administration, PPE) but, as the last line of defence, it is still critically important.

Choosing the correct PPE and level of protection is essential.

The following guidelines and standards listed below can assist with making that determination.

Specialists may also need to be called in to correctly evaluate the potential incident energy levels, risks and to advise on control measures.

Protection for hands

Leather gloves should be worn over insulated gloves that offer fire resistance and protect the



An arc flash over-glove.

A leather over-glove.



rubber gloves.

There are now flame-resistant materials for gloves: the Powerflex is an example of a glove which is extremely comfortable and allows great dexterity of the fingers, offers a high cut protection, secure grip and is rated HRC2 12.0 cal/cm².

The materials used in the glove are inherently flame-resistant even after washing.

Protection for arms, torso and legs

ENA NENS 09-2014 concludes that plain cotton is not suitable for general clothing for electrical workers as the cotton fabric can ignite in the event of an arc fault.

Workers should wear a minimum of 4 cal/cm² or higher arc rated fire-resistant clothing long sleeve shirts and trousers to provide a level of PPE Category I.

Arc flash coveralls can be worn to increase the protection to PPE2 or greater than 8 cal/cm².

The next consideration would be full arc flash Kits for low energy risks. The EFO Arc Flash Kit HRC2, which contains a face shield, balaclava, coverall and glove kit and hi-vis carry bag, provides a convenient solution to PPE2 level protection.

Higher energy risks require switching suits, which can be rated up to 40 cal/cm².

PPE Categories

To understand what cal/cm² represents in terms of heat, the common explanation is 1 cal/cm² = holding one match under your finger for one second; similarly, 8 cal/cm² = holding eight matches under your finger for one second. Reported injuries resulting from arc flash often involve burns to the hands, face and upper body so following are some PPE options covering these areas.

- **AS/NZS 4836:2011** Safe working on or near low-voltage electrical installations and equipment Section 9, Table 9.1 and Table 9.2 provide guidelines of the selection of personal protective equipment in relation to the type of work performed and the potential current present at the work area.

- **Electrical Arc Flash Hazard Management Guideline March 2019**

Australia Energy Council (AEC)

ENA NENS 09-2014

National Guideline for the Selection, Use and Maintenance of Personal Protection Equipment for Electrical Arc Hazards

Energy Networks Australia

IEEE 1584 & NFPA 70E

Standard For Electrical Safety in The Workplace is the American Standard and has been commonly used and referred to as a resource for assisting in selecting appropriate PPE for electrical workers within facilities with large diverse electrical systems, determining approach boundaries and calculating the incident energy (potential calorie rating)



The EFO Arc Flash Kit HRC4 can be supplied in various configurations of bib and braces and short jacket or a long jacket and leggings, full hood or lift front face shield to PPE4 level protection.

Protection for the face

Face shields can consist of a fully enclosed hood or the increasingly popular helmet with a lift front.

Some manufacturers have improved the colour recognition and general visibility to allow workers to correctly distinguish colours through the arc face shield.

Anti-fog and anti-scratch coatings have also been developed.

EFO has just released a range of LV and HV wall-mounted rescue and operators kits.

For permanent installations in manufacturing industries, mines and utilities that have repeat tasks performed, the water and dust resistant wall-mounted safety cabinet allows the correct operators PPE and the observers rescue equipment to be readily available at all times.

Often the task required, such as switching, can be performed quite quickly and the convenience of having the PPE on hand to utilise makes compliance easier.

Standard configurations contain a rescue kit grab bag and operator's face shield and insulating mat.

Additional items can be added, such as coveralls, glove kits, switch board drapes and a balaclava.

MORE INFORMATION: Electrical Factory Outlet | 07 32094333 | www.electricalfactory.com.au



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Once field tested, the new WG series engines are inspected and evaluated by Kubota's engineers.

Kubota ignites the spark

NATIONAL

AUSTRALIA is the largest gas exporter in the world, and when the market asked for a sub-4L reliable engine to power the gas well heads, Kubota's engineers set to work to develop a spark ignition natural gas engine.

Kubota Australia OEM engine application engineer Alex Pedemont said the new WG series engines have the DNA of a diesel engine.

"Based on diesel engine derivatives, the WG range share the Kubota diesel engine block, premium timing gear train cam and valve systems and cast-iron cylinder heads," Mr Pedemont said.

"The WG range is built stronger than its automotive counterpart and the feature that really makes it stand out is the coil-on-plug ignition system.

"The automotive system is a distributor where you have spark plug leads that run across the engine whereas the coil-on-plug ignition system is directly over the spark plug – so there are less components and less chance of failure."

The ignition system eliminates spark plug wires and is a water-resistant system that starts easily and runs smoothly, with sensors managing the spark.

"The engines have knock sensors which detect detonation through mechanical vibration in the engine block, cylinder or head," Mr Pedemont said.

"The sensor sends instant feedback to the ignition system in order to retard spark, reduce knock intensity and therefore protect the engine.

"Also, the electronic control unit (ECU) can be programmed on site with an engine calibration file (CAL) to match fuel input."

The replacement intervals on the spark plugs are 2000 hours, and Mr Pedemont said the new engines provide a longer life cycle than the automotive engines with the added benefit of being cheaper to power and maintain.

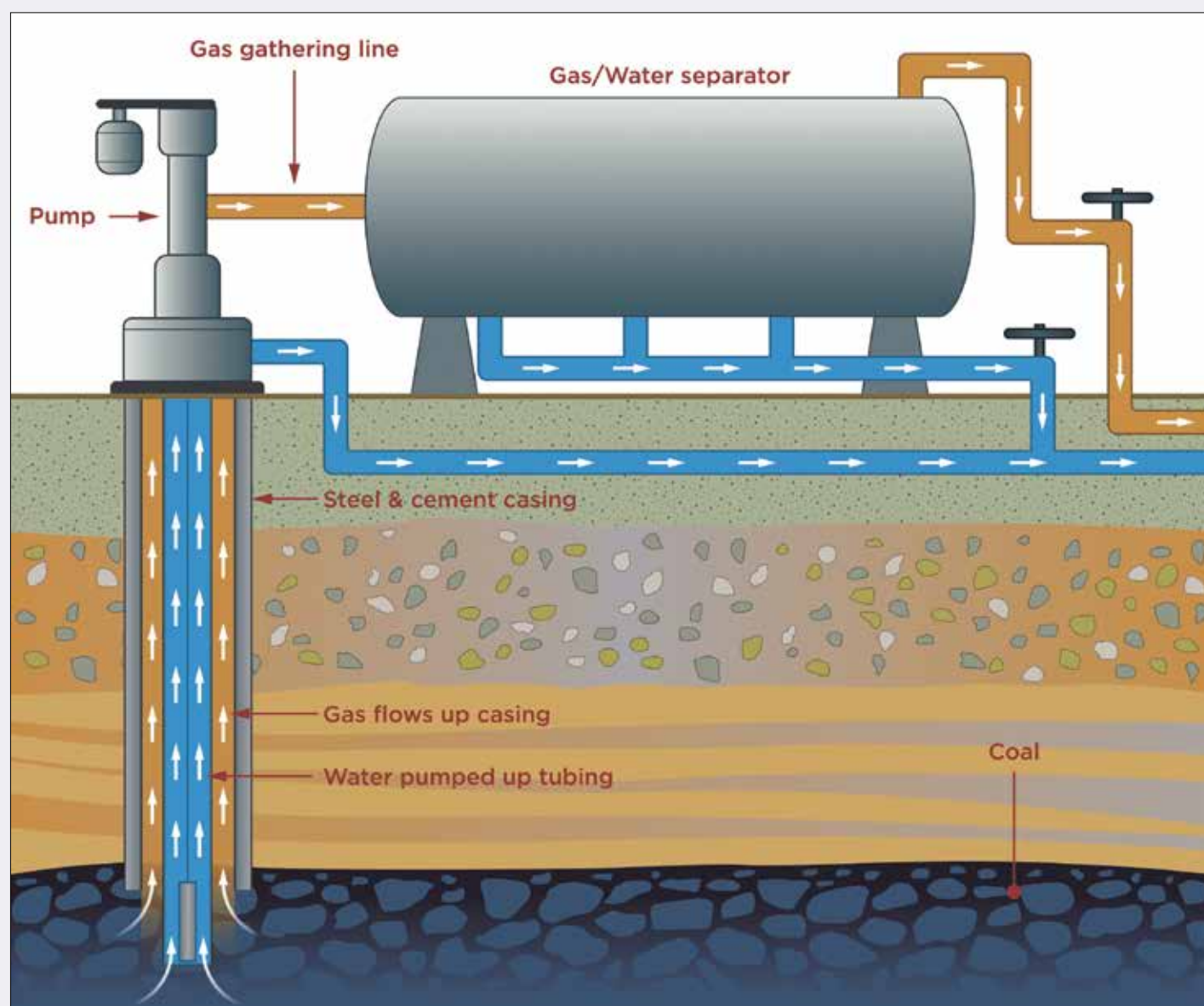
"With less moving parts than the automotive engines currently in use, the WG engines advantage is clear, less maintenance, less downtime," he said.

"That's great news for operators who can expect continuous and uninterrupted production."

Natural gas engines

The new family of Kubota engines have similar components to the company's reliable diesel counterparts and are designed to run on natural gas.

Kubota have targeted that these engines to power wellhead application using generators and hydraulic power units.



Typical coal seam gas extraction process.

The new engines provide a sub-4L option to the automotive engines currently running pumps at gas wellheads.

Configured to be fuelled by natural gas, Kubota's WG engines also provide gas field operators with an efficient, low fuel usage engine that increase the profit of the wells for the operators.

Mr Pedemont said the engines are perfect for gas wellhead operations and because they are smaller, the engines are key to wellhead profitability.

"The power demand to extract the gas at the wellhead decreases over time, and that is where the smaller engine comes into service," he said.

"Cheaper to run, easy to install and maintain, the Kubota engines have easy access points and testing has shown the engine to provide continuous uninterrupted power."



The WG3800 S1 engines are based on V3800 diesel [C1] engines.

After field testing at different speeds on gas wellheads, engineers from Japan inspect and evaluate the engines - demonstrating the importance of the WG natural gas market and Kubota's dedication to making a first impression that lasts.

"The engineers in Japan have learned that the engines are capable to withstand extremely harsh environments and a broad range of wellhead gas," Mr Pedemont said.

"They are simply built stronger to last longer in the harsh Australian environment."

Key features

- Coil-on-plug ignition
Individual coils for each spark plug deliver improved control and durability.
- Runs on natural gas
The diesel engine block is built on the footprint of the tried and trusted diesel counterpart.
- Front gear train with heavy duty valve timing control
Delivers heavy duty valve timing control and zero maintenance.
- Premium engine valves with robust cast iron cylinder head
Valves made of high temperature alloys to provide a longer life cycle and are built to operate in Australia's harsh conditions.
- Knock sensors
Programmable on site to match fuel energy levels, the knock sensors regulate spark ignition to provide superior engine protection.

WG2503-N-E3 AND WG3800-N-E3 SPECIFICATIONS

Emissions:

Kubota's WG series engines have been designed to comply with EPA Tier 2/CARB Tier 3 + Stage V (EU Stage V for the WG2503-N-E3 engine).

Fuel Flexibility:

The installation compatibility that exists between spark-ignition engines (SI) and compression-ignition engines (CI) is convenient for customers who need fuel flexibility for their products. The Kubota WG3800 includes gasoline, LPG, and natural gas versions, as well as dual fuel version (gasoline and LPG) to meet customer needs.

Durability and reliability:

Kubota's WG3800 SI engines are designed based on Kubota V3800 diesel (CI) engines, which are known worldwide as reliable industrial engines and feature combination chambers, as well as fuel and ignition systems dedicated for SI engines.

The WG2503 SI engines are designed after Kubota 03 Series diesel (CI) engines. While keeping the same footprint as the V2403 diesel, they offer performance similar to that of our turbo diesel engines, which are known worldwide as reliable industrial engines.

The WG series engines offer very low vibration and extremely low noise.



The WG2503 series have the same footprint as the V2403 diesel engines.



MORE INFORMATION: Kubota | 1300 582 582 | www.kubota.com.au

A GAME CHANGER!
Kubota WG Natural Gas Engines

Coil-On-Plug Ignition system

Individual coils for each spark plug delivers improved control and durability.

Electronic Control Unit (ECU)

Programmable on site to match fuel energy levels. Knock sensors regulate spark ignition to provide superior engine protection.

Diesel Engine Block

Built on the footprint of the tried and trusted diesel counterpart, set to outlast it's automotive competition.



Cast Iron Cylinder Head

Built to operate in Australia's harsh conditions.

Premium Cam and Valve System

Valves made of high temperature alloys to provide a longer life cycle.

Front Gear Train With Heavy Duty Valve Timing Control

Delivers heavy duty valve timing control and zero maintenance.

Available in 42 & 65 kW options

WG3800-N-E3

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**Meet Australian Standards
& EPA Licence Conditions**



*Proudly Designed &
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Environdata's Australian-made weather stations and **WeatherMation LIVE**, weather data management and alerts system, provides your mine with a robust, reliable weather monitoring and alert solution.

Ideal when you need to alert your chosen staff about Heat Stress, Lightning, High Winds, Rainfall at remote sites or along access roads at night.

For detailed information about our Weather Stations and their specific applications for the Mining industry go to www.environdata.com.au and click on Industry Applications.

<http://www.environdata.com.au/our-industryapplications/mining-weather-stations>

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