

# COAL

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## New cost-competitive, large-scale filter press delivers 93% availability and 95% water recovery

The newly released AFP2525 Automatic Filter Press from FLSmidth delivers high availability and efficiency, with the lowest cost possible – in fact, the lowest cost per ton of production in the industry. To keep mines operating at its highest levels, all components of the AFP2525 Automatic Filter Press are designed for quick and easy maintenance.

We know that when treating tailings at high volumes, even the smallest process disruptions add up. That's why we focussed heavily on ease and speed of maintenance – for instance, the AFP2525 provides fast plate-pack removal, while cloth change and plate maintenance happen outside of the filter, ensuring maximum efficiency and safety while the filter is operating.

"We are delighted to launch this large-scale, cost-competitive filter press to the mining industry. With

a combination of fast and safe maintenance, lower costs and a minimised environmental footprint, the AFP2525 immediately becomes the leading solution in its area. It meets growing customer demand for fast and efficient water recovery and illustrates our determination to meet our MissionZero ambition and help mining move towards zero water waste by 2030," comments Mikko Keto, Mining President at FLSmidth.

As well as the lowest cost per ton of production, the AFP2525 also delivers the lowest cake moistures and the highest production rates – 300 tph from a single filter; 7,200 tpd. The AFP2525 is also highly durable and long-lasting due to a maintenance-friendly, robust design so it is built to last for the life of the mine and beyond.

Ultra-efficient water reclamation allows miners to recycle and reuse a



significant amount of water in their operations, reducing the need for fresh water intake. This cuts both water-sourcing and wet tailings management costs for the mine site, while also reducing environmental footprint.

Why does the AFP2525 provide a step change in this area? Firstly, the AFP2525 has the highest availability in the industry – the filter is easy to maintain, which means costly downtime is minimised. Secondly, the filter is exceptionally efficient and operates at high capacity – i.e., it

maximises water recovery and is suitable for large-scale mines.

Additionally, fast filtration rates and short mechanical times minimise the filter cycle time; this combination of speed and reliability result in the lowest cost per ton in the industry. With the AFP2525 Automatic Filter Press, miners can expect an average of 93% availability and up to 95% recovery of process water.

The AFP2525 Automatic Filter Press is a key solution in FLSmidth's MissionZero ambition to enable mines to eliminate water waste and emissions by 2030.

## Profits fall along with prices

The falling coal prices in the first half of the 2021 financial year have seen ASX-listed Whitehaven Coal swing to a loss in the six months under review.

Whitehaven reported a net loss after tax of A\$94.5-million for the six months to December, compared with a net profit after tax of A\$27.4-million for the previous corresponding period.

Earnings before interest, taxes, depreciation and amortization declined by 79% over the same period, to A\$37.2-million, reflecting the lower average achieved coal price of A\$80/t, compared with the A\$108/t

achieved in the previous corresponding period.

"The impacts of subdued pricing on seaborne coal markets were a key feature of the first-half results as Covid-19 impacts on economic and industrial activity continued to be felt," said Whitehaven MD and CEO Paul Flynn.

"The business responded strongly to these challenging market conditions, including through improvement measures that delivered meaningful cost reductions and greater operational efficiency, offsetting price headwinds to some extent."

Run-of-mine (RoM)

production during the six months under review increased by 28%, to 7.7-million tonnes, while saleable coal production was up 10% on the previous corresponding period, to 7.1-million tonnes.

Total coal sales for the period under review increased by 3%, to 8.7-million tonnes, while revenues declined by 21%, to A\$699.3-million. Unit costs per tonne for the period were also down by 8%, to A\$70/t.

"We have closed out the first half of 2021 with strong levels of liquidity, strong banking support and we are focused on retaining

debt against the backdrop of the improving price environment," said Flynn.

"With future savings targets identified and coal markets rebalancing in response to demand signals, we are optimistic about achieving stronger outcomes through the second half."

Whitehaven's RoM production targets have remained unchanged at between 21-million and 22.5-million tonnes for the full 2021 financial year, while its managed coal sales targets have also remained unchanged at between 19-million and 20-million tonnes.





## Aurizon anticipates export growth

Aurizon Holdings is confident of the long-term demand for Australian coal from international markets despite a 10% drop in exports during the second half of last year.

Australia exported 183 million tonnes of coal during the period, comprising 86 million tonnes of metallurgical coal and 97 million tonnes of thermal coal, down 6 and 12%, respectively, on the prior year.

Aurizon also experienced interruptions to its export contracts with Australian coal miners due to COVID-19-related disruptions to steelmaking, particularly in China.

The company was unable to retain its 3.2 million tonne a year export contract with Stanwell Corporation, which ended in December 2020, and is also saying goodbye to a 5.2 million tonne per annum contact for New Acland this

December.

This caused Aurizon's coal revenue to drop by 8%, or \$73.2 million, to \$644.5 million.

Aurizon managing director and chief executive Andrew Harding reiterated that the company remained confident for long-term demand for Australia's high-quality coal.

"Steel production has now resumed to pre-COVID levels, though the challenging trade

environment with China will continue to impact near-term export volume," Harding said.

"We expect continued coal growth export of 1% per year over the next decade, supported by steel-intensive growth in India and a relatively young fleet of coal-generation power plants in Asia."

India was Australia's largest metallurgical coal export market during the second half of last year, with an export volume of 27 million tonnes, followed by Japan at 16 million tonnes and China at 12 million tonnes.

Japan topped Australia's thermal coal export market with an export volume of 37 million tonnes during the same period, with South Korea coming in second at 16 million tonnes and Taiwan at 10 million tonnes.

Aurizon's iron ore transport increased by 2.4 million tonnes, thanks to commencing new contracts with Rio Tinto and Mineral Resources during 2020.

## Domination of India's energy generation until 2040

Coal is forecast to hold its top position as India's largest single source of electricity in 2040, despite the rising use of renewable energy, according to International Energy Agency (IEA).

In a report titled India Energy Outlook 2021, IEA noted that India's energy use had doubled since 2000, with coal, along with oil and solid biomass, meeting 80% of this demand.

Despite the Indian Government's plan to increase renewable energy sources, especially solar, from 52 gigawatts in 2017 to 175 gigawatts by 2021-22 and 275 gigawatts by 2026-27, it will still fall short of meeting India's energy needs.

India will be the country with the highest increase in energy demand in the world by 2040, driven by an expanding economy, population, urbanisation and industrialisation.

"As India recovers from a COVID-induced slump in 2020, it is re-entering a very dynamic period in its energy development. Over the coming years, millions of Indian households are set to buy new appliances, air conditioning units and vehicles," IEA stated.

"India is set to become the world's most populous country, adding the equivalent of a city the size of Los Angeles to its urban population each year.

The World Coal Association (WCA) expressed its support for the IEA's call to support India in building a reliable and affordable energy mix to meet the needs of its growing population.

"A pragmatic and collaborative focus from international governments, industry, and investors is now needed to ensure

that policies are in place to support the deployment of all clean technologies," the WCA stated.

"Our success as a global community in meeting our environmental goals will rely on a realistic and leveled approach."

Coal currently powers 70% of India's electricity generation, with solar accounting for less than 4%.



## Czech mining regions confronted with ‘hidden’ energy poverty

About 14 % of households in the Ústecký region face problems paying their heating bills, according to research.

While Czech coal mining regions supply heat and electricity to the whole country, local people are often unable to afford heating their own homes, researchers say. More broadly, Czechia is struggling to meet its EU reporting obligations on energy poverty, an issue common to other countries in Central and Eastern Europe.

About 14% of households in the Ústecký region – one of Czechia’s three coal mining regions – face problems paying their heating bills, according to research by the Prague University of Economics and Business (VŠE).

The second most affected region is Moravskoslezský kraj, another Czech coal-mining region. “Energy poverty is caused mainly by ineffective buildings and appliances, low incomes of households, high costs of energy and special needs of its consumers,” said Radek Tahal from VŠE.

At European level though, the Czech Republic is considered to be among the best in class when it comes



Czechs eyes coal phase-out by 2038

to preventing energy poverty.

Officially at least, that’s what the statistics show.

In 2018, 2.7% of the Czechs were reportedly unable to keep their home adequately warm while the European average is 7.3%, according to the EU Energy Poverty Observatory. And only 2.1% of the Czech population cannot pay their energy bills on time due to financial difficulties, while the EU average is 6.6%.

However, these numbers do not reflect regional disparities across the country, and may be underestimated, critics say.

Energy poverty affects less developed regions – especially coal mining areas – as well as the most vulnerable in Czech society: unemployed people, low-

skilled workers and those aged above 60.

However, the Czech government does not acknowledge the issue, according to Climate Action Network Europe, an environmental NGO.

“In the Czech National Energy and Climate Plan, energy poverty is discussed in a rather theoretical way,” CAN Europe said in a briefing published in December. The country has currently no clear definition of energy poverty, which complicates any attempt to monitor the phenomenon.

The Czech coal commission recommended to phase out coal by 2038. Environmental groups, who fought for 2033, were outvoted and walked out of the commission in protest.

## Mining innovation lab launched in Shanxi

An intelligent mining innovation lab was established in north China’s coal-rich Shanxi Province to facilitate the digital transformation of the country’s coal industry.

The lab in Taiyuan, the provincial capital, was jointly built by the Shanxi provincial government, Huawei Technologies Co., Ltd., and two local enterprises.

Huawei CEO Ren Zhengfei said that Huawei hopes to combine ICT with coal mining technologies to support the digital and intelligent transformation in the coal industry, realize a production model that features “fewer workers, greater safety, and higher efficiency,” and enable coal mine workers to “wear suits and ties” at work.

The lab will be staffed with 220 ICT and coal mining experts. Huawei plans to use the innovation lab as a place to continue innovating with partners and making breakthroughs in technologies that can be used in mining pits, including self-cleaning cameras, low-frequency wireless transmission, and risk prediction technologies.

The lab ultimately aims to help Shanxi’s mines reduce their numbers of workers by 60% in fully mechanized and intelligent mining scenarios, and reduce their numbers of workers entering mining pits each shift by 10 to 20%, it said.

“It’s like Microsoft providing services for aircraft engines,” said Ren. “Huawei provides services for mines, airports and docks.”





A photograph of two miners in an underground setting. The miner on the left is wearing a red hard hat, a yellow high-visibility vest over a red shirt, and has a headlamp. The miner on the right is wearing an orange hard hat, a blue respirator mask, and a red high-visibility vest over a red shirt. They are standing in a dimly lit tunnel with rough rock walls.

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## Is coal really pulling out of South Africa?

South Africa's formerly thriving coal sector has had a noticeable decline in net investments over recent years with statistics from the Minerals Council of South Africa reporting a R2-billion drop from 2010 to 2018.

As the future of the South African coal industry remains bleak and divestment from coal mining continues around the world, some of South Africa's giant coal miners have sold or are in the process of selling their operations.

Challenges facing the coal industry include an altered customer base for the country's coal exports as developed countries are moving towards renewable energy resources. There is a hostile funding environment for coal projects as financial institutions nationally and internationally are no longer investing in coal projects due to the pressure from environmental lobbying – a challenge too for newer coal miners with less financial muscle compared to major coal producers.

Litigation against some major coal developments is also setting a precedent for the future of investments in coal projects. In November 2020 the High Court in Pretoria set aside the environmental approval for the proposed 1200MW Thabametsi coal-fired power plant outside Lephalale in Limpopo because the minister of environmental affairs had failed to take into account the climate change impacts of the proposed coal-fired power station.

"The shelving of Thabametsi means that 136,1-million tonnes of carbon dioxide equivalent greenhouse gas emissions

will never enter the atmosphere; and 720,000 cubic metres of precious water per annum, for 30 years, have been saved – a crucial win in a highly water-scarce region of a water-scarce country forecast to be particularly hard hit as the climate crisis intensifies," said Nicole Loser, attorney and programme head for pollution and climate change at the Centre for Environmental Rights (CER).

"Significant air pollution that would have harmed the lives and health of residents of Lephalale and surrounds – already affected by Eskom's Medupi and Matimba power plants – has been avoided."

Speaking at the 2021 virtual Investing in African Mining Indaba earlier in February, the chief executive of one of the country's top five coal producers announced that his company would no longer be investing in its thermal coal assets.

Exxaro Resources' move from thermal coal forms part of its transition to becoming carbon neutral by 2050, said Mxolisi Mgojo. The company will continue to supply thermal coal to Eskom's Medupi and Matimba power stations in line with existing supply contracts.

"We understand that we are a fossil fuel company and we are migrating to a whole new sustainable development goal where we intend to drive the renewable part of the future, [while simultaneously]



Mpumalanga's coal fields: 'The result of major producers selling their coal assets is that the enormous environmental damage of the mines is left to smaller, less-resourced companies after much of the profitable reserve has been pulled out.' Photo © Daylin Paul/courtesy Life After Coal.

managing the balance between the current environment and the communities we operate in," said Mgojo, as quoted in Mining Weekly.

### Energy mix

Even with the declining coal sector, the government remains intent on keeping coal as a major part of the country's energy mix, and well into the future.

According to Eskom, one of the core pillars of its coal strategy is to procure coal for the life of Eskom's power stations, or the life of the coal-mining reserves.

In response to questions on what the future holds for Eskom's coal-fired power stations, the company's media desk replied that "coal requirements are underpinned by the anticipated demand and Integrated Resource Plan (IRP) assumptions into the future".

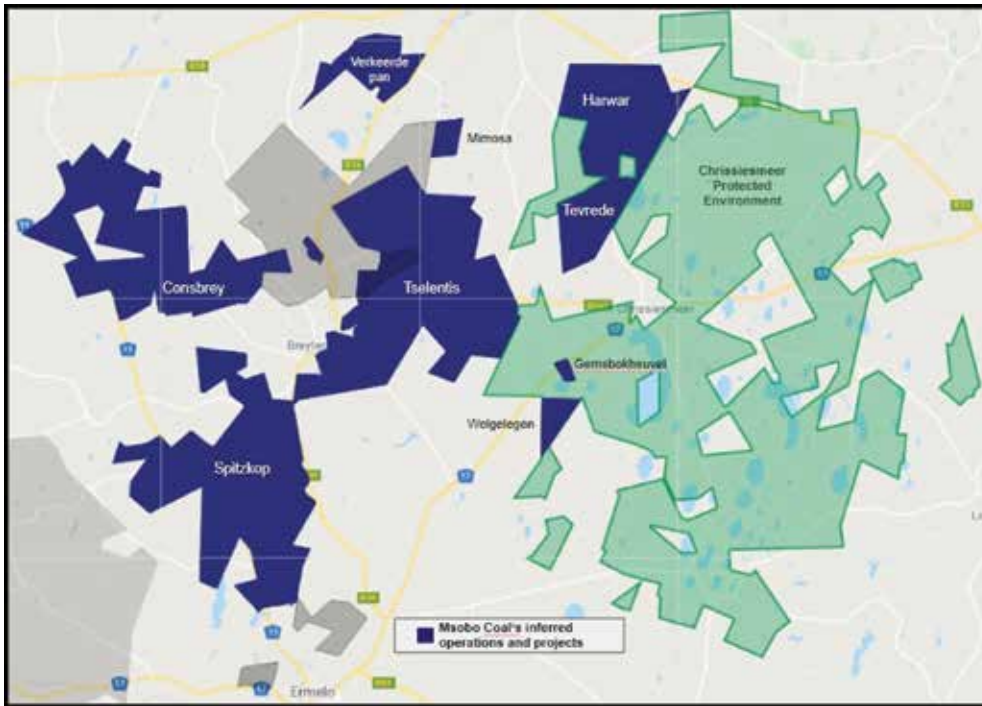
The IRP is a long-term electricity capacity plan which provides the country with a "living plan" of its envisaged energy mix up to 2030.

In response to questions about the transition towards a clean and sustainable



Duvha power station near Emalahleni: Eskom's strategy is to procure coal for the life of its power stations, or the life of coal-mining reserves. Photo © Mujahid Safodien/courtesy Life After Coal.





New order: Among the 82 new coal projects in exploration, feasibility study and/or construction phase in Mpumalanga are several in and around the Chrissiesmeer Protected Area. Map courtesy AmaranthCX.

energy supply, Eskom responded: “Eskom is embarking on a just energy transition plan which seeks to map out a pathway to decarbonising the grid, shifting to cleaner energy solutions and ensuring concomitant increase in sustainable jobs. We are in the process of detailing this plan with the respect to technology options, financing options and socio-economic development options.

“From a coal perspective, improving the quality of coal procured to acceptable levels could potentially assist with current emissions regulations as we transition towards a cleaner and more sustainable energy supply,” said the entity’s media desk.

### Smaller coal operations

Divestment by the larger companies has resulted in coal mines being taken over by smaller operators and some big companies that are not listed on the Johannesburg Stock Exchange.

One of Mgojo’s concerns about the disposal of coal assets by the major coal producers is that they could land in the hands of companies that may not comply with environmental, social and governance (ESG) requirements.

“A big concern [when] disposing of one’s coal assets [is that] they may land in the hands of parties who may not want to act responsibly in terms of how they treat the environment and other aspects of ESG,” Mgojo was quoted saying on the Argus website.

Paul Miller, director of mining supply consultancy AmaranthCX, echoes Mgojo’s concerns: “This is yet another blow to transparency within the sector as listed companies had stricter environmental, social and governance reporting and disclosure requirements,” he said.

According to Miller, the lack of proper follow-ups on the smaller operators opens up the possibility for them to get away with not doing due diligence

on basic environmental impact assessments and consultation processes with interested and affected parties.

An example of this was the application by Manzolwandle Investments to mine coal near the southern border of the Kruger National Park. Despite backlash from the surrounding communities, the small company was confident about its application being successful.

Manzolwandle initially failed to follow proper consultation processes and failed to notify all interested and affected parties about some public meetings held to discuss their proposed mining project. Its environmental consultants landed in hot water when it was discovered their background information document had been copied and pasted from other similar documents.

The application was rejected by the Department of Mineral Resources and Energy (DMRE) in October

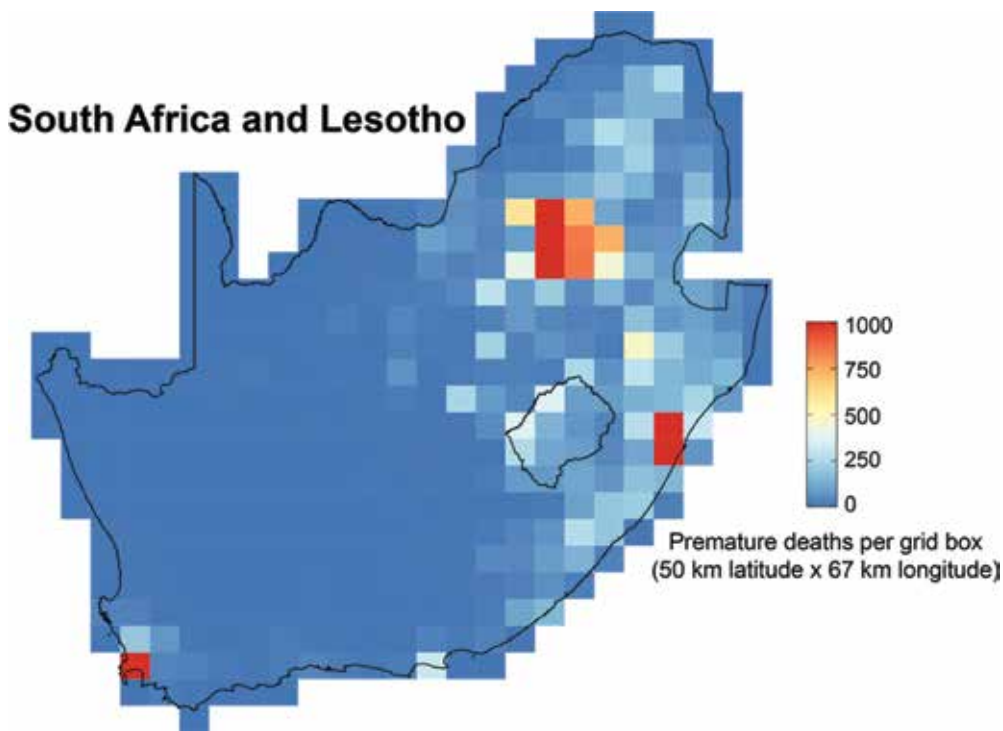
2020. Reasons for the rejection included that “the activity will conflict with the general objectives of the Integrated Environmental Management laid down in Chapter 5 of the National Environmental Management Act and that any potential detrimental environmental impacts resulting from the activities cannot be mitigated to acceptable levels”.

Speaking to MineAlert about this application in September 2020, the attorney for the communities objecting to the application, Richard Spoor, said there was a growing trend of DMRE awarding prospecting rights and mining permits to small entrepreneurs, especially around the Mpumalanga region.

Attorney and programme head of mining at CER, Catherine Horsfield, cautions that “when one has regard to the fact that coal assets are rapidly becoming stranded assets, one cannot avoid the inference that selling these assets is more akin to dumping them, and buyers should beware”.

According to Horsfield, the result of major coal producers selling their coal assets is that the enormous environmental damage of the coal mines is left to these smaller, less-resourced companies after much of the profitable reserve has been pulled out.

In response to questions on how they would ensure compliance, the DMRE responded: “When a company sells its mining rights or changes a control in a listed entity, the cessionary (buyer) must demonstrate the technical and financial ability that they will be able to carry through the



Pollution hotspot: Recent research found that in South Africa 9.3% of deaths can be attributed to air pollution from fossil fuels – about 45,134 people each year.

mining operations and comply with the compliance requirements of the existing mining right.”

Horsfield remarked that it is crucial “the financial provision needed for environmental rehabilitation is accurately assessed and properly collected by the DMRE. That financial provision needs to be set aside and ring-fenced before profits are paid out to shareholders.”

#### Coal data

Miller’s company recently mapped out 271 coal mines and prospecting operations across South Africa. His data shows there are currently 112 new coal projects in exploration, feasibility study and/or construction phase. Of these new projects, 82 are in Mpumalanga province, which is already heavily polluted due to mining and coal power stations.

According to the Global Energy Monitor (GEM), there are 23 new mines currently under development in South

Africa, an additional four mines undergoing expansions, and one being recommissioned after a period of care and maintenance.

“If all of these projects were to go into operation as planned, they would add 128-million tonnes to South Africa’s output, a 51% increase in current production,” said GEM energy analyst Ryan Driskell Tate.

The DMRE hosts an online directory of operating mines that shares brief details such as the mine code, owner, name and commodity type. The site also hosts the South African Mineral Resources Administration System (SAMRAD), the official administration system of mining applications and permits. However, recent attempts to access the portal proved fruitless, and calls to the number provided for the SAMRAD help desk rang unanswered.

Miller said the DMRE portals do not make information on new

prospecting applications and new coal projects owned by small operators publicly available. None of the new coal projects which are in their exploration and studies phase that he mapped out for AmaranthCX appear on the DMRE ‘Operating Mines Directory and because of the login issues with the SAMRAD system these could not be verified on it.

“It has become apparent that there are deep systematic issues with the SAMRAD system,” said Miller. “There is no one-stop-shop for information, and that is a general issue of [lack of] transparency.”

In response to questions from MineAlert about the inaccessibility of SAMRAD, the DMRE’s media desk responded that the system is available during working hours and is updated quarterly.

#### Life after coal

Life After Coal/Impilo Ngaphandle Kwamaladle, a joint campaign of civil organisations committed

to discouraging the development of new coal-fired power stations and mines; reduce emissions from existing coal infrastructure and encourage a coal phase-out; and enable a just transition to sustainable energy systems has had some notable successes towards these objectives.

Some milestones in the past year include the criminal prosecution of Eskom for violating permit limits and filing misleading information to authorities at its Kendal coal power station; and the proposed Thabametsi coal plant being set aside (following successful litigation by the campaign), with the proposed Khanyisa coal plant in Mpumalanga likely to follow.

“These victories have resulted in tangible benefits for health, climate, the economy and the environment,” said Loser.

A new study published this week by scientists at Harvard University, University College London and other universities found that air pollution from fossil fuel use is responsible for one in five deaths worldwide. This research found that in South Africa, 9.3% of deaths can be attributed to air pollution from fossil fuels – about 45,134 people each year.

“Coal is not on the way out, but we have certainly seen positive indications of a declining coal sector in South Africa,” Loser said. “Examples include the withdrawing by investors and financiers from proposed coal power projects, the adoption of policies by commercial lenders to restrict funding of coal projects, and diminishing allocations in South Africa’s electricity mix to coal power.”



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# Gas monitoring – is continual monitoring the answer?

**W**

Without delving into the past of early methods of gas detection in mines when the warm-blooded birds like canaries were commonly used, the industry is now implementing new technology in gas detection methods that may even see the return of the canary albeit a modern version that is highly unlikely to fall off its perch, this new technology to remotely detect toxic gases in underground mines is being trialled in Western Australia.

Sophisticated monitoring equipment and wireless sensor networks are now at the forefront of detecting gas and hopefully will save many unnecessary deaths. Many companies have now started producing automatic detectors which tells the exact concentration of the gases present in the mine environment, these devices are able to detect even a very small amount of gas percentage.

The key issue of research on wireless sensor networks is to balance the energy costs across the whole network and to enhance the robustness in order to extend the survival time of the whole sensor network. Zigbee technology is given preference over others such as Wi-Fi for establishing a wireless network because it provides a large range of coverage and less fluctuation in the signals

When a high potential incident occurs in a coal mine, the situation can quickly spiral downward to cause multiple loss of life, loss of equipment, loss of coal assets and major damage to a company's reputation. Without wanting to state the obvious, a fire in a coal mine is very difficult to control as the fuel (coal) is abundant and changing the ventilation may endanger the underground mine workers.

Such incidents in underground coal mine are an ever-present risk in the industry. However, the mine can be better prepared to take control of the situation earlier by having

some of elements of the mine designed with consideration of emergency situations, having some emergency equipment onsite and a comprehensive training programme in place.

It is a well-known fact that gas monitoring on its own will never prevent a mine fire or put it out if it starts. What it does offer is a means of identifying a problem early and subsequently an opportunity to take appropriate controlling actions. The earlier a problem is identified the better the chance of successfully dealing with the problem. The best chance of getting an early warning is by continual monitoring. The successful application of mine monitoring systems requires the setting of appropriate alarms that trigger effective remedial actions. The mine must also implement effective maintenance and calibration procedures to ensure reliable ongoing operation of the mine gas monitoring systems if they rely on them for this early warning or in fact use results to assess any control measures they might implement during an event.

Coal mines around the globe all implement different gas monitoring measures, however Queensland in Australia's underground operations, as a whole, has arguably the best gas monitoring systems in the world. Each mine utilises real time, tube bundle and onsite ultra-fast gas chromatograph systems. Queensland's mining legislation has specific requirements for mine gas monitoring but there is no requirement for all three techniques. Industry has however identified the need for all three and adopted this as a standard, resulting in over sixty thousand gas results collected each day. Automated monitoring systems are programmed to alarm for gas concentrations, gas ratios and explosibility. These alarms are then used to initiate predetermined actions to take control of the situation and prevent the compromise of safety to workers and the loss of resources. Dedicated software packages have been developed to assist in the interpretation of the large volume of results generated. The real time systems are used for



real time warning, essential for incidents such as belt fires. Tube bundle systems suit long term trending used for identification of the onset of spontaneous combustion or for the determination of explosibility during the routine sealing of worked areas. Gas chromatograph analysis is used to provide a complete analysis and provides results for hydrogen and ethylene, key gases used in the assessment of spontaneous combustion. It is also crucial during significant spontaneous combustion events and coal fires to use gas chromatography to determine the explosibility status of the underground atmosphere otherwise the severity of the situation is likely to be underestimated. This paper outlines the need for all three techniques for assessing the underground status and outlines advantages and disadvantages of each.

### REAL TIME MONITORING

Real time sensor systems (telemetric systems) are ideal for telling us what is happening now. The sensors must be located where the gas needs to be measured, and the measurement signal is sent to the surface. This means having multiple sensors underground, and that these sensors are exposed to the harsh underground environment which is not ideal for precise analytical measurements. This is not really a major problem as these systems are used to detect step changes, such as the onset of a fire, a sudden increase in a seam gas in the general body or reduction in oxygen. They offer real time warning and are the best system for identifying a sudden event such as a belt fire. The situation is reported when it happens. Generally, sensors included are methane, carbon monoxide, carbon dioxide, and oxygen. These types of sensors employed underground tend to have limited measuring ranges: carbon monoxide is often only capable of being measured up to 50 ppm, methane to 5 % and carbon dioxide to several percent. This range is fine while no problems exist, and indeed to alert the onset of a problem. But if a fire or other major incident involving generated gases occurs, these sensors may quickly reach full scale and be unable to return a true indication of the concentrations. Due to the environment these sensors are in and their characteristics, they are not as useful for long term trending as the other techniques. Most of these sensors require the presence of oxygen to work and are therefore unsuitable for monitoring areas of low oxygen concentration such as sealed or non-ventilated goafs. As each individual sensor needs to be calibrated regularly (at least monthly) they are not suited to being located for long term monitoring in inaccessible areas. Some of these sensors also suffer from cross sensitivities, as the reactions they rely on to give a response can be common to other gases found underground, such as carbon monoxide sensors being cross sensitive to hydrogen sulphide and hydrogen.

In the case of an explosion, it is likely that the real time monitoring system will be rendered inoperable, requiring other techniques for the determination of the status of the underground environment

### TUBE BUNDLE

Tube bundle systems draw gas samples from designated sampling locations underground to the surface through plastic tubes using vacuum pumps and analysed

sequentially using infrared and paramagnetic techniques. Gases measured are carbon monoxide, carbon dioxide, methane and oxygen. Because the analysers are on the surface, tube can be located in the goaf as once positioned there is no requirement to access the end sampling point (although sample filters and water traps located out bye will require maintenance). Tube bundle systems are suited to long term trending (provided the system is suitably maintained). Very good analytical equipment is available and can be housed in dedicated air-conditioned rooms on the surface with the samples dried and passed through particulate filters prior to entering the analyser.

Generally, systems are set up to measure oxygen, carbon monoxide, carbon dioxide and methane. Given their ability to measure carbon monoxide down to 1 ppm, the long-term stability of these analysers and the frequent sampling, this technique is best for long term trending of carbon monoxide, and carbon monoxide make, to identify a spontaneous combustion event. With respect to measuring range, it is normally only carbon monoxide that presents problems, with most systems capable of measuring to only 1000 ppm. Because methane and oxygen concentrations can be measured over all expected concentrations ranges, this technique is the best for automated monitoring of explosibility of an area so long as a fire or heating doesn't exist. This technique is best for monitoring explosibility during a routine sealing operation and for the early onset of any spontaneous combustion event.

To get this improved stability and analytical capability, the immediate availability of the results is sacrificed. The samples need to be drawn to the surface prior to being analysed, meaning the data being generated can be from samples collected from over an hour before. There is only one bank of analysers, so only one sample is analysed at a time. Depending on the number of tubes in the system and the programmed sampling sequence, each point may only be sampled once every thirty to sixty minutes. Add this to the time taken to draw the sample from underground, which may be as long as an hour and it is obvious this technique is not suitable for the instantaneous detection of an incident such as a fire. To minimise delay time in sample analysis, even when a sampling location isn't been analysed it is being drawn to the surface by purging pumps that just vent the sampled gas to atmosphere. As multiple points are drawn through these purging pumps it is important to balance the flows of each of the tubes to ensure that each of the tubes is being purged and not just the tube with the least resistance.

Because the analysers in these systems rely on infrared absorbance and paramagnetic attraction the gas matrix is not important, making this technique suitable for the analysis of gases from oxygen depleted areas such as the goaf. What must be remembered is that the measurement of oxygen using paramagnetic analysers is flow rate dependent and the flow from each tube must be balanced to be the same, including any calibration gases used. Otherwise, it is possible that two locations could in fact have the same oxygen concentration, but because of more resistance in one of the tubes, the flow through the analyser is at a lower flow rate and as such results in a

lower reading than a location with the same concentration but flowing through the instrument at a faster rate.

Too often the maintenance of the tubes is overlooked, and the monthly leak testing identified in Australian Standard “AS2290.3 Electrical equipment for coal mines – Maintenance and overhaul Part 3: Maintenance of gas detecting and monitoring equipment.” is not performed or not done as stated by the standard. If maintenance follows the method outlined in the standard, it is not only possible to confirm that no leaks exist but also determine an approximate time taken for a sample to reach the surface. The knowledge of the draw times of each tube is critical to adequately assess what is happening and how long ago it actually happened in an emergency situation.

In the event of a mine explosion the tube bundle monitoring system may still appear to be functional but the location from which tubes are sampling may not be the same, due to damage to the tubes. A good tube bundle system will include monitoring of the vacuum pressure in each of the tubes, so following an explosion this data can be used to determine whether a tube has been compromised or not. It is also useful during routine operation for identifying increased restriction or sudden leakage in a tube, both of which can compromise the operation of the system.

If the tubes are damaged and not providing any valuable information, it may be possible to make use of boreholes and connect new tubes to locations of interest as the surface equipment will still be operational (flame arrestors are installed at each end of the sampling tubes). Another major advantage of the tube bundle system is that it draws the sample to the surface and any locations requiring further analysis such as GC don't require any additional trips underground to collect samples. This is particularly advantageous in emergency situations when personnel may have been withdrawn from the mine and re-entry is prohibited.

## GAS CHROMATOGRAPHY

Gas chromatography, with regard to gas analysis, involves the separation of all sample components followed by their measurement on relatively non-specific detectors. Specificity is obtained by virtue of the separation process rather than detection. The use of a GC expands analytical capabilities to include gases crucial in the interpretation of spontaneous combustion events, particularly ethylene and hydrogen. The GC provides a complete analysis of the gases expected underground and is the only one of the three techniques capable of measuring hydrogen, nitrogen, ethylene and ethane. Determination of nitrogen is particularly important for determining oxygen deficiency in some spontaneous combustion indicating ratios. Similar to the tube bundle, problems exist with bringing the samples to the GC. The significance of time delays in getting results is dependent on what the results are being used for. GC is not going to be suitable for detection of a belt fire because of the time delay between collection of the sample and analysis, but the delay is acceptable for confirmation of other results or for evidence and trending of spontaneous combustion indicators.

The GC is not the best analytical technique for low concentrations of carbon monoxide; therefore, this technique is not the preferred method for determination of carbon monoxide makes nor low general body concentrations. However, during a significant spontaneous combustion event, fire or following an explosion, it is the only technique that will allow us to make an accurate determination of the explosibility of the underground environment. Like the tube bundle system, the gas matrix of the sample does not affect GC analysis. So long as appropriate calibration gases are available, this technique is capable of measuring gases at any concentration above their detection limit. This eliminates the problems seen with the other techniques, particularly for carbon monoxide concentrations greater than 1000 ppm.

The ultrafast gas chromatographs in use in Queensland mines allow the analysis of most the components expected underground in approximately 2 minutes. Since their introduction the number of routine samples analysed has increased significantly allowing the mine to build comprehensive background knowledge of the normal background composition of particular areas underground. This increased sampling and analysis regime has also increased the chances of identifying and deviation from what is normal and allows the early intervention to deal with any problems identified.

This increased speed of analysis is invaluable during emergency situations, particularly when assessing the safety of the underground atmosphere for re-entry or during re-entry by mines rescue teams. In these cases what makes this assessment more effective is that GC is onsite and can be operated by mine personnel. There is no delay in determining the status underground while waiting for external providers to arrive or transporting samples away from site for laboratory analysis.

## COMPARISON OF TECHNIQUES

Comparison of results obtained at the same monitoring location using the different techniques are shown in **Figures 1-7**. It can be seen In **Figure 1**, that oxygen measurements collected over 1 day showed much less variation in measurements made using the tube bundle than for the real time sensor which regularly varied by more than 0.3 %

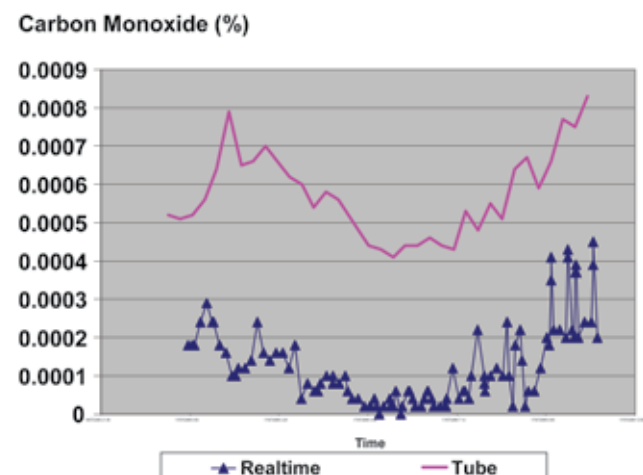


Figure 1: Real time vs tube bundle oxygen measurements.



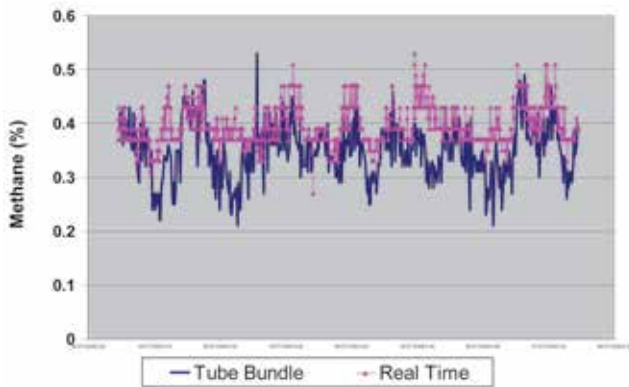


Figure 2: Real time vs tube bundle methane Measurements.

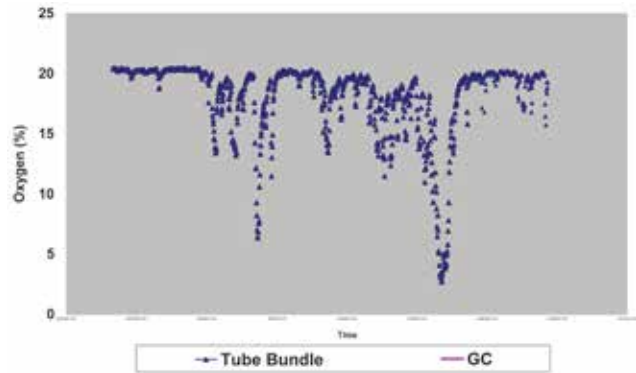


Figure 5: Tube bundle vs GC oxygen measurements.

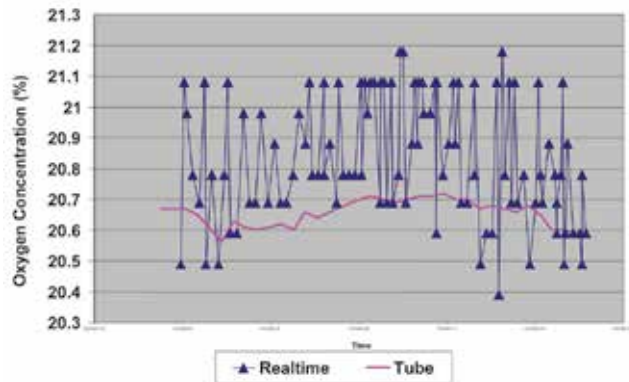


Figure 3: Real time vs tube bundle carbon monoxide measurements.

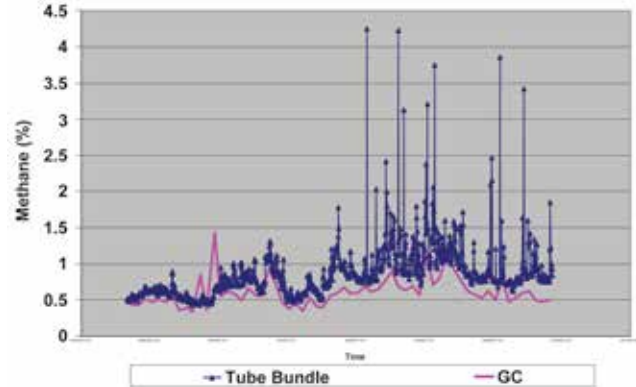


Figure 6: Tube bundle vs GC methane measurements.

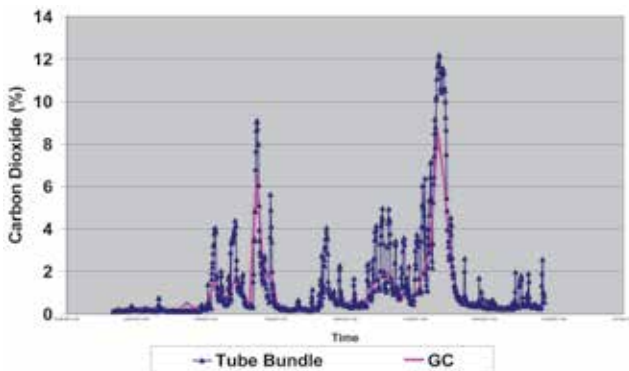
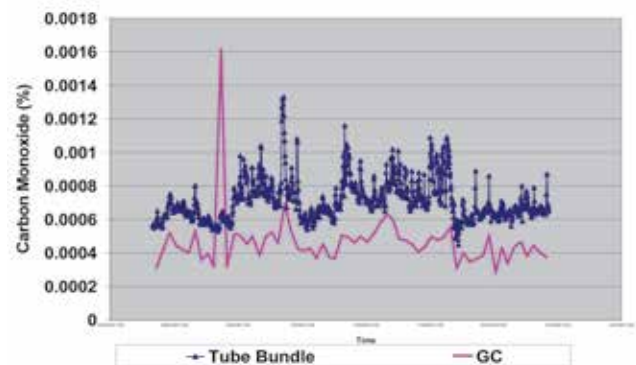


Figure 4: Tube bundle vs GC carbon dioxide measurements.



Figures 7: Tube bundle vs GC carbon monoxide measurements.

(absolute) between measurements. These variations make calculation of oxygen deficiencies used in ratios used for indicating /assessing spontaneous combustion, unreliable.

The methane results collected over 1 week in **Figure 2** show good correlation in the magnitude of methane and reasonable agreement with trends between the two techniques. Although the absolute carbon monoxide concentrations measured over 1 day in **Figure 3** were different, the trend over the 24 hours was the same for the two techniques. This difference may be as a result of a difference in calibration between the two techniques or as a result of sensor drift (most likely the real time).

Slight differences in absolute concentrations are evident and the difference in the amount of data collected by the techniques is significant, however the tube bundle data and GC data (**Figures 4-7**) show very good agreement over a

one-month period, reflecting increasing and decreasing trends. The difference in absolute concentration seen in **Figure 7** could be a result of a difference in calibration gases used to set the instruments response.

When differences exist in the concentrations measured using the different techniques it can complicate the application of pre-set trigger levels. It also means that data for trends should only be generated by one technique and not an accumulation of results. When trends from different techniques are viewed, they should indicate the same pattern. Often these measurement differences are related to the techniques themselves but some of the issues can be removed if calibration gases used for each technique are compared prior to being used to set instrument response.

Another strong point of real time sensors and tube bundle monitoring is that the monitoring points are at fixed locations,

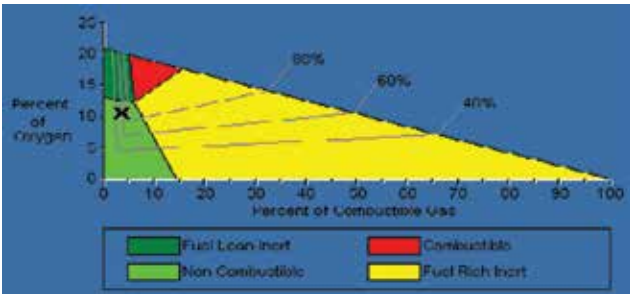


Figure 8: Sample 1 as measured by tube bundle.

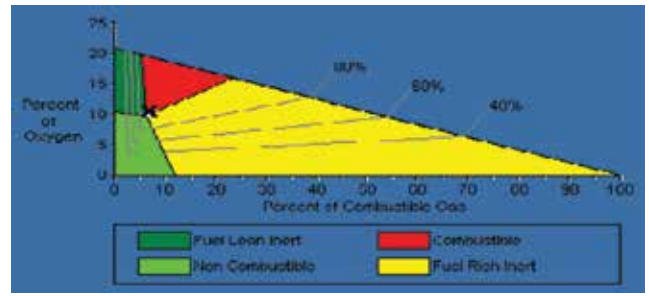


Figure 9: Sample 1 as measured by GC.

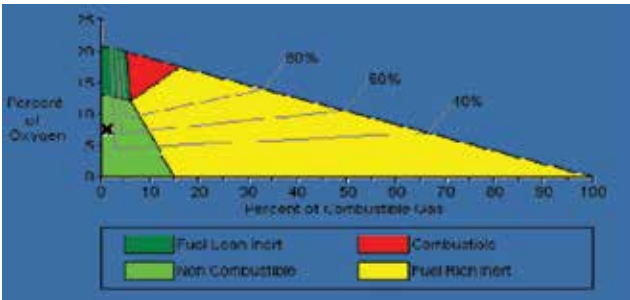


Figure 10: Sample 2 as measured by tube bundle.

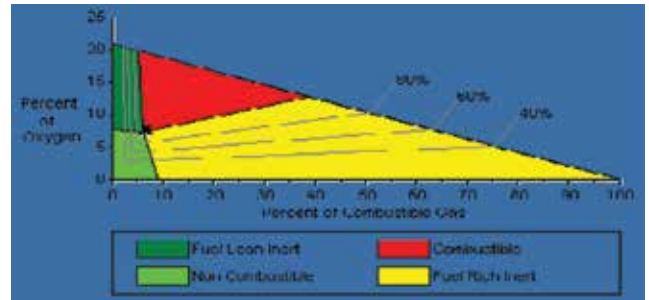


Figure 11: Sample 2 as measured by GC.

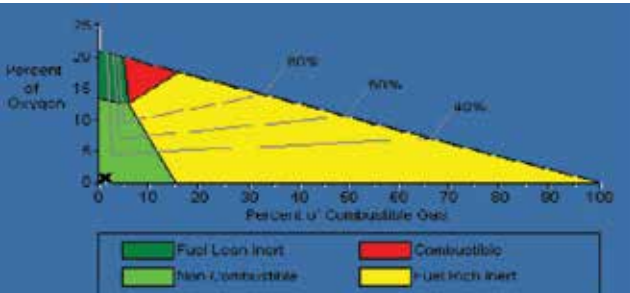


Figure 12: Sample 3 as measured by tube bundle.

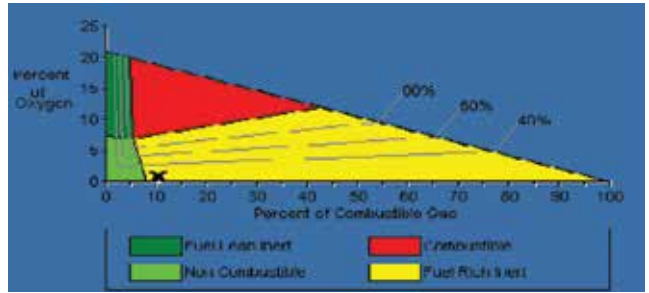


Figure 13: Sample 3 as measured by GC.

resulting in consistent automated sampling/measurement. When samples are collected underground for subsequent GC analysis, variations in results and trends can often be attributed to not collecting samples from exactly the same locations, or poor sampling techniques.

Gas chromatography is the only one of the techniques that actually measures nitrogen. As mentioned, nitrogen is included in some ratios used to indicate spontaneous combustion. These ratios are still calculated from measurements made from the other techniques but when nitrogen values are required, the nitrogen concentration is assumed to be the balance remaining and calculated by summing the measured components and subtracting from 100. This presents obvious problems with the reliability of such calculations and in critical situations, calculation of these ratios should be done using GC results. It is usual practice to confirm any abnormal results with one of the other techniques so prior to the need for any such comparison knowledge of how the mine's own individual systems compare is required.

### ASSESSMENT OF FLAMMABILITY

The need to perform a complete analysis by GC of atmospheres generated during coal fires or heating's is not only critical but the only option to obtain an accurate assessment of the flammability status of the underground environment. Failure to do so can lead to wrongly assessing the atmosphere to be inert, when in fact it could be explosive

or fuel rich, due to the generation of percent levels of carbon monoxide and hydrogen during mine fires. The presence of percent levels of these gases not only adds to the percentage of combustible gases present but also has a major influence in the lowering of the oxygen nose point (the lowest oxygen concentration at which an explosion can occur). **Figures 8-13** are examples of explosibility diagrams generated by GC analysis and tube bundle analysis of the same gas mix coming from heatings and mine fires. The composition of these samples is listed in **Table 1**. Because the tube bundle analysis does not include the hydrogen, and only includes up to 1000 ppm carbon monoxide, the percentage of combustible gas is underestimated, and the calculation of the combustible (explosive) zone is incorrect. In a fire or heating situation, without the GC analysis an assessment of the flammability of the atmosphere underground is likely to be unreliable and can indicate that the atmosphere is inert when in reality it is explosive. **Figures 8 and 10** represent explosibility diagrams generated using results from tube bundle analysis during advanced spontaneous combustion events. If tube bundle results were used in isolation without consideration to the presence of hydrogen or concentrations greater than 1000 ppm of carbon monoxide, then the atmosphere could be assessed as being inert and rescue/firefighting teams sent into the mine to deal with the situation. GC analysis of the same samples shows the atmosphere to be explosive (**Figures 9 and 11**) and considering the intensity of the spontaneous combustion an ignition source is likely to be present.



**Table 1:** Mine fire samples.

Gas	Sample 1	Sample 2	Sample 3
Hydrogen (%)	1.26	2.90	6.48
Oxygen (%)	10.45	7.51	6.48
Nitrogen (%)	78.85	78.45	73.17
Methane (%)	3.93	1.38	1.99
Carbon monoxide (%)	1.82	2.02	2.33
Carbon dioxide (%)	3.66	6.67	15.07
Ethylene (%)	0.013	0.048	0.1152
Ethane (%)	0.0179	0.108	0.0774

**Figures 12 and 13** represent a sample collected from an advanced mine fire. In this case the explosibility diagram from the tube bundle data shows the atmosphere to be non-combustible. This would mean that from this data only and with no consideration to the presence of hydrogen or carbon monoxide concentrations greater than 1000 ppm it would appear that it was safe to re-ventilate the area as there was not enough fuel for an explosion. The explosibility diagram generated by the GC data shows that the atmosphere is actually fuel rich, and the addition of oxygen to the area could push the atmosphere through the explosive zone, again with a likely ignition source present.

These examples highlight the necessity to determine the explosibility of the underground atmosphere using gas chromatography.

**TRIGGER ACTION RESPONSE PLANS (TARPS)**

Mines determine gas levels that they think should not be exceeded. Often these numbers are based on historical data collected from the monitoring systems. To handle the large volumes of measurements made gas monitoring software has been developed that will automatically trigger a visual and audible alarm if one of the pre-set levels is exceeded. Alarm set points can be different for every sample point. These alarms activate what are known as Trigger Action Response Plans (TARPS) that have predetermined actions to follow. These actions have been formulated to ensure that appropriate actions are taken to ensure the safety of workers and maintain control of the mine.

Alarms can be generated from absolute concentrations, gas ratios or explosibility. They are most useful as an early warning, not as an alert to an emergency or a need to evacuate the mine. When alerted early enough the mine will have time to take remedial action to rectify the problem. Having continual automated gas monitoring provides the best chance for early detection.

The frequency and scope of monitoring is often included in the TARPS to ensure that the situation is not escalating or that the control measures are being effective. It must be noted that if inertisation is one of the control measures called for in the TARPS, any monitoring to determine the effectiveness of the control must be done from a location

indicative of the affected area and not just at the point of entry of the inertisation gas, otherwise assessment of the situation may not be indicative of the true state.

**CONCLUSION**

As beneficial as they are, it must be remembered that monitoring systems on their own are not going to provide a successful solution to gas monitoring. Success depends on systems, processes and training built around the hardware and the way these systems are used.

- An effective gas monitoring system includes real time sensors, a tube bundle system and a gas chromatograph.
- Each technique is addressing different hazards.
- Each technique has strengths and weaknesses which must be known by those both operating them and using the generated results for interpretation.
- Effective maintenance and calibration procedures are required to ensure reliable ongoing operation of mine monitoring systems.
- Interpretation of data is best done looking at trends rather than one off samples. Even if the situation is being underestimated, any increase in intensity should result in an increase in the trend although the rate of change may not match the increase in intensity.
- Trends should only be based on data collected from the same technique.
- There are likely to be differences between in absolute measurements made using different techniques.
- A true indication of the flammability of the mine atmosphere during a mine fire, heating or post explosion can only be determined by gas chromatograph analysis due to the high concentrations of carbon monoxide and hydrogen possible.

**REFERENCES**

Australian Standard (1990) *AS2290.3 Electrical equipment for coal mines -Maintenance and overhaul Part 3: Maintenance of gas detecting and monitoring equipment.*

The Coal Mining Safety and Health Regulation 2001 Reprint No. 2C, 2007 the Office of the (Queensland Parliamentary Counsel).

**ACKNOWLEDGEMENT**

Darren Brady Department of Mines and Energy, Queensland

## Bonfiglioli acquires Sampingranaggi

Bonfiglioli S.p.A. won the auction at the Court of Bologna, 12 March 2021, for the acquisition of Sampingranaggi from Bentivoglio (BO), for € 7,158,000.

This acquisition confirms the interest Bonfiglioli S.p.A. had already expressed in Sampingranaggi, generated by the total synergy of Sampingranaggi's know-how with the Group's design and production strategies. The move preserves and consolidates the Sampingranaggi strategic supply chain, strengthening their role as a technological pivot for the Bologna regional and metropolitan area.

The acquisition includes the assets of the Italian and Chinese Sampingranaggi companies (Bentivoglio – BO, Funo di Argelato-BO and Shanghai-China), their respective warehouses, the Sampingranaggi brand, patents, designs and products for robotics, as well as all their staff. Sampingranaggi's 2020 turnover was €21 million, of which €15 million in Italy and €6 million in China.

Precisely with this in mind, on 3 March 2021

Bonfiglioli S.p.A. had signed a "Bonfiglioli/Sampingranaggi integration agreement" with the Emilia-Romagna Region, Metropolitan City of Bologna and FIOM-CGIL Emilia Romagna. FIOM-CGIL Bologna and the Sampingranaggi joint trade union representatives (RSU), a pact that the Group has declared complementary and functional to its own bid, with a view to safeguarding the production continuity of Sampingranaggi and the people who work there, currently about 80 employees.

A priority will in fact be the appropriate enhancement of the workforce, also through the provision of the Bonfiglioli Academy's continuous training programs, now available also to the Sampingranaggi staff, with a view to a synergic and transversal use of their respective skills.

With this acquisition, Bonfiglioli S.p.A. will be able to increase its production verticalization both in Italy and China, accessing the robotics market also through the development of other extremely precise and efficient products.



The Chairwoman Sonia Bonfiglioli commented: "I like to think that, if Sampingranaggi had not already been there in the post-war period, today Bonfiglioli would not exist. Because it all began there, in 1948, when a young technical graduate started out on a valuable journey of work and experience that, three years later, led him to set up his first business.

So beyond this "sentimental" reunion, which makes me very happy, and the full complementarity of Sampingranaggi and Bonfiglioli products, my first thought, however, goes to the women and men of this company who now become an important part of Bonfiglioli.

Many times we could have bought plants to produce bevel gears (that are the heart of gearboxes), but without

the human hand, machines are merely stationary atoms. Their skills, knowledge and experience are the great heritage of Sampingranaggi, and today become part of the great Bonfiglioli family. My warmest welcome goes to them."

"For Bonfiglioli, SAMP represents a great opportunity," underlined Fausto Carboni, CEO of the Group, "in many aspects. From an industrial point of view, it offers us the possibility to integrate some strategic component productions, including bevel gears, while in terms of business development it allows us to enter the robotic gearbox market, where there is ample room for growth in future, both in Italy and in China through their local company, which that is part of the acquisition."

## Weekly reports

It would appear that China was South Africa's largest export market in February, followed closely by Pakistan, beating India into 3rd place as Indian buyers struggled with firmer freight rates.

Panamax rates have seen



significant strength in both basins, whilst many Chinese buyers are immune to the freight market, either owning their own vessels or having long-term fixed rate capesize time charters.

It seems that Chinese buyers don't have issues with SA coal's trace elements after all, although the first cases of cargoes stuck in dispute with China's CIQ agency have

yet to be experienced. TFR has struggled with railings to RBCT since the start of 2021, with unavailability of locos, heavy rain and Covid related issues causing problems. Which probably all goes to explaining why physical RB1 is trading at a \$3 premium to paper.

Japan's J-Power has meanwhile started producing liquified hydrogen from Australian brown coal, as Australia pushes to become a major hydrogen exporting nation. CO2 released from the process is planned to be buried off the coast of Victoria. High

coal and EU carbon prices are once again dampening European dark spreads after the recent surge of coal purchases, whilst warmer weather in SE Asia has seen Korean demand slow down too.

Eskom is apparently going ahead with a revised 10-year Duvha contract for around R600/ton, which is terrible timing for it considering coal prices are making recent highs. Locking in prices for 10 years is also an incredibly brave move, which will likely either result in hero or villain status in the future.



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## Some smaller or one large pump?



Whether two small pumps are better than a single large one: In this consideration of many users, it depends on the application. And a special component that in many cases even makes the purchase of new pumps completely unnecessary.

Tsurumi, the market leader in dewatering pumps in the construction industry, points out that various aspects speak in favour of two or more small pumps in applications with dirty water. In some cases, one large pump is too much of a good thing.

If the distances are short, only one adequate pump is needed. If the distance to be covered exceeds its capacity limit, a second pump can be connected via an adapter. This is called booster operation: the second pump increases the possible total length of the water pipe.

Many pump operators do not know that this option exists at all. Moreover, it is relatively easy to realise.

Theoretically, the number of pumps that can be operated in series is unlimited. Significant capacity losses



are not to be expected. With two identical pumps, the achievable distance performance is roughly doubled. However, the flow rate remains the same. If one wanted to increase this, parallel operation of the pumps is necessary or the use of larger models.

### Key factor flexibility

Small pumps connected in series offer the advantage that the individual pumps can be moved more quickly due to their relatively low weight, they are easier to replace and can be better maintained or repaired. There are practical advantages in terms of spare parts logistics and capital requirements, too.

Two pumps can be connected directly one after the other. Alternatively, they can be spaced so that, for example, one pump is positioned every 30 metres. Whether the piping is fixed or with flexible hoses is functionally irrelevant. There are also advantages during dismantling.

Dewatering with large pumps is particularly interesting because the entire system consists of only a few components.

This is attractive, considering the potential problems of an extensive small unit configuration. That comes with the core risk of all complex systems: (Too) many components are involved, they may not be in the best condition, they may not be set up optimally or they simply should not have been combined in the first place.

### Space requirements as a bottleneck

However, a solution with a powerful unit like the multi-stage high-pressure pump LH4110W, the manufacturer's top model with a delivery head of 216 m, has to be



realised first: such a pump weighs about 1.3 tonnes when dry. Also, the use of these big guys only makes sense if their performance is needed from the very beginning.

The reliability of the system must also be taken into account: if the only large pump fails, the entire dewatering system stops. However, this also applies to the chain solution if a link fails – no matter how small. But getting a large pump going is likely to take longer.

In some cases, however, the question does not even arise. If sheer performance with high throughput is required, for example in open-cast mining, there are hardly any alternatives to large-scale equipment.

On the other hand, the space available underground or in tunnelling is often so limited that there is simply no room for a large pump: After all, vehicles, mining machines and people still have to be able to move accident-free in the narrow veins. Often there are not even intermediate basins for pumping in the roadway sections, so that only a slim solution is available for dewatering. A similar problem arises with deep bore holes or in the waste water sector of industry and municipalities.

The booster adapters are available from Tsurumi Europe in Düsseldorf, Germany, as a standard component at a comparatively low price. Operators of dewatering pumps should therefore first consider connecting them in series if necessary. As a rule, different pump types may be combined. The adapters can thus continue to be used

if other, larger pumps are purchased later.

### Info box: Pump performance

What a pump is actually capable of is stated in the data sheet. Every pump unit has an optimum operating point. Two essential factors determine the performance of a pump: the maximum flow rate indicates the highest possible throughput under ideal conditions. Usually 15 degrees Celsius outside temperature, a homogeneous medium and horizontal pumping are defined. Which already describes the second factor, the maximum delivery head: the greater the slope or distance, the higher the power required. If pumping is to be vertical, the pump must not only bear the weight of the water column, but also generate flow velocity so that the pump sump empties. The specific weight of the pumped medium and its viscosity also play a role.

### Info box: Booster adapter

The booster adapter is a passive component that is quickly mounted: unscrew the swash plate at the bottom of the first pump, replace the series screws with new double bolts, put on the adapter, screw it tight, and connect the second pump or hose there. A video on Tsurumi's Youtube channel shows how easy the assembly is.



# Evaluating a new method when considering IPCC

**L**arge, semi-mobile crushing plants have been an option for open-cut limestone, coal, and metal operations for a long time now, since 1956 at least. The advantages of in pit crushing/conveying systems have been well-established since then but in the 1990s the availability of increasingly large haul trucks limited their appeal to some extent. More recently, though, mine developers taking advantage of increasing demand for coal and mineral commodities have paid more attention to the in-pit crushing and conveying (IPCC). Improvements in the technology have also attracted attention. However, realizing these potential cost savings still requires very careful evaluation of geological, technical, and economic factors at any given site. In the past mine operators turned to shovel-and-truck without considering alternatives. Now, however, the game is really changing practically every greenfield project, every expansion project and even brownfield operations investigate alternatives to shovel and truck.

Although the IPCC concept is not new, companies are still concerned with the implementation of such an alternative due to the high risk involved. Another issue is that it is not as simple as choosing a particular haulage system; one also needs to know how to adapt it to the mine plan to ensure a reduction in the overall mining costs. Therefore, the uniqueness of a project poses a contractual constraint, as no pre-made off-the-shelf options are available. With a sometimes-confusing array of IPCC systems coming onto the market and an abundance of claims regarding their potential advantages, working installations and projects

in active development beyond the study phase do not necessarily match the hype. Despite the trend towards 'off-the-shelf' offerings from the market, one system does not suit all operations. Of paramount importance is understanding and acceptance of the system by the operating team that will eventually have to make it work. The best design and delivery of an IPCC system will count for little if the operating and maintenance teams, do not adequately understand the issues that influence production. Machine selection cannot be easily separated from site specific factors. A sizing unit or transfer system that works in one operation is not guaranteed to do so in another due to these factors. Therefore, 'Off-the-shelf' systems need to be carefully analysed.

A significant cost in the operating budget of most mining operations arises from purchasing and maintaining haulage trucks. In-pit crushing and conveying (IPCC) has been subject to research over many years because of its potential to reduce haulage costs. What might be the (IPCC) option for one mine differs for lots of reasons and all options have to be considered and identified early on in any project as to whether or not the semi-mobile IPCC (SMIPCC) or static crusher is an appropriate alternative to the conventional truck haulage method on the loading and hauling approaches.

## **GIVEN THEIR PROMISE, WHY ARE NOT MORE MINING COMPANIES SERIOUSLY EXAMINING IPCC SYSTEMS?**

There are still a number of barriers to implementation with operational reliability being a key factor. A shovel/truck system has an inherent level of redundancy. If one unit is out of service, the mine will not lose all production. IPCC



systems, however, can be viewed as series-connected systems. If one element is out of service, the mine loses total production. In addition, stoppages do not just occur for reasons of maintenance. Many operational delays also result in loss of production. The criticality of IPCC components means that a different philosophy needs to be adopted towards maintenance and operations. Activities need to be planned according to a “campaign” strategy, whereby a “mini-shutdowns are programmed at regular intervals to perform all necessary maintenance and inspections.

In this issue of Coal International we do not intend to discuss the merits of the multitude of major equipment OEMs designing IPCC solutions, or mining companies that have seen the benefits of employing the technique, but rather focus on a new method of evaluating open pits in the early stages to determine the merits as to the mining alternatives available and of course costs.

## CHALLENGES

One of the challenges while evaluating the early stages of open pit mining projects is to determine which of the alternatives for material transportation and which location for the primary crusher should be considered for further detailed studies and scenario selection. A parallel study between the alternative of the conventional truck haulage with the primary crusher located outside of the pit and the in-pit crushing and conveying alternative can be a long, expensive process. Mining companies with portfolios that contain many open pit projects usually face issues in evaluating the benefits of an IPCC implementation due to the massive workload and time necessary for completion. Properly evaluating these alternatives is important since the haulage costs in open pit mines can be 60% or more of the mine's operating cost systems are now receiving more attention due to the rising cost of the truck haulage cycles, which can be attributed to the cost of diesel and spare parts, leading to the IPCC being the favourable option. In contrast, the IPCC is considered a low-cost alternative in terms of operating costs due to its continuous operation regime, reduced labour, and lower energy consumption, but it requires a high capital cost, and has reduced flexibility.

There have been many studies carried out in the past proposing the use of SMIPCC systems as an alternative to conventional trucking and regular IPCC systems, where the crusher is fully mobile and only a conveyor is used for haulage. A SMIPCC can exploit the advantages of both systems, conventional trucking, and fully mobile IPCC, but it is important to ensure that the in-pit crusher is at an appropriate distance from the work front and that its location will be suitable for at least one year of operation before it needs to be moved. SMIPCC systems are considered flexible and adaptable because of the continuous use of trucks and being able to install a crusher in a suitable location. In the majority of studies that compare IPCC with truck-based haulage systems using conveyors, results in large operational savings due to a more efficient energy and capital allocation.

Furthermore, from an environmental licensing process standpoint, the method used for decision-making can

be a relevant tool to be used before going through the preliminary environmental licensing process, so that the SMIPCC alternative can be considered to demonstrate a reduction on the environmental impacts.

## NEW METHOD

To get a better understanding of the IPCC alternative, a new method is proposed that aims to estimate the technical, economic, and environmental benefits of the semi-mobile IPCC alternative from an early project stage. The proposed approach has been tested using data from the initial design studies FEL-1 of an open-pit copper-gold mine located in Brazil but the same method can be applied to most open pit operations including coal.

The method was designed as a model that uses the data available from the early stages of the evaluation of mining projects, usually from the scoping studies, as its input parameters. The model analyses both the conventional trucking and the SMIPCC scenarios. In order to properly estimate the truck requirements, production capacities, and costs, the following should be calculated: truck payload, engine powering and propulsion, cycle time estimations, and production rates.

The input data can be classified into the following groups:

- Material: the material itself, in situ density, and swell factor
- Truck Size: to be chosen from a payload of either 100, 150, 200, or 250 short tonnes.
- Operating: average haulage distance (flat, uphill, and downhill), rolling resistance, grade, speed limit, typical fixed times for spotting, dumping, and waiting, primary crushing P80 and design safety factor, working hours, hourly efficiency, conveyor's average speed, length, and elevation
- Production: throughput, and life-of-mine
- Economic: operating costs, discount rate, and exchange rate (if applicable)

The input models considered for the evaluation of the conventional trucking and the SMIPCC scenarios remain unchanged, with the exception of:

- Operating: Haulage distance (flat, uphill, and downhill) considering the location of the semi-mobile in-pit crusher, the conveyor average speed, length, and elevation
- Economic: capital and operating costs, considering the capital and operating costs resulting from the implementation of the conveyor, reduction of the haulage fleet, and relocation of the semi-mobile in-pit crusher

It is important to highlight the three assumptions used in this model:

1. The mine's throughput and, consequently, the life of mine for the conventional and SMIPCC scenarios remain the same, given that only the haulage fleet and the conveyor's input must be changed from one scenario to the other.

- The truck payload (referred to below as the truck size) is an input parameter instead of a calculated one and is then used to select the loading equipment. This method is the reverse of the conventional fleet selection method. The payload relates to known off-road truck models that cover most mine operation cases.
- Since both alternatives use the same number of excavators, the excavator CAPEX and OPEX were not included in the economic analysis and calculations because their costs will be equal.

The model continues the analysis as follows:

- Truck and auxiliary equipment fleet dimensioning
- Conveyor dimensioning
- Economic Analysis
- Environmental Impact Analysis

The method proposed in the article aims to be a tool to help in deciding on the best type of transport alternative to be used. It includes important topics such as the transportation scenario for the open pit mine, a comparison between the conventional model and the SMIPCC, and the economic feasibility and sustainability of each scenario.

The truck fleet size is determined by evaluating the model that is based on the mine's production capacity and operating parameters, specifically, the average haulage distance (AHD). These two factors are very important as they hold a great weight in the decision to use the IPCC system. By selecting the truck size (model) from one of the four options, the number of trucks is calculated, as well as the number of bulldozers and motor graders required (Figure 1). It is worth mentioning that, because the transportation model considered in this study is a SMIPCC,

it is still necessary to use trucks to move the material from the mining face to the in-pit crusher, where it will then be crushed and loaded onto the conveyors. Therefore, only the AHD from the mining face to the in-pit crusher is considered in the SMIPCC sizing, whereas the entire route is considered for the conventional model. In Figure 1, the AHD node indicated by [1] is subject to change based on the material transport alternative selected. The output nodes, indicated by [2], can be determined by using a rule of thumb based on the required truck units of one bulldozer for every 20 trucks and one motor grader for every 15 trucks, with a minimum of one unit in both cases.

The conveyor's characteristics, such as the width, the power of the required motor, and the data to calculate the SMIPCC installation costs, are selected based on the material characteristics and operating parameters, such as the P80 for the primary crusher, and the mine production data (Figure 2). Also in Figure 2, refer to Osmetti *et al.*, (2012), and Bertinshaw *et al.*, (2012), for three of the input parameter nodes, [3], in order to determine the conveyor dimensioning.

The economic analysis of the mine for the two alternatives is performed considering these inputs. All the costs are included in this analysis and are separated into capital expenditure (CAPEX) and operating expenditure (OPEX) throughout the life of the mine (LOM). The costs are brought to the present value based on the discount rate(s) selected, resulting in the net present value of the cost (NPC) (Figure 3).

Using the discount rate when evaluating mining projects serves the same purpose as it does when evaluating projects in other fields: it considers the time value of money

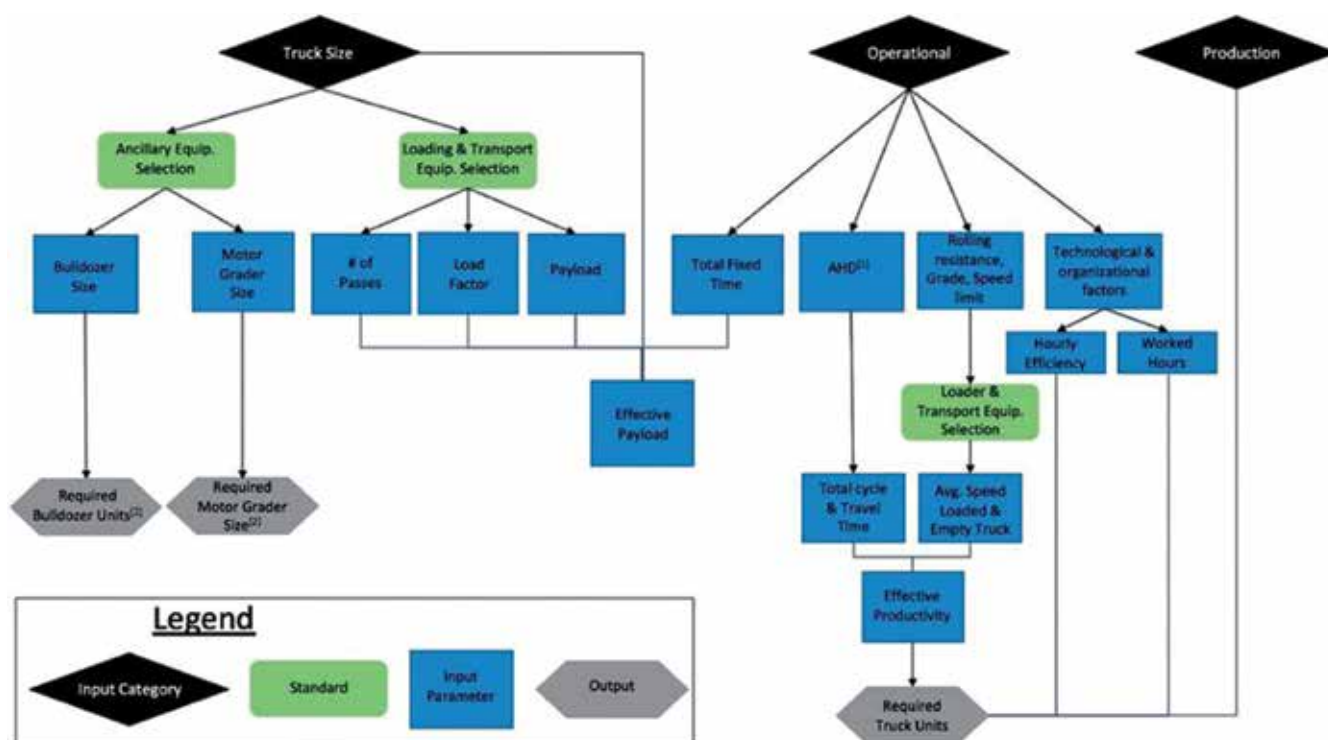


Figure 1: Fleet sizing flowchart.



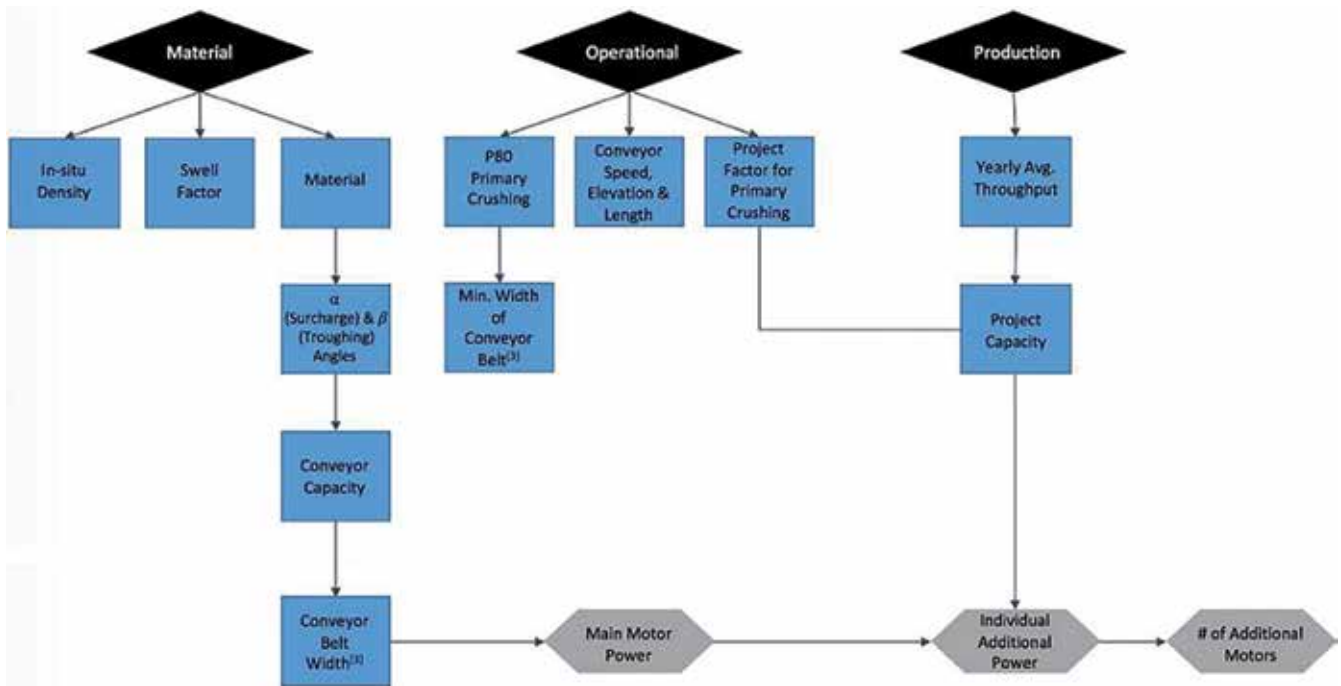


Figure 2: Conveyor sizing flowchart.

and the project risk (Ataee-Pour *et al.* 2009). Since each project involves a different set of risks, the discount rates analysed in each one will be different. Product standards for nodes [4] are used for the input parameters. These standards were based on the truck cost, freight cost, and the import tax associated to it. In addition to the discount rate and the LOM, the total OPEX for the conveyor [5] also considers relocating the in-pit crusher and the cost of the conveyor's electricity consumption.

The model also proposes a comparison of each scenario's environmental analysis on gas emissions. Based on the previously sized fleet, the amount of equipment and the type of engine is assessed and the tonnage of gasses emitted during the LOM is calculated based on the EPA's Tier 4 Standard (US EPA 2004). The gasses being analyzed are the following: carbon monoxide (CO), non-methane hydrocarbons (NMHC), nitrogen oxides (NOx), and particulate matter (PM) (Figure 4).

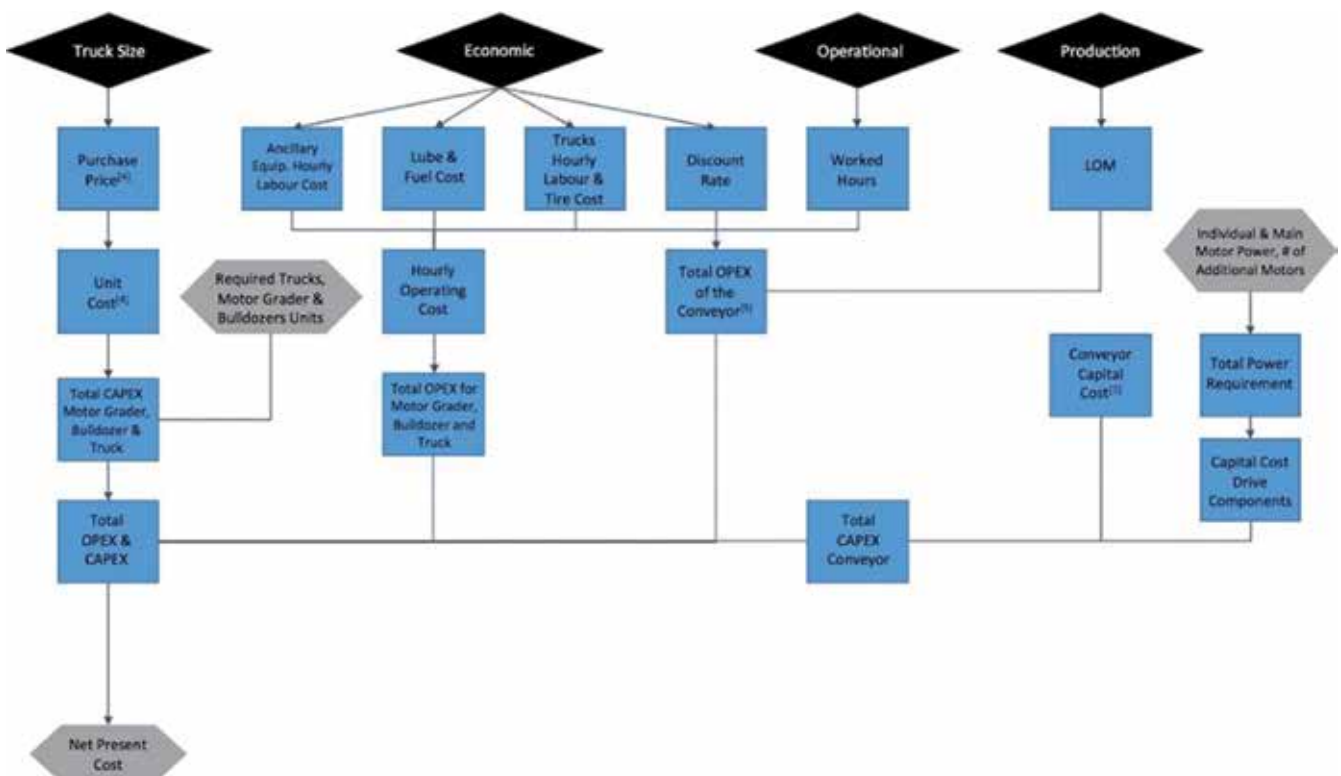


Figure 3: Economic analysis flowchart.

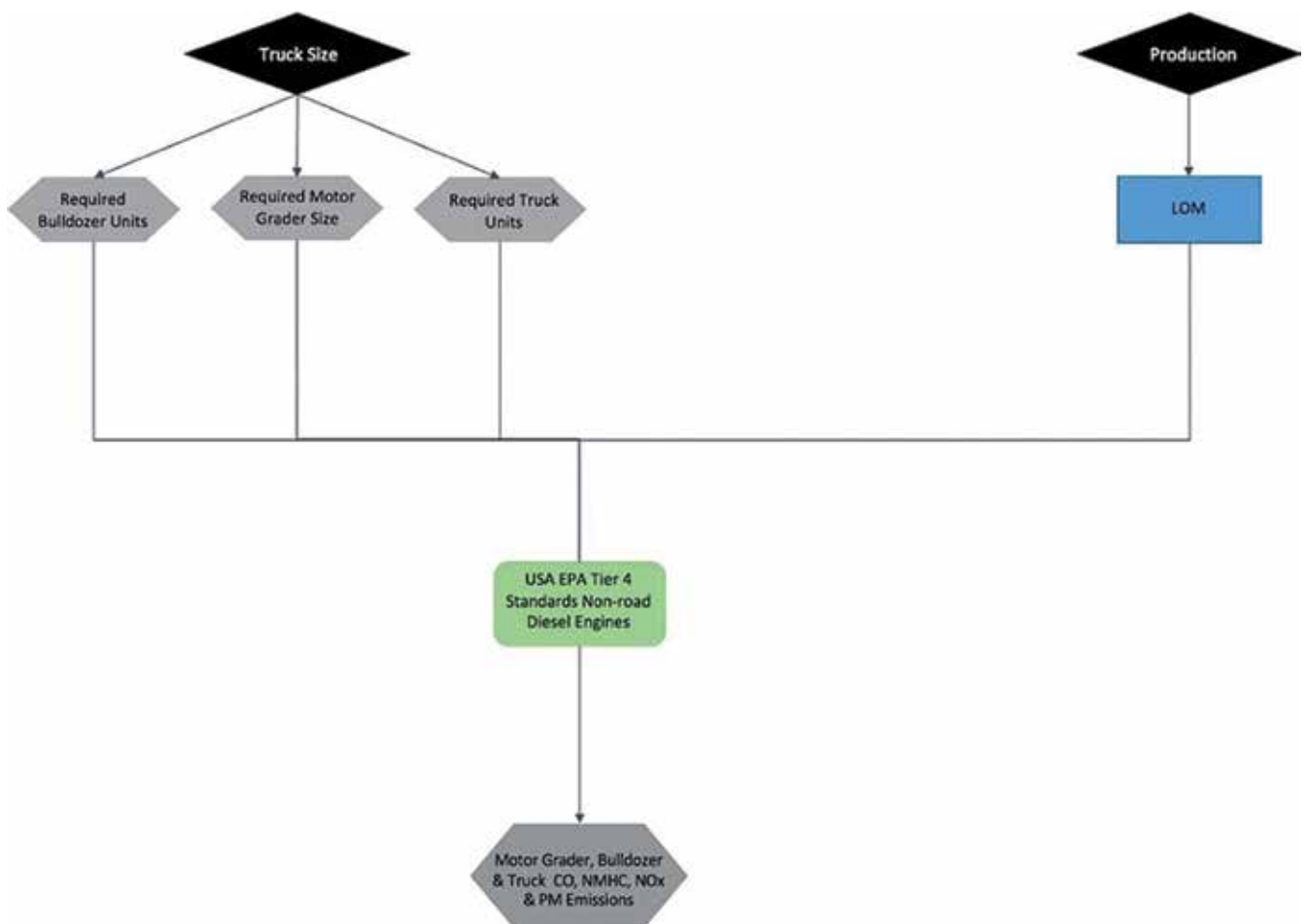


Figure 4: Environmental analysis flowchart.

## RESULTS

Data from a Brazilian copper-gold mine was used for this analysis. This study was implemented for a FEL-1 based on the Project Management Body of Knowledge (PMI 2013). This decision-making process can be applied to any open pit mining project, as long as the specifications for each project are incorporated.

The life of mine was set as 20 years with an annual production of 16 million tons using 150-short ton trucks (Table 1). The AHD for the two alternatives was 1.6km. In the case of the SMIPCC scenario, the trucks travel 0.5km from the mining face to the in-pit crusher (IPC), and then for the next 1.1km, the material is transported by the conveyor to the transfer chute. In the conventional scenario, the trucks travel the entire 1.6km along the ramp that closely

Table 1: Production parameters.

Truck size	[short tons]	150
LOM	[years]	20
Estimated throughput	[Mt]	16
Material		Copper ores, crushed

follows the conveyor's profile, to a crusher that would be located near the indicated transfer chute in Figure 5.

The inputs considered for the decision-making model were created using Excel and VBA Macro and are summarised in the following table (Table 2). The calculated fleet sizes for both alternatives are listed in Table 3.

The cost values for the mine were obtained by complementing the above data from the previous two tables with the initial data from the mine (Table 4). A noticeable difference in the initial CAPEX (before year 3) is that the SMIPCC installation is approximately 60% higher than the conventional scenario. This is due to the high installation cost of the crusher and conveyor belt.

However, the sustaining CAPEX (after year 3) for the conventional alternative is more than two times greater than that of the SMIPCC, due to the need for fleet replacement. Furthermore, when considering the OPEX, for the conventional case without including the discount rate, it is about 43% greater than that of the SMIPCC because of high maintenance costs, tires, fuel, and labour.

The net present cost (NPC) is an important factor for a project. In this study, five different discount rates were taken into account, which expanded the possible number



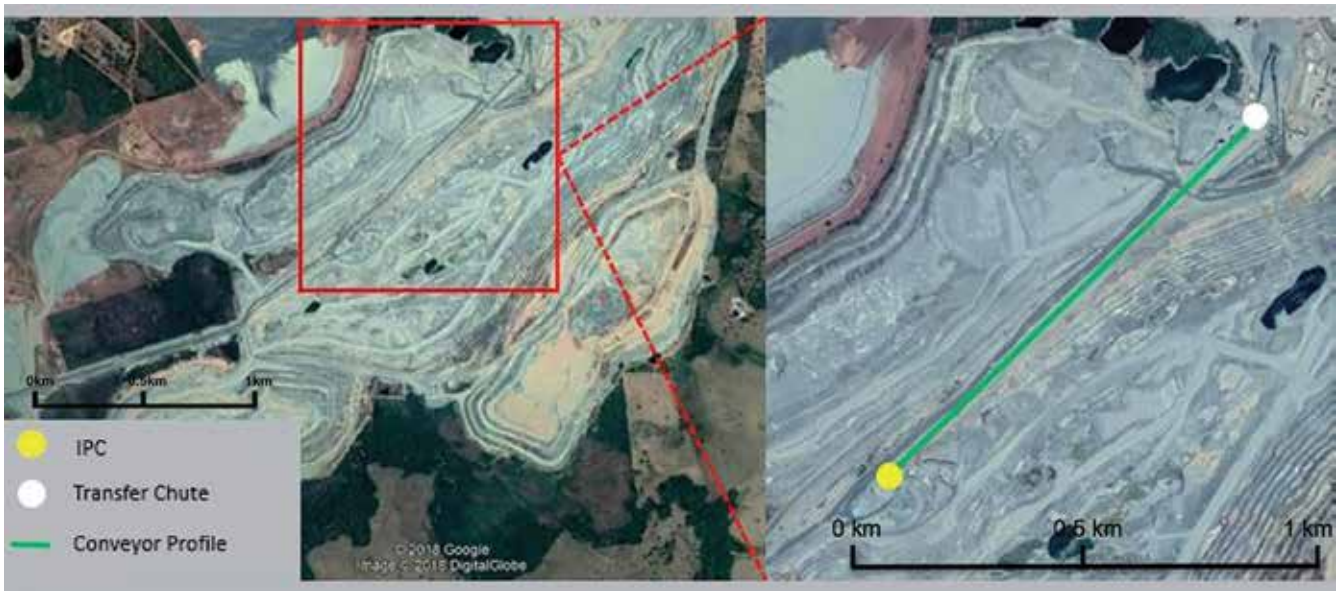


Figure 5: Environmental analysis flowchart.

Table 2: Model Input Parameters for the study case.

INPUTS					
TRUCKS			EXCAVATORS		
Selected Truck	short tons	150	Bucket Size	m <sup>3</sup>	14
	model	785D	Payload	t	38
Max. Speed	km/h	40	Fill Factor	%	85
RESISTANCES			OPERATING PARAMETERS		
Rolling Resistance	%	3	Working days / year	days	365
Grade Resistance	%	8	Shifts	shifts/day	3
Total Resistance (Flat)	%	3	Hours per shift	hrs/shift	8
Total Resistance (Uphill)	%	11	Availability	%	84
Total Resistance (Downhill)	%	11	Utilization	%	80
ORE PARAMETERS			Efficiency	%	83
Density	t/m <sup>3</sup>	2.7	Hours per year	hrs/hrs	5887
Swell Factor	%	40	ECONOMIC PARAMETERS		
Moisture content	%	5	Annual Discount Rate	%	5
PRIMARY CRUSHING PARAMETERS			Exchange Rate	R\$/US\$	3.25
Required Nominal Capacity	t/h	2718	CF-CIF+Import Tax+ Custom Clearance	%	30
Design Safety Factor	fixed	1.4	OPEX		
Required Project Capacity	t/h	3805	Electricity Cost	US\$/MWh	73.6
Estimated P80 – approx. 80% fines	mm	250	Diesel Cost	US\$/l	0.7
CONVEYOR			Lubrication Cost	US\$/l	0.1
Average velocity	m/s	3.5	Tire Cost	US\$/h	68
Motor Efficiency	%	95	Labour Cost	US\$/h	63.5

**Table 3:** Required fleet Sizes for each alternative.

Required Fleet Sizing		
Equipment	Conventional	SMIPCC
Trucks	8	3
Excavators	2	2
Graders	1	1
Bulldozers	1	1
Conveyor	0	1

**Table 4:** Economic results.

Thousands		Conventional	SMIPCC
Initial CAPEX – Before Year 3	[US\$]	\$28,893	\$46,966
Sustaining CAPEX – After Year 3	[US\$]	\$43,244	\$18,534
OPEX	[US\$]	\$190,313	\$107,959
NPC @ 5% discounted rate	[US\$]	\$174,619	\$126,230

**Table 5:** Cost per ton.

		Conventional	SMIPCC
CAPEX&OPEX	[US\$/t]	\$0.82	\$0.54
CAPEX	[US\$/t]	\$0.23	\$0.20
OPEX	[US\$/t]	\$0.59	\$0.34

**Table 6:** Environmental analysis.

		Conventional	SMIPCC
CO – Carbon Monoxide	[t]	3,586	1,516
NMHC – Non-methane Hydrocarbons	[t]	195	82
NOx – Nitrogen Oxides	[t]	3,344	1,274
PM – Particulate Matter	[t]	39	16

of scenarios. The considered discount rates were 0.0%, 2.5%, 5.0%, 7.5%, and 10.0%. The values obtained from using a discount rate of 5% are presented above (Table 4). Table 4 shows that the NPC for the conventional alternative is about 50 million dollars more expensive than using the semi-mobile IPCC. When considering the total cost per ton (CAPEX & OPEX), the SMIPCC has a value of almost 34% lower than that of the conventional alternative (Table 5).

The results of the environmental analysis were also very insightful. During the LOM, when opting for only using trucks, the carbon monoxide emissions are more than double that of the SMIPCC alternative. The additional

emissions are due to the high number of trucks required for the conventional trucking compared to the SMIPCC. For the examined mine, eight trucks are needed for the strictly trucking alternative, whereas when using the SMIPCC, only three trucks are needed. Therefore, the results also corroborate that the IPCC alternatives are also a means of reducing carbon emissions (McCarthy 2011; Cooper and Turnbull 2009).

## DISCUSSION

The expected result of the decision-making method presented was to conclude on which alternative should be selected while considering the proposed parameters, the OPEX, the CAPEX, the NPC, and the environmental analysis. Achieving this result was successful. The evaluation method allowed for a broader view of the importance of such variables in the decision-making process. In the discussed case, the SMIPCC alternative resulted in a lower sustaining CAPEX and OPEX, as well as a lower cost per tonne as compared to the conventional alternative. There were also environmental benefits from using the SMIPCC system: the amount of carbon monoxide, non-methane hydrocarbons, nitrogen oxides, and other particulate matter was reduced. The economic, operational, and production data of the initial study were compared for both transportation systems (conventional and SMIPCC), which exposed the pros and cons of each one and allowed the company to improve data interpretation so they could make an informed decision on whether or not to continue to the next project phase. In the case of the studied mine, the SMIPCC was the more viable method considering the net present value and the lower costs and gas emissions. Even though the production is not extremely high, nor is the AHD very long, there was still a noticeable difference in costs.

## CONCLUSION

The method presented is meant to be used for a conceptual study level (FEL-1). By using the proposed decision-making method, it is possible to identify the projects that have the potential for SMIPCC implementation without necessarily spending a large amount of time, which can be expensive and wasteful. Therefore, it enables mining companies to shift their focus to the alternatives that continue to show potential for further in-depth studies. In general, IPCC installation is an attractive option due to its lower sustaining CAPEX and OPEX. After evaluating the decision-making model for the specific case treated, the sustaining CAPEX is approximately halved, and the OPEX is 34% lower. However, due to the high initial cost of installing the SMIPCC, which in this case is seen to be 60% higher, installation is only feasible when there is a long mine life. In addition, if the mine has a small AHD and/or low production, the IPCC is not very appealing because the initial CAPEX may not be paid back during the LOM. In this particular case, the haulage distance and mine life are sufficient to notice a 0.28\$/t decrease in total expenditure. Savings are not solely restricted to the costs; there are also noticeable environment benefits. For the discussed case, carbon monoxide emissions drop 58% when using the SMIPCC scenario. Later, the miner moved to a feasibility study and detailed design phases and the SMIPCC is now installed and in operation at the site.



## REFERENCES

- ATAEE-POUR, M., IRANNAJAD, M., TAHERI, M. Risk-adjusted discount rate (RADR) estimation for evaluating mining projects. *The Finsia Journal of Applied Finance*. Jassa, n. 4, Winter, p. 36-42, 2009. [ Links ]
- BERTINSHAW, R., ROBINSON, N., TURNBULL, D., WOODWARD, V. Surface mining. In: NOAKES, M., LANZ, T. (Ed.). Cost estimation handbook. (2. ed.). Victoria, Australia, *The Australasian Institute of Mining and Metallurgy*, p. 100-125, 2012. [ Links ]
- COOPER, A., TURNBULL, D. In-pit crushing and conveying (IPCC) – a tried and tested alternative to trucks. Proceedings of the New Leaders' 2009. Melbourne, Australia: *The Australasian Institute of Mining and Metallurgy*, 2009. p. 59-66. [ Links ]
- DEAN, M., KIZIL, M. S., KNIGHTS, P., NEHRING, M. Selection and planning of fully mobile ipcc systems for deep open-pit metalliferous applications. In: INTERNATIONAL FUTURE MINING CONFERENCE, 3. *Proceedings...* AusIMM, p. 219-225, 2015. [ Links ]
- HUSTRULID, W., KUCHTA, M., MARTIN, R. *Open pit mine planning and design*. (3. ed.). CRC Press, Taylor and Francis Group, 2013. 1308p. [ Links ]
- LONDOÑO, J. G., KNIGHTS, P. F., KIZIL, M. S. Modelling of in-pit crusher conveyor alternatives. *Mining Technology*, v. 122, n. 4, p. 193-199, 2014. [ Links ]
- MCCARTHY, R. In-pit crushing and conveying: fitting a square peg in a round open pit. *Proceedings CIM Montreal 2011*. Montreal, Canada: Canadian Institute of Mining, Metallurgy and Petroleum, 2011. [ Links ]
- MOHAMMADI, M., HASHEMI, S., MOOSAKAZEMI, F. Review of in-pit crushing and conveying (IPCC) system and its case study in Copper Industry. In: WORLD COPPER CONFERENCE, 1. *Proceedings...* 2011. [ Links ]
- NEHRING, M., KNIGHTS, P. F., KIZIL, M. S., HAY, E. A Comparison of strategic mine planning approaches for in-pit crushing and conveying, and Truck/Shovel Systems. *International Journal of Mining Science and Technology*, v. 28, n. 2, p. 205-214, 2018. [ Links ]
- OSMETTI, R. J., ARBUTHNOT, I., ELVISH R. D. Beneficiation – materials handling. In: NOAKES, M., LANZ, T. (Ed.). Cost estimation handbook. (2. ed.). Victoria, Australia, *The Australasian Institute of Mining and Metallurgy*, p. 299-305, 2012. [ Links ]
- [PMI] Project Management Institute. PMBOK Guide and Standards PMI. A Guide to the Project Management Body of Knowledge – PMBOK. (5. ed.). 2013. [ Links ]
- RAHMANPOUR, M., OSANLOO, M., ADIBEE, N., SHIRAZI, M. A. An approach to locate an in pit crusher in open pit mines. *International Journal of Engineering (IJE)*, v. 27, n. 9, p. 1475-1484, 2014. [ Links ]
- RIBEIRO B. *Estudo de viabilidade econômica para a implantação de correias transportadoras de rom de minério de ferro. Estudo de Caso da Mina Fábrica em Congonhas, Estado de Minas Gerais*. Ouro Preto (MG): Federal University of Ouro Preto, 2013. 81 p. (Master's Thesis in Portuguese). [ Links ]
- RITTER, R., HERZOG, A., DREBENSTEDT, C. Automated Dozer Concept Aims to Cut IPCC Downtime. *E&MJ*, p. 52-55, 2014. [ Links ]
- [US EPA] United States Environmental Protection Agency Guidelines – Tier 4 Emission Standards – Nonroad Diesel Engines. May, 2004. [ Links ]

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# Automated conveyor belt cleaner tensioner reduces maintenance and guesswork

The tensioner and control box are designed to require minimal changes to the stringer.

**A**

global innovator of conveyor belt cleaning technology has introduced an autonomous tensioning system that continuously monitors and delivers proper cleaner tension. By utilizing Martin Engineering's intuitive new smart technology platform to maintain proper blade-to-belt pressure, the

N2® Twist™ Tensioner provides the best possible cleaning performance throughout the life of the blade. The system also alerts operators on the Martin Smart Device Manager App when the blade needs changing or if there is an abnormal condition. The result is efficient cleaning, increased safety, reduced labor and a lower cost of operation.

"We designed the unit for heavy-duty applications and tested it outdoors in punishing environments and applications," said Andrew Timmerman, P.E. and Product Development Engineer at Martin Engineering. "The N2 Twist Tensioner has proven itself to be a rugged and highly effective way to maximize both cleaning efficiency and blade life."

## THE IMPORTANCE OF PROPER TENSIONING

Located on the head pulley, primary belt cleaners commonly have a twist, ratchet or spring tensioner to ensure the cleaner blade stays in consistent contact with the conveyor belt for proper cleaning and material discharge. Prior to the new design, belt tensioners had to be monitored and adjusted manually, in some applications on a daily basis, so they would maintain optimum pressure and carryback removal. Estimating when blades needed changing was often a guessing game that, if left too long, could lead to belt damage.

Inadequate tensioning causes carryback to cling to the belt and spill along its path, piling up under the conveyor and emitting excessive dust. This requires extra labor for cleanup and can affect air quality. Over-tensioning leads to friction damage to the carrying side of the belt, premature blade wear and potential splice damage. Both scenarios create unsafe work conditions and raise the cost of operation significantly.

## NEXT STEP IN TENSIONING TECHNOLOGY

The N2 Twist Tensioner automatically maintains precise



cleaning pressure throughout the entire life of the blade, without maintenance. The tensioner applies the proper amount of torque to deliver optimum cleaning pressure at the blade tip, supporting the Constant Angle Radial Pressure (CARP) cleaner design that withstands the force of heavy bulk cargo but retains a consistently tight seal across the belt profile.

Martin Engineering's smart technology platform monitors blade wear and informs operators when the blade needs changing from control systems that are housed in a durable weather-resistant NEMA 4 control box. Experts recommend changing blades before there is a chance of detachment or a "pull through" (inversion under the head pulley). In the event of a premature pull through, operators are alerted, and the tensioner's internal self-relieving coupling rolls over. A blade detachment also triggers an alert allowing operators to quickly shut down the system and avoid expensive belt damage.

The electrical system runs both the tensioning system and the sensors. The unit is powered by a rechargeable 12-volt battery life and can also be specified to run on 110-220 VAC. The system includes all necessary components for installation based on the power supply option.

### LOWER MAINTENANCE AND EFFICIENT PERFORMANCE

The N2 Twist Tensioner and Smart Device Manager App ease the burden on managers and workers so they can focus their attention on other critical details of the operation. Precise tensioning and improved belt cleaning reduce the volume of dust and spillage from carryback, improving workplace safety and decreasing the labor needed to maintain and clean around the discharge zone.

"This is a game-changer for most bulk handling operations that struggle with tensioning and carryback," Timmerman concluded.



The Martin N2 Twist Tensioner and control box. 2021 Martin Engineering.

# Longwall innovations — challenging times in Russia



G

lobally, across virtually all industries, a powerful technology trend has been clearly emerging: a progressive transition from manual, non-cognitive work to automated, cognitive work. A similar force is also at work within the mining community, challenging both needs and expectations.

The rapid adoption of longwall automation technology is an indication that mine operators expect that productivity gains that will ensure a highly attractive return on investment. Furthermore, new, and improved technologies are constantly in demand to meet the need for better remote and automated underground mining processes to achieve safer and more productive mining and there can be no doubt that the Russian coal industry in particular SUEK the country's leading producer has taken the technology on board with massive investments in longwall equipment expertise from leading equipment manufacturers worldwide such as Komatsu Mining, Caterpillar, Sandvick, Eickhoff and Famur, add to this all the associated OEMs worldwide supplying all, and everything required to run a high-performance longwall operation. Overcoming geological conditions to produce a safe and productive working environment in any longwall mine is a major challenge for today's technology.

The success of SUEK is highly dependent on maintaining a skilled and productive workforce. All coalmines in Russia are commercially operated and privately owned, so remuneration is competitive. Miners have decent standards of living and stable employment. SUEK has not suffered any layoffs or mine closures as a result of tightened markets, but has continued to develop, modernise, and improve standards even throughout the last financial recession and the current COVID-19 pandemic.

The company is currently rolling out big-data tools and automation across its 26 mines in Kemerovo and elsewhere in Siberia. In some mining operations, it is even experimenting with completely replacing workers with machines.

One has to only look at the record-breaking longwall at Yalovsky Mine and the strategies and actions taken by SUEK that have converted the company's Kuzbass assets from relics of the Soviet era to modern, highly productive, safe, and extremely competitive mines – in a remarkably short time.

SUEK-Kuzbass started to develop longwall face No. 50-05 at its Yalovsky mine that contained more than six million tonnes of coal reserves after the combination of its Kotinskya and No7 mines led to the formation of Yalovsky in 2016.

'In the history of SUEK-Kuzbass, this became the largest site prepared for mining in terms of coal reserves. A distinctive feature of this longwall face, along with two others in the same mine, is the unique length of the face section, 400 metres. Minefield development using large longwall faces contributes to the higher reserve volume of extracted column and reduces the number of longwall face moves. This way, the company increases the load on the working face by diminishing the number and duration of final and auxiliary operations. The need for tunnelling also decreased, along with the associated costs.

For longwall face No. 50-05 at the Yalovsky mine, the company used 233 sections of CAT2500/5000 power support, instead of the standard 175 sections. The face also included a new generation Eickhoff SL 900 shearer, the first of its kind used in Russia, capable of extracting up to 4,000 tonnes of coal per hour. The well documented story of a team led by the Hero of Kuzbass Evgeny Kosmin recorded several production achievements, including the Russian and world records. In May and July 2017, the team extracted 1.407 million tonnes





Eickhoff SL900.

and 1.567 million tonnes, respectively. In August 2018, the record increased to 1.627 million tonnes of coal. This was the best monthly performance in Russian and global underground coal mining.

Eickhoff (Germany), has shearers of this type operating worldwide, but the fact remains the record was set by Russian miners.

SUEK management recognises that monthly or annual records are not normal objectives of modern mining companies. However, there is a tradition of such records in Russia, and they are still a powerful way of motivating personnel. Russia was in a state of economic chaos only 20 years ago, and the changes made in mining are paralleled. Mines have transitioned from State owned, out of date and under-funded enterprises to advanced, modern, completely commercial, and profitable businesses. In this environment Stakhanovite records still play a part – and still demonstrate that higher levels of technology can greatly increase production, and the earnings of the workforce.

Records are not sustainable and must be closely supervised to ensure safety and quality are maintained, but they do serve to drag up average performance in all the mines in the company. As a result, acceptable levels of output from similar longwalls have increased from 400,000 to 600,000 t in a month in recent years. The above figures indicate the reliability of the equipment and the high professional level of the workers. SUEK aims for the efficient and safe work of mining crews; therefore, this followed another Eickhoff SL 900 shearer being put into operation at the Magistralny site (Ruban mine).

For all our Coal International readers we enclose a brief description of why and how Stakhanovite records came about.

### STAKHANOVITE – NATIONAL HERO

Aleksey Grigoryevich Stakhanov was born 3 January 1906 – 5 November 1977) and was a Russian Soviet miner, Hero of Socialist Labour (1970), and a member of the CPSU (1936). He became a celebrity in 1935 as part of what became known

as the Stakhanovite movement – a campaign intended to increase worker productivity and to demonstrate the superiority of the socialist economic system

Born in Lugovaya, a village near Livny, Oryol Governorate. He began working in a mine called "Tsentralnaya-Irmino" in Kadievka (Donbass). In 1933, Stakhanov became a jackhammer operator. In 1935, he took a local course in mining. On 31 August 1935, it was reported that he had mined a record 102 tonnes of coal in 5 hours and 45 minutes (14 times his quota).

On 19 September, Stakhanov was reported to have set a new record by mining 227 tonnes of coal in a single shift. His example was held up in newspapers and posters as a model for others to follow, and he appeared on the cover of *Time* magazine in the United States.

Stakhanov's records set an example throughout the country and gave birth to the Stakhanovite movement, where workers who exceeded production targets could become "Stakhanovites".

The validity of Stakhanov's record has been called into question. In 1985, *The New York Times* printed a story alleging that though Stakhanov had indeed succeeded in his feat, it was only because the Communist Party had arranged the event as a way of boosting public morale, with many other miners working to help Stakhanov beat the mining record

The *Times* quoted the chief of the Tsentralnaya-Irmino mine branch of the Party, Konstantin G. Petrov, as saying that "I suppose Stakhanov need not have been the first... It could have been anybody else. In the final analysis it was not the individual face-worker who determined whether the attempt to break the record would succeed, but the new system of coal extraction.

SUEK's investment in the development of the Yalevsky mine has exceeded \$100 million. The ongoing environmental projects at the mine included the construction of a new block of



container-type modular treatment facilities worth \$4.7 million.

Taldinskaya-Zapadnaya coal mine is another mine complex, operated by SUEK, producing 5.8 MTPA at two underground mines in the village of Bol'shaya Talda, in the Kuzbass coalfield, that also received huge investment.

### DOES HIGH PRODUCTIVITY COME AT A COST?

The achievements mentioned in recent years by some enterprises of record highs for Russia engineering and economic performance in underground coal mining is now compliant with the level of top coal mining countries, this however has not changed the situation in the sector in general, which is characterized by low competitiveness of most of the Russian mines and huge safety issues culminating in large disasters: Taizhina mine (Kuzbass) in 2004, 47 people died, Yesaulskaya mine (Kuzbass) in 2006 – 25 people, Ulyanovskaya mine (Kuzbass) in 2007 – 110 people, Raspadskaya mine (Kuzbass) in 2010 – 91 people, Severnaya mine (Pechora basin) in 2016 – 36 people. It should be noted that all above tragedies are connected with methane explosions while modern high-productivity equipment was used.

### MINING CONDITIONS

The underground mines of SUEK extract two categories of seams – from 1.6 to 2.6 m thick, and 3.8 to 5.2 m thick. All mines contain multiple workable seams – typically from 6 to 15 seams per mine. Seams are normally worked in descending order, although alternatives have been used for particular reasons. Seams are relatively free of minor faults, and there are no volcanic intrusions in the area. In most cases the roof of each seam is weak mudstones and shales. High levels of support are required during development and ahead of longwalls, and it is not possible to use place changing in

developments – by law and in practice it is essential to cut one cycle and then bolt immediately. Cycles are also limited to 0.9 m. The roof is normally bolted with six bolts of 2.4 to 2.6 m length, and each side is supported by two or three roof bolts of 1.8 m. Roof and sides are meshed. The width of roadways is limited to 5.2 m or less, due to difficult strata conditions and weak floor. Roads are driven at 2.6 to 2.8 m high in thinner seams and 4.0 to 4.5 m high in thicker seams. Major considerations are the height required to transport longwall shields and the area required to provide adequate ventilation. All seams are gassy, with the gas content increasing from about 5-20 m<sup>3</sup> /t of total gas content, with depth. There is a theoretical risk of gas outburst at depth, but no occurrences to date. The seam gas is mainly methane. The greatest problem with gas is the extremely low gas permeability of Kuzbass seams. It is exceptionally difficult to pre-drain the coal in the target seam, even with closely spaced holes on suction. There are also numerous seams above and below the mining horizon which release large volumes of gas into the face and goaf areas. The deposits are world class, with good to moderate mining conditions that are well suited to long, wide longwall panels, and contain high quality coal.

The only system for mining is longwall. There is no room and pillar mining in SUEK mines, and no real potential. Most Kuzbass mines operate a single longwall, but Kirova Mine operates two longwalls simultaneously as this is a thin seam mine extracting large reserves of high-quality coal. One set works in a seam of 1.9 m and the other is 2.6 m. In 2017 this mine produced more than 7 Mt ROM, and output is expected to increase because one longwall set is being replaced at the end of the year, and the second set should be replaced with new equipment in 2019. Longwalls are conventional, using two gate roads and leaving pillars between walls, so layouts are very similar to Australian longwalls. All main roads and longwall gate roads are supported with bolts, but cross-measure drifts must be supported by arches under Russian law. Caving conditions are relatively favourable. Even where sandstones occur above the seams, they are relatively weak, jointed, and easily caved, so supports are typically in the range of 800-1100 t. Most deposits are synclinal with steep gradients near the outcrops. Deeper parts of the deposits generally have dips of 3 to 100 but the shallowest longwalls in each seam have gradients across the face of up to 260 . All faces are driven generally along the strike, ideally with a small inclination along the gate roads so the faces retreat to the rise, causing water to flow back into the goaf rather than into the face line and down the gate roads. Face widths have been increasing over the last 15 years, from initial widths of 180-240 m to 300 m and SUEK is currently increasing the width of all suitable longwalls to 400 m.

Panel lengths have also increased over time, partly as a consequence of deepening the mines, and partly due to investment in improved longwall equipment with increased working lives. Several of the Kuzbass mines are under major railway lines which cannot be undermined until a critical depth has been reached, so this has limited the extent of longwall panels.

### EQUIPMENT

There is no doubt that most of the SUEK mines have been re-



engineered and re-equipped in recent years and they are now modern mines that are comparable to successful longwall mines in Australia and the US. This has included twelve new main fan installations, five new longwall sets, two fully modernised longwall sets, plus major developments in gas management and mine safety. At the same time AFCs have been upgraded from a mix of Russian and imported machines to the latest imported models (PF4 and PF6 from Cat in thicker seams, Komatsu in thinner seams), shearers have been upgraded from Eickhoff SL500 to Joy 7LS6 and Eickhoff SL900, and development has been largely changed from light duty Russian road headers to Komatsu and Sandvik bolter miners. Belt conveyor systems have been upgraded and are commonly 3500- 4500 tph, originally using imported VSD drives and controls, but recently with high quality Russian designed VSD drives and controls. Several mines have been converted from vertical shaft winding by driving inclined drifts with belt conveyors. SUEK now has only one mine that winds coal in a shaft and even this has recently been upgraded to a fully automatic operation to maximise capacity.

Owing to the steep gradients and soft floor and frequently wet conditions in most mines the most common system for transport of men, materials and longwall equipment is roof-mounted monorail diesel locomotives. These are significantly less flexible and efficient than rubber-tired diesels, but they can operate on gradients up to 260 or more, and they are not affected by floor conditions or water, and they are narrow so they can operate alongside belt conveyors. This has improved longwall salvage operations compared to the former methods of dragging shields along the salvage chamber using low speed winches. After the face is bolted up a monorail is installed through the face, so diesels can drive along the face, pick up pans and supports and drive out the other end. However, they are a major constraint in transferring equipment to the next longwall. A monorail diesel carrying a 28-t shield or a 90-t shearer can only move at 1-1.5 km/hr, and it stops frequently at corners, shunting points and changes of gradient. In this mode of operation availability is low due to frequent breakdowns of the locomotives. Upon reaching the installation chamber the diesel drives along the new face line and lowers the shields at the required positions, and carries on through the face to exit. In many instances a loop is established to enable several diesels to work without interfering with each other. Beams are installed using roof bolts and heavy brackets. These bolts are in addition to the roof support system. It is rare for bolts to fail, even when carrying large shearers (7LS6, intact but minus the drums), because anchors are installed to high standards, in the knowledge that they will be carrying big loads. An additional limitation of this technology is damage to beams. When shields, pans, AFC drives and shearers are being transported they are drawn up close beneath the locomotive. Any swaying of the load translates into torque acting on the monorail beam, so the profile becomes twisted and damaged. To counteract this, it is necessary to set a steel beam against the roof, and then attach the monorail beam to this. Monorail beams have also been reduced in length in order to reduce bending and buckling damage.

## CONCLUSION

SUEK is a major buyer of mining equipment and infrastructure. In the last 5 years the company has bought

three new longwalls and extended two thick seam sets to 400 m, upgraded most AFCs, upgraded complete conveyor networks in several mines, purchased six new shearers and 12 new bolter miners. All of this is world-class, high-capacity equipment from US and European suppliers. The only exception is belt conveyors – here SUEK has worked with Russian companies to develop systems that suit local conditions and operate with software that has local support. As new equipment is introduced, changes in work practices and organisation are introduced to maximise performance and continue the drive for more output with higher margins.

Similar progress has been made in washeries, opencasts, transport operations and the company's export ports. The company follows bold strategies, is not affected by short-term consideration of share prices, and has continued to invest in holistic improvements even during the worst years. There is still considerable improvement under way, with new underground mines being developed and several more longwalls planned to be upgraded and extended to 400 m. There are still problems to be overcome, including the constraints imposed by monorail transport and a major challenge to substantially increase development rates in order to replace longwalls. However, these are being actively addressed, and solutions will be developed. Technical improvement of mines is essential but improved equipment and operations alone are not adequate. It is essential that this is combined with clear and sound strategies for operational efficiency and commercial optimisation. In Russia mining and processing is only half of the equation, and transport and ship loading are of equal importance and complexity. Only a large company that can develop holistic solutions can be truly successful on the world scale. SUEK is one such company.

## THE FUTURE IS LOOKING BRIGHT.

Russia aims to expand domestic coal production to 448-530 Mtpa by 2024 and 485-668 Mtpa by 2035, while doubling coal exports during this period. These objectives were adopted in June 2020 as part of Russia's Energy Strategy to 2035. At least 20.3 Mtpa of capacity expansions are categorised as more advanced. Most of these projects are expected to produce coking coal. This focus on exports requires expanded rail and coal export terminal facilities. A number of investments in both railway and port infrastructure have been announced in recent years.

A particularly ambitious project is the construction of a rail connection between Tuva, a Siberian Republic bordering Mongolia, and the rail network of the rest of the country. The connection would allow for the development of the coal deposits of the Ulug-Khemsy Basin located in the Tuva Republic. First trains on the 410 km Elegest-Kyzyl-Kuragino railway line are planned for 2023. Cargo transport capacity of 14 Mtpa is planned for the first phase, which could be expanded to 27 Mtpa. Costs for the rail development are estimated to be about RU 126 billion

More bigger mines are planned and new longwall mines will play a major part of Russia's plans to expand its presence globally.

# Software playing a crucial role



Modern mine planning software plays a crucial role in the operation of many of the world's mining operations and projects. Mine planning software provides the mining industry with a fast, accurate, cost effective and efficient tool in order to manage their

business interests worldwide. Every aspect of the mining industry is today using some form of mine planning software. From exploration to rehabilitation, the use of software is becoming more and more widespread. Mine planning software companies are constantly under pressure to evolve products to meet new challenges and solve new problems. Development of software is a result of both programming foresight and reaction to industry demands. Without mining industry feedback, many of the products now available would probably not have been developed.

Mining companies need software solutions to manage exploration and production of minerals, optimize the use of human resources and equipment, and comply with environmental and health and safety regulations. Mining software can be used to estimate the financial potential of mineral deposits, manage the infrastructure needed for ore recovery, or track the movement of ore during the mining cycle. Some solutions also offer features for land rehabilitation for closed mines. Since mining projects require substantial investments, companies can use this type of software to lower costs for maintenance and production. It can also help mining companies increase the productivity of their employees through better scheduling. Some mining software solutions focus on exploration and production, while others provide only features for asset maintenance. Most solutions provide integration with back office software like accounting, and with CMMS or EAM for asset management.

To qualify for inclusion in the Mining category, a product must:

- Include schematics and maps to display ore deposits and the infrastructure needed to recover them
- Capture and analyse survey data for surface and underground operations.
- Schedule personnel based on availability, safety requirements, and customer demand.
- Provide features for basic asset and equipment management, and integration with CMMS and EAM
- Ensure compliance with health and safety, or environmental protection regulations.
- Manage the inventory of equipment and spare parts required to support operations.
- Help mining companies manage relationships with suppliers or equipment or services.
- Deliver reports and analytics on mine productivity, equipment efficiency, or profitability.

The engineer employs the software systems that are most in demand in the industry. Historically, geological modelling and mine design and planning have been packaged together, while scheduling, reporting, and costing were often done using spreadsheets or a separate package. Many packages attempted to bridge this division, but due to their inability to effectively meet the requirements of mining operations, no clear leader has emerged in scheduling software. However, as scheduling software developers delve into mine design, while modelling companies increase their scheduling capabilities and expertise, the playing field levels out.

There are a multitude of software companies offering packages to the mining industry although the most



commonly used software packages in geological modeling for coal are MineScape, within Datamine's suit of software and Geovia Minex who claim are the only integrated end to end geology and mine planning solution for coal and other stratified deposits. Some providers may add Surpac to the mix to calculate the reserves and conduct mine planning and scheduling of mining activities. Mining software is an extremely competitive market which constantly drives the levels of development to new heights.

## UNDERGROUND

From the late 1970s to early 1980s open pit operations increased, achieving high quantities of production and lower production costs. However, today, with environmental considerations and the greater depth of coal seam deposits, underground mining is proving to be the more viable alternative.

Underground mining technology has experienced a revolution in the last few centuries, from pick-and-shovel mining to fully automated systems in every aspect of the process. This has not only improved productivity by leaps and bounds but, more importantly, has significantly improved safety standards. Modern underground mines are highly mechanized as new technology continues to evolve.

This high level of mechanization must be accompanied by a high level of monitoring and reporting, as the investment in these systems is extremely costly. For example, the cost of a typical longwall installation can run into high millions of pounds, a shearer alone can cost £40 million plus. Investments at that level must be supported by accurate geological data, resource, and reserve estimation, mine planning and economic projections. The application of mine planning software systems contribute significantly to proving the economic viability of the mine, by handling large data sets with flexibility and speed. Using these tools engineers can assess the geological information, prepare 3D models of the seam, develop quality parameters, and conduct structural interpretation. In turn, data is available for engineering and mine planning using specific modules for underground and open pit, respectively. Engineers use these packages to calculate resources and reserves within mining parameters, such as method of mining, presence of structural interferences, quality parameters and seam extraction height.

Following the mine plan, the development and production quality parameters and seam extraction height can be scheduled to identify the achievable production rates and the optimum utilization of the available resources. These software packages and mechanized mining methods have improved the economics of underground coal mining operations, despite high capital investments.

## OPEN PIT MINING

The old adage that "bigger is better" manifests itself in open cut mining for coal. In the last decade, open pit mining equipment has exploded in size and productivity. Coal mines have benefited greatly from the technology boom, as previously "un-mineable" resources are now well

within the capabilities of the new generation of equipment. Open pit coal mines are typically large, table-like, flat-lying deposits with minimal cover. Since coal is extremely susceptible to oxidation, the deposit must be thick enough to absorb a degree of oxidation without losing its economic value. The equipment used to mine the overburden must maintain a high level of productivity to ensure that such deposits can be mined economically.

Typically, it was assumed that open pit coal mines required dragline excavators – the massive slow-moving machines that compensate for their ungainly movements with the sheer size of the bucket that moves waste material. Today, advances in truck and shovel technology allow quick-moving, extremely mobile fleets of hydraulic excavators, shovels, and haul trucks to reach, and even exceed, the productivity levels of draglines. Instead of tying up tens of millions of dollars in a single piece of excavating equipment, it is possible to obtain three or more excavators for the same price as a single dragline – and still maintain production levels, while increasing the availability and utilization of the fleet. Continued advances in technology successfully provide operators the tools to monitor fleet productivity and equipment performance that prevent breakdowns before they happen, ensuring that the open pit operations will continue to produce for years to come.

## CONSULTANTS ENDORSEMENTS

The role of the consultant is changing with the major causes for change coming from:

- major technical advances in communication, particularly the ability to transfer large amounts of information by telecommuting through e-mail and the internet,
- the development of mine design packages and software systems that can be linked to databases accessed remotely by the mining operation and the consultant,
- and the global unavailability of direct hire experienced technical staff (for operating companies and consultancies),
- the reduction of on-site mine infrastructure and the establishment of mines as non-residential sites with extended work shifts on commute rosters.

It is very interesting to note that many of the worlds leading Mining Consultant Engineers play a major part in promoting the software of their choice as the best supplier of solutions for any given project. Most are well familiar with the wide range of software available on the market and any endorsements play an important part in getting software companies messages across, most engineers are also proficient in using proven geological modelling and design packages such as Micromine, Gemcom, MineScape, Surpac Minesight, Vulcan, Minex and Xpa to name a few. The competition for software packages is high and the preferred choice can differ between companies.

World leaders such as SRK for instance in the period of global demand for coal worldwide led to South Africa seeing an increase in coal exports through its Richards

Bay terminal that resulted in many coal mines re-focusing their plans on optimising production to ensure adequate coal reserves. SRK at the time utilised Micromine's suite of software solutions to achieve the production goals of coal mines throughout Africa.

Grant Van Heerden senior geologist within the company at the time noted that the Micromine software provided a tool for geological modelling and mine design, ensuring that solutions are cost-effective, auditable, and sustainable. "We began using Micromine around two years ago," he said. At the time, I was using a simple package that gave me one aspect of the model I needed to create. We saw the Micromine modelling package and were impressed with the multiple ways it could display, validate and interpret data." Van Heerden explains that his coal team were already using Micromine's Geobank software for data management, however, to supplement and visualise this data, SRK decided to use the complete Micromine suite of modules adding that all its coal modelling packages tie in seamlessly with Geobank. "It has the correct mathematical algorithms for coal, and offers assistance, even if you don't understand coal seams. Micromine has also recently incorporated additional functionality for stratigraphic modelling in the coal industry, as 'block modelling' used for hard rock mines doesn't work too well for coal."

### AN EASY TWO-STEP APPROACH

Micromine's two-step approach provides powerful tools to collect, assemble, prepare, and correlate all the data

associated with a project before modelling the deposit and designing the mine.

Geobank's data management solution provides a flexible and efficient environment for capturing, validating, storing, and managing data from diverse sources. Micromine's powerful modelling environment quickly creates 3D seam block models for either simple or complex deposits.

This intuitive approach saves vast amounts of time. A continuous automated checking process ensures that data such as core logs, analytical data, survey information or downhole geophysics, is correct before it is written to the production database. Any mismatches or errors are highlighted and reported to the geologist. This unique feature speeds up the data correlation process and ensures errors are identified before modelling commences, saving time and money.

Once the geologist is confident the data is accurate, Micromine generates a logical workflow to map the stratigraphy, identify the pinchouts, model faults and generate a 3D model that can be viewed and checked for accuracy. Depending on the style of the deposit, a block model can then be generated.

In coking coal deposits, Geobank's standardisation tools interpolate missing data, compile a standard wash matrix, and provide features to display and export coal washability tables, as required.



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## Anglo American suspends operations at Moranbah North mine on safety concerns

Operations at Anglo American's Moranbah North coking coal mine in Queensland, Australia, is suspended on safety concerns following detection of a gas leakage, the company said in a statement.

The suspension of operations was due to "a change in underground conditions" at Moranbah North Mine on 20 February, and the company had evacuated workers as a precaution.

"The trigger for the underground withdrawal was elevated levels of some gases in the goaf, which would indicate a coal heating issue and an overpressure event," a spokesman for Anglo American said in an emailed reply to S&P Global Platts queries.

The company said it had been "mining through some particularly challenging geology."

There was no evidence of any explosion, the spokesman said, "and methane levels on the longwall were well within the regulatory levels."

Moranbah North is 88% owned by Anglo American. The mine's hard coking coal is exported mainly to Japan, South Korea, Taiwan, India, Brazil and Europe.

"At this junction, market participants are still in the early stages of assessing

the impact and awaiting more news from the company," a trader source said, anticipating that the disruption in coking coal production could impact spot prices.

Anglo American did not provide a timeline on the mine's reopening.

"The conclusions from the expert review of the incident will inform a comprehensive risk assessment prior to re-entry, which will require regulatory approval," the spokesperson said.

"It seemed to be less of an issue as compared to the Grosvenor mine incident," a trader source said, referring to the Grosvenor coal mine explosion on 6 May 2020, when five people were injured.

Miner Anglo American had revised its 2020 metallurgical coal production to about 17 million mt from the previous estimate of 16 million-18 million mt at an investors' update call on 11 December 2020. The latest metallurgical coal output figure is down 26% from the 2019 production volume of 23 million mt, the same report stated.

For 2021, production volume is estimated within 18 million-20 million mt. The lower production levels in 2020 and 2021 is due to the Grosvenor incident, the company had said.



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## World's largest battery to be built in Australia mining hub

Australia is planning another giant grid-scale battery as the global roll out of super-sized energy storage projects accelerates.

The project in New South Wales-state, which will be three times larger than the current No. 1 battery in California, aims to store energy for the grid as Australia raises its share of renewable power.

Renewable energy fund CEP.Energy Pty plans to begin construction on the

1,200-megawatt unit early in 2022, and bring the battery online the following year, the firm said in a statement.

Big batteries “will play a major role in filling the gaps left by the gradual retirement of coal and gas-fired generation assets,” Chairman Morris Iemma said in the statement. The project will support the Hunter Valley region’s longer-term shift from its role as a coal-mining hub, he said.



## Exporting to China set to continue – Glencore

Glencore heading for a future without any coal production.

The export of South African coal to China is poised to continue while China decides not to buy Australian coal, Glencore CEO Ivan Glasenberg said during Glencore’s media conference.

“China still imports round about 185-million tons to 190-million tons of seaborne coal. They like to import the better quality coals, and therefore to substitute the Australian better quality coal. Indonesia and Russia do supply them, but they need other sources of supply once Australia is out of the market,” Glasenberg said in response.

“South Africa has picked up a good portion of the Australian coal that went into China. We’re shipping round about two to three Capes a month into China and

hopefully that will continue while the spat continues between China and Australia.

“Naturally those tons that we now move to China means less tons for India, which means Australia will be supplying those tons that went to China to India. So, the trade routes are changing somewhat and naturally that puts pressure on the freight rates, but someone in the end has to absorb that extra freight rate. I think that will continue for as long as the battle exists between Australia and China,” said Glasenberg.

Glencore is planning to deplete its coal mines globally as part of its commitment to mitigate climate change.

Asked whether it would be taking part in the planned just transition out of fossil fuels as coal-fired power stations close and Glencore’s coal

mines in South Africa close, Glasenberg said what the company was also doing in South Africa was helping to develop other forms of energy. The company’s ferrochrome business was looking at other sources of energy, including solar, and supporting other parties who were able to supply solar energy. The company had comprehensive closure plans that included taking care of the communities surrounding the mines as the mines close, “like we do in all parts of the world, and South Africa will be no different”.

Incoming Glencore CEO Gary Nagle said some of Glencore’s South African coal mines would close in the 2030s, and the others over the next 20 years.

As Glencore grows in copper, cobalt, nickel, zinc, aluminium and vanadium, it will be depleting its global coal production, which represents its biggest decarbonisation step.

It has published its pathway to net-zero total carbon dioxide emissions, with a large part of the 40%-by-2035 targeted reduction being coal depletion.

By 2050, its South African and Colombian coal

operations will be shut and Australian coal mines largely depleted.

It will also reduce its scope 1 and 2 emissions through energy efficiency and fuel switching at its operations. Besides its primary coal depletion, its other mines will also get to zero-emission through offsets and efficiencies, primarily from carbon capture and storage.

“So, we’ve got a clear pathway of how we get there. Our medium-term target is 40% reduction by the year 2035 and then zero by 2050,” said Glasenberg.

A large part of Glencore’s emissions come from Scope 3 when the consumers are utilising its products.

It will be putting its plan to shareholders for an advisory vote at its annual general meeting in April.

“If there’s a demand to do something different by the shareholders, we’ll listen and we’ll focus on what the shareholders want us to do. But I strongly believe in the approach outlined. It’s the way forward by our company. It sets us up for the future, and I look forward to driving the strategy as we go forward,” said Nagle, who takes over from Glasenberg in mid-2021.





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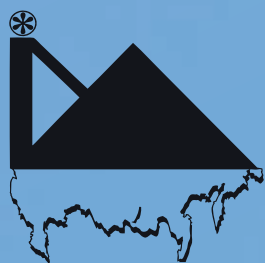
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## Komatsu commissions Australian-first ultra-class truck

Komatsu has furthered the sustainability of Australian mining by commissioning an advanced low-emission mining truck, the Tier-4 930E-5.

The original equipment manufacturer (OEM) is a partner with the UN's Sustainable Development Goals.

In line with its contribution to these goals, Komatsu's latest truck reduces the volume of fine particles in the air by 80%, allowing the system to work more efficiently.

The technology at play is a high-pressure fuel injection system, which aids the haulage process – a major contributor to mining's emissions.

Such high-temperature combustion is an unavoidable mining process and knowing this, Komatsu tackled the problem head-on.

Komatsu's national product manager for mining, Jason Arthur, is proud of his company's dedication to sustainability.

"Komatsu has a strong commitment to environmental best practice, with a continuous focus on reducing our environmental impacts and our carbon footprint," he said.

"Our ongoing research and development efforts include developing new products that significantly reduce fuel consumption

as well as greenhouse gas emissions" he said.

After the combustion process, the 300-tonne 930E-5 further processes any leftover emissions through a cylinder to reduce any remaining nitrogen oxide greenhouse gas emissions.

On top of this low-emission system, Komatsu's Tier 4 truck also satisfied its client's request for noise reduction measures.

Arthur said the truck's sound-suppression technology more than halved the standard truck's emitted sound.

"Our US-based Komatsu Engineering team became intimately involved and created a factory-engineered sound suppression solution that would meet our customer's requirements," he said.

"Successfully achieving these sound levels was a very challenging undertaking for a large mining truck," Arthur said.

The new mining truck is just one of many developments from Komatsu, which continues to show initiative in their industry to further reduce greenhouse emissions.

In 2019, Komatsu's CO<sub>2</sub> emissions had been reduced by over 31% since 2010, with a goal of 40% reductions by the end of 2021.

## Rises in revenues but declining profits

As mining activities are seasonal and affected by the weather, revenue and profit of coal mining businesses have fluctuated continuously over the past 10 years.

Vinacomin – Northern Coal Trading Joint Stock Company (TMB) saw an average growth rate of 9% in revenue every year during the 2010-2020 period.

Vinacomin – Coal Import Export Joint Stock Company (CLM) has reported a 17% rise in revenue during the past 10 years, from VND1.6 trillion (US\$69.4 million) to VND7.5 trillion.

Ha Lam Coal (HLC), Vang Danh Coal (TVD), Ha Tu Coal (THT) and Mong Duong Coal (MDC) witnessed the same average revenue growth in the 2010-2020 period of 6-7%.

### Low profits

Despite earning trillions of dong in revenue, coal companies only achieved tens of billions of dong a year in profit, with some even suffering losses.

Compared to 2010, the profits of coal companies were almost unchanged.

Mong Duong Coal (MDC) had a profit of VND79 billion in 2010 – the highest in the group mentioned above. But by the end of 2020, this enterprise only reported VND27.8 billion in profit.

Coc Sau Coal (TC6) witnessed profit fall from VND67 billion in 2010 to only VND5.6 billion in 2020, the lowest level among the group, although its yearly average revenue is much higher than many other businesses in the industry.

The merger between Cao Son Coal (TCS) and Tay Nam Da Mai Coal (TND) also did not help Cao Son Coal improve its profit in

2020, hovering at more than VND54 billion.

Viet Bac Mining (MVB), which started the equitisation process in 2015, made a breakthrough in profit growth with VND55 billion in 2015, soaring to VND270 billion in 2020, a jump of 37%.

Businesses in the coal mining industry have to confront specific risks such as the reserve of open-pit mines gradually drying up.

Most mines are exploited deep underground, with some at even 300m below sea level. Underground coal mines have higher soil removal costs compared to open-pit mines, which leads to less competitive coal prices.

Mining activities are seasonal and affected heavily by the weather. Due to the negative impact on the environment, taxes and fees for the coal industry are always high and tend to increase.

However, if comparing coal stocks, it can be seen that there are still good stocks with low price-to-earnings (P/E) rates and high dividend payout ratios.

Leaders of Viet Nam National Coal and Minerals Group (Vinacomin or TKV) said that the coal industry was facing many difficulties due to the impact of the COVID-19 pandemic, which has caused millions of tonnes of coal residuals at the yards and warehouses of TKV.

They said the coal demand for the economy in 2021 will not grow much, staying at the same level as in 2020. In addition, the mining conditions are increasingly difficult due to the rising depth underground, hampering the transportation process.





# MINING & QUARRY WORLD

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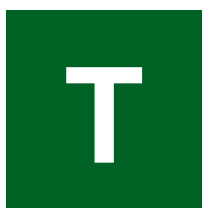
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# It's sheer madness to import the coal essential for our steel industry when we can produce it ourselves

**Political civil war has broken out in the Johnson family – and not for the first time.**



The Prime Minister's father, 80-year-old Stanley, has denounced the Government's decision not to block the construction of Woodhouse Colliery, Britain's first new deep coal mine in over 30 years.

Johnson Sr pronounced this to be 'a massive mistake . . . How can we ask other countries to bring in their climate

change reduction programmes when we are reopening the whole coal argument here?'

Stanley, who in 2019 praised the Extinction Rebellion protesters then bringing the centre of London to a standstill, was speaking in his capacity as 'international ambassador of the Conservative Environment Network', the role in which he will be attending the UN Climate Change Conference (COP26) in Glasgow in November.



Stanley Johnson has denounced the Government's decision not to block the construction of Woodhouse Colliery. In fact, the UK has been assiduous in eliminating coal from domestically produced energy.

But this new mine – in the Cumbrian constituency of Copeland – is not for 'thermal' use in power stations. It is coking coal, for indispensable use in the blast furnaces of what remains of the British steel industry.

One tonne of such coal is required for the production of every 1.25 tonnes of steel – and, as yet, there is no economically viable alternative (recycling scrap steel is hardly a complete answer).

The Prime Minister has declared his commitment to making Britain 'the Saudi Arabia' of wind power, as part of the plan to make our entire electricity network 'net-zero carbon' by 2050. This will cost a stupefying £160 billion a year over the next 30 years, according to the National Grid.

Vast numbers of new wind turbines will be needed for this. And what will they be made of? Yes, steel. So the question is whether we wish to make as much as possible – or indeed any – of that steel in the UK. If we do, then coking coal is required.



It comes after the Prime Minister declared his commitment to make Britain 'the Saudi Arabia' of wind power



An artist's impression of the Woodhouse Colliery.

Britain's first new deep coal mine in over 30 years is situated in the Cumbrian constituency of Copeland.

Next question: where should that coal come from? Recently, almost 90% of the coal we burn here has been imported, almost double the proportion of only a few years ago.



Mike Starkie.

It should be obvious that importing the stuff from our two biggest sources – Russia and, especially, Australia – involves the emission of much more CO2 because of that generated in transporting the excavated minerals from the other end of the planet.



Dr James Hansen.

These points were emphatically made by the mayor of Copeland, Mike Starkie, on BBC Radio 4's Today programme.

He was pitched against Dr James Hansen, a very grand American scientist, frequently described as 'the father of climate change awareness'.

Dr Hansen published an open letter to Boris Johnson declaring the Copeland mine would guarantee the PM 'ignominy and humiliation [for] contemptuous disregard of the future of young people and nature'.

The mayor of Copeland was not impressed by this intervention (which was backed by sundry other climate change campaigners, including, inevitably, Greta Thunberg).

'He's not even in this country,' said Mr Starkie. 'His views are completely irrelevant . . . For any new green sources of energy, we're going to need steel – and lots of it. It is better it is made here, in a modern mine, than shipping it from around the world.'

Obviously, Mr Starkie is delighted that the Copeland mine will generate at least 500 jobs in a part of the country that has suffered more than most from deindustrialisation.

That was also the local council's attitude: its members – Conservative, Labour and Liberal Democrat – voted unanimously for the development.

The local constituency had been Labour for almost a century before Trudy Harrison won it for the Conservatives in a 2017 by-election.

That event was the canary in the mine for the disaster that befell Labour in the 2019 general election, when its 'Red Wall' across the North and Midlands was shattered by Tory gains, even in old coal-mining seats thought impregnable given the hatred there for Margaret Thatcher.

It just so happens that Trudy Harrison is Boris Johnson's parliamentary private secretary. So if the Prime Minister was in any doubt about the views on the ground in Copeland, she could certainly have clarified matters for him.

There is, in fact, a real political problem for the Prime Minister, simultaneously committed (in typical 'have-my-cake-and-eat-it' fashion) both to addressing the concerns of such 'left-behind' parts of the country and to move Britain away from the 'high-carbon' manufacturing methods that have been at the heart of the Northern and Midlands economy.

Last month the think-tank Forward published a report signed off by both a former Tory and a former Labour minister.

Though they were in favour of the 'net-zero carbon plan', they pointed out that 'the industrial and manufacturing heartlands in the Midlands and the North are far more likely to experience economic disruption during the net zero transition than the South East and London ... Many of these places were worst-hit from the deindustrialisation of the 1980s and 1990s, [which] reinforces this problem'.

As if to demonstrate how much the modern Labour Party has lost touch with its roots, the Shadow Business Secretary and former party leader Ed Miliband told the BBC's Andrew

Marr that the Copeland mine should be 'stopped' and that 'alternatives' should be adopted.



Mr Miliband.

Mr Miliband, who was the author of the 2008 Climate Change Bill, did not explain what these 'alternatives' were for steel producers.



Alok Sharma.

So perhaps the Cumbrian mine go-ahead came as a shock to Alok Sharma, the former business secretary. He would have done well to read an article published by two MPs for steel-producing areas, Jessica Morden and Holly Mumby-Croft, who wrote: 'Steel is not just an industry, it is an identity...hard-coded into the communities we represent. They are a key part of our industrial

future . . . a perennially uncompetitive steel industry will simply increase our reliance on imported steel, which may not be produced to the same environmental standards.'

The secretary of state responsible for planning decisions, Robert Jenrick, decided not to challenge the local approval for the Copeland mine.

But Government policy in this field is capricious. Last October, Jenrick blocked the locally approved construction of an open-cast mine, Highthorn, in Northumberland, even though its product was also coking coal required by the British steel industry, and even though Highthorn would have had a much shorter production life than Woodhouse Colliery.

Absurdly, that verdict was based on the argument that ministers could not work out whether importing coal from Russia and Australia would generate more or less CO2 than making and transporting it domestically.

So perhaps the Cumbrian mine go-ahead came as a shock to Alok Sharma, the former business secretary now charged with full-time leadership of the UN climate change event in Glasgow.

He is widely reported to be 'apoplectic' about Jenrick's decision to let the Copeland coal mine go ahead. Sharma's manner is so smoothly anodyne that it's hard to imagine him being 'apoplectic' about anything.

But I can see that it's necessary for him to be said to be so, given his new responsibilities.



Robert Jenrick (pictured outside 10 Downing Street with Nicky Morgan) decided not to challenge the local approval for the Copeland mine

Yet is it actually true that other countries will look at this decision and say: 'Because Britain has done this, we won't



feel obliged to do our bit to counter man-made climate change’?

Or to put it another way, would China – now building hundreds of new coal-fired power stations and financing many others across the developing world – have said, if the British government had blocked the Copeland mine: ‘Oh, now you have done that, we will scrap all our coal-fired power stations and definitely not build any more new ones’?

No, they wouldn’t.

To be frank, the whole idea of British ‘leadership’ in this matter is grossly to over estimate our significance in the world.

It’s a form of moral vanity – and if it has local victims, they will principally be in the ‘left-behind’ regions of our country that the PM promised to prioritise.

Perhaps Boris Johnson might explain that to his dad.



The sun setting behind the Teesside steelworks along the bank of the River Tees in 2015.

NEWS, PLANT AND EQUIPMENT

Cokal contracts Harmoni at Bumi Barito

Cokal has appointed Indonesia’s Harmoni Panca Utama to provide contract mining services at the Bumi Barito Mineral coal development project in the country’s Central Kalimantan province.

Cokal is aiming to develop the Bumi Barito project into an operating coal mine that produces export quality coking and pulverised coal injection (PCI) coal products within

“an expedited timeframe”.

The agreement with Harmoni involves the provision of overburden services, including project management, mine planning, supervision, equipment, maintenance, labour and site infrastructure.

It will start within 90 days and last for a duration of five years.

Although the agreement value is not disclosed,

Cokal will be funding the agreement with a \$US20 million (\$26 million) debt facility and the sale of coal from Bumi Barito.

Cokal stated that the costs payable were variable, depending on the mine production volume, Harmoni’s performance and external costs.

Cokal chairman Domenic Martino said the company had negotiated a strategically advantageous

price environments, whilst retaining margin enhancements for Cokal as coal prices rise,” he said.

Cokal has the right to terminate the agreement should Harmoni fail to achieve monthly production targets by 25% or more for two consecutive months, or three months out of six consecutive months.

Should termination occur, Harmoni will be required to continue providing mining services until Cokal has selected a replacement contractor.

Harmoni is one of the largest mining services companies in Indonesia and has worked in some of the largest coal mines in the country.

The Bumi Barito project is Cokal’s most advanced project, covering a mining lease area of nearly 15,000 hectares.



## China's plant capacity build, three times more than the rest of the world in 2020

China built more than three times as much new coal power capacity as all the other countries in the world combined last year.

That's according to a new survey by the San Francisco-based think tank Global Energy Monitor (GEM) and the independent organisation Centre for Research on Energy and Clean Air (CREA), which suggests China

commissioned 38.4GW of new coal plants last year.

That translates to more than one large coal plant every week.

The research, which surveyed global coal-fired units through to 31st December, also shows 73GW of new coal power projects started in China, which is five times as much as in all other countries.



The report demonstrates China's coal fleet grew by 29.8GW in 2020, while in the rest of the world's net capacity decreased by 17.2GW.

In addition, China was home to 85% of the

87.4GW of proposed new global coal-fired capacity in 2020.

The Chinese President Xi Jinping has recently announced a pledge for the country to be carbon-neutral by 2060.

## New Hope's \$55m loss may see Acland mine mothballed

New Hope's interim profit has plunged to a loss of \$55 million for the six months to 31 January as the cost of delays on its Acland expansion added to almost \$90 million.

New Hope's profit has dived because of costs associated with Acland.

The Brisbane coal producer said it was looking at a much-improved second half as the benchmark thermal coal prices rose above \$US90 a tonne, but its first half was littered with costs and write-downs.

And it warned that the delays at Acland could mean the mine would be mothballed.

It said losses on take-or-pay contracts were \$37 million, group redundancies were \$10 million and asset write-downs on mining assets were \$40 million.

Revenue for the company was \$405 million, a fall of 34% on the same period in 2020. Its earnings before interest, tax, depreciation and amortisation (EBITDA) were down 62% to \$81

million and its bottom line sank 179% to a loss of \$55 million. It declared a 4 cents a share dividend.

Adding to the delays at Acland were a fall in coal prices and a drop in production because of maintenance at its Bengalla mine.

Chief executive Reinhold Schmidt said it was a tough period for the company but there were signs of a recovery with prices jumping from a low of \$US50 a tonne in 2020 to \$US90.

"Bengalla continues to perform strongly for the

business and, although production was down slightly in the first half due to the dragline shutdown, it was above expectations," Schmidt said.

He said the continued uncertainty around approvals for the New Acland expansion was impacting on the broader business.

"Redundancies continue as a result of nearing final stage two coal at New Acland," he said.

"With the High Court of Australia ordering New Acland back to the Land

Court of Queensland in the first quarter of 2022 and the prospect of the project being placed in care and maintenance, a further impairment of the asset has been accounted for in the half year results."

The State Government has refused to grant approvals for the mine expansion while court action remains.

The company has fought a decade-long fight for the approvals and spent \$658,000 on the last election campaign to push their case.





## Azsalaam Power Project

The Azsalaam power project is a 1.32GW coal-fired power generation facility under construction in the Chittagong district of Bangladesh.

The project is being developed on a built, own and operate (BOO) basis of through a joint venture between S. Alam Group and China's Shandong Power Construction Number Three Company. The coal-fired power plant will be operated by the joint venture for a period of 25 years as part of the BOO contract.

The total investment on the project is estimated to be approximately £2.03bn (\$2.48bn). While the preliminary works were started in September 2018, the main civil construction works on the project were started in January 2019.

The foundation pouring for the unit one turbine, along with the hoisting of the last roof girder of the turbine-generator (TG) building took place in January 2021.

At full capacity, the Azsalaam coal-fired power project is expected to generate up to 10 billion kWh of electricity a year.

### Location and site details

The Azsalaam coal-fired power project site is located on the banks of the Bay of Bengal, approximately 70km south of the Chittagong port city

in the Banskoli sub-district of the Chittagong district, Bangladesh.

### Azsalaam power plant make-up

The Azsalaam thermal power plant will be equipped with two super-critical, coal-fired units of 660MW capacity each. Each unit will comprise a super-critical boiler, turbine and generator, along with the balance of plant (BOP) facilities for the entire power station.

The plant will use sea water for cooling and will also house sea water desulphurisation facility.

The other infrastructure facilities for the project includes a coal jetty, coal conveying system with two dry coal sheds, apart from the chimney and electricity transmission infrastructure.

The project also involves the construction of a temporary wharf, and approximately 7.8km of concrete asphalt road.

### Project financing

The Azsalaam coal-fired power project is being financed through £1.43bn (\$1.75bn) loan from the China Development Bank, the Bank of China, and the China Construction Bank.

### Contractors involved

Sinohydro Foundation Engineering Company was



contracted for the construction of the coal conveying system for the project in September 2020. The company was also previously contracted for the construction of the temporary wharf, roads, PHC pipeline, along with pile foundations.

Hebei Electric Power Equipment Company was contracted to supply 168 medium voltage switchgears along with power monitoring and management system in July 2019.

Shandong Sanjian, a subsidiary of PowerChina Group, was awarded an engineering, procurement and construction (EPC) contract for the project in July 2015.

Beijing Bavi Company was subcontracted for the supply of boilers and associated equipment in 2017, while Dongfang Electric Group was subcontracted for the supply of turbines, generators, and associated ancillaries in 2017.

Hebei Institute of Engineering and Design was contracted for the survey

and design of the Azsalaam coal-fired power project in November 2016.

Qingdao Hongrui Power Engineering Consulting Company was engaged for the preparation of the feasibility study report for the main plant, while Zebec Marine Consultants & Services was engaged for the feasibility study of the Jetty for the coal-fired power project.

Centre for Environmental and Geographic Information Services (CEGIS) Bangladesh was engaged for the environmental study of the Azsalaam power project.

### Azsalaam coal-fired power project background

The Azsalaam coal-fired project was officially unveiled by the governments of Bangladesh and China in October 2016.

The project forms part of the Bangladesh-China-India-Myanmar (BCIM) Economic Corridor of China's Belt and Road Initiative (BRI).

## South African miner Exxaro will not invest in new thermal projects

South African coal company Exxaro Resources will not invest in new thermal coal assets, Chief Executive Mxolisi Mgojo said.

Exxaro, which exports coal



as well as supplying it for domestic power generation, said the company would continue to supply thermal coal to state-owned power utility Eskom's Medupi and Matimba power stations through its coal contracts.

"As we come to the end of life of our other coal reserves, we will not be building any new ones," Mgojo said during a virtual

panel at the Investing in African Mining Indaba conference.

Exxaro, which also has interests in mineral sands, iron ore and energy, has sought opportunities in greener energy and acquired full ownership of two wind farms in the Eastern Cape province in 2019. It began seeking investment opportunities in water, food

security and cleaner energy in 2017 and has already put up some of its coal assets for sale as part of a strategic review of its portfolio.

South Africa, the continent's biggest greenhouse gas emitter, gets most of its power from coal-fired power stations run by Eskom, but plans to move towards a more diversified mix of generation sources.

## Ukrainian miners produced 2.57M tonnes in January

In January 2021, Ukrainian mining enterprises produced 2,576,551 tonnes of coal, which is 106% of the production plan, the Coal Miners Union of Ukraine reported with a reference to the Energy Ministry.

In Donetsk region, 1.104 million tonnes of coal were produced by coal mining enterprises of all forms of ownership in January 2021, including 192.9 thousand tonnes of coal produced by state-owned mines, which is 21.2 thousand tonnes less than the production plan.

Enterprises of the Energy Ministry in Luhansk region

produced 21.4 thousand tonnes of coal, which is 13.4 thousand tonnes less than the production plan.

In Dnipropetrovsk region, DTEK Pavlohradvuhillia extracted 1.336 million tonnes of coal, which is 121.6 thousand tonnes less than the production plan.

In Lviv region, Lvivvuhillia State Enterprise produced 112.8 thousand tonnes of coal. The production plan was exceeded by 12.4 thousand tonnes.

PJSC Nadiia Mine extracted 1.380 thousand tonnes of coal. The production plan was fulfilled by 13%.



## Mining job seekers consider move to renewables

Almost half of the mining industry's workforce is considering a move to renewables, according to a recruitment report.

The 2021 energy outlook report by Oilandgasjobsearch.com and Brunel contains a survey of 22,000 employees across the mining and oil and gas sectors.

It found that 73% of those surveyed are looking to move jobs, compared with 56% in the previous year.

A move to green energy was the key driver for workers who are looking to seek new roles, the survey found.

Almost half of the 37% of jobseekers that listed renewables as a field they would consider moving into were from the mining industry.

The survey found that younger workers were attracted to greener sectors due to their longer-term stability.

"In particular, younger workers are attracted by the longer-term, more stable employment options on offer with renewable companies, and the fact that sectors like solar power or offshore wind are at the forefront of technological innovation makes them even more attractive," the report stated.

"On top of this, an increasing percentage of new graduates are highly

aware of, and motivated by, the threat of climate change."

The report suggested that resources companies should provide high-quality training, career development programs and benefits to allow young people to compete with highly skilled jobseekers.

The survey also found that global mobility slowdown was a key trend.

Role location was listed as "top concern" for jobseekers in the resources industry, however only 14% of the mining sector stated that they are looking to avoid excess travel.

The report stated that it "(remained) to be seen" whether the mobility slowdown was caused by the COVID-19 pandemic or a speeding up of existing trends.

A total of 58% of respondents that were asked how they would respond to diseases similar to COVID-19 in the future said they would consider finding other job opportunities, employers and locations.

"This shift affects not just day-to-day travel, but also the willingness or ability of workers to permanently relocate or take short-term expat contracts due to closed borders between many states – a trend that will most keenly affect the oil & gas and mining sectors," the report stated.

## GE starts up Chinese Chp plant

General Electric has started up commercial operations at the Junliangcheng 661-MW combined heat and power (CHP) plant in Tianjin City, mainland China.

The plant, replaces a coal-fired plant. Following the coal-to-gas transition, Junliangcheng plant is expected to reduce sulphur dioxide (SO<sub>2</sub>) and NO<sub>x</sub> emissions by some 1,194 and 7,775 metric tons/year respectively, it said.

The plant is owned by China Huadian Tianjin Junliangcheng Power Generation Co, part of China Huadian Corporation (CHD) and features the first commercially operating GE 9HA.01 technology in China. GE's local partner, Harbin Electric, provided the steam turbine, generator and balance-of-plant equipment

for Juliangcheng.

CHD said: "Coal-to-gas switching is an effective and rapid method to reduce emissions and we are pleased to have selected GE's highly efficient gas technology for this project. We have been working with GE since 2014 and we put our trust in GE's record-setting HA technology. We are sure our CHP plant represents a best practice for modernization and transition of existing coal-fired power plants in the country".

GE said its "new, high efficiency combined cycle capacity offers massive potential to combat climate change, and we are honoured to support our customers like China Huadian in this transition."







# China Coal & Mining Expo 2021

China's 19th International Technology Exchange &  
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**Co-host:**

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**Organizers:**

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