



Improving gas safety in Australian mining



Why safety is not a gas

Mining environments are inherently dangerous for several reasons. Among those dangers is the presence of toxic gases – which can be both naturally occurring or created by mining activities. Geological attributes of mines, such as their remote location and the regular requirement to work within confined spaces, can further exacerbate the consequences of gas exposure. Also, some toxic gases are not easily identifiable to the naked eye or nose – in fact, carbon monoxide, methane and carbon dioxide are odourless and colourless.

Whilst the risks presented by toxic gases in mine sites is well-known, there have been a spate of serious incidents in recent years. Five workers were rushed to hospital with severe burns from an underground gas explosion at a coking coal mine in May 2020⁵. In 2018, an underground fire ignited by gas in a mine enforced such a lengthy evacuation of the site that it was later deemed financially unfeasible and shut down⁶.



Gases pose a significant hazard in mine sites. They can be highly combustible, explosive and fatally toxic to personnel. In addition to affecting the health and safety of people working in a mine site, they can also negatively impact the financial viability of an operation.

This whitepaper provides an industry overview of gas safety in the Australian mining sector, with a discussion around the types of gases that present risks and the challenges that mining companies face in addressing and managing these hazards. Importantly, it examines several practical detection solutions that mining companies can deploy, to monitor and minimise exposure risk.

Industry overview

The mining and resources sectors are Australia's largest contributor to the national economy – comprising 11.1% of the GDP share – and employ over 1.1 million people in the mining equipment, technology and services sectors¹⁻³.

It is also ranked as one of the most dangerous industries to work in – with the third highest rate of fatalities among all Australian industries⁴.



The hazardous mining gas list

This hazardous mining gas list includes flammable, suffocating and toxic gases, which pose risks ranging from explosion and asphyxiation to poisoning.

Methane

Non-toxic but flammable and poses high risk of explosion.

Carbon Monoxide

This can cause poisoning and is also flammable.

Carbon Dioxide

Excessive levels can cause issues with breathing and headaches and in extreme cases can cause suffocation.

Hydrogen Sulphide

A highly toxic flammable gas – acute exposure can be fatal.

Nitrogen Dioxide

Whilst non-flammable and non-combustible on its own, it reacts violently with other combustible materials.

Nitric Oxide

Whilst non-flammable it will increase the risk of fire and explosion in combustible materials.

Sulphur Dioxide

Is extremely poisonous at high concentrations, with short term exposures at low concentrations being dangerous and potentially life-threatening.

Hydrogen Cyanide

A fast-acting, poisonous gas that is also highly flammable.

Anhydrous Ammonia

A toxic flammable gas that can be life-threatening, it is corrosive to the skin, eyes and lungs.

Challenges in the sector

Even though some types of mining have a heightened risk of gas hazards compared with others, gas safety management is a priority across the industry. As part of the risk management process, there are a number of measures mining companies can adopt to support controls around gas safety. Two such measures include: awareness and detection.

According to Nick Taylor – product manager for Thermo Fisher Scientific’s gas detection instrumentation in Australia – the two are intrinsically connected.

“There are multiple scenarios in mining applications where a worker’s safety will be at risk, gas exposure being one of these where the worker is required to wear portable gas detection devices. In these cases, it comes down to the training and understanding of the product being used by personnel,” explains Nick, who has worked with Thermo Fisher Scientific for over 15 years. “People need to have an understanding of why they need to wear a detection device in the first place and what standard they are complying with, along with how the device will measure and alert of dangerous gas levels, so that companies can apply and

ensure that gas safety controls are in place and maintained.”

“Adequate training of how to use the equipment is required, particularly in any workplace where the casualisation of the workforce has meant there are less experienced people on sites,” says Nick. “Wearing a gas detection device is not a trivial requirement, but if an inexperienced person comes in to work and doesn’t fully comprehend the risks and regulations, they may be complacent. Obviously, workplaces need to enforce these kind of safety measures – which extends to ensuring equipment is calibrated and ready for use – as there will be penalties that apply otherwise.”

Moreover, as occupational work and safety laws are decentralised in Australia, each state or territory has its own legal framework and different regulations apply according to the individual jurisdiction. Mining companies have a responsibility to ensure their workers understand what regulations affect them, and to keep abreast of current guidelines, which can be updated regularly. For example, a mining disaster in New Zealand – where a methane gas explosion caused 29 deaths⁷ – prompted an update to Standards Australia’s guidance on gas detection in coal mine sites⁸.



Effective detection solutions

When it comes to choosing and implementing a gas detection solution, there are various factors to consider. “The most salient driver, however, is trust,” says Nick.

“A gas detection solution should provide peace of mind that workers are safe and that the safety controls in place are adequate,” Nick expands. “Thermo Fisher Scientific has a long-earned reputation in this space and is a trusted supplier of gas detection products. We also provide a high level of after sales support and technical services such as the commissioning of devices onsite, calibration of the equipment and staff training.”

On the portable gas detection front, Nick says “Thermo Fisher Scientific supplies a broad product range, but the products come from just a handful of carefully selected suppliers.”

“We provide solutions from Honeywell, MSA Safety and Blackline Safety – all dependable brands that are established in their field. These solutions include personal and area gas detection solutions, monitoring from just a single gas to up to six gases and with functionality that ranges from simple, alarm-only units to advanced, fully configurable instruments,” he elaborates. “Depending on the requirements of the customer, we can provide an economic solution, or a more rugged, complex and cloud-connected solution,

In more advanced solutions – such as those that include GPS positioning and cloud connection – real-time worker safety alerts can be incorporated.

“For example, the Blackline G7 solution includes both gas detection monitoring and lone worker safety alerts,” says Nick. “In the event that a person injures themselves and cannot ask for help, the device will send an alert to the central operations system.”

Thermo Fisher Scientific also provides fixed gas detection solutions.

“Our product offering includes the full range of fixed point and open path gas detection equipment, along with



gas leak detection, to complement our portable gas detection range,” says Nick. “We often get involved in the commissioning of these systems on site, as well as provision of training to users.”

Importantly, Thermo Fisher Scientific can provide traceable and NATA calibration services, depending on a site’s requirement.

“We can either provide calibration at one of our service facilities, or we can offer an on-site option where we drive our accredited van on site and provide calibration there,” explains Nick. “The latter is a popular option as it means the mining company doesn’t have to send their devices off site and wait for the turnaround. We can provide immediate, certified calibration of gas detection equipment on site.”

Summary

Gas detection plays a critical role in ensuring mine sites are safe for workers. Reliable gas detection equipment will vindicate a mine’s gas safety control measures and provide peace of mind to both employers and employees. Whether its portable gas detection or fixed gas detection, Thermo Fisher Scientific is both a trusted supplier of quality equipment and a services provider with decades’ worth of experience working with customers in the mining sector.

REFERENCES:

1. [Composition of the Australian Economy – Snapshot](#), Reserve Bank of Australia
2. [Mining is the largest contributor to the Australian economy 2019-2020](#), Minerals Council of Australia, October 2020
3. [Resources and Energy Quarterly](#), Australian Government: Department of Industry, Science, Energy and Resources, March 2021
4. [Work related fatalities](#), Safe Work Australia
5. [Mine evacuated as gas raises safety fears for Anglo American](#), Australian Financial Review, Feb 2021
6. [Safety concerns after further gas incidents reported at Queensland mine](#), ABC News, June 2020
7. [Pike River Mine Disaster](#), New Zealand History, November 2021
8. [Fresh guidance for gas detection in coal mines](#), Standards Australia, July 2018

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