The 14,000 residents of Morwell, Australia, didn’t know what to expect when an underground coal seam mine fire broke out near them on February 9, 2014.

The 4-mile by 2-1/2-mile burn began as a grass fire in the tinder-dry wild land area outside of Morwell. The grass fire ignited a brown coal seam, resulting in an open-pit mine fire that burned for weeks and seemed unstoppable.

The Morwell open-cut mine is located in Victoria, within the Latrobe Valley, just southeast of Melbourne. The mine is a critical source of the brown coal used as fuel for the nearby Hazelwood power generation station, which powers eight 200-megawatt generators and creates approximately 30 percent of Victoria’s electricity. Without the coal, at least 1/3 of the area’s power including lights and air conditioning, were at risk.

- In Morwell, mail delivery stopped.
- The local courthouse was temporarily closed.
- The elementary school shifted its students to a nearby town.
- Some 18 local firefighters were initially treated for carbon monoxide poisoning, and air pollutants in the town were said to be 10 to 15 times above safe limits.
- As the brown coal fire burned, Morwell residents routinely wore masks as they walked around town.
- The Australian government offered free rail fares to the residents if they would vacate the area; some were given stipends to leave the area temporarily.

No end was in sight.
The mine owners needed to stop the fire and make sure the local residents had clean, breathable air. They called in the Victoria County Fire Authority, headed by Rick Owen. The firefighters would need to work feverishly to get the fire under control.

“My whole organization became focused on this incident. We enlisted five interstate fire services and other state services to get the job done,” says Owen, senior station officer (equivalent to a Captain in a U.S. fire department) of the Victoria County Fire Authority. “In the end, it came down to the ability of most firefighters to continue to toil against the odds and make things happen, as we have got a job to do.”

BROWN COAL CREATES HEALTH RISKS, FIRE SUPPRESSION CHALLENGES

Brown coal is more easily ignited and presents a greater fire and toxic fume risk than black coal. A coal seam mine fire burns underground and smolders for long periods.

The 4-mile by 2-1/2-mile burn began as a grass fire in the tinder-dry wild land area... burned for weeks and seemed unstoppable.

In fact, some fires—for example, in China, India, Malaysia and Pennsylvania—have burned underground for decades. India’s Jaharia Mine has burned since 1916. An abandoned coal mine fire in Centralia, Pennsylvania, has been burning since 1962.

It is not just fire and its spread that concerned safety officials. Poor air quality and exposure of nearby residents to contaminants are greater concerns. A Dutch researcher studied some underground coal fires in China and found that the amount of carbon dioxide released in the vicinity was significant and approached levels that amounted to two- to three-percent of global carbon dioxide sources.

Mine fires of this type are battled using different tactics and strategies. They sometimes are extinguished with water, and then covered with foam. Later, the affected earth and soil may be fully removed. In other cases, the mine may be sealed off and filled with inert gas. If the landscape allows, the mine is flooded and the fire is extinguished in full.
“In the end, it came down to the ability of most firefighters to continue to toil against the odds and make things happen, as we have got a job to do.”

“We needed to use several different techniques for extinguishment,” explained Owen. “We used Class-A Foam, water and compressed-air foam systems. This was supported by 1,000-gallon bucket aerial drops via helicopter. The crews in the mine were deployed and relied on a two-hours-in, two-hours-out [schedule] over 12-hour shifts, to limit exposure to carbon monoxide and other fire products.”

**WIRELESS AREA MONITORS PROVIDE CITIZEN, WORKER, AND RESPONDER PROTECTION**

Firefighters deployed a gas detection strategy that relied on 25 AreaRAE transportable gas monitors throughout the 4-mile by 2-1/2 mile vicinity of the mine and surrounding townships. These AreaRAE monitors wirelessly polled two separate base stations, which transmitted through broadband Internet to a central computer. Data was instantly delivered in real time, then recorded, archived and summarized in a spreadsheet for review and analysis by key stakeholders.

The rugged, portable AreaRAE monitors allowed Victoria County Fire Authority responders to quickly establish a fire perimeter. The AreaRAE’s photoionization detector (PID) allowed responders to measure and track volatile organic compounds (VOCs) in parts per million, as well as track oxygen and lower explosive limit (LEL) compounds.

Real-time gas readings were transmitted to a base station that utilized ProRAE Guardian software that operated on a Windows-based platform, but could be accessed via tablet computers and smartphones by the responders. ProRAE Guardian aggregated, logged and displayed sensor information from the AreaRAE wireless gas detection instruments, biometric data and GPS information into a comprehensive real-time display of threat data.
The AreaRAe’s RF modem allows real-time data transmissions to a base controller located up to 500 feet (150 meters) away or, with an added portable modem, two miles (3.2 km) away. A personal computer can be used as the base station. With the RAE Systems software, this configuration is capable of monitoring the input of up to 64 different remotely located monitors such as the AreaRAe.

At the base station, response commanders monitored the readings from each of the AreaRAE monitors, as well as various data from wireless personal gas detection monitors and biometric sensors, in a cascading display.

At day-35 of the mine fire, the AreaRAe monitors used by the Victoria County Fire Authority and the township had been running continuously for 32-days.

Eight hazardous materials technicians monitored AreaRAEs on-site and also performed routine maintenance on the monitors. This included battery and filter replacement twice a day. Data was downloaded every day, alternating days being used for each half of the units.

Owen says that during the initial weeks of fighting the fires, they were getting readings significantly above the exposure limit—for both responders and the public. Eventually as they brought the fire under control, the readings went down in both the mine and the local township.

“A service technician from a local RAE Systems distributor visited the site every two to three days to maintain units with calibrations and sensor changes if required,” explains Owen. “Ultimately, we had around 40 units on-site, with at least 25 deployed in the field and 8 to 10 spares—which we used to swap-out with the active AreaRAE monitors if any required servicing.”

“We’ve relied on AreaRAE monitors to protect us and the public. And we’re going to rely on them in the future.”
Some of the deployed AreaRAe units were over eight years old, Owen says, and County Fire Authority has never had any substantial issues with them. “We have purchased 30 additional units with GPS and RAe Systems’ ProRAe Guardian Software,” adds Owen. “We’ve relied on AreaRAe monitors to protect us and the public. And we’re going to rely on them in the future.”

“As far as reliability, I don’t believe that in anyone’s mind who built these units that they were designed to operate continuously for over a month,” adds Owen. “Due to the support from various people, such as our scientific officers, HazMat technicians and RAe Systems staff, we kept these monitors going. With the spare capacity, we have ensured that our strategy has remained viable.”

“We also have five MultiRAe handheld units for the technicians to use to back up readings when out completing basic servicing,” says Owen. “We have also ordered two ppbRAe 3000s for low-level VOC detection in the field.”

He says that the AreaRAEs performed excellently and expects that authorities will recommend more single-sensor carbon monoxide (CO) units after a lessons-learned evaluation of the entire incident.

**VICTORIA COUNTY FIRE AUTHORITY INCREASES SAFETY, REDUCES RESPONSE TIMES**

The environment of coal mining fires can be dangerous to workers, emergency responders and the communities that surround the mines. Dangerous gases from the fire process can be harmful, and even lethal, if incident areas and plume dispersion of toxic gases are not monitored, tracked and communicated properly. In addition, first responders are challenged to manage HazMat situations, extinguish the fire and contain the fire, while also ensuring the highest safety standards.

**STRANGE, BUT TRUE …**

**AreaRAE Tracking Capability Prevents Monitors from Going “Walkabout”**

In first month of the mine fires, Victoria County responders experienced some unusual tales of missing detectors.

During the early stage of the fire an AreaRAE monitor was stolen. The firefighting team was able to detect it remotely. Prior to being stolen, the AreaRAE had been indicating safe levels of exposure. Once stolen and in the home of the thief however, the AreaRAE began to detect a high and dangerous readings. As a result of some sleuthing and GPS location, local law enforcement authorities recovered the unit. And they evacuated the house where they found the AreaRAE.

In another incident, an Australian milk cow picked up an AreaRAE unit and carried it around a field. The cow meandered over the countryside with the AreaRAE—which was reading an erratic level of O₂. After recovery of the instrument and further investigation, it was determined that the cow’s saliva was causing the anomalous O₂ readings.
In Australia, where there’s been a 10-year drought, Rick Owen and his brave team must use every advantage they can get to contain, control and combat fires such as the Morwell Mine Fire and wildfires in the outback. In so doing, they have sought out reliable wireless gas monitors tools such as RAE Systems AreaRAE monitors as a critical ingredient to set a perimeter, know how a plume is moving, and detect harmful VOCs so that they can protect nearby citizens, town assets and firefighters.

“As far as reliability, I don’t believe that in anyone’s mind who built these units that they were designed to operate continuously for over a month...”

By using RAE Systems monitors, Victoria County Fire Authority was able to quickly respond to the Morwell open-cut mine fire, better inform the community, minimize safety incidents and risk to responders, and achieve control of a dangerous situation.

RAE Systems by Honeywell

RAE Systems is a global gas and radiation-detection wireless-system innovator. The company develops and delivers a wide range of rugged, reliable, connected, intelligent yet easy-to-use gas and radiation detection instruments and systems. RAE Systems safety solutions help save lives, protect workers, contractors, emergency responders and the public, provide plant asset protection, and deliver regulation compliance.

RAE Systems combines field-proven wireless functionality with its best-in-class detection capabilities to deliver integrated wireless gas monitoring capabilities that help deliver unsurpassed safety. The company offers a full line of fixed and portable gas detection solutions, including handheld and personal chemical, compound and radiation detection instruments that are widely recognized for their performance and reliability.

RAE Systems’ real-time safety and detection systems have been deployed in more than 120 countries by leading organizations in the oil and gas, fire and HazMat, industrial safety, national security, public event safety and environmental markets.

RAE Systems’ wirelessly connected systems provide the reliability, advanced capabilities and easy operation that response, security and safety professionals demand.

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