CB3 Mine Services Pty Ltd

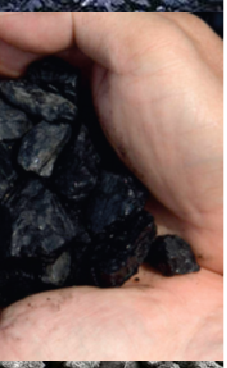
Spontaneous Combustion Services

Gas Evolution








Introduction

Spontaneous combustion is a significant hazard for coal mine operations with the occurrence of spontaneous combustion events often leading to severe outcomes and major disruptions to production. It is therefore essential for coal mines to produce detailed and reliable Principal Hazard Management Plans based on accurate measurements of the propensity of coal to self-heat under in-mine conditions and the associated gas evolution trend of the heating.

Early detection of heating events is important for underground coal mines so they can take appropriate measures to prevent thermal runaway. Normal practice uses gas trending information as a proxy for temperature to recognise the heating development stage. Onsite gas monitoring plays a key role, alerting personnel when pre-set gas limits are exceeded. A laboratory gas evolution test has been developed to assist with identifying the most relevant gases and gas ratios for trending and setting limits and to validate Trigger Action Response Plans (TARP) settings for the mine as part of the Principal Hazard Management Plan (PHMP) for Spontaneous Combustion.

CB3 Mine Services Pty Ltd (CB3) and CRL Energy Ltd (CRL) provide a range of advanced laboratory tests that are leading practice in quantifying the spontaneous combustion propensity of coal and other materials. This site specific data is then used to develop effective mitigation and Spontaneous Combustion PHMPs across the spectrum of operations including, at the mine, in transit or in stockpiles.

Staff Experience & Expertise

CB3 and CRL staff members have extensive experience within the mining and minerals sector and have a sound knowledge of the industrial process and regulatory context present in different mine operations and locations worldwide. Staff have provided consulting services on spontaneous combustion for projects in Australia (Queensland's Bowen Basin, Galilee Basin, and Surat Basin; New South Wales' Sydney Basin and Gunnedah Basin), New Zealand (North Island and South Island Coal Regions), The United States, India, Indonesia, South Africa and Colombia.

With laboratory testing facilities in both Australia and New Zealand, including in house coal quality analysis completed in an IANZ accredited laboratory, we can carry out the complete scope of works from start to finish, at which point you will be supplied with a comprehensive report signed off by Basil Beamish, a registered professional engineer with over 30 years of experience in coal principal hazard issues and a world leader in spontaneous combustion assessment.

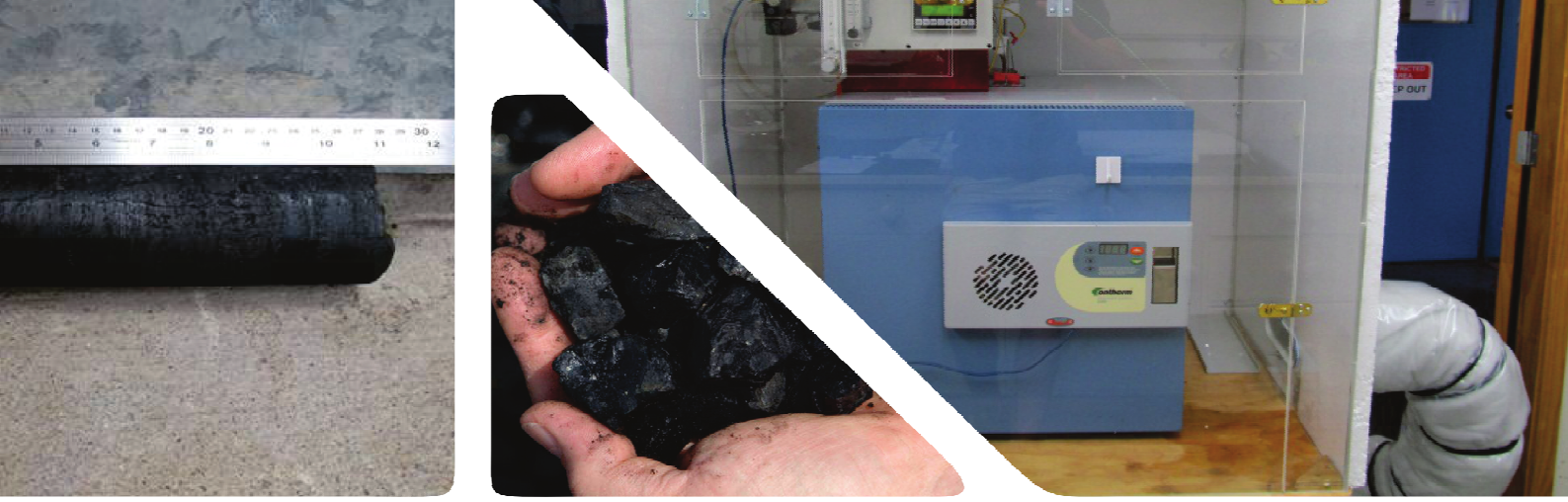
Testing Capabilities and Services

All testing programs are tailored to suit, as each mine and coal seam occur in different settings, both geographically and geologically. These factors need to be recognised in deciding on testing parameters that are designed to simulate the site specific conditions. As such, each project is developed in consultation with the client to provide the best outcome for management planning.

SponComGAS™ testing

The gas evolution trend that occurs in response to coal self-heating can be used as a signature for the early detection of a self-heating event. CB3 and CRL can determine the unique gas evolution trends for your situation which can be vital to define and support the alarm limits set in the TARPs developed as part of the Spontaneous Combustion PHMP for an underground coal mine.

Fresh coal samples are crushed, placed in a sealed flask in an oven and left to equilibrate at the pre-set start temperature. A flow of dry air is passed through the sample and the oven set to heat the sample to approximately 200 ºC. A Micro Gas Chromatograph determines the concentrations of O_2, N_2, CH_4, CO_2, CO, H_2, C_2H_6 and C_2H_4 at regular temperature increments. This information is used to evaluate the gas evolution trend of the coal in response to increasing temperature. In addition, established gas indicator ratios (Young's, Graham's, Jones-Trickett, CO/CO_2) are calculated to establish the most reliable gas ratios for trending the development of a heating event.



An example of individual gas evolution trends for a high volatile bituminous coal sample is shown in Figure 1. Carbon monoxide is progressively evolved from low ambient temperature through to elevated temperatures that would correspond to advanced stages of a heating. In contrast ethylene for this coal sample only shows an increasing trend once the coal temperature exceeds 120 °C. The other gases analysed show different trends, some of which may be related to their presence as seam gas. Each coal sample that is tested from a minesite will have its own site-specific gas evolution trend that can be established from the SponComGAS™ test and subsequently correlated with the mine gas monitoring data. This may vary between different areas within the same mine. Gas indicator ratios are calculated using the individual gas results to identify the most appropriate ratios for providing additional confirmation of possible heating development at the mine.

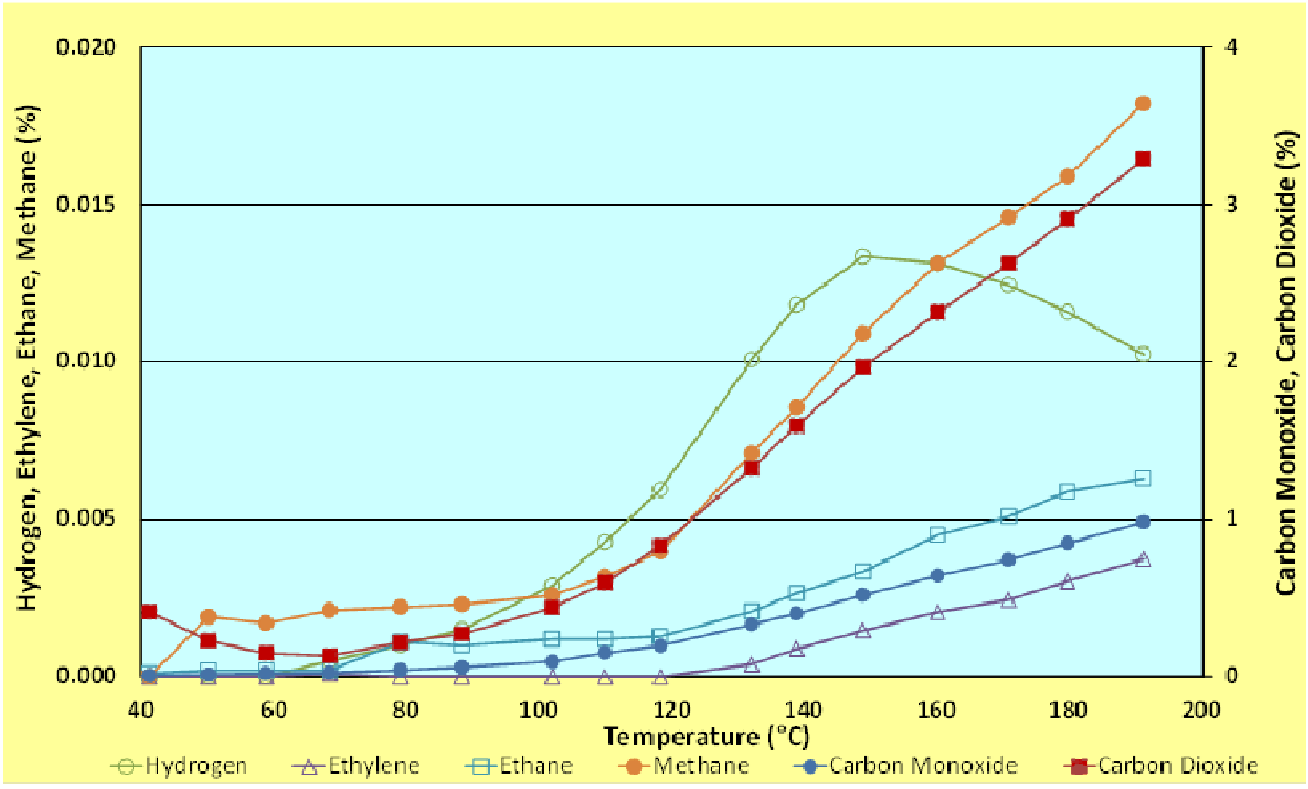


Figure 1. Summary graph of individual gas trends with increasing coal temperature

Analysis, Interpretation and Reporting of Results

The final report includes information that can be incorporated directly into the PHMP for Spontaneous Combustion. All test results are analysed, interpreted and compiled into a comprehensive report by Chartered Professionals who are members of the Australasian Institute of Mining and Metallurgy. Reports are certified by Registered Professional Engineers who are registered under the terms of the Professional Engineers Act 2002 (Queensland) and have appropriate knowledge and experience.

Contact Us:

CB3 Mine Services Pty Ltd and CRL Energy are always happy to discuss your spontaneous combustion needs and work towards developing an appropriate management plan with you.

For more information or for a confidential conversation please contact us on:

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References

Beamish, B and Beamish, R, 2012. Testing and sampling requirements for input to spontaneous combustion risk assessment, in Proceedings of the Australian Mine Ventilation Conference (eds: B Beamish and D Chalmers), pp 15-21 (The Australasian Institute of Mining and Metallurgy: Melbourne).