

CB3 Mine Services Pty Ltd

Spontaneous Combustion Services

Stockpile Management



Introduction

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 Principal Hazard Management Plans across the spectrum of operations including, at the mine, in transit or in stockpiles. Our analysis methods can answer several key questions related to stockpile management.

- 1. How reactive is the coal?
- 2. What is the incubation period for self heating under various conditions?
- 3. What are the effects of temperature, humidity or moisture on incubation periods?
- 4. What are the implications of supply chain handling, stockpile, rail, barge and delivery to client on spontaneous combustion?
- 5. What chemical treatments (inhibitors) are available to change the self-heating behaviour of a specific coal and reduce the likelihood of spontaneous combustion?
- 6. What is the optimal application rate for chemical inhibitor?

Spontaneous combustion in coal stockpiles is not only a safety problem, it can increase the amount of handling needed in coal stockpiles, either as a result of fires or to avoid problems. Spontaneous combustion can decrease the specific energy of coal, and can also cause problems for onward transportation in bulk carriers or rail wagons.

With our state of the art sampling, testing and analysis procedures, we provide the scientific data and expertise necessary to accurately characterise spontaneous combustion propensity. Profitability and safety can be improved with a fact based spontaneous combustion management plan that incorporates safe stockpiling periods, identification of when special precautions will be necessary and any site-specific factors that need to be considered. In addition, the effectiveness of chemical treatment applications to reduce spontaneous combustion risk can be quantified.





Figure 1. Coal stockpile steaming prior to thermal runaway and hot spot reaches surfaces and goes to open flame.

Who are we?

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, New Zealand, Indonesia, South Africa, Turkey, The United States, India, and Colombia. We have laboratory testing facilities in both New Zealand and Australia including in house coal quality analysis completed in an IANZ accredited laboratory.

We can carry out a complete scope of works from field visit, sampling, site interpretation, analysis and then supply of a comprehensive report certified 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.



What are the analysis methods?

SponComSIM[™]

The key analysis method for spontaneous combustion assessment of stockpiles is SponComSIM[™]. The test is used to benchmark the coal self-heating performance and provides a value for the minimum timeframe for coal to reach thermal runaway based on site conditions. SponComSIM[™] can also be used to quantify the effectiveness of chemical treatments to delay or reduce the risk of spontaneous combustion. The effect of different rates of inhibitor application on incubation period can be tested so that the application rate can be optimised.





Figure 2: SponComSIM[™] test results showing typical coal self-heating behaviour from low mine ambient temperature to thermal runaway, where moisture evaporation moderates the coal self-heating. The x-axis shows laboratory hours for the test and a scaled equivalent in days is shown for spontaneous combustion issues in a loose coal pile on site as documented by Beamish and Beamish (2012).

R₇₀ The R₇₀ test provides a quick and accurate measure of the intrinsic reactivity of coal to oxygen and is backed by an extensive database of results from locations around the world of previous on-site heatings. The values obtained are strongly coal rank dependent and are affected by the intrinsic properties of the coal such as mineral matter content (acting as a heat sink) and maceral composition. A value for the Relative Ignition Temperature (RIT) of each sample (a high temperature index value obtained from the R70 test as it reaches thermal runaway), is also used to confirm the intrinsic spontaneous combustion reactivity of the coal. As such the adiabatic R70 self-heating rate test is now two tests in one.



Figure 3: Typical adiabatic R₇₀ self-heating rate results for high volatile bituminous (Coal A) and sub-bituminous (Coal B) coals.

Contact Us:

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

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

Australia

Basil Beamish	Technical Director	+61 7 33754100	b.beamish@cb3mineservices.com
Jan Theiler	Laboratory Officer	+61 7 33754100	j.theiler@cb3mineservices.com

CB3 Mine Services Pty Ltd Unit 3/20 Archerfield Road Darra Qld 4076 Australia

www.cb3mineservices.com

New Zealand

Tana LeviTechnology Manager+64 21 843380t.levi@crl.co.nzRod BrownSenior Engineer+64 4 5703704r.brown@crl.co.nz

CRL Energy Ltd 68 Gracefield Road Lower Hutt 5040 New Zealand

www.crl.co.nz



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).