Department of Industry
Resources Regulator
Mine Safety

MINE SAFETY INSPECTORATE

INVESTIGATION INFORMATION RELEASE

High potential incident

Incident date 19 August 2016

Event Coalburst on longwall face

Location Austar Coal Mine

Overview

A pressure bump of significant intensity was immediately followed by a “dynamic” ejection of coal from the longwall B2 face during production at Austar Coal Mine at 5.15 am on 19 August 2016.

The ejection of coal from the face resulted in two workers being knocked to the ground and struck by small pieces of coal. They suffered no serious injuries.

Figure 1: Broken coal on the face side of spill trays following the reported coal burst.[i]

Figure 2: Ejected coal in the walkway as a result of the coal burst.[ii]

The mine

Austar Coal Mine (Austar) is a deep underground coal mine located near Paxton about 10 kilometres south west of Cessnock in the Hunter Valley, NSW.

Production in the Greta seam (4m thick) is achieved using the Longwall mining method and bolter-miners used for roadway development.

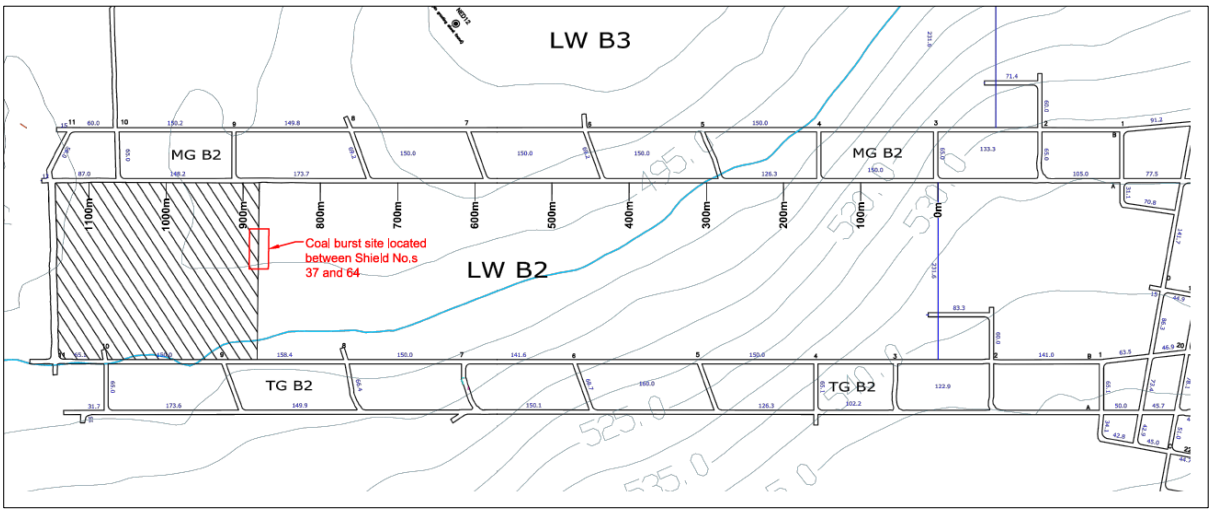
The mine produced 1.64 Mt of raw coal in 2013-14.[iii]

The incident site

The incident site was on longwall B2 with the face at the 872 m mark as shown in Figure. 3. The longwall had retreated 260 m from the starting position, having just passed the “square” goaf position. The depth of cover at the incident site was approximately 495 m.

The longwall panel width was 237 m with 131 hydraulic shield supports.

Figure 3: Location of the incident[iv]



The incident

At the time of the incident, the shearer was cutting towards the tailgate when a significant pressure bump and subsequent dynamic ejection of coal (coal burst) occurred from an area of the coal face between shields 37 to 64.

Two workers were positioned at shield 51, with a further three workers adjacent to the shearer at shield 90. The two workers at shield 51 were knocked to the ground by the force of the coal burst and were sprayed with coal dust and small pieces of coal. No workers suffered serious injury.

It is estimated that about 11 to 12 tonnes of coal (in total) was projected from the face over an area covering approximately 50 m of face length with some 400 kg travelling up to 7 m into the walkway area of the powered supports.

Actions post incident

A prohibition notice was issued by Mine Safety inspectors suspending longwall operations pending a geotechnical assessment and review of the incident and associated control measures.

Both Austar and the Inspectorate gained independent geotechnical advice. Both reports confirmed that the incident was defined as a low level coal burst event and not as a result of a goaf fall or an outburst of gas.

Under the direction of the regulator and in agreement with the mine operator, the following actions were taken.

Austar implemented a review of control measures associated with the *Coal burst management plan* which included, but was not limited to

1. Installation of coal burst conveyor mats between the coal face and the powered support walkway in addition to operating the roof support flipper bars at 90 degrees to the roof support canopy.
2. Reducing exposure of the workers on the coal face by limiting the number of workers during production and maintenance activities.
3. Providing direction as to the position of workers during production and maintenance activities.
4. Reviewing the cutting methods.
5. Ensuring all workers are trained in, and made aware of, the new operating procedures for longwall B2.

In addition, the regulator imposed that:

a) the *Coal burst management plan* and associated trigger action response plan (TARP) be adjusted to the high hazard level, which would remain in place for the remaining life of longwall B2, and

b) Austar must immediately notify the regulator of any coal burst or dynamic strata failure event during the extraction of longwall B2.

Contributing factors

Coal burst is best described as a sudden and dynamic failure of overstressed coal or rock resulting in the release of stored energy. It is associated with a seismic event often referred to as a pressure bump.

Contributing factors to a coal burst may include but are not limited to:

- depth of cover
- pillar/panel design and layout
- lithology, particularly when thick, strong and rigid strata is overlying the seam being mined
- geological features such as sandstone channels, seam rolls and faulting
- seam thickness.

The incidence of coal burst is not well-documented in Australia to date with only one previous recorded incident associated when there was a double fatality in a development panel in 2014. This incident occurred at Austar.[v]

Investigation and collection of data will continue for the most recent incident to increase the knowledge associated with coal bursts. The following factors have been identified as potential contributors to this incident:

1. **Depth of cover.** At the time of the incident the longwall was operating at a depth of 495 m.
2. **Overriding stiff massive strata.** The Greta seam being mined is 10 to 20 m below the base of the Branxton Formation. This formation is more than 400 m thick and comprises of sandstone and conglomerate units that are generally described as strong and massive.
3. **Geological structures.**
    a. Sandstone channels and seam rolls were identified in the panel on development and were present at the location of the coal burst.
    b. The longwall is between two faulted zones within a regional anticline.
4. **Mining layout and sequence.** Longwall B2 was the first longwall block in the area. With a face width of 230 m and having retreated some 260 m from the starting position, most of the weight of the undermined strata would be concentrated on the longwall face and the side panel abutments.
5. **Concentrated loading from overlying strata.** Fracturing of stiff beds in the super incumbent strata resulting in a sudden release of energy.

Observations

Research has identified that coal bursts were recorded in countries such as Poland, Czechoslovakia, USA and China. Despite this research, coal burst remains one of the unresolved technical problems facing the coal mining industry as stated at the recent International Workshop on Coal Burst Experience and Research Direction, at UNSW in August 2016.[vi] Further research is continuing through the Australian Coal Industry's Research Program (ACARP).

At this time, prediction of a coal burst event is not entirely possible. Mine operators therefore need to ensure that they are aware of the most significant contributing factors associated with a coal burst event such as:

1. the stress environment being sufficiently high to result in rock failure
2. a situation in which a state of unstable equilibrium could exist such as low friction bedding planes
3. a change in the loading system. For example, a reduction in rock strength due to a local change in rock material or structural properties, an increase in stress associated with geological structure or decrease in confinement due to formation of one or more excavations.
4. stored energy generated by increased depth of mining, bridging strata or geological structures.

Additionally, mine operators should be aware of current research into the identification of coal burst potential and mitigation techniques. Sources of information are available through industry forums, conferences, research bodies and reputable full text academic databases.

About this information release

The NSW Resource Regulator as the WHS regulator for mining has issued this information to draw attention to the occurrence of a serious incident in the mining industry. The investigation may be ongoing. Further information may be published as it becomes available.
The information contained in this publication is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that the information upon which they rely is up to date and to check the currency of the information with the appropriate officer of the Department of Industry, Resources Regulator, Mine Safety or the user's independent adviser.
For information about health and safety regulation on mine sites contact a mines inspector at one of our local offices: www.resourcesandenergy.nsw.gov.au/miners-and-explorers/safety-and-health/mine-safety-offices

PUB16/451

Issued by

Tony Forster
Chief Inspector of Mines
Appointed pursuant to Work Health and Safety (Mines and Petroleum Sites) Act 2013

---

[i] Photo supplied by Austar Mine Pty Ltd
[ii] Photo supplied by Austar Mine Pty Ltd
[iii] NSW Coal Industry Report 2014
[iv] Plan supplied by Austar Mine Pty Ltd
[v] www.resourcesandenergy.nsw.gov.au/miners-and-explorers/safety-and-health/incidents/incident-updates
[vi] Professor Ismet Canbulat – Professor and Kenneth Finlay Chair of Rock Mechanics
Mining Engineering - UNSW School of Mining