Metropolitan Colliery
MG26 Grunching Induced Outburst

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1. Metropolitan Mine Introduction
2. Outburst
3. Gas drainage and permit to mine process
4. Geotechnical summary
5. Ventilation and gas monitoring
6. Key learnings
Metropolitan Mine
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Development 1 – MG27

Development 2 – TG301

Longwall – LW26

Development 3 – 300 MAINS
Introduction

Metropolitan Colliery had two small outburst incidents in the MG26 development gate-road panel. The panel was utilising the mining process of Grunching (drill and blast) due to an area of coal associated with the North West Mains fault where the seam gas pressure could not be drained below outburst threshold levels.

The Grunching round leading into the North West Mains fault released a higher than usual volume of gas ($CO_2$) and was discovered by the panel Deputy and associated gas levels on the panel return monitor.
Introduction

Coal was not ejected further into the roadway than what is normally experienced with past grunching rounds, what was observed was a cone void on the right hand side of the heading extending beyond the planned grunching round. It has been determined that the force of the grunching shot has induced an outburst.

Location of Outburst
MG26 Outburst Event

Location: MG26 A hdg 4-5 c/t 100m chainage
Date: 23rd September 2015
Time: 8:25pm

Volume of material released: Total = 100 tonnes
- Planned grunching round = 59 tonnes
- Unplanned material = 41 tonnes

Volume of gas released: $1,411 m^3$ or 1,411,000 litres
Muck pile and top RHS outburst cavity
Post muck out and support
Fault plane
Pre-drainage of the Outburst Prone Structure

- Cross block drainage was drilled from 5 c/t and 6 c/t MG25 beginning on the 3rd of April 2015
- Maximum time on drainage was 5 months and 3 weeks
- The drilling process identified a boggy zone in the location of the predicted structure in all holes which crossed the structure
- Boggy zone was soft and produced an increase of fines and gas which was expected
- In hole 9 MG25 6 c/t a drill string compromising of motor and survey tool was bogged and unrecoverable using the drill rig as a result of the boggy zone
- Drill string was recovered during development
Pre-drainage MG26 4-5 c/t

- Virgin cores taken to calculate approximate gas reservoir
- Borehole flow monitoring conducted to track drainage of the reservoir
Coring Program and Permit to Mine

- Following the pre-drainage, a coring regime was implemented from A hdg 4-5 c/t and B Hdg 4-5 c/t according to Outburst Prevention Plan requirements.

- This coring program included the coring within an envelope either side of the outburst prone structure (see adjacent).

- The coring program resulted in above and below threshold core samples which triggered combination normal mining and grunching mining methods.
Coring Program and Permit to Mine

9.61 m³/t  
99.7% CO₂

15 m³/t  
99.3% CO₂
Permit to Mine issued
Geology
Geology

- Strike Slip Fault Zone
- 4-7m width containing multiple shear surfaces with mylonite 50-150mm thickness
- Coal is weak and friable
- Horizontal Stress ENE-SSW
- RHS biased roof cavity and roof sag on development
- Depth of cover 420m
- Major cleat sub parallel to heading
- Outburst cavity defined by inbye fault plane and coal cleat
Ventilation and Monitoring Summary

- At the time of the incident, the panel was being ventilated by 24 $m^3/s$ of air
- The face was ventilated by means of 22 $m^3/s$ auxiliary fan
- Atmospheric monitoring in the panel is by means of a real time Gas Guard System which reads to a maximum value of 2%
- The real time monitor was located approximately 520m from 4 c/t and with a ventilation velocity of 1.2m/s, it took just over 7 minutes for the gas emission to register on the real time system
Gas trends

- The background gas trend in MG26 prior to the event averaged 0.35% $CO_2$ with a background 0.04% $CH_4$
- The figure below shows the average gas release from normal grunching shots without inducing an outburst.
- An average of $81m^3$ of $CO_2$ was released and is relatively consistent.
Gas trend from previous shots

CO2 from grunching operations - No Incident

Volume of Gas = 80 m³ CO₂
Volume of Gas = 82 m³ CO₂

17th September 2015
Volume of gas from the Outburst

Volume of CO2 Generated from Outburst Induced from Grunching

Peak Reading extrapolated (CO2 sensor peak 2%)

Volume of Gas = 1411 m³ CO2

Background CO2 = 0.33%

Date / Time
Outburst incident vs normal grunching shot

Outburst Incident vs Normal Grunching Shot Gas Release

% CO2

Minutes after Shot

0 50 100 150 200 250

Normal Grunching Shot
Outburst Incident
Key learnings

- Grunching was successful in eliminating the exposure to personnel to an induced outburst and was the primary control method.
- Implement dilution zones based on data from the outburst event, previously the dilution zone was in place until the next panel return air is diluted by the next ventilation split.
- Dilution zone to take into account diluting panels general body gas levels.
- Deputy to contact Control following blast for information on panel return monitoring prior to inspecting face, this will indicate waiting time rather than the standard 10 minute waiting time.
- All statutory personnel to undertake refresher in Outburst Management Plan.