Metropolitan Low-Level Outburst Incident Learnings and Improvements

Wednesday 19 June 2013
Wollongong Outburst Seminar
Master Builders Club

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Metropolitan Coal
Presentation Overview

- Metropolitan Coal
- The Incident
- Improvements in our Outburst Management Processes
- Learnings for Peabody Australian Platform and the Illawarra Coal Industry
This year Metropolitan Mine turned 125 years old.
The mine has a long and proud mining history in the Illawarra.
Peabody acquired Metropolitan in 2006 when it recognised the potential of the operation and the direction of coal prices.
Peabody has invested $450 million to date.
Metropolitan – Low-level Outburst Location

MG 23 B hdg 6-7 c/t – 17 October 2012 @ 11.30am
Incident Sequence of Events

1. During bolting cycle the face slumped in at commencement of fault zone MG23 6-7ct. Approximately 5t of coal was displaced.

2. Pocket of CO₂ Released exposing 5 operators to > 1.99% (Maximum reading on miner sensor)

3. Operators withdrew immediately to fresh air, minimal exposure, no harm. Withdrawal was trigged by the readout of the onboard CO₂ monitor.

4. Incident scene isolated by Deputy. Undermanager & M.O.M.E. notified.

5. Outburst review committee inspected the incident scene.

6. PTM revoked by M.O.M.E.

7. Inspectorate notified - CMHSR Cl 56 (1) g Gas accumulation, withdrawal of men.

8. Drill rig mobilized to commence coring for gas content determination at face.
Rise in Gas Levels Prior to the Incident

Panel Return Gas Readings

- Spike at time of incident
- Increased CO$_2$ trend
- Increase was observable but relatively small in magnitude (0.16%)
Contributing Factors

1. Cross drainage hole in the fault zone incomplete due to boggy (soft coal) conditions
2. Permit to mine issued based on flank passed core result.
3. No gas issues when mining through fault in adjacent roadway (A Hdg)
4. Historical data of the mining through the fault zone not reviewed (as not previously identified as a risk at metropolitan)

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>Core Results (90% CO₂)</th>
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<tbody>
<tr>
<td>1.</td>
<td>9.37</td>
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<tr>
<td>2.</td>
<td>7.70</td>
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<td>3.</td>
<td>6.02</td>
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<td>4.</td>
<td>13.07</td>
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Failed Cores from Additional Re-drilling
Inspection of Incident scene with Inspector of Coal mines and Site Check Inspector
Area had been cleaned and supported to the face. Evidence of outburst indicators
Incident re-classified as CI 55 “low-level outburst”

Clause 51 notice served – Prohibition further mining MG23 B 6-7ct

Drill cores verified high in-situ CO₂ content

High intensity drilling regime initiated in face zone

Unsuccessful in reducing insitu gas content to threshold levels

Risk assessment conducted on grunching through outburst zone

Reviewed grunching procedures and training packages

Setup panel for grunching. Spiled (pre-supported) roof level with 4m tendons

Successfully grunched through zone without incident. No outburst triggered during shot firing

Recommenced normal mining with 30MB. Unit was off-line for 6 weeks due to incident
Learnings and Improvements – Changed Definition of Outburst in Metrop O.M.P.

<table>
<thead>
<tr>
<th>Previous Definition</th>
<th>New Definition</th>
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<tr>
<td>“A violent ejection of gas, coal and/or stone from a mining face. Typically the volume of gas released is significantly higher than can be accounted for by the gas content of the coal displaced.”</td>
<td>“A sudden release of gas and material from the working place that can vary in magnitude and intensity.” Quoted from MDG1004</td>
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Improvements to the Metropolitan Permit to Mine

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<thead>
<tr>
<th>ITEM</th>
<th>DETAILS</th>
<th>PERMIT DETAILS</th>
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<tr>
<td>BOREHOLES</td>
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<td>Geological Review Added</td>
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<tr>
<td>CORES</td>
<td></td>
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<td>LONGHOLES</td>
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<td>GEOLOGY</td>
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<td>PRODUCTION</td>
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<td>RECOMMENDATIONS</td>
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<td>GENERAL COMMENTS</td>
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<td>PTM Consultation</td>
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<td>Members:</td>
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**PTM Consultation Members:**

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<tr>
<th>Name</th>
<th>Role</th>
<th>Manager of Mining Engineering or his delegate</th>
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<td>Gas Drainage Superintendent or his delegate</td>
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<td>Workforce Representative familiar with the mining process</td>
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Mandatory Attendees Added
Re-Evaluation of Panel Gas Monitoring TARP’s

Utilising our gas monitoring to record and alarm increasing CO₂ levels
Improvements to On-Board Gas Monitoring and Warning System

● Prior to event
  – CO₂ remote display partially hidden behind cover
  – CO₂ warning strobe not visible to off drivers side

● Changes made following event
  – CO₂ remote display relocated to be more visible
  – CO₂ warning strobe mounted on top of cover and can now be seen from both sides of the miner
Improvements to On-Board Gas Monitoring and Warning System

Visibility of Gas Levels to Face Crew

Strobe for CO$_2$ and CH$_4$ warning relocated to roof of display cabinet.

Relocated display readouts (Methane – Top, Carbon Dioxide – Bottom)
Improvements to On-Board Gas Monitoring and Warning System

Visibility of Gas Levels to Face Crew

View of strobe from off drivers side platform
Education and Training of Workforce

**Summary of Indicator Signs**
- Coal and/or changes in coal gas leaks or gas leaks
- Coal cutting near fault lines, altered faces, and/or changes in coal quality
- Changes in coal cutters, eg, increased dusting
- Joint movement or change in joint axis, e.g., "greasy surfaces" on joint faces (indicator of fault movement)
- Visible faulting
- Weathering of longwall ribs
- Changes in coal quality, eg, increased dusting

**Mechanics of an Outburst**

**Igneous Intrusions (Dykes)**

**Main symptoms of Carbon dioxide toxicity**
- Visual
  - Dimmed sight
- Auditory
  - Reduced hearing
- Central
  - Drowsiness
  - Mild narcosis
  - Dizziness
  - Confusion
  - Headache
  - Unconsciousness
- Respiratory
  - Shortness of breath
- Muscular
  - Tremor
- Skin
  - Sweating
- Heart
  - Increased heart rate and blood pressure
Improvements to Drilling and Coring Practices

- Fan pattern – designed to suit environment
- Flank holes must close the “Grid”
- Sampling at maximum 60m spacing in worst case location for gate roads
- Sampling every 10m on both sides of roadway in outburst prone areas
- 4” drainage hoses from stand-pipes - increase flow rate
- Gas flow readings on every hole once every 2 weeks to monitor reduction in gas reservoir
- Sampling between and in proximity to identified fault zones
Evolution of Metropolitan Cross Drainage Drilling Pattern

Generation 1 - January 2008 Focus on Coring
Evolution of Metropolitan Cross Drainage Drilling Pattern

**Generation 2 – October 2010, Flankholes Introduced**
Evolution of Metropolitan Cross Drainage Drilling Pattern

*Generation 3 – November 2011, Extended Drilling Beyond Planned Roadway, optimized drilling direction*

- Hole Spacing 20m
- Drainage 15-20m beyond roadway

LONGWALL 22A
Evolution of Metropolitan Cross Drainage Drilling Pattern

**Current – Holes Further Extended Beyond Planned Roadway and Spacing is Reduced in Outburst Risk Zones**

- Hole Spacing 10m
- Drainage 35-40m beyond roadway
Geological Learnings Post Incident

Mapping Of Outburst Prone Areas
Key Learnings

Key Learnings for Peabody and the Coal Industry

- Classic definition of an outburst is now redefined
  - An outburst does not have to be **violent** in nature

- Prediction of structures
  - Outburst prone zones shaded on the mine plan to pre-determine adequate drilling and coring patterns
  - Abnormalities detected during drilling are logged
  - Cuttings are reviewed by Geologist for Geotech assessment
  - Geological information to be thoroughly reviewed at the PTM meeting. Geotech submits a report at every PTM

- Review all historical outburst incidents at Metropolitan
Key Learnings

Key Learnings for Peabody and the Coal Industry

- An educated workforce is a more confident, safer and productive workforce
- Compliance core regime around structures is critical
- Photos of incident scene - poor quality
  - Training of management in underground photography completed
- The improvements to the Outburst Management Processes has lowered Metrop’s Outburst Risk profile and improved drivage rates
  - Record development metres achieved in May 2013 with enhanced compliance requirements
- Learning’s and knowledge of Outburst risk shared on the Peabody Platform and the Illawarra UG coal mines
Importance Of Sharing Key Learnings

Metropolitan’s sister Longwall mine in Qld

- North Goonyella
  - Very Gassy
  - 420 m deep
  - Operating under Outburst Management Plan

- Recently had a similar outburst associated with structures and coring regime

- Peabody instantly directed sharing of learnings, information and Management Plans between sites and operations personnel flew interstate to ensure our knowledge base was utilised to full potential.
QUESTIONS ?