Metropolitan Gas Drainage Operations, Challenges and Future

Tyler Stephen
Gas Drainage Superintendent

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Metropolitan Mine - Overview

- Located in Illawarra region, NSW
- Oldest operating underground mine in Australia (celebrating 130 year anniversary in 2018)
- Budgeting 2.1 Mt ROM and 1.8 Mt clean coal production for 2018
  - 70% HCC/Semi Hard, 30% other met coal
- Mining the Bulli seam
  - Joy Longwall (2014)
  - 3 Continuous Miners (14km/year development)
  - 3 Bort Longyear Gas Drainage Rigs (130km/year)
- Current life of mine out to 2032
- 40% domestic product sold to local steel producers
- 60% exported through Port Kembla Coal Terminal
Metropolitan – History of Outburst Events

- Longest history of outbursts in the Bulli Seam going back to 1895
  - 157 recorded outbursts at Metropolitan colliery (mostly induced by grunching)

- Seven lives have been lost as a result of outbursts
  - Last Outburst related fatality occurred in 1954

- Last major event occurred January 2017 (LW27)

- All major events associated with geological structures
Gas Drainage - Key enabler for safe production

- Virgin content ranges across the lease from 25m$^3$/tonne (100% CO$_2$) to 12m$^3$/tonne (70% CH$_4$)
  - Change in composition associated with proximity to dyke

- Target 150 days gas drainage lead time to reduce below outburst threshold limits
Gas Drainage - Key enabler for safe production

- Metropolitan approval conditions stipulate negligible impact to sensitive surface features and catchment area, hence mine layout
  - Relatively narrow longwall blocks (153m reducing to 128m)
  - Chain pillars 50m centers (increasing to 75m)
- To achieve +2Mtpa ROM production we need a lot of development and gas drainage meters
- Steady state ratio (to avoid LW discontinuity)
  1 (meter of LW retreat) : 5 (development meters) : 60 (gas drainage meters)
Gas Drainage - Challenges

- Gas drainage is a high priority, well resourced and a well established process at Metropolitan.
- However, even with all of those holes and 150 days lead time we still struggle to achieve threshold values in certain “tight” areas.
- Large business impact 34 days lost along MG303 due to PTM delays. 
  - Gas drainage delays almost solely responsible for LW discontinuity.
Challenges - Zones of Poor Drainage and Depth of Cover

- Apparent relationship to depth of cover (ranges from 410m to 540m)
- Drainage performance issues associated with rapid changes in surface features (stress)
- Compounded by localised changes in seam
  - Seam roll (low point in bowl)
  - Coal harder and duller
- Hole stability factor
  - Increased stress, boreholes may self mine, large drilling fines
Challenges - Zones of Poor Drainage and Depth of Cover

- Confused data set as we have good results in high DOC areas
- Issues mainly around transition points
  - Rapid changes in DOC, stress and depositional changes

Credit, Work Completed by –
Pat Booth and UOW
Challenges – Other factors

- Reticulation system currently relies on differential ventilation pressure (range runs back to vent shaft) – no vacuum plant
- Fan pattern drilled in unfavorable stress direction
- All holes drilled down dip, possible effect of water towards back of hole (in critical drainage area for development)
- Vertical position of borehole in the seam may affect drainage performance as certain plies less permeable than others (as indicated by UOW)
The future

- Vacuum plant due to be commissioned Q1 2019
  - 3 x liquid ring pumps
  - Each 2,400 l/sec capacity (total 7,200 l/sec)
  - Significant improvement on current system (1,200 l/sec free vented to bottom of shaft)
  - Anticipated benefits
    - Reduction in collar pressure from +1 to 10kPa to negative
    - Will improve flow rates and hence reduce lead time
    - Will provide improved gas management methods for both development intersection and drainage sites
    - Provides scope and system capacity for cross measure drilling down to the Balgownie seam (pre and post drainage to reduce LW emissions)
The future

- Hole dewatering (conduit) installed
  - Trial completed at drill sites MG303
  - Every 3rd hole conduit installed
    - 16m perforated end
    - Entire hole lined
    - Insurance for hole collapses
  - Initial difficulties in managing gas make into drill stub during installation process
    - Worked with suppliers to successfully manufacture effective non return valve and gas management system
The future

- Squid Pattern
  - Drilling additional gateroad ahead of development
  - Provides an additional 120 days lead time

- Squid holes drilled in favorable stress direction
- Initial flows have been very good (3 x holes putting out as much as 16 x fan pattern holes)
- Still plan to drill fan pattern additionally
- Confident of significantly reducing gas drainage delays to development (and subsequently the LW)
Questions?