Mt Owen Complex

In-Pit Lowwall Dump Design and Stability at Mt Owen Mine
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Location

Overview

- In the past Mt Owen Mine lowwall dumps have failed.
- Lowwall dumps are integral to the mining process at Mt Owen.
- Important considerations in the management of lowwall dumps include:
  - dump design,
  - monitoring of slope movement and
  - management of the risk to personnel.
Product Coal is thermal and semi-soft coking coal for supply to the export markets.

Up to 11 coal seams are mined in Mt Owen. Some seams consist of up to 6 splits, splits greater than 0.4m and partings less than 0.4m are mined.

The mined seams at Mt Owen include:
- Lemington Seams,
- Pikes Gully Seams,
- Arikas Seams,
- Upper Liddell Seams,
- Middle Liddell Seams,
- Lower Liddell Seams,
- Barrett Seams,
- Upper Hebden Seams and
- Lower Hebden Seams.
Lowwall dumping is necessary to minimise truck hauls and make use of available dump space.

Due to the mine turning a corner there is limited dump space available.

Dumping on a lowwall with a dip of up to 22 degrees.
Stability analysis is an assessment of the factors driving failure and the factors that resist failure. Stability of a slope is referred to as a Factor of Safety (FoS).

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\text{FoS} = \frac{\text{Factors Resisting Failure}}{\text{Factors Driving Failure}}
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Factors Influencing Stability:
- Material Properties;
  - Cohesion, the strength required to shear rock and soil,
  - Angle of friction, the angle at which material will shear causing failure, and
  - Weight of material.
- Rock mass characteristics, discontinuities, faults
- Water and piezometric level
- Geometry of the slope

Factors Decreasing Stability:
- Over steepening of slope.
  - Removal of material at the toe. Mining deeper.
  - Loading at the crest. Dumping material at the crest of the slope.
- Change in water level.
Slope Monitoring
Monitoring is installed so that we can monitor deformation to better understand the and predict failure.

Automated Prism Monitoring
- Monitors prism movement.
- Measures prisms 2 or 3 times a day.
- Triggers alarms when thresholds are exceeded.

Slope Stability Radar
- Measures sub millimetre deformation of a slope.
- Scans a slope approximately every 2 to 8 minutes.
- Triggers alarms when thresholds are exceeded.
- Close to real-time alerts when movement exceeds thresholds.

B6 Lowwall TARP
- Failure of low wall.
- Imminent failure of low wall indicated by Rapid opening of cracks, floor heave, constant movement of spoil material.
- Low wall monitoring showing > 15mm/hour increase in rate over a 12-hour period.
- Rapid opening and slumping of cracks around low wall crest or toe.
- Rapid onset of floor heave.
- Isolated movement of low wall material.
- Low wall monitoring showing > 7.5mm/hour and < 15mm/hour over a 12 hour period.
- Rapid acceleration path in low wall monitoring showing over 1 week.

2005 B4 Lowwall Failure

Conditions:
- L4 Red
- L3 Orange
- L2 Yellow
- L1 Green

2005 B4 Lowwall Failure
Monitoring

Result of Failure

Recovery from Failure

Recovery from Failure

Recovery from Failure

Recovery from Failure
Recovery from Failure

Back Analysis of Failure

Information Obtained

- Back analysis of the failure provided properties of failed materials.

- Increased understandings of critical velocities and accelerations was derived from the analysis of slope movements.

Current B6 Lowwall Movement
Buttress Construction

- RL-90 Buttress

- RL-60 Buttress

Buttress Construction

- RL-60 Ramp

Current Rate Movement

B6 Displacement from SSR and Prisms

Conclusion

- Trigger Action Response Plan’s (TARP’s) are implemented to manage risk to personnel.
- Automated monitoring make it possible to analyse slope movement regularly and update the TARP level.
- Slope stability assessments, buttress and dump design are constantly updated to maintain stability as mining proceeds.