Coal Loss and Dilution Considerations for Western Canadian Foothills Open Pit Coal Projects

Presenter: Mike Allen
Manager, Surface Mining

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Outline

• Terms / Definitions
• Factors affecting coal loss and dilution
• Coal mining methods / equipment
• Measurement Considerations
• Reconciliation Process
Terms / Definitions

• Contact / Interface:
  – Hanging Wall
  – Footwall

• Dip

• Dilution

• Mining recovery

• Mining section

• Parting:
  – Removable
  – Non-removable

• Seam
Factors Affecting Coal Loss and Dilution

- Coal seam dip
- Proximity to faulting / complex structure
- Seam thickness
- Hanging wall and footwall competency
- Dilution physical properties
- Preparation plant configuration:
  - Raw coal handling
  - Sizing / separation
Mining Methods by Seam Dip

- Steepley Dipping - coal seams that dip greater than 55° to 60°
- Moderately Dipping - coal seams that dip between 10° to 15° and 55° to 60°
- Shallow Dipping - coal seams that dip between 0° and 10° to 15°
Steeply Dipping Seams

65°
Moderately Dipping Seams

15°

35°
Shallow Dipping Seams
• Coal Cleaning
  – Dozer
  – Backhoe

• Coal loading
  – Loader
  – Backhoe (up to 90t class)
  – Shovel or Excavator (over 90t class)
Steeply Dipping Coal Seams
Mining Sequence - 1

1. DRILLING AND BLASTING
   - BLASTHOLE DRILL
   - DRILLING AND BLASTING
   - COAL REMOVED ON PRIOR BENCH
   - SEAM DIP > 60°
   - 10m

2. WASTE REMOVAL
   - EXCAVATOR REMOVES BLASTED MATERIAL
   - DIG OUT WEDGE IN FLOOR

3. COAL REMOVAL
   - 10m
   - SEAM DIP > 60°

4. DRILLING AND BLASTING
   - BEGIN ON THE NEXT INTERBURDEN

- Do not have to blast through coal.
2. WASTE REMOVAL

- Depending upon coal strength, may have to excavate in 5 to 7m benches to expose coal.
• Cleaning assistance with small backhoe (5m³)
• Trying to limit coal rehandling to minimize fines generation.
4. DRILLING AND BLASTING
BEGIN ON THE NEXT INTERBURDEN

- Could sub-out coal and place rock to protect coal from blast damage.
Steeply Dipping Coal Seams
Coal Cleaning
Blast holes are geophysically logged to allow for controlled blasting through coal.
• Operator training is key to maintaining good recovery and controlling dilution.
Moderately Dipping Coal Seams
Mining Sequence - 3

3. COAL REMOVAL

- Cleaning assistance with small backhoe (5m³)

1. DRILLING AND BLASTING

2. WASTE REMOVAL

3. COAL REMOVAL

4. WASTE REMOVAL

5. DRILLING AND BLASTING
BEGIN NEXT BENCH
4. WASTE REMOVAL
5. DRILLING AND BLASTING
BEGIN ON THE NEXT INTERBURDEN

- May sub-out coal and replace with waste to prevent crushing/coal loss from traffic
Moderately Dipping Coal Seams
Coal Loading
Shallow Dipping Coal Seams
Mining Sequence

1. DRILLING AND BLASTING

2. WASTE REMOVAL

3. COAL REMOVAL
Shallow Dipping Coal Seams Mining Sequence

4. WASTE REMOVAL

5. COAL REMOVAL

6. DRILLING AND BLASTING BEGIN NEXT BENCH
Shallow Dipping Coal Seam
Coal Cleaning
Measurement Considerations

If you don’t measure it, you can’t manage it.....

• Geological Confirmation:
  – In pit mapping / surveys of coal seams
  – Seam thickness
  – Seam position relative to the modelled position
  – Coal quality
Measurement Considerations (continued)

- Mining Considerations
  - Blasthole logging
  - Blasting
  - Bench grade control
  - Incorporate into revised mining geology model
Measurement Considerations (continued)

• Plant:
  – ROM stockpile management
  – Raw coal quality
  – Scales (calibration)
  – Plant mass balance
  – Product quality (moisture, ash)
Reconciliation Process

1. Define Parameters
2. Develop Mining Geology Model
3. Measure
4. Reconcile
5. Mine Coal

 repetitions of cycle