Coal Field Characteristics

- Mountainous terrain / steep incised canyons
- Massive sandstone / siltstone cliff forming members
- Several major coal seams sit directly on top of massive beach sandstones
- Poorly defined and widely spaced joint pattern in rock formations
- Low to negative angle of draw around gob areas (-15 to +25 degrees)
- Major sandstone channels
- Rolls
- Deep cover (up to 3,000’)
- Faulted
- Strong brittle coal
- Multiple seam mining
UEI Tower Mine
Belt Air Presentation

Castle Gate Sandstone
Aberdeen Sandstone
Beach Sequence
Flat laying (0% to 10% grades generally to the West)
Non gassy

Steep grades (10% to 22% generally to the North and East)
Gassy
Hydrocarbons

Two-Entry Operating Mines:
- West Ridge
- Dugout
- Aberdeen
- Skyline
- Deer Creek

Other Operating Mines:
- CW Mining
- SUFCO
- Emery Deep
- Horizon

Sunnyside
Mining History

• Started in 1880’s
  – 1,000 to 1,500 foot overburden barrier to second mining

• Best ground control
  – narrow entry widths
  – minimum number of entries
  – large stiff pillars in main entries
  – small yield pillars in panels
More Recent History

- John Peperakis
  - Bureau of Mines
  - Deeper than 1,500 feet
- Kaiser Steel Sunnyside Mine begins longwall mining 1962
- Two-entry yield pillar gateroads – based on experience (approved in RCP and VP)
- 41 longwall panels from 1962 to 1992 at depths up to 2900’ of cover
Other Mines Begin Longwalling

- Other mines decide to start up longwall operations
  - Braztah
  - Deer Creek
  - Plateau
- Evaluation of gateroad designs
  - Bureau of Mines
  - Charles Holland
  - Arthur Wilson
  - National Coal Board
  - Others
- Had to demonstrate 3-entry would not work
UEI Tower Mine
Belt Air Presentation
Wilberg Mine fire

- Wilberg Mine fire
  - December 19, 1984
  - Fire started by over heated compressor
- Mine was using 2-entry yield pillar longwall gate roads
  - Mines had to apply for “interim relief”
  - 101(c) Petitions required
- Disaster investigation team plus 2-Entry Task Force
- Final report said use of 2-entry, with additional recommendations, safest overall design for longwalls in Wasatch and Bookcliffs coal fields
  - AMS Systems
- Utah longwall mines granted Petitions and continued use of 2-entry
- Influential in rules governing use of belt air 30CFR75.350, 351 and 352.
Benefits of Using Belt Air

• 3 entries provide better ventilation if they can be held open
  – Severely restricted by:
    • supplemental roof and rib support
    • cave-ins
    • floor heave
    • rib sloughage
  – escapeways are compromised
• 2-entry longwall gate road systems significantly improve ventilation and escapeways over a three entry system that has significant ground control problems.
  – However, minimum number of entries increase resistance and requires high pressure ventilation system.
  – Belt air provides additional intake air and improves bleeder system
UtahAmerican Energy Inc. Aberdeen Mine

• Aberdeen mine
  – 7,000 tons per day
  – 2,000,000 tons per year
  – Liberates 11 million cubic feet methane per day

• 65% of methane from active longwall panel removed through vertical methane drainage holes

• 35% of methane removed by mine ventilation system
Push/Pull System

• Ventilation Upgraded
• Upgraded from exhausting system to Push / Pull system
• New intake ventilation shaft
• Blowing fan
• Cost about $1,500,000
Tower Mine Longwall Panel 10
Effect of Utilizing Belt Air Before & After Ventilation Improvements
(including addition of Airshaft & Blowing Fan)

(a) With Belt Air -- After Fan/Shaft

1.60 *wg Panel Available Pressure  (X) Leakage through 8 Xcuts  Headgate Intake Entry
140.35 kCFM  91.35  90.91  88.68  86.69  84.95  83.44  82.18  81.18  80.50
49.00  49.44  51.67  53.65  55.40  56.90  58.16  59.16  59.85
Headgate Belt Entry

(b) Without Belt Air -- After Fan/Shaft

1.60 *wg Panel Available Pressure  (X) Leakage through 8 Xcuts  Headgate Intake Entry
141.12 kCFM  134.88  129.00  123.68  118.72  114.08  109.89  105.84  102.21  98.92
43.2  39.96  31.08  25.76  20.80  16.17  11.88  7.92  4.29  1.00
Headgate Belt Entry

0.985 *wg Available Pressure
Available Intake Air
Longwall
0.480 *wg Available Pressure
Available Intake Air
Longwall
# Benefits of Belt Air

Tower Mine Longwall Panel 10
Effect of Utilizing Belt Air Before & After Ventilation Upgrade

<table>
<thead>
<tr>
<th>Case</th>
<th>Belt Air</th>
<th>Fan Upgrade</th>
<th>Air Available at Headgate (cfm)</th>
<th>Percent Increase with Belt Air</th>
<th>Diagonal Pressure at HG (inches w.g.)</th>
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</thead>
<tbody>
<tr>
<td>a</td>
<td>X</td>
<td>X</td>
<td>140,000</td>
<td>42.9%</td>
<td>0.98</td>
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<tr>
<td>b</td>
<td></td>
<td>X</td>
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<td>0.48</td>
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<td>X</td>
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<tr>
<td>d</td>
<td></td>
<td></td>
<td>83,000</td>
<td></td>
<td>0.34</td>
</tr>
</tbody>
</table>
Benefits of Belt Air

• Reduces methane concentrations in the belt entry, on the face and in the bleeders.
• Reduces respirable dust concentrations
• Provides more usable air at the face
• AMS systems improve safety of underground coal mines more than anything else.
  – Accurate
  – Dependable
  – Sophisticated
  – Well accepted by workforce – Confidence in the system
• CO detection rather than point-type heat sensors (as required by law).
• Escapeway routes not compromised by belt air – in fact, they are improved because of second intake airway.