Coal Mining in Pennsylvania

Safety is the first priority.

- 16 Billion tons produced since 1870
- 2004 Production of:
  - 72+ Million Tons Bituminous Coal
    - 80% from Underground Mines
  - 3+ Million Tons Anthracite Coal
    - 90% from Surface Mines
- Over 60% of production from 5 companies.
Coal Mining in Pennsylvania

- Additional Coal Resources
  - 25 Billion Tons of Bituminous
  - 7 Billion Tons Anthracite

- The easy coal is gone.
- Accessing the remaining resources will continue the trend of more underground production.
Coal Mining in Pennsylvania

- Technological Challenges for Pennsylvania Anthracite Producers include:
  - Development and deployment of mechanized underground mining technologies for steep seams is necessary to access most remaining resources.
  - Dewatering to bottom of synclines.

The Whaleback
Northumberland County, PA
Environmental Challenges

- Mine Drainage
- Subsidence Control
- Waste Management
- Ventilation Air Methane
- Mine Closure
Mine Drainage

- Mining accelerates natural weathering processes.
- Uncontrolled it will destroy streams and water supplies.
- Prevention is better than treatment

Bennetts Branch
Elk County, Pa
Mine Drainage

- **Challenges:**
  - Modify or develop prevention and mitigation strategies specific for underground mines.
  - Reduce treatment costs or find value in the treated water, metals recovered during treatment, and/or the potential energies (both gravitational and thermal) of mine waters.
  - Ensure long term treatment funding is left after mine closure.
Regardless of mining method underground mining causes surface subsidence. It’s more a question of when it happens.

- Longwall techniques force planning for subsidence.
Subsidence Control

- Subsidence affects every thing on the surface.

Washington County, PA

Investigating a stream dewatering case in Southwestern Pennsylvania

Greene County, PA

1-79 in Greene County, PA
Population increases and residential sprawl coupled with the immense geographic size of modern underground mines will increase the number and complexity of subsidence issues.
Subsidence Control

- Challenges include:
  - Public acceptance of planned subsidence.
  - Better methods for prevention and mitigation of damages to surface structures.
  - Protection of stream flow (especially headwaters).
  - Prompt repair and compensation for unavoidable damages to homes, water supplies, and streams.
Cleaning and preparation of coal products will be more important in the future.

Better cleaning means more coal refuse wastes.
Waste Management

- 1,300+ megawatts of electricity are generated in Pennsylvania using Circulating Fluidized Bed (CFB) boiler technology to burn coal refuse.

Inter-Power/AhlConPartners, L.P.
Cambria County, PA
Waste Management

- Challenges:
  - Minimize amount of wastes generated while maximizing amount of wastes used for fuel.
  - Site coal refuse disposal facilities to minimize potential for embankment or impoundment failure.
  - Design to minimize both air and water infiltration.
Ventilation Air Methane

- Methane is a safety hazard to miners, a greenhouse gas, and an economic resource.
  - Underground mines traditionally diluted methane with ventilation air using mine fans.
  - Methane is a 21x stronger greenhouse gas than CO$_2$.
  - Some mine operators are now degassing the coal seam before mining through coalbed methane production.
Ventilation Air Methane

- Challenges
  - Elimination of methane explosion hazards.
  - Ownership and production conflicts.
  - Development of safe and accepted technology to reduce emissions of coal mine methane.
  - Produced water issues.
Mine Closure

- Mine closure reclamation is common practice today.

- Maintain coal mine spatial data for use in future surface and subsurface development.
Conclusions

- Coal mining has never been an easy endeavor.
- Present day mining is closely scrutinized by the public and heavily regulated by both Federal and State Agencies.
- **Any** mining needs to be safe!
- Application of human ingenuity is needed to minimize the challenge of environmentally friendly future production.
- **Any** mining needs to be safe!
Thank You

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