Coal Mining in PA

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Outline

Coal Mining Processes
Mine Labor
Mining Safety
Family and Society
Bituminous Coal Mining
Coking and Steel-making
Politics of the Mine
Decline of PA Mining
Coal Extraction Technology

- Two main categories
  - Surface mining
  - Underground mining
- Surface mining in the U.S. accounts for 67% of coal production\(^1\)
  - PA has one-third of U.S. surface coal mines (‘96/’97 data)\(^2\)
- Underground mining yields 60% of world coal production\(^1\)
Coal Extraction Technology
Surface Mining

- Only viable when coal seams are near the surface
- Can recover a high proportion of coal (90%+)\(^1\)
- Often cover large areas of land (many square miles)
- Use of massive machines and equipment
  - Draglines
  - Power shovels
  - Bucket wheels
  - Trucks
Underground Mining

- Two main types
  - Room-and-Pillar
  - Longwall
- Room-and-Pillar mines have been in PA since the late 1700s\(^3\)
- Longwall mining did not arrive in the U.S. until 1875\(^3\)
Room–and–Pillar Mining

- Coal is mined by extracting “Rooms” of coal separated by “Pillars”
- Low efficiency
  - Pillars can account for as much as 40% of the coal in the seam\(^1\)
- Higher efficiency achieved by “robbing the pillars”
  - Can recover over 70% of the target coal\(^3\)
- Today, room–and–pillar mining is done with continuous mining machines
Room-and-Pillar Mining (Cont.)

- Continuous Mining Machine
- Coal
- Pillar
- Conveyor Belt
- Continuous Mining
- Haulage

Source: Energy Information Administration
Longwall Mining

- Began with undercutting techniques in late 1800s
  - Modern mechanization didn’t arrive until 1952³
- Requires careful planning and high startup costs
  - Longwall machines can cost $50M¹
- Extracts a full section of the coal face
  - Face can be 100m to 350m in length¹
- Immediate efficiency
  - Coal extraction rates exceed 75%¹
Longwall Mining

Direction of mining

Longwall Mining Machine (Works back and forth across coal face)

Coal

Conveyor Belt

Self-Advancing Hydraulic Roof Supports

Brattice to Control Ventilation

Gob Area (Collapsed Roof Material)

Pillar

Source: Energy Information Administration
Labor and Wages

- Labor for the mine owners came at a cheap price:
  - Men worked for next to nothing, while women worked in the home (cooking, cleaning, etc.)
  - Children also contributed to family income (breaker boys)
- Wages were little to nothing after company stores taxed miners and laborers.
- This left families in a devastation: poor living conditions, no money, stuck in company towns!

Unionization and Violence

- Main cause: low wages and frustration among the miners
  - Miners divided because of language and ethnic barriers
- Many blame the Molly Maguires, a secret society of miners, for the violence in the anthracite region
- Violence throughout the region likely aided the cause of unionization
  - When the violence ended, unions sprang up to support higher wages and better conditions
Unionization

- Developed after violence terrorized the anthracite region
  - Men came together to form United Mine Workers of America
- Coal Strike of 1902
  - Threatened all major cities’ heating supplies
  - Required federal intervention
Unionization and Politics

- Labor unions and Strikes
  - United Mine Workers brought together mine workers to achieve common goals
    - Improved working conditions
    - Fair compensation
  - Strikes were only slightly productive
    - Union leaders not very progressive
    - Mine owners/operators were steadfast about not changing
    - Some changes were made, but not without opposition
    - Many strikes proved violent and brought bloodshed
Company Law Enforcement

- Coal and Iron Police
  - Private police force operated by the mine owners
  - Suppressed opposition to company policies
  - Municipal police didn’t exist in the patch towns, as they were owned by the companies.

- The Coal and Iron Police were responsible for some violence of their own
PA Mine Disasters

- Given PA’s long history of coal mining, we’ve had our fair share of mine disasters.
- The three most deadly are:
  - Darr Mine (Van Meter, PA)
  - Mather Mine No. 1 (Mather, PA)
  - Hawkick Mine (Cheswick, PA)
PA Mine Disasters (Cont.)

- **Darr Mine**
  - December 19, 1907
  - 239 killed
  - Caused by an explosion

- **Mather Mine No. 1**
  - May 19, 1928
  - 195 killed
  - Caused by an explosion

- **Harwick Mine**
  - January 25, 1904
  - 179 killed
  - Caused by an explosion

Source: CDC (NIOSH)
Mining Safety

- Coal mining was a dangerous job
- Mine safety issues include:
  - Gas buildup
  - Various “damps”
  - Ventilation issues
  - Health concerns
Methane

- Chemical compound: CH$_4$
- Occurs naturally in the mines, depending on the age of the coal
- Creates Fire Damp
  - Methane gas
  - Hazardous to miners
Damps

- White Damp
  - CO
  - Leads to suffocation

- Stink Damp
  - Hydrogen Sulfide
  - Suffocation
Damps (cont.)

- **Choke Damp**
  - Carbon–based gas
  - Animals as warning system
- **After Damp**
  - Gas after a mine explosion
Ventilation Developments

- The need for better ventilation
  - Needed to get oxygen down into the mine
- John Buddle (1773 – 1843)
  - English mining engineer
  - Created two developments in mine ventilation
Immigration and Mining

- Most immigrants came to the country out of free choice
- Arrived looking for good work, but found hardship in the mines
  - Irish turned away due to their religion
- Immigration caused turmoil in the region
  - Unfair treatment of ethnicities
    - English and Welsh were highly valued
    - Slavs were given the worst jobs in the mine
  - Language barriers

Immigration and Mining (Cont.)

- Immigration and ethnicity played into a miner’s wages
  - English and Welsh miners paid more than Irish and Slavic miners
  - True even for people doing the same job
Immigration and Politics

- Immigration was both a key to success and a catalyst for problems in PA coal mines
  - Immigrant workers kept the mines operating
    - More experience immigrants held better positions
    - New immigrants were put into the lowest-paid and most dangerous jobs
  - Inequality created unrest
    - Separation of work based on ethnicity
    - Social casting
    - Religious differences
Companies and Immigrants

- Many companies did not welcome new immigrants and offer them work
  - Did not want to add people to payroll
  - Language barriers and ethnic dissension
- Companies rarely gave immigrants a fair chance
  - When offered work, it was not a high paid position
  - Little chance for advancement
Bituminous and Anthracite
Anthracite Coal

- Located in northeastern PA and central Appalachians
- Production began toward the beginning of the nineteenth century
- Transportation was grueling due to mountainous terrain
- Production reached 99.7 million tons in 1917
- Anthracite proved to be ideal for home heating
Bituminous Coal

- Located in western and north-central PA
- Mines first opened in 1760
- Proved to be ideal for the iron/steel industry
- Production reached 177 million tons in 1918
## Bituminous vs. Anthracite

### Bituminous
- Roughly three-quarters of residents resided in patch towns.
  - Mine owners had more control
- Mining done using various techniques
- Klondike and Connelsville produced the best coking coal
- Driven by eastern European immigrants during the industrial revolution

### Anthracite
- One-third of residents depended on the patch towns
  - Region pushed by the UMW of America
- Origin of strip mines due to terrain
- “Mammoth Vein” of Summit Hill
Decline of Anthracite

- Production in the anthracite region peaked in 1917
  - This increase in production meant a better living
- Child labor was used less
- From 1928 to 2000, there was a substantial production decline
  - With this decline, came a decline of employment
Reasons for Decline

- Bituminous coal and coke became more important
- Anthracite coal became harder to mine
- Government investigation showed the monopolies of the region
- During World War II, coal production couldn’t keep up with demands
Reasons for Decline (cont.)

- Technology also played a major role in the decline
  - Heating substitutes became popular
- Bituminous became more popular
  - Technology for bituminous coal...
- The union also added to Anthracite demise
  - Each strike caused a halt in production
Death to Anthracite

- The Knox Mine disaster was the final hit to the industry
  - The men were ordered to mine too close to rock that separated the mine from the Susquehanna River
  - Flooding was unable to be stopped, so work halted
- State investigation found that the coal company wasn’t following safety procedures
References


3. PA DEP. “The Effects of Subsidence Resulting from Underground Bituminous Coal Mining on Surface Structures and Features and Water Resources”. Section IV. <http://www.dep.state.pa.us/dep/deputate/minres/bmr/act54/sec6.htm>

Bibliography


Please note, some information is taken from power points used in class.