Surface Mining...

Draglines... and mining

... Dragline Methods
History of Draglines

- First dragline built in 1904 by Page & Schnable
- Built for a specific need on the Chicago Drainage Canal project
- In 1912, Page Engineering Company incorporated when Page discovered building draglines more profitable than contracting
History, continued

✔ Up until 1912 no one had developed a means of propelling the machine

✔ In 1913 an engineer for Monighan Machine Company revolutionized dragline by placing two shoes, one on each side of the revolving frame

✔ The Model 1-T became the first walking dragline
World’s Largest Machines

- 1935 12 CY manufactured by Bucyrus Erie
- 1942 30 CY manufactured by Marion
- 1961 40CY manufactured by Ransom & Rapier (British)
- 1963 85 CY manufactured by Marion
- 1965 145 CY manufactured by Marion
- 1969 220 CY manufactured by Bucyrus Erie
History, continued

World’s Largest Machines

- **BIG MUSKIE**
- Muskinghum Mine of Central Ohio Coal Company (AEP)
- Operated until June 1991
- Attempting to preserve as a public historical facility
History, continued

✔ Today only two remaining manufactures of draglines:
  – Bucyrus Erie
  – P & H
History of Dragline Operations in West Virginia

✔ Joe Hughes of Northeast Mining Company operated a 4 yard Page near Beaver Creek in Tucker County in 1963
✔ During late 1960’s and 1970’s several operations including:
  - Imperial Coal & Construction Co.
  - Grant County Coal Corp.
  - Byron Construction Company
  - Bitner Mining
  - Island Creek Coal
History of Dragline Operations in West Virginia

- 1983 Hobet Mining began operations with a BE 1570 - 80 CY dragline at Hobet 21 near Madison
- 1983 Taywood Mining operated a Marion 183M - 9 CY
- 1987 Hobet Mining installed Marion 8200 - 72 CY machine at the Hobet 07 operations (transferred to Dal-Tex in August 1996)
- 1989 Morrison Knudsen began contract mining operations at Cannelton with a Marion 8200 - 72 CY
- 1989 AOWV/Ruffner added Marion 8400 - 49 CY machine
- 1994 Catenary Coal Company installed a BE 2570 - 100 CY machine at the Samples Mine (upgraded 1998 to 118 CY)
- 1998 Evergreen Mining commissioned a BE 1570 - 75 CY machine in Webster County
History of Draglines Operating in West Virginia

1999 - 6 draglines in operation:

- BE 1570 at Hobet 21 Mine
- Marion 8400 at AOWV/Ruffner Mine
- Marion 8200 at Dal-Tex Mine
- BE 2570 at Catenary/Samples Mine
- Marion 8200 at Cannelton Mine
- BE 1570 at Evergreen Mine
West Virginia Dragline Operations
Arch Coal, Inc.
Mine Planning..
General Considerations in WV

- Topographical constraints
- Pit geometry (length/width/bench height)
- Need for added mobility of machine
- Single vs. multiple seam
- Development requirements
- Contemporaneous reclamation
- Economics
Topographic Map of Dragline Area
Coal Seam Correlation
Coal Crops / Reserve Boundaries
Volumetric Gridding
3-Dimensional Modeling
Pit Geometry
BE 2570 - Samples Mine
Schematic Showing Typical Dragline Operation

METHOD OF MINING

Many companies utilize a method known as mountain top mining. The mining method employs five basic steps.

1. ORIGINAL SECTION

2. UPPER SEAMS REMOVED

3. BEGINNING DRAGLINE OPERATION

4. BEGIN REGRADING (Spoil from Cuts 1, 2, & 3 Regraded)

5. REGRADED SECTION

Once coal removal is complete, the land is graded by bulldozers and revegetated to reclaim the land in an environmentally sound way that is both attractive and productive.
General Mining Sequence ‘A’
General Mining Sequence ‘B’
General Mining Sequence ‘C’
Typical Multi-Seam Dragline Sequence ‘1’
Typical Multi-Seam Dragline Sequence ‘2’
Typical Multi-Seam Dragline Sequence ‘3’
Typical Multi-Seam Dragline Sequence ‘4’
Typical Multi-Seam Dragline Sequence ‘5’
During Mining
After Mining
(1+ yrs. reclamation)
Concept of Excess Spoil
Original Cross Section Prior To Mining

[Graph showing original cross section prior to mining with dimensions and percentages]
Original Material Swelled 125%
Regraded Cross Section After Reclamation

167,912 sq.ft. (Swelled)
-115,515 sq.ft. (Regraded)
52,397 sq.ft. (Remaining)

167,912 SQ.FT. (Swelled)
115,515 SQ.FT. (Regraded)
Concept of Excess Spoil
Disposal Alternatives

✔ Two primary disposal alternatives:
  1 - Valley Fill (usually durable rock construction)
  2 - Backfill on mined-out area
Durable Rock Valley Fill Construction

Phase 1
Sediment Pond Construction
Phase 2
Initial Overburden Placement
Phase 3
Continued Overburden Placement
Phase 4
Overburden Placement Completed
Surface Drainage Conveyances Constructed
Phase 5
Regrading / Revegetation Completed
Backfilling Operations
Coal Loading Operations
Typical Cross Section
Stockton Coal Zone

Overburden

S-1 1.2'
Parting 1.5'
Rash 2.5'
S-2 2.0'
Parting 3.2'
S-3 2.6'
Parting 0.1'
S-4 1.8'

Stockton Coal Zone
2” to 15” S-3 Parting

30” S-3

2” S-4 Parting

24” S-4
Environmental Considerations
Establishment of Drainage and Sedimentation Controls
Approximate Original Contour
Other...

✓ Waste Management Plan
Ground Water Protection Plan
Spill Prevention Control &
Countermeasure Plan
Fixing the Scars of the Past

• “Third Generation” Surface Mining
  ✔ Restoration of abandoned refuse sites eligible for AML funding at no cost to the state
  ✔ Creation of wetlands and passive water treatment sites
  ✔ Elimination of miles of pre-SMCRA highwalls
  ✔ Extinguishment or isolation of abandoned underground mine fires
Pre-SMCRA Highwalls and Deep Mine Entries
Abandoned Coal Refuse Dumps
Acid Mine Drainage
Reclaimed Pre-law Refuse Sites
Wetlands Construction
Related Benefits

- Resource recovery
- Can address prior environmental problems
- Provides opportunities for future use of resource due to infrastructure development
Russian Dragline - Circa 1998