WPCAMR

Western PA Coalition for
Abandoned Mine Reclamation

Coal Refuse Burning Power Plants

Pennsylvania's partner in improving the environment

Introduction

- A new kind of electricity generation power plant is changing the landscape in Pennsylvania's coal country…

…for the better!

Introduction

- Fueling their boilers with **gob**, the waste product from the old coal mining days, coal refuse burning power plants annually rid the environment of millions of tons of ugly, polluting refuse piles that have been fixtures of Pennsylvania's landscape for decades.

Technology makes it possible

- Coal refuse (gob) has some residual coal. Gob can now be economically burned because of advanced technology.
- The technology offers the cleanest burning, minimally polluting coal-fired power generating stations in the world.
- As a bonus, even the byproduct ash of coal refuse combustion has a beneficial use in reclamation projects.

A win-win situation

- Coal refuse burning power plants offer the single greatest hope for the widespread reclamation of coal refuse piles…

  … and they do it without taxpayer dollars!

Gob Piles

The origins of gob piles

- Coal refuse (gob) is the unwanted waste product of coal mining.
- It's comprised of minerals extracted incidentally but not purposely along with coal.
- A separation process segregated waste from coal (but imperfectly… some coal was invariably discarded along with the waste.)
- Gob was dumped into piles that sometimes grew to millions of tons in the old days of mining.
- Gob piles have been abandoned for decades and are common throughout the mining communities of Pennsylvania's coal country.

The problems with gob piles

- Huge, ugly eyesores
- Dangerous, unstable and highly eroded steep slopes
- Gob will not support much vegetation
- Sometimes piles catch on fire and burn for years
- **Sources of abandoned mine drainage (AMD)**

  Gob piles create the perfect conditions for generating AMD. Sulfur bearing minerals (pyrites), when exposed to water and air (the weather), generate acids and heavy metals which are quite harmful to streams and rivers.
- Devalued property values and communities
- Reclamation is too often prohibitively expensive

Almost no vegetation

Deep erosion gullies

It's big, ugly, and very costly to remove

Treacherous terrain

Evidence of past burning

Exposure of pyritic material to the weather creates acid mine drainage

Unstabilized dust stirred up by the wind, causing local air pollution

Coal refuse goes by many names

- **Gob Piles**
- **Boney Piles**
- **Slate Dumps**
- **Culm Banks**

CFB Boilers

The technology

burning gob to produce electricity

- Gob is burned in specialized containers called **Circulating Fluidized Bed (CFB)** Boilers

  CFB boilers are the breakthrough technology enabling the economical burning of low grade fuels such as coal refuse.

- Pulverized coal refuse and limestone are injected into the CFB boiler along with strong jets of hot air.
- The solid material circulates in the boiler as it **completely burns** in the turbulent environment.
- The burning fuel creates the heat to produce stream which in turn drives electric generators.

The technology

CFB boiler power plant

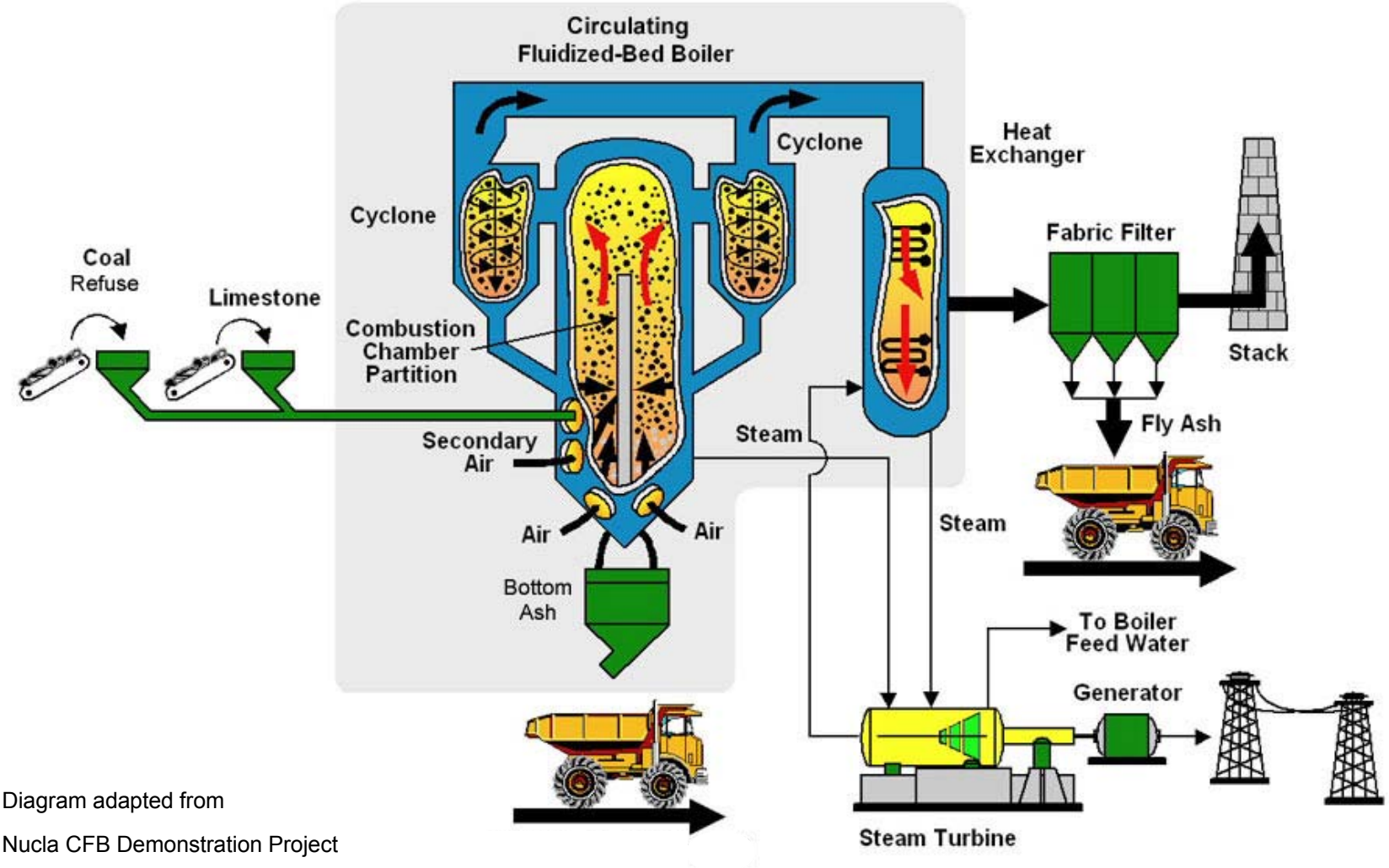


Diagram adapted from

Nucla CFB Demonstration Project

The technology

pollution controls

- Practically complete combustion of gob at relatively low operating temperatures minimizes nitrogen oxide (NO_x) air pollution formation
- Limestone combines with sulfur compounds in the gob to create an inert solid that is captured to minimize airborne sulfur (SO_x) emissions.
- A fabric filter captures lighter particulate matter, the fly ash.
- CFB boilers fitted with appropriate pollution controls meet or exceed the strictest air pollution requirements.

CFB Ash

The technology

combustion byproducts: CFB ash

- Following combustion of gob in the CFB boiler, the solids that remain are called ash.
- Heavier ash collected at the bottom of the CFB boiler is “bottom ash”.
- Lighter ash collected in the fabric collector is “fly ash”.
- CFB ash is **alkaline** (not capable of producing acidity) because of the limestone added to control sulfur emissions.
- CFB ash is suitable for reclamation projects involving beneficiation of acid-producing materials and filling of surface-mine pits and deep-mine voids because of its low permeability and benign chemical properties.
- Ash from other types of power plants usually doesn’t have the alkalinity of CFB ash, and not the usefulness.

Use of CFB Ash in Gob Pile Reclamation

- Heavy metals present in acidic environments (as are common in mining impacted lands) are very mobile and tend to leach to surrounding soils and waters; CFB ash can neutralize acidity and can help to immobilize the metals to prevent leaching… a vast improvement.

- Alkaline CFB Ash is often hauled back to the same gob pile sites used for CFB fuel. The haul back avoids the costs of landfilling the CFB ash.
- The land the gob piles occupied is typically very acidic from abandoned mine drainage.
- The alkaline ash is mixed with the acidic soils for neutralization and metals immobilization.

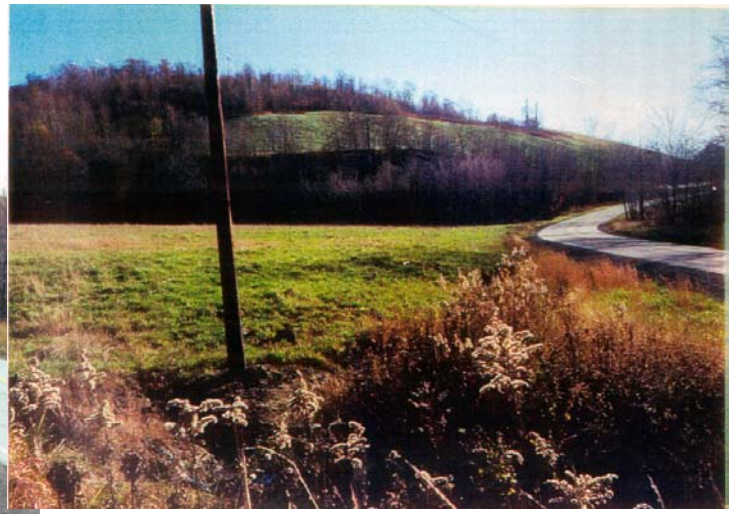
CFB Ash use is safe, tested and regulated

- Reputable research indicates CFB ash is a safe material for mine land reclamation projects.
- CFB ash is routinely tested for content, and is regulated by DEP, which has certified it for beneficial use in mining-impacted reclamation projects.
- CFB ash has an exemplary record as a reclamation material.
- Unfortunately, disparaging claims have been made regarding its suitability for reclamation projects. However, no claim that CFB ash is unsuitable for use as a reclamation material has ever been substantiated.

Gob Pile Removal and Reclamation adds tremendous value to the environment

- Not only are the CFB power plants responsible for removing the coal refuse material, they totally reclaim the pile site to productive use, often using CFB ash.

Before



After

Other uses of CFB ash

- CFB Ash can be used for other kinds of reclamation projects
- One project will use CFB ash injected into the partially flooded underground voids of an abandoned mine to mitigate acid mine drainage that currently breaks out on the surface.

Considerations in using gob

Economics of pile removal

- The ability to use the refuse material as CFB fuel of any particular gob pile is dependent a variety of factors…
  … but it all hinges on the economics of making a profit for the power plant operator.
- Important considerations affecting the cost of operations include:
  - Energy content of gob material
  - The distance of the pile to the power plant
  - The sulfur content of the material
  - Moisture and clay content
  - Accessibility to and site characteristics of the pile
  - The ability to use CFB ash on the site
  - Negotiations with the pile owner

Economic Considerations (cont)

- Energy content of gob material should be greater than 6000 BTU/lb. (Virgin coal is about 12,000 BTU/lb.)
- Transportation is a major cost. The closer the distance of pile to plant the better. Outside limits are about 50 miles.
- Higher gob sulfur content requires more limestone addition and higher costs.
- Moisture and clay content of gob may affect material handling and combustion properties, possibly affecting costs.
- The pile site needs to be accessible to trucks and equipment and site characteristics need to be conducive to pile removal and site reclamation.
- The ability to haul back CFB ash to the pile site lessens the costs of ash disposal, while providing the benefit of the material.
- Price paid to pile owner has to allow for profit by operator.

Economic Considerations (cont)

- All the foregoing considerations will contribute to the costs of permitting, material handling, transportation, preparation, and reclamation.
- The bottom line is that it has to make good economic sense in order to remove a pile.
- In some instances, providing a subsidy to the operator may be a way of removing a pile with otherwise marginal economics.

Conclusions

Conclusion - a winning combination

- CFB boiler technology has made the hope of ridding Pennsylvania's landscape of hundreds of coal refuse piles a reality.
- The environment, the economy, and Pennsylvania's citizens all benefit from the services Coal Refuse Burning Power Plants provide: electrical power produced under stringent pollution standards, removal of mountains of coal refuse, and reclaimed land.