Ash 101: Coal Ash Production & Use
Production and Utilization

CCP Production & Use (1966 - 2007)

- Production
- Use
- Percent Use

Short Tons (Millions)

Data Years

50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Coal Ash vs. CCPs

- Coal combustion products are the residuals from the combustion of coal and include:
  - Fly ash
  - Bottom ash and boiler slag
  - Air emission control system residues

- Although “Ash” and “CCPs” are terms often used interchangeably, CCPs is the more applicable terminology

- Numerous technical standards apply to CCP uses
Beneficial Rules of Thumb

- For each ton of fly ash used instead of portland cement, approximately one ton of CO2 can be avoided or postponed

- Fly ash is typically less expensive than portland cement

- CCPs can replace virgin, earthen or manufactured materials
What Makes CCPs Useful?

- Non-hazardous nature
- Mineralogical components allow them to be used in lieu of other natural materials
- Locally available
- Economical
- Can be conveyed in dry or in moistened form
Leading Use for Fly Ash

- Additive to concrete as a replacement for portland cement
  - Enhances durability
  - Reduces permeability
  - Improves workability

- When used in concrete it can reduce greenhouse gases and improve performance while conserving natural resources.
Other Fly Ash Uses

- Cement production
- Masonry blocks and grouts
- Stabilization of soils
- Road base material
- Specialized applications such as metal castings, plastic fillers and in paints
- Structural fills and mine reclamation
- Waste stabilization and odor control
Bottom Ash Uses

- Heavier than fly ash and granular in nature
- Used as raw feed for cement production
- Use in soil applications to improve drainage and blended with other materials for composting
- Used in masonry blocks, bricks and concrete products
- Can be used in road base and mineral fillers in asphalt and shingles
- A component of artificial aggregates
Flue gas is scrubbed before leaving the stack to remove sulfur and nitrogen oxides

- “Wet” processes such as flue gas desulphurization (FGD)
- “Dry” process such as spray dryers
- Other FGD technologies

Other ways to scrub – selective and non-selective catalytic reduction (uses ammonia)
FGD Gypsum Factors

- Provides high quality byproducts, such as synthetic gypsum, that is, in some ways, superior to natural mined gypsum
- Can be used in many agricultural settings
- Is often an ingredient in portland cement production
FGD Gypsum – cont.

- Approximately 8.2 million tons (80%) of synthetic gypsum is used each year.

- 30% of the wallboard produced annually uses synthetic gypsum exclusively.
Architects are requiring increased amounts of fly ash in concrete.
Bottom ash is widely used in green roofs.
Pervious concrete is used to control storm water runoff.
CCPs are found in flooring applications, composites, geotechnical uses, etc.
LEED and other rating systems award points for CCP use.
Green Highway Partnership

- Public/private sector partnership that promotes more environmentally sensitive transportation planning
  - Storm water management
  - Ecosystem protection
  - Use of recovered industrial byproducts
- EPA Region 3, FHWA, state agencies and industry are partners
- www.greenhighways.org
EPA, DOE and industry have set the goal of 50% utilization of all CCPs by the year 2011 as part of the Resource Conservation Challenge.  
- 2007 utilization was approximately 42%  

Support the implementation of state beneficial use guidelines  

Provide technical information on characteristics, performance and potential uses whenever needed  

Participate in the development of technical standards
Three decades of research and analysis support non-hazardous determination.


Many states have beneficial use or regulatory guidelines for CCPs.
Projects should be evaluated on a case-by-case basis to determine appropriate characteristics and processes.

Potential for leaching needs to be considered and mitigated, as appropriate.

Climatology, geology, water sources and other factors are part of any characterization.

Local, state and federal regulations may apply as well as engineering standards.
Conclusions

- CCPs can be used in many ways and support sustainable construction

- They conserve natural resources and other materials, reduce the need for landfill space and help offset CO2 emissions

- When properly managed and engineered, CCPs do not have a negative impact on public health and the environment
Conclusions - cont

- We cannot ignore the impacts of inefficient resource management on our environment and society.
- Use, reuse and recovery of industrial materials has a role in sustainability.
More Information

- www.ACAA-USA.org
- http://www.NETL.DOE.gov/
- http://www.caer.uky.edu/kyashe/education/index.html
- Several FHWA related websites (RMRC; Turner-Fairbank, FHWA, etc.)
Questions?

Thank You
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