

University of Kentucky Research Foundation Project

Benefits Presentation



Clean Coal Power Initiative - Round 1 -

Advanced Multi-Product Coal
Utilization By-product
Processing Plant

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Executive Summary

- **Demonstration projects are critical to successful commercialization of technology developed under DOE's Fossil Energy R&D program**
- **Successful commercial application of the Advanced Multi-Product Coal Utilization By-product Processing Plant in the United States would**
 - Increase the utilization of the 110 million tons of coal utilization by-products produced annually
 - Reduces CO₂ emissions from Portland cement production by replacing 30% of the Portland cement with pozzolon in concrete



Project Information

Plant, Fuel, Location, Cost, and Schedule

- **Demonstration of an advanced coal ash beneficiation processing plant at LG&E Energy Corp.'s 2,000 MWe Ghent Power Plant. The plant represents the next generation in coal utilization by-product (CUB) beneficiation in that it addresses the entire CUB stream and generates a variety of useful products**
- **Location: Ghent, KY**
- **Project cost: \$8.9 million;
DOE share: \$4.4 million**
- **Schedule:**
 - 2004 Project Start
 - 2008 to 2009 Construction
 - 2009 Completion



Project Information (continued)

Team Members

- **Kentucky Utilities (Louisville, KY)**
 - A subsidiary of LG&E Energy Corporation
 - Participant
- **University of Kentucky Center for Applied Energy Research (Lexington, KY)**
 - Collaborator
- **CEMEX USA (Houston, TX)**
 - Collaborator

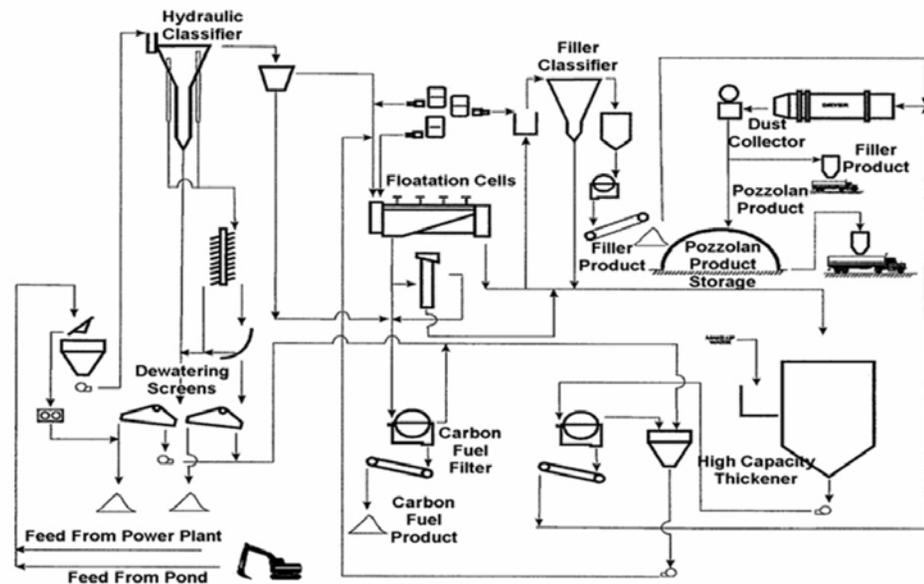


Project Information (continued)

CUB Processing Plant Schematic

- The technology can process ash that is either stored in existing disposal ponds or directly as it is produced by the power plant
- Products are produced by physical beneficiation of coal-fired power plant ash using well-known techniques

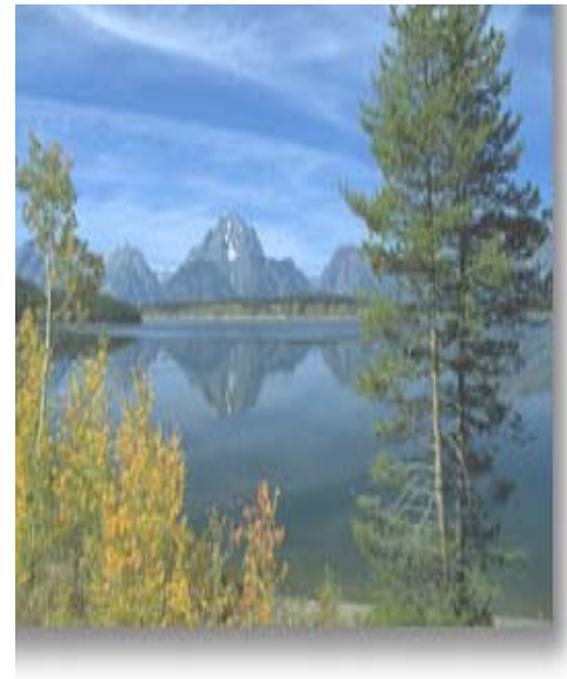
- Hydraulic classification
- Froth flotation
- Column flotation
- Spiral concentrators
- Solids dewatering



Project Information (continued)

Advantages

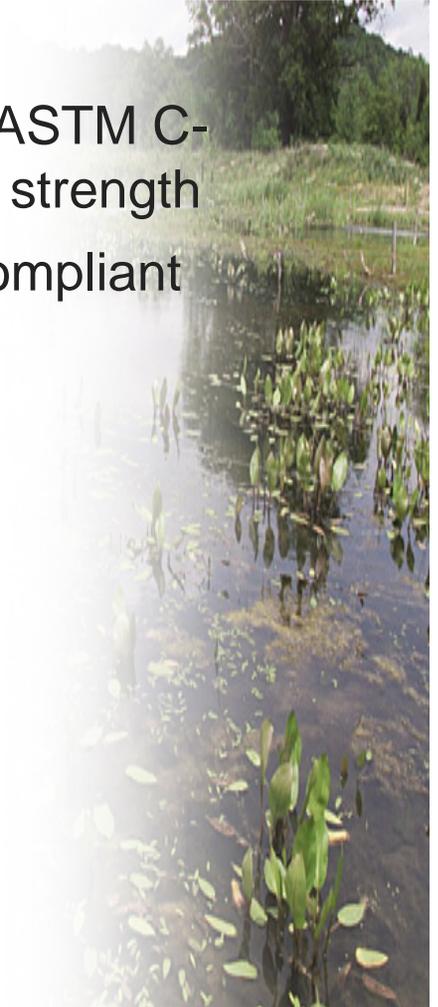
- Increased use of ash to replace pozzolanic Portland cement (30% vs. 20%)
- Improvement of local environments
- Potential for greenhouse gas mitigation



Project Information (continued)

Performance

- **The demonstration plant will produce**
 - 156,000 tons per year of pozzolan which exceeds ASTM C-618 criteria for loss on ignition (LOI), fineness, and strength
 - 16,000 tons per year of ASTM C-330 and C-331 compliant high grade lightweight aggregate
 - 16,000 tons per year of graded fill sand
 - 1,500 tons per year of high quality polymeric filler
 - 8,000 tons per year of recycled carbon fuel



Estimated Benefits

Approach

- **Forecast market penetration**
 - Quantify the number of potential plants needed to support the Portland cement quantities



Estimated Benefits (continued)

Market Penetration Assumptions

- **Market survey of potential buyers of the by-products was conducted**
 - In Kentucky, the demonstration plant would be able to capture 13% of the total annual fly ash market of 2,280,000 tons, or 296,000 tons, which is almost double the tons of pozzolan expected from the plant
- **Additional information was collected for Portland cement use in other states surrounding Kentucky**
 - Total potential pozzolan use was calculated and estimates of the number of commercial-sized plants that would be needed to support the 2001 Portland cement quantities reported in those states



Estimated Benefits (continued)

Market Penetration Assumptions

Potential Markets by States	Tons of Fly Ash	Potential Plants
Florida	1,300,000	4
Alabama	264,000	1
Mississippi	158,000	1
Louisiana	303,000	1
Arkansas	161,000	1
Missouri	433,000	1
Indiana	373,000	1
Illinois	148,000	0
Ohio	660,000	2
TOTALS	3,800,000	13



Estimated Benefits (continued)

Total Emissions for Ghent

Annual Fly Ash and Bottom Ash Production (tons)	520,500
Ash disposal eliminated by installing demonstration plant* (tons)	200,000
Waste disposal cost savings	\$2 million

Ash from the Ghent Power Plant was not marketed because quality problems with both LOI and fineness eliminated any potential for sales

* Only Unit 1 and Unit 2 will provide direct feed to the CUB Processing Plant. Ash from Unit 3 and Unit 4 will not be utilized.



Estimated Benefits (continued)

Regional

- **CUB processing can be used throughout Kentucky and the Ohio River Valley**
- **CUB's provides an extra income stream for the power plants**



Estimated Benefits (continued)

National



- **Increase the utilization of the 110 million tons of coal utilization by-product produced annually (currently 32% utilization)**
- **Reduce or even possibly eliminate the need for future ash disposal**



Conclusions

- **CUB processing helps mitigate accumulating coal wastes while providing an additional income stream to the power plant**
- **Reduces power plant footprint by reducing or eliminating the need for ash disposal**
- **Reduces CO₂ generation in the production of Portland cement**



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Power Plant Improvement Initiatives and
Clean Coal Power Initiative projects**

www.netl.doe.gov/technologies/coalpower/cctc

