

# **An Evaluation of Free-Lime Containing By-products to Produce CCB Grouts for Use in AMD Abatement**

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## **Abstract**

In 1995, the Maryland Department of Natural Resources Power Plant Research Program (PPRP) and the Maryland Department of the Environment (MDE) initiated the Western Maryland Coal Combustion By-products (CCB)/Acid Mine Drainage (AMD) Initiative. The Initiative is a joint effort with private industry to demonstrate the beneficial application of CCBs to create flowable grouts to abate AMD.

In 1996, the Initiative undertook the Winding Ridge Project to demonstrate this technology. The Winding Ridge Project injected 5,600 cubic yards of a 100 percent CCB-based grout into a small, underground coal mine to abate AMD. The grout consisted of fluidized bed combustion (FBC) ash as the lime activator, Class F fly ash, flue gas desulfurization (FGD) material, and mine water. For full scale application of this technology, however, the current and future availability of FBC in western Maryland is uncertain.

Accordingly, PPRP initiated a study in 1997 to identify, evaluate and test other sources of free-lime containing by-products that could be used with FGD and Class F fly ash to form grouts for AMD abatement. Based on acceptable lime content, consistent physical and chemical characteristics, and cost, lime kiln dust (LKD) was selected as the lime activator for this study. A laboratory program was initiated using LKD, fly ash, FGD material and acid mine water to determine optimum grout mixes for high flowability/low strength and high strength grouts.

The laboratory program evaluated various chemical and physical properties of the grouts, including elemental and mineralogical makeup, unconfined compressive strength, flowability, permeability, affects of injection under submerged conditions and temporal changes due to exposure in a simulated acid mine water environment. This paper presents the study findings and optimum grout mixes.