

The Cementitious and Pozzolanic Properties of Fluidized Bed Combustion Fly Ash

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Abstract:

The focus of our work is to develop an understanding of the potential for Fluidized Bed Combustion (FBC) fly ash to serve as an additive in Portland cement concrete. FBC fly ash from the E.A. Gilbert Generating Unit of the Spurlock Power Station in Maysville, KY was used in this study. In fluidized bed combustion, coal is burned in the presence of limestone at much lower temperatures than conventional pulverized coal combustion (PCC). It also produces both a fine fly ash and a coarse bottom ash product. The FBC fly ash differs from PCC fly ash as it is not fused or spherical and it is high in sulfate. Although this material is outside of the ASTM C-618 specification, it is non-crystalline, has a relatively high surface area and does have the potential to be both pozzolanic and cementitious. Samples were tested for particle size distribution, mineralogy, chemistry and BET surface area. The FBC fly ash was pre-hydrated to slake raw lime then fractions were screened and hydraulically classified. These materials were tested in mortar cubes using ASTM procedures to examine water demand and the compressive strength. The FBC fly ash material was found to initially retard strength development but rapidly gained strength, achieving strength index values as high as 94% in 7 days. Mortar bars were created to test the potential for shrinkage and expansion. Further insight into the potential use of FBC fly ash in construction was made through the examination of concrete cylinders. Compressive strength testing of these cylinders confirmed previous results from mortar cube strength analysis.

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