

Fly Ash from Co-combustion Technology for Use in Concrete Construction

**Michael J McCarthy¹, Ravindra K Dhir¹, Laszlo J Csetenyi¹ and
John H Brindle¹**

¹Concrete Technology Unit, University of Dundee, Dundee, DD1 4HN, Scotland, UK

KEYWORDS: co-combustion fly ash, physical and chemical properties, morphology, fresh and hardened concrete properties, practical implications

ABSTRACT

Fly ash (FA) produced from the combustion of hard coal has a proven history of use in concrete construction in many countries, ensured by conformity to national standards. Indeed, the material can be effective in improving many aspects of concrete performance.

With concerns about CO₂ emissions, a recent development in electricity generation has seen the emergence of co-combustion processes, which replace part of the coal with organic waste materials, for example, harvested biomass. This offers a disposal route for materials with limited value as monofuels and in reducing the C-H ratio of the fuel, relatively less CO₂ is produced in relation to electricity generated. However, this practice is also likely to have an impact on the properties of FA produced and potentially may have implications for the use of the material in concrete construction.

The paper will describe the work of a study undertaken to assess the influence of co-combustion on fly ash and its use in concrete. A range of ashes derived from different secondary materials (combined with coal at levels up to 10%) were considered including, sawdust, wood chips, cocoa shells, sewage sludge and chicken litter. The physical, chemical and morphological properties of the FAs and their impact on the fresh and hardened properties of concrete were examined.

Overall, the results indicate that there were minor effects of co-combustion on the properties of the FA and these were influenced by the secondary fuel used. However, in concrete, co-combustion FA was generally indistinguishable from normal FA. The paper will examine some of the environmental issues associated with the materials considered and review the practical implications of the study.

Submitted for consideration in the 2005 World of Coal Ash, April 11-15, 2005, Lexington, Kentucky, USA.