Stockpile and Pond Stored Fly Ash for Use in Structural Concrete

Michael J McCarthy and Paul A J Tittle

Concrete Technology Unit, Department of Civil Engineering, University of Dundee, Dundee, DD1 4HN, Scotland UK

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ABSTRACT

Most national standards covering fly ash as a cement component in concrete require dry storage before use. This is similar to Portland cement (PC) and is intended to prevent deterioration and handling difficulties. While some fly ash is stored dry in silos or bags, most collected at power stations is moistened (with 10 - 30% water) and stockpiled, or slurried and stored in ponds. In the UK, use in industrial applications of only 40% of the near 8 Mt of fly ash produced annually is achieved, with much of the wet material requiring disposal.

Given that the reaction characteristics of fly ash are different to PC, the material could conceivably be stored wet and still be used as a cement component, without affecting the properties of concrete. Based on this premise, the restriction of wet fly ash use within concrete standards has been challenged in an investigation carried out to establish the feasibility of using moistened/slurried fly ash in this application.

The paper will examine the effects of stockpile/pond storage on the physical, chemical and morphological properties of fly ash. The influences on the reaction processes when combined with PC within a cementitious system will also be reported. A range of storage conditions will be considered, using fly ashes of different initial physical and chemical properties. Thereafter, practical issues including methods of using these materials in concrete will be discussed. The effects of stockpile/pond fly ash on the fresh and hardened properties of concrete, compared to dry fly ash, will be reviewed and routes to accommodating these considered.

The paper will conclude by describing full-scale concrete production trials with stockpile fly ash. The work, as a whole, has indicated that stockpiled and ponded fly ash can be used successfully in concrete construction, thereby offering a new outlet for increased use of the material.