The Influence of Fly Ash After Change to Low-NOx Burners on Concrete Strength – Case Study

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ABSTRACT

Coal-burning electric utilities have increasingly turned to low-NOx burners (LNB) to reduce nitrous oxide emissions. Changes in the form and quantity of unburned carbon and the possible presence of ammonia compounds have negatively impacted the use of low-NOx fly ash in concrete. Less well documented are possible changes in low-NOx fly ash that may impact strength activity index (SAI) values, including particle shape and size and glass content.

This study was undertaken to explain reduced concrete strength experienced with a particular fly ash after changing to LNB. Samples of fly ash obtained before and after the change to LNB at a plant consistently burning a southern lignite from one mine were tested for SAI according to ASTM C 311 and for heat evolution by calorimetry. Additional detailed fly ash testing included chemistry, particle size, and X-ray diffraction.

SAI values for LNB samples were consistently 10% lower than those before the burner change, reproducing observations from field concrete. No significant change in bulk chemical composition was found between samples taken before and after LNB. Low-NOx fly ash samples have slightly greater carbon contents, more coarse particles, and slightly less glass.

Although this study involves a limited number of samples from only one plant, it does document the possibility of lower SAI values after changing to LNB. This may not be the case in the majority of LNB conversions as reports of strength reductions are not widespread. Chemical admixtures have been used in concrete using this low-NOx fly ash to restore strengths.

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