

## Investigations on Enhancement of Fly Ash in Cement Manufacturing through Optimization of Clinker Quality and Fly Ash Fineness

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**Abstract :** Enhancing the fly ash utilization in the manufacture of cement is identified as one of the key areas to mitigate the Green House Gas emissions from the cement industry. Though increasing the fly ash content in cement has economic and environmental benefits, it results in a decrease in the compressive strength values, particularly at early ages. Quality of clinker and fly ash were identified as predominant factors that govern the extent of absorption of fly ash in the manufacturing of cement. This paper presents systematic investigations on the effect of clinker and fly ash quality on the properties of resultant cement. Since mechanical activation alters the physicochemical properties such as particle size distribution, surface area, phase morphology, understanding the variation of these properties with activation is required for its applications. The effect of mechanical activation on fly ash surface area, specific gravity, flow properties, lime reactivity, comparative compressive strength (CCS), reactive silica and mineralogical properties were also studied. The fineness of fly ash was determined by Blaine's method, specific gravity, lime reactivity, CCS were determined as per the method IS 1727-1967. The phase composition of fly ash was studied using the X-ray Diffraction technique. The changes in the microstructure and morphology with activation were examined using the scanning electron microscope. The studies presented in this paper also include evaluation of Portland Pozzolana Cement (PPC), prepared using high volume fly ash. Studies are being carried out using clinker from cement plants located in different regions/clusters in India. Blends of PPC containing higher contents of activated fly ash have been prepared and investigated for their chemical and physical properties, as per Indian Standard procedures. Changes in the microstructure of fly ash with activation and mechanical properties of resultant cement containing high volumes of fly ash indicated the significance of optimization of the quality of clinker and fly ash fineness for better techno-economical benefits.

**Keywords :** flow properties, fly ash enhancement, lime reactivity, microstructure, mineralogy

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