

The Effect of Cenosphere Additions on the Grinding and Strength Development of OPC

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Cenospheres are small spherical glass particles recovered from fly ash emissions after the burning of pulverised coal for power generation and are classified in various size fractions from 5 μm to 110 μm . Being essentially fly ash, cenosphere additions to cement and concrete can lower the cost of production and increase the durability of the final structure in which it is applied. Its spherical nature ensures a potential to affect the grinding of cement and the energy consumption in the process. Usually grinding aids employed in cement production are organic in nature and little emphasis have been placed in the consideration of inorganic materials for such purposes.

The effect of using three different sizes of cenospheres as grinding aids for Ordinary Portland cement was investigated and is described in this paper. Clinker from two different companies and factories were used to produce OPC-fly ash blends. The Bond working index during the grinding process and the strength development of the cement blend at various time intervals were used as criteria to measure the effect of the different cenosphere additions on the process. It was found that the additions with particle sizes of 5 μm and 15 μm increased the grinding energy, while the cenospheres of 45 μm decreased the grinding energy in the OPC production process. The effects of the cenospheres on the strength development varied with size fraction and w:c ratio.

It can be concluded from this investigation that the use of cenospheres can contribute to the reduction of carbon dioxide emissions in the cement production process, because it can replace clinker partially without negative effects on the strength development of the cement and it can lower the grinding energy requirements in the production of the cement blends. Furthermore, it has the potential to increase the durability of concrete made from such blends.