Effect of Fly Ash and Coal Bottom Ash as Alternative Materials in the Production of Self Compacting Concrete: A Review

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Abstract. The construction and building sector have successfully made a breakthrough by utilizing eco-friendly and recycled industrial by-products. One efficient way to mitigate rising costs in construction is to use industrial by-products such as Coal Bottom Ash (CBA) and Fly Ash (FA) as substitute materials. The large amount of CBA and FA wastes generated each year, together with inappropriate disposal methods, has created a serious environmental problem as these wastes have adverse effects on the environment and human health. In recent years, numerous breakthrough researches successes have been achieved in the production of self-compacting concrete (SCC). The application of industrials by-products wastes will significantly improve the structural characteristics of SCC. This paper reviews previous studies on the physical properties and chemical composition of CBA and FA and its potential use as a substitute material in the construction sector. The main objective of this review is to emphasize the recycling potential of CBA and FA in terms of fresh and mechanical properties. Therefore, it has been an ongoing topic for several researches, and many studies investigating the properties of SCC comprising CBA and FA have been conducted. According to studies, coal ashes materials have been used as a partial or total replacement of conventional materials. The researchers conclude from the available data that industrial by-products have the potential to be used as replacement materials in the production of SCC. The findings suggest that incorporating CBA and FA to an optimum level in SCC contributes to sustainable development and helps the construction industry economically.

Keywords: Self-Compacting Concrete, Fly Ash, Coal Bottom Ash, Fresh Properties, Mechanical Properties, Strength, Pozzolanic Materials

INTRODUCTION

Concrete is a conventional building material used in a wide range of civil engineering projects all around the world due to its flexibility, durability, and sustainability [1]. Throughout its life, the concrete structure supposedly maintains the appropriate strength and serviceability. This norm requires concrete to be resilient to the degradation processes when exposed to them throughout the concrete's planned service life. Durable concrete can resist a wide range of degradation processes [2]. There are a variety of internal and external factors that can contribute to the deterioration of exposed concrete. Poor durability of concrete might be because of chemical, physical or mechanical factors [3], [4]. In terms of durability, the concrete's pore and permeability have a significant effect on the durability characteristics of a material [5]–[7]. Nowadays, the use of conventional concrete is hampered by the difficulties in concreting buildings with high reinforced concrete content, thin structural members, and complex curved sections.

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