Use of Waste Fiber and Industrial Waste in Construction

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Abstract- *Use of recycled or waste materials for the construction of civil structures is a matter of great significance in this century. Use of waste materials in construction industry reduces the utilization of Portland cement per unit volume of concrete. OPC has large energy emanation related with its production, which may be declined by substituting cement partly with waste products. Mixing of mineral admixtures in concrete and mortar enhances compressive strength, pore structure and permeability. The replacement of cement and sand are the present issue in the current construction scenario, because of higher cost and environment pollutants. This article reviews several recent researches on the use of waste fibers and industrial waste in new construction.*

I. INTRODUCTION

Concrete is the most widely used man- made construction material in the world, and after water it is the most utilized substance on the planet. It can be obtained by mixing cementing materials, water and aggregates and sometimes admixtures, in required proportions. The mixture when placed in forms and allowed to cure hardens into a rock-like mass known as concrete. The hardening is caused by chemical reaction between water and cement and it continues for a long time, and consequently the concrete grows stronger with age. The hardened concrete may also be considered as an artificial stone in which the voids of larger particles are filled by the smaller particles and the voids of fine aggregate are filled with cement like binding materials. Cement is utilized mutually in mortar and concrete, so it is the most vital element of the infrastructure and has been identified as a resilient construction material. Though, the environmental characteristics of cement are now growing anxiety of researchers, as cement manufacturing is to be blame for approximately 2.5% of whole universal waste releases from commercial resources.

Use of recycled or waste materials for the construction of civil structures is a matter of great significance in this century. Use of waste materials in construction industry reduces the utilization of Portland cement per unit volume of concrete. OPC has large energy emanation related with its production, which may be declined by substituting cement partly with waste products. Mixing of mineral admixtures in concrete and mortar enhances compressive strength, pore structure and permeability. Some materials known as Pozzolana, which have no cementitious properties, but when added with OPC reacts to form cementitious materials. Fractional substitution of Pozzolana in concrete decreases the amount of Portland cement. This reduction in cement quantity further decreases the construction cost, energy loss and waste emissions such as carbon dioxide (CO2) emission. This also, decreases the energy consumption and thus, reduces the rate of global warming.

Concrete has been used as a construction material for several years. Structural design of concrete structures traditionally focuses over the compressive strength and construction. However, the field experience in the last decades has established that concrete structure degrades with age, there is gradual deterioration in material characteristics and properties and this translates into declination in the performance and durability of a structure.

II. LITERATURE REVIEW

Several researchers worldwide are working on the utilization of waste materials in concrete. The waste MDP passing through 90 microns, has been used for investigating of hardened concrete properties. Furthermore, the effect of different percentage replacement of MDP on the compressive strength, splitting tensile strength (Indirect tensile strength) & flexural strength has been observed by Ranjan Kumar et.al (2015) [1]. In this project, the effect of MDP in concrete on strength is presented. Five concrete mixtures containing 0%, 5%, 10%, and 20% MDP as cement replacement by weight basis has been prepared. Sharma et.al (2015) [2] investigated that, marble powder creates environmental problems but due to a presence of high oxide calcium content, which has cementing property, marble can be used as in the partial replacement of cement in cement sand mix. In this study, waste marble powder was collected from the industry and investigated its effects on the cement sand mix in different proportion and also compared the compressive, split tensile and flexure strength of cement sand mix, workability and durability.

An investigation has been conducted on Periodic Research by Pawar et.al (2014) [3], The Significance of Partial replacement of Cement with Waste Marble Powder. The effect of using marble powder as constituents of fines in mortar or concrete by partially reducing quantities of cement has been studied in terms of the relative compressive, tensile as well as flexural strengths. Saravanan et.al (2014)[4] addressed the strength behavior of polypropylene fibre reinforced fly ash concrete (PFRFAC). The variables of study included the polypropylene fibre content (0.25%, 0.3%, 0.35%, 0.40%, 0.45% and 0.50%) and 10% of Fly ash as cement replacement are incorporated in all the concrete mix proportions considered in this study. The test results indicate dthat mechanical properties of concrete increases with 0.40% polypropylene fibre with 10% fly ash content. Rishi et.al (2014) [5] observed that the combination of marble dust and other ingredients has modulus or compressive strength higher than alone for 7 days and 28 days respectively.

The addition of UHPFRC of either short discrete fibers or continuous long fibers to the cement based matrix. When UHPFRC compared with high performance concrete (HPC), UHPFRC exhibits superior properties in terms of compressive behavior, tensile behavior, workability, toughness, ductility and durability, was observed by Hamdy et.al (2013) [6]. A Study has been conducted by Sounthararajan et.al (2013) [7] on Effect of the Lime Content in MDP for Producing High Strength Concrete. It was found that the MDP up to 10% by weight of cement was investigated for hardened concrete properties. Furthermore, the effect of different percentage replacement of MDP on the compressive strength, splitting tensile strength and flexural strength was evaluated. It can be noted that the influence of fine to coarse aggregate ratio and cement-to total aggregate ratio had a higher influence on the improvement in strength properties.

The scope of investigation deals with the strength properties of concrete containing polypropylene fiber and class C fly ash With different proportions. In this study Murahari et.al (2013) [8] was carried out various mixture of class C fly ash in ratio of 30%, 40% and 50% and containing polypropylene fiber of volume fractions of 0.15,0.20,0.25,0.30 was used for all fly ash concrete mixes..

Shirulea et.al (2012) [9] found that the leaving of waste materials to the environment directly can cause environmental problem. Hence the reuse of waste material has been emphasized. Waste can be used to produce new products or can be used as admixtures so that natural resources are used more efficiently and the environment is protected from waste deposits. Patel et.al (2012)[10] has been searched concrete has two major drawbacks: low tensile strength and a destructive and brittle failure. To increase concrete ductility and energy absorption, polypropylene fibre reinforced concrete (PFRC) has been introduced. This study was part of a research program on evaluating the performance of polypropylene fibre reinforced concrete.

III. DISCUSSION AND CONCLUSIONS

From above review it has been observed that, high use and production of Portland cement as the major construction material in concrete construction affects the environment by creating large amount of CO2 gas also there is a direct relationship between cement usage and Green house gas production. Many studies have tried to find a way to minimize the use of Portland cement to reduce these problems without increasing construction cost. Partial replacement of Portland cement by supplementary cementitious materials is one such method and with a proper amount of replacement, it has the benefit of improving the properties of concrete, reducing costs, conserving energy and minimizing waste emission. The main conclusions drawn are use of waste materials in concrete in different proportions influences the various properties such as compressive strength, workability, compaction and flexure strength; this can also enhance the characteristics of formed binder mixes.

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