Study the Strength Property of Concrete Using Fly Ash (FA), Rise Husk Ash (RHA) and Egg Shell Powder (ESP)

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Abstract- in this study centers around the growth of strength and permeability of concrete by partial replacement of cement with joint ratio of fly ash, rise husk ash with synthetic egg shell powder (ESP). Two categories of fly ash and rise husk ash with four distinct content of 5%, 10%, 15%, 20%, 30% in terms of weight was perform for the substitution of cement and addition of a persistent 5%egg shell powder in every Substitution. Concrete is being widely use for construction of most of building, bridges etc. Hence it is the most important part to the infrastructure development of a nation. To meet out this rapid infrastructure development a high quantity of concrete is required and cement is the main ingredient of concrete and demand for exceed the supply make the construction activity costlier. To minimize the use of cement and ultimately reduce the construction cost use effective waste material like fly ash, rise husk ash and egg shell powder with cement replacement.

Indexed Terms- Fly ash, Rise husk Ash, Egg shell powder, Green concrete, Sand replacement.

I. INTRODUCTION

Natural resources are of two types the renewable and the non-renewable which can be recycled again and again which are utilize for our benefits. But non-renewable resources are those which once removed and utilized are lost forever. The major problem facing by mankind today is about the utilization of natural resources in order to meet human need and economic growth without exhausting the resources and endangering the environmental integral on which life economic prosperity and our security depend. The worldwide utilization of regular sand is high because of the broad utilization of cement. Specifically, the interest for regular sand is high in creating nation inferable from quick infrastructural development, buildings and different structures in since cement assumes the critical part a substantial quantum of its being used.

Fly ash is compromised of the non-combustible mineral portion of coal consumed in a coal fueled power plant. Fly ash particles are glassy, spherical shape typically finer than cement particles. That are collected from the combustion air steam exciting the power plant. Rise husk ash globally, on an average 20% of the rise husk ash paddy is husk, giving an annual total production of 120 million tones. The treatment of rise husk as a resource for energy production is a departure for the perception that husk present disposal problems. In recent years, special attention has been devoted to industrial sector that are sources of pollution of the environment the industry produces large volumes of solid wastes.

This natural solid waste, although non-hazardous, is directly disposed in the environment. As a consequence, a huge problem of pollution is generated. In addition, it can attract rats and warms due the organic protein matrix, resulting in a problem of public health. The studies have been already made in this area by using egg shell powder wall tile is ceramic material primarily composed of clays, carbonates.

II. LITERATUREREVIEW

A significant amount of this research work on various structural aspects of use of structure and their Reviews of some of the technical papers are briefed below.

E.D. Lim et al (2015) this study reports the results of using seawater as mixing and curing water and different fly ash replacement ratios on the properties of reinforced mortars. The compressive strength, corrosion potential, corrosion current density and chloride content were the key means of measurement in determining the effects of seawater. Mortar specimens with 0%, 10%, 20%, 30%, 40%, and 50% fly ash replacement ratios and ordinary Portland cement mixed and cured with freshwater will prepare. Cylindrical specimens were prepared for compressive strength while rectangular prism specimens of size 4 cm x 4 cm x16 cm will use for corrosion monitoring. Ten millimeter in diameter round steel bars will suspend in the specimens with constant cover of 5 mm in order to accelerate the corrosion process. In addition, the 20% fly ash replacement specimens were also cured in seawater using full immersion or wet burlaps. Results show that using seawater as mixing water can produce comparable compressive strength as freshwater especially when cured for longer periods. (1)

Gemma de Sensale et al. (2005) study on the development of compressive strength up to 91 days of concretes with rice-husk ash (RHA), in which residual RHA from a rice paddy milling industry in Uruguay and RHA produced by controlled incineration from the USA were used for comparison. Two different replacement percentages of cement by RHA, 10% and 20%, and three different water/cementations material ratios (0.50, 0.40 and 0.32) were used for experiments. The results are compared with those of the concrete without RHA, with splitting tensile strength and air permeability. He concluded that residual RHA provides a positive effect on the compressive strength at early ages, but the long-term behavior of the concretes with RHA produced by controlled incineration was more significant. Result of compressive strength was increased with all water/cementations ratios from 13% to 47% for 20% replacement of RHA produced by controlled incineration. (2)

Maisarah Ali et al (2015) introduced RHA as the micro filler in concrete mixtures. The replacement of RHA which is lighter as compared to the Ordinary Portland Cement results in decreasing density of cement fibre composite and less permeable concrete. 5% of RHA was used as cement replacement material for target strength of 50MPa. Microstructure properties of both mixes were analysed using FESEM. Higher silica contains in concrete cubes containing RHA led to the greater formation of calcium Silicate Hydrate (CSH) that contributed towards strength development to the concrete during curing. Water absorption of concrete with RHA replacement is lower than concrete without RHA. The compressive strength test of concrete with 5% RHA replacement is lower than without RHA replacement. However, the target compressive strength of is achieved. (3)

Satish H. Sathawane et al (2013) studied the effect of partial replacement of cement by Fly Ash (FA) and Rice Husk Ash (RHA) in combine proportion started from 30% FA and 0% RHA mix together in concrete by replacement of cement with the gradual increase of RHA by 2.5% and simultaneously gradual decrease of FA by 2.5%. Experiments were done on mechanical properties of concrete such as compressive strength, flexural strength, and split tensile strength. combination of 22.5% FA and 7.5% RHA gives compressive strength increased by 30.15% in compared with targeted strength flexural strength increased by 4.57% compared with control concrete at 28 days, split tensile strength decreased by 9.58% compared with control concrete at 28 days. Results suggest that Partial replacement of FA and RHA reduces the environmental effects, produces economical and eco-friendly concrete.(4)

Divya Chopra et al (2014) replaced cement content with rice husk ash (RHA) as supplementary cementitious materials (SCM's) in SCC and observed fresh flow (slump flow, V Funnel, U-box, L-Flow), mechanical strength (compressive and split tensile) and durability properties (porosity and rapid chloride permeability test) at 7, 28 and 56 d. Concrete specimens were prepared with 0%, 10%, 15% and 20% RHA replacing cement content. Conplast SP430 was used conforming to IS: 9103 (1999) as a high range water reducing admixture. An increase of about 25% strength at 7 d, 33% at 28 d and 36% at 56 d was observed with RHA content of 15% RHA when compared to control mix. Maximum split tensile strength was 3.8 N mm^2 at 28 d and 4.0 N mm^2 at 56 d for 15% RHA replacement. All the mixes were less porous as compared to the control mix at all ages and showed “low range” to “very low range” chloride penetration(5)

Rafat Siddique (2003) conducted experimental investigation carried out to evaluate the mechanical properties of concrete mixtures in which fine aggregate (sand) was partially replaced with Class F fly ash. Fine aggregate (sand) was replaced with five percentages (10%, 20%,30%, 40%, and 50%) of Class F fly ash by weight. Tests were performed for properties of fresh concrete. Compressive strength, splitting tensile strength, flexural strength, and modulus of elasticity were determined at 7, 14, 28, 56, 91, and 365 days. Compressive strength, splitting tensile strength, flexural strength, and modulus of elasticity of fine aggregate (sand) replaced fly ash concrete continued to increase with age for all fly ash percentages. (6)

Baoshi et al. (1998) used bottom ash in amounts of 10– 40% as replacement for fine aggregate. Test results indicate that the compressive strength and tensile strength of bottom ash concrete generally increases with the increase in replacement ratio of fine aggregate and curing age. The freezing–thawing resistance of concrete using bottom ash was lower than that of ordinary concrete and abrasion resistance of bottom ash concrete was higher than that of ordinary concrete. (7)

Hwang et al. (2004) examined the effects of fine aggregate replacement on the rheology, compressive strength, and carbonation properties of fly ash and mortar. Rheological properties, compressive strength, and rate of carbonation of mortars of water to Portland cement ratio of 0.3, 0.4, and 0.5, in which the fine aggregate was replaced with fly ash at 25% and 50% levels. Test results showed that rheological constants increased with higher replacement level of fly ash and that, when water to Portland cement ratio was maintained, the strength development and carbonation properties were improved. (8)

Shirish V. Deo et al (2015) explored the use of fly ash as replacement of sand is an economical solution for making green and denser concrete. M45 concrete mix (control mix) was designed as per Indian Standard concrete mix design method (IS 10262: 1982) and its comparative performance was verified with respect to minimum voids method and maximum density method for partial replacement of sand with fly ash along with the addition of super plasticizer dose to enhance the workability and strength. For the designed mix five alternative cases were studied. The compressive and the flexural strength of concrete mixes with partial replacement of sand by fly ash was found to be 15% higher without super plasticizer and 28% higher respectively with super plasticizer. They concluded that fly ash could be very conveniently used as partial replacement of sand in structural concrete where its proportion and replacement of sand could be efficiently done by using minimum voids method for higher compressive strength, flexural strength and workability and lower voids at lower cost. (9)

Homnuttiwong (2012) investigated compressive strength, water permeability and abrasion resistance of high volume fine fly ash and fine ground palm oil fuel ash concrete. They replaced up to 70% Portland cement type I by fine fly ash (FFA) and fine ground palm oil fuel ash (GPA). They reported that FFA was more reactive than GPA. Their results also confirmed that compressive strength, water permeability and abrasion resistance were comparable with normal concrete due to increase in pozzolanic activity of FFA. (10)

III. OBJECTIVE ANDSCOPE

This investigation looks at the partial replacement of cement by fly ash, rise husk ash and egg shell powder of size 75 microns in the concrete. Fy ash and rise husk ash is replaced for every 5%, 10%, 15%, 20%, and 30% and 5% egg shell powder is used as additive for every replacement. These result are compared with control concrete. To study the effect on strength and permeability properties of concrete by mixing of FA, RHA and ESP in concrete.

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