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A Review Paper On The Partial Replacement Of Cement In Concrete With Eggshell Powder

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ABSTRACT

The world's most popular building material, concrete's production has skyrocketed in tandem with the rapid construction of infrastructure. In the construction industry to make more money while reducing waste. Alternative products that can cut construction costs are being sought by the construction industries. The effect and experimental results of replacing eggshell powder in cement are discussed in the paper.In Portland pozzolona cement, eggshell powder of 10%, 15%, and 20% was added to the concrete for the compressive test [1].The outcomes demonstrate that eggshell powder can be utilized in place of cement. The hydration products of the pastes were altered as a result of the reaction between the C3A and the eggshell CaCO3.Eggshell powder accelerated cement hydration and provided nucleation sites in the hydration products.

Keywords -Compressive strength, processing, and eggshell powder.

I. INTRODUCTION

Any nation's socio-economic development has greatly benefited from the construction industry. Energy plays a crucial role in growth of developing countries like India. In the context of low availability of non-renewable energy resources coupled with the requirements of large quantities of energy for Building Materials like cement, the importance of using industrial waste cannot be underestimated. since numerous replacement experiments for coarse and fine aggregate were carried out.

As a result, we opt for a cement substitute. Powdered eggshell served as our project's alternate material.[2]When tri-calciumaluminate (C3A) reacts with calcium carbonate (CaCO3) in cement, calcium carboaluminates are produced [3]Using fine filler, like fine CaCO3, has the advantage of reducing capillary porosity and possibly increasing early strength [4]found that adding 6% limestone powder had an effect on the products of cement hydration and the cement's early strength after four days.[5]

II. LITERATURE REVIEW

The rise of depletion of natural resources and the increasing emission of Carbon Dioxide (CO2) gas, has forced the construction industry to seek innovative solutions to

these problems and achieve sustainable construction by using eco-friendly concrete (Jhatial et al., 2018) Cement is a vital component in the manufacturing of concrete, as it acts as a binder, gluing together other components to produce a solid, strong and durable material The demand of concrete has risen over the years, which subsequently increased the demand for cement According to a report, the cement industry produces approximately 7% of the global CO2 gas emissions (Benhelal et al., 2013) as well as consume natural resources such as clay, limestone etc Researchers have over the years investigated cement's alternatives, in an attempt to reduce the cement content and in turn reduce the rising demand for cement for constructional purposes Waste can be used as a partial replacement for cement and An added benefit of waste disposal is waste management With the increase Urbanization, increased waste generation

III.MATERIALS AND METHODOLOGY

A. Eggshell Powder

Cement and eggshell powder were found to have similar chemical compositions. About 51% of the eggshell's components are calcium carbonate. Waste eggshells originate from hotels, restaurants, and poultry farms. These wastes are disposed of in many nations because they are used in animal feed. In our project, such wastes are collected and used.

B. Processing

The steps for making egg shell powder are as follows: gathering the materials, grinding and powdering the egg shell, sieving the powder through a sieve, and finally mixing the powder with cement. Eggshell powder is filtered through a 75-micron sieve. The retained residues were distributed to the fertilizer and animal feed production industries.

C. Experimental Work

The dry raw materials were uniformly mixed for a few minutes with the concrete mixer before the specified amount of water was added.A few more minutes were spent running the mixer.The slump test, which was carried out in accordance with IS: **456-2000**, was used to determine the concrete mix's workability in order to observe the effect that varying percentages and levels of ESP had on the concrete's workability.After the slump values for each mix were recorded, the wet mix was poured into 150 x 150 x 150 mm cubic molds and stored for 24 hours.They were then decapitated and kept for water curing for three, seven, fourteen, and 28 days, respectively.The cubic samples were subjected to a compressive strength test in a universal testing machine in accordance with IS: **456-2000**guidelines once the curing time had passed.

IV.DESIGN AND TESTING

A. Mixing ratio

Mixing ratio that our project is offered under the M25 brand concrete, and the mix composition was based on IS 10262- 1982 and IS 383-1970 Code provisions Mix The ratio arrived at was 1:1,139:2.6 (cement: fine filler: coarse filler)

B. Water absorption test

The water absorption test was carried out for 7 the saturated cubic sample and oven dried Sample. The water absorption of the sample was 7% to 9% (multiple samples) OUT.

C. Compressive strength test

Compressive strength tested on concrete Cube measuring 150 x 150 x 150 mm Check was carried out in a compression testing machine with a capacity of 100kN. When testing for compressive strength, the loading rate was 50 kN/s. The compression test was performed On the 7th day, 150 mm cubic samples must also be performed on the 28th day

V. RESULT AND DISCUSSION

Table 1. Chemical Composition

	Eggshell Powder	Cement
Al2O3	0.03	6.6
SiO2	0.08	21.8
Fe2O3	0.02	4.1
CaO	55.85	60.1
others	0.62	-
Specific gravity	3.15	2.135

Table 2. Compressive Strength

Percentage Of Eggshell Added	Trial No	Compressive Strength On 7 Th Day N/Mm2
0 %	1	18.10
	2	18.45
	3	17.65
10%	1	21.08
	2	21.30
	3	22.44
15%	1	23.00
	2	24.50
	3	22.60
20%	1	22.03
	2	19.60
	3	18.11

CONCLUSION

The conclusion is that eggshell powder can be used as a cement-replacement material because the results of all tests were successful. The findings demonstrate that replacing about 10% to 15% of the eggshell powder is effective, and that increasing the percentage of eggshell powder further lowers compressive strength.

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