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Egg Shell Powder Partial Replaced With Cement Concrete

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Abstract: ***This paper reports the results of experiments evaluating the use of egg shell powder from egg production industry as partial replacement for ordinary Portland cement concrete. The chemical composition of the egg shell powder and compressive strength of the cement concrete was determined. The cement concrete of mix proportion in which cement is partially replaced with egg shell powder as 5%, 10%, 15% by weight of cement. The compressive strength was determined at curing ages 7, 28 days. There was a sharp decrease in compressive strength beyond 5% egg shell powder substitution. The admixtures used are Saw Dust ash, Fly Ash and Micro silica to enhance the strength of the concrete mix with 5% egg shell powder as partial replacement for cement. In this direction, an experimental investigation of compressive strength, split tensile strength, and Flexural strength was undertaken to use egg shell powder and admixtures as partial replacement for cement in con In this developing world, many countries are going to urbanization due to population growth. Since India is one of developing countries, the construction will grow in the future.***

Keywords: Egg shell powder partial replace with cement concrete

1. Introduction

General

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 under estimated. During manufacturing of one tones of Ordinary Portland Cement we need about 1.1tones of earth resources like limestone, etc. Further during manufacturing of 1tones of Ordinary Portland Cement an equal amount of carbon-di-oxide are released into the atmosphere. The carbon-di-oxide emissions act as a silent killer in the environment as various forms. In this Backdrop, the search for cheaper substitute to throughout the world, waste products are seriously polluting the environment. There are many types of waste disposal system such as land filling, open burning, drains clogged up with rubbish and river fill definitely indicate solid waste is a major environmental problem in India.

History of egg shell powder

Every day, the world's egg companies process an estimated one million eggs. In the process to produce liquid and powdered egg products, these companies also generate huge volumes of wastes. In this environment-conscious world, disposal of eggshells and paper egg trays represents a significant cost and in many countries, legislation requires eggshells to be heat-treated so that they do not become a source of disease to humans or animals. A 'green' solution Danish engineering company, Sunoco Environmental Solutions, has developed a new way to deal with these wastes in an environmentally friendly and safe way. Eggshells and trays are processed together, the trays forming the fuel to burn the shells. Rather than worthless ash from heating at low temperatures, the resulting residue from incineration is burnt limestone (also known as quicklime), a chemical with many industrial uses, including the building industry.

2. Background of Study

Earlier works on the combination concrete conducted by scholars have led us to the point that the eggshell ash can be used as an additive in concrete production. Eggshells are agricultural waste materials generated from chick hatcheries, bakeries, and fast-food restaurant among others which can litter the environment and consequently constituting environmental problems or pollution which would require proper handling.

Problem Statements

In India, waste disposal is one of the factors contributing the environmental problem and increasing dramatically year by year. According to Antara News (2011), In India, the egg consumption of the Indian people which is still low. In Indian the per capita egg consumption of the people was recorded at one egg per week while in Indianthe per capita egg consumption was noted at three per day.

Scope of Study

An investigation the effect on the performance of the eggshell powder as in additive in concrete mixed. In eggshell concrete production, Portland composite cement, coarse aggregate, fine aggregate, water, and eggshell. The experiments will use to investigate are sieve analysis test, slump test, curing, compressive strength, flexural test, water absorption test and water penetration test respectively. Thus, the amount of eggshell waste can be used as additive in concrete production. Besides that, it also will decrease the construction cost and landfill. Some test and experiments are proposed to be performing to determine the performance concrete strength and eggshell ash. These eggshells must be grinded into fine powder. This test will be tested at 7 day, 14 day and 28 days to get the strength.

3. Literature Review

The goal of this investigation work is to use the egg shell powder, silica fume as a limited additional of cement. Egg shell powder is replaced by 5%, 10% and 15% in addition with the silica fume of weight of cement. An experimental research demonstrates the strength features such as split tensile strength, compressive strength, and flexural strength

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test of egg shell based concrete were investigated. It is found the strength of the concrete rises with the adding of egg shell powder and silica fume and finally the comparison is made for the egg shell and silica fume added strength of concrete. Today India is the third largest egg producer and fourth in broiler production in the world reported by Food and Agriculture Organization (FAO) Statistics Division. India is developing as the world's second major poultry marketplace with a yearly development of additional than creating 61 million tons or percent of global egg manufacture. The yearly growth amount of egg production is 5-8%. Separately from this, India ranks sixth in broiler production with a yearly output of 2.39 million tons of broiler meat, as per the approximations of the Ministry of Agriculture. The total poultry industry is appreciated at about 350billion rupees. About 250,000 tons of egg shell left-over is shaped yearly universal by the food processing manufacturing only. In the account, it was projected that 10000 -11000 tons of egg shell has to be willing of each year by egg mainframes and makers in India1. Most of egg shell waste is willing in landfills without any pretreatment because it is conventionally useless and eventually creates serious eco problems2.Therefore, proper alternative is required to achieve the wastes2-4. The bioconversion of waste to practical energy is part of the operation of wastes. The actual treatment and operation of bio-waste has been stressed in our society for ecological and economic angles5. Removal of egg shell waste are usually not in come centers but cost centers6, 7. Therefore, the smallest cost of discarding is most wanted. Some of the choices left must be observed at very disapprovingly and the greatest cost real method of reprocessing are considered. The research and reported that egg shell consisting 2.2gms of calcium in the form CaCO3 which is 94 per cent.

RASAYAN J.Chem 2017weight of cement along with the egg shell powder results increase in compressive strength. Since the addition of Silica fumes doesn't make any broad changes to the Concrete strength, Flexural and Split tensile tests are performed with the plain Egg shell mix only.

The comparison of compressive strength for conventional mix and all other eggshell and silica fume concrete mix with different percentage is also done under uniaxial compression the blows are about parallel to the practical load but some blows form at a position to the applied load. The similar cracks are triggered by a localized tensile stress in a standard to the compressive load and the motivated cracks occur due to collapse caused by the growth of shear planes. It should be noted that the cracks have formed in two planes equivalent to the load and that the specimen fragments into column type trashes. The results of compressive strength obtained for all types of specimens by conducting compressive test and Concrete like other engineering materials needs to be designed for properties like strength, durability, workability and cohesion. Before having any concrete mixing, the selection of mix materials and their required materials proportion must done through a process called mix design. Concrete mix design is the science of deciding relative proportions of ingredients of concrete, to achieve the desired properties in the most economical way. With advent of high-rise buildings and pre-stressed concrete, use of higher grades of concrete is becoming more common. Even the revised IS 456-2000 advocates use of higher grade of concrete for more severe conditions of exposure, for durability considerations. With advent of new generation admixtures, it is possible to achieve higher grades of concrete with high workability levels economically. Use of mineral admixtures like fly ash, slag, meta kaolin and silica fume have revolutionized the concrete technology by increasing strength and durability of concrete by many folds There are lots of methods for determine concrete mix design. In this project IS Method of Design shall be used.

N. Sivakumar 2010 environments. Pozzolana materials are usually able to association with the hydrated calcium hydroxide starting the hydrated calcium silicate which is the principal responsible for the benefit of hydrated cement pastes. Also, a rise in the bulk density of concrete fallouts as the mixture voids are occupied with very small admixture elements. The addition of silica fume in concrete leads to decrease in porosity of the evolution zone between matrix and aggregate in the renewed concrete and delivers the microstructure desirable for a robust transition zone. Hence, silica fume is extra with egg shell powder in the cement to recover the strength

4. Material

Cement

Portland cement is the most ordinary cement used in the world and it is often used in concrete and mortar respectively. Ordinary Portland cement is specified according to Indian Standard IS 269. Mixed proportion of aggregates, sand, water, cement form the concrete which is use in construction development of buildings, bridge, roads, and others structure. The hydration process opc 43 results in hardening and increase strength gain when mixed with water.

We are used the opc cement **43** grade and replaced by egg shell powder 5%, 10%, 15%.

Oxide Contents	Percentage (%)
CaO	60-67
SiO2	17-25
Al2O3	3-8
Fe2O3	0.5-6.0
MgO	0.1-4.0
Na2O	4.0-1.3
SO3	1.3-3.0

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Eggshell powder

Eggshell known as a smooth surface that is desirable compared rough eggshells fracture more easily. Most good quality eggshells from commercial layers contain approximately 2.2 grams of calcium in the form of calcium carbonate. About *95%* of the dry eggshell is calcium.

Eggshell powder

S. NO	Oxide Contents	Percentage (%)
1	CaO2	50.7
2	SiO2	0.09
3	Al2O3	0.03
4	MgO	0.01
5	Fe2O3	0.02
6	Na2O	0.19
7	P2O5	0.24
8	SrO	0.13
9	NiO	0.001
10	SO3	0.57
11	Cl	0.219

Advantages of Egg Shell

- Considerable reduction in alkali-silica and sulfate expansions.
- Meets the most stringent environmental regulations nationwide.
- Ideal for painting in occupied spaces.
- Excellent durability and washable finish.

Course Aggregate

Without aggregate, large castings of neat cement paste would essentially self-destruct upondrying. Coarse aggregates are particles greater than 4.75 mm, but generally range between *9.5* mm to *37.5* mm in diameter. They can either be from primary, secondary or recycled.

Fine Aggregate

The finer aggregate have a better positive effect on the properties of fresh concrete and hardened in high performance concrete. Thus, fine aggregate are playing an important role in the concrete mixture.

Fine aggregate

Slump Test

In order to assess the workability of the fresh concrete the slump test was conducted. A concrete mix should be workable enough in order to be placed, compacted and finished. The ingredients in concrete should be in such a proportion as to allow a good workability of the concrete and sufficient strength to support the required load after hardening.

S.NO	Mix Code	Riplaced OPC	W/B	Observed
1	EP0	0%	0.55	35
2	EP5	5%	0.56	35
3	EP10	10%	0.58	33
4	EP10	15%	0.60	32

5. Results and Discussions

Properties of fresh concrete

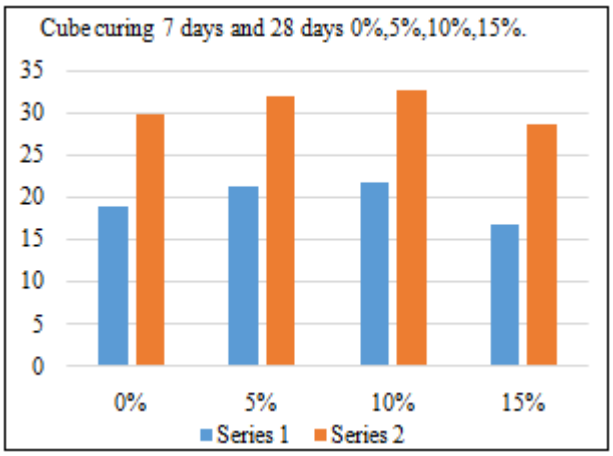
Some experiments such as slump-flow and compaction test was performed and result are given in Table.

Mix No	% of eggshell powder	Water cement ratio	Slump test (mm)	Compaction factor test
Mix 1	0	0.4	0	0.87
Mix2	5	0.4	3	0.82
Mix3	10	0.4	5	0.93
Mix4	15	0.4	8	0.88

Cube Compressive Strength

Compressive strength average value in 7 days and 28 days riplacement by eggshell powder in cement

%	7 DAYS	28 DAYS
0%	19.15	30.1
5%	21.37	32.26
10%	21.82	32.78
15%	16.84	28.88



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