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AN INVESTIGATIONAL STUDY ON EGG SHELL POWDER AS A FRACTIONAL SUBSTITUTION BY CEMENT IN CONCRETE

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ABSTRACT

This study evaluated the use of egg shell powder from the egg production industry as a partial replacement for traditional cement in cement mortar. Our decisions were influenced by the egg shell powder's chemical makeup and the cement mortar's compressive strength. The egg shell powder is used as a five-hitter replacement for cement in the mortar of mix ratios 1:3, 10%, 15%, 20%, and 25% by weight of cement, respectively. Our decisions were made at the age of twenty-eight days of action by the compressive strength. On the other side of the five-hitter egg shell powder substitution, there was a noticeable loss in compressive strength. The admixtures used or saw dirt ash, ash and small silicon dioxide to reinforce the strength of the concrete combine with five-hitter egg shell powder as partial replacement for cement. During this direction, an experimental investigation of compressive strength, split enduringness, and flexural strength was undertaken to use egg shell powder and admixtures as partial replacement for cement in concrete.

Keywords: Egg shell powder, cement mortar, saw dirt ash, Fly ash, small silicon dioxide, compressive strength, split Tensile Strength, Flexural strength

INTRODUCTION

Energy is essential to the development of developing nations like those in Asia. Given the limited availability of non-renewable energy resources and the need for enormous amounts of energy for Cement is a building material, hence the significance of industrial waste in general cannot be underestimated. One is what we aim for while producing one tonne of conventional cement. 1 tons of rock and other earth resources for every time one tonne of conventional cement is manufactured, an equal quantity of carbon dioxide is released into the atmosphere. The various kinds of carbon dioxide emissions function as a silent murderer in the atmosphere. In this environment, the sought-after less expensive alternative to OPC might also be necessary.

INDUSTRIAL WASTES

Industrial waste is that the waste created by industrial activity that has any material that is rendered useless throughout a producing technique like that of factories, mills and mines. it's existed since the start of the business revolution. In recent years, special attention has been dedicated to industrial sectors that unit of measurement sources of pollution of the atmosphere. The trade produces huge volumes of solid wastes like ash, Saw dirt Ash, little oxide, which can end up in rivers, lakes and coastal waters.

The disposal of these wastes could also be an important disadvantage, which can cause risk to public health, contamination of water resources and polluting the atmosphere. AN outsized varies of food plants unit of measurement constantly accumulating substantial quantities of businesswaste.

EGG SHELL POWDER

Eggshell consists of the many reciprocally growing layers of CaCO3, the innermost layer-maxillary 3 layer grows on the outer egg membrane and creates the lowest thereon palisade layer constitutes the thickest an area of the covering. The best layer could also be a vertical layer lined by the organic cuticle. The covering primarily contains Ca, metal carbonate (lime) and super molecule. In many completely different countries, it is the accepted follow for covering to be dried and use as a providerof Ca in animal feeds. The quality of lime in covering waste is influenced greatly by the extent of exposure to sunlight, raw water and harsh climate. It's the fine grained powder with acceptable proportion that's sieved to the required size before use with

concrete/mortar.

Eggshell is mostly thrown away as a waste. The egg shell conjointly creates some allergies once unbroken for a extended time in garbage. Disposal could be a drawback. It creates undesirable smell which may cause irritation. The mostingredient in eggshells is metal carbonate(the same brittle white stuff that chalk, limestone, cave stalactites, sea shells, coral, and pearls are created of). The shell itself is concerning ninety fifth CaCO3 (which is additionally the most ingredients in ocean shells). The remaining five-hitter includes metallic element, Aluminum, phosphoric, Sodium, Potassium, Zinc, Iron, Copper, Ironic acid and silicon dioxide acid. covering contains a plastic structure and contains amino acids; therefore, it's expected to be an honest bio-sorbent and it absolutely was according that enormous amounts of eggshells are created in some countries, as waste merchandise and disposed in landfills annually.

FLY ASH

Fly ash could also be a fine, glass powder recovered from the gases of burning coal throughout the assembly of electricity. These micron- sized earth elements consist primarily of oxide, alumina and iron. Once mixed with lime and water the ash forms a building material compound with properties very rather likes that of cement. Owing to this similarity, ash is accustomed replace portion of cement among the concrete, providing some distinct quality advantages. Relying upon the availability and makeup of the coal being burned, the elements of ash vary considerably, but all ash includes substantial amounts of chemical compound (both amorphous and crystalline) and lime, every being endemic ingredients in many coal bearing rockstrata

BACKGROUND OF STUDY:

Earlier works on the mixture concrete conducted by students have light-emitting diode America to the purpose that the covering ash may be used as AN additive in concrete production. Eggshells are agricultural waste materialsgenerated from chick hatcheries, bakeries, and fast-food eatingplace among others which may litter the atmosphere and consequently constituting environmental issues or pollutionwhich might need correct handling. Within the ever increasing efforts to convert waste to wealth, the effectiveness of changing covering to useful use becomes a plan price clutches. The composition of eggshells indicates that the result of it ash on cement treated materials ought to be articulated. It's scientifically familiar that the covering is especially composed of compounds of metal that is extremely like the cement. Literature has shown that the covering ash primarily contains lime, metal and super molecule wherever it may be used as another stuff within the production of wall tile material, concrete, cement paste et al. Covering conjointly contribute to housing industry that is it may be cut back in construction value and lowland that it provide sensible performance in properties in concrete and sturdiness of the concrete. Thus, eggshells may be createdreplacement stuff for development within the housing industry as AN additive within the typical concrete.

DRAWBACK STATEMENT

In Malaya, waste disposal is one amongst the factors conducive the environmental drawback and increasing dramatically year by year. Consistent with Antara News (2011), In Malaya, the egg consumption of the Indonesian individuals that remains low. In Indonesia the per capita egg consumption of the individuals was recorded at one egg per week whereas in Malaya the per capita egg consumption was noted at 3 per day. Hence, the egg consumption of Malaysians is increasing with high demand for native food trade.Eggshells wastes are seriously poignant the atmosphere and inflicting pollution to public health. Covering is classed as a waste by the food trade however is indeed a extremely subtle composite. The last word goal is to use the coverings in packaging to safeguard egg merchandise giving a second lease of life to the eggshell within the terribly role it absolutely was created for a real case of utilization. Therefore, utilization eggshells into the helpful product provide sensible potential profit on several levels, each for food makers and a way wider housing industry.

SCOPE OF STUDY

An investigation the result on the performance of the covering powder as in additive in concrete mixed. In covering concrete production, Portland composite cement, coarse combination, fine combination, water, and covering. The experiments can use to analyze are sieve analysis take a look at, slump test, curing, compressive strength, flexural take a look at, water absorption take a look at and water penetration take a look at severally. Thus, the number of covering waste may be used as additive in concrete production. Besides that, it conjointly can decrease the development value and lowland. Some take a look at and experiments are planned to be performing arts to work out the performance concrete strength and covering ash. These eggshells should be grinded into fine powder. This take a lookat are tested at one day, seven day and twenty eight days to induce the strength. The take a look at administered within the investigations are slump take a look at, compressive strength take a look at, flexural take a look at, water absorption take a look at and. Slump take a look at was chosen because theworkability take a look at and therefore the compressive strength take a look at can confirm the hardened concrete. On the opposite hand, the flexural take a look at is to check most load beam that able to sustain. Water absorption is administeredto work out the sturdiness of concrete. Sturdiness is one amongst the necessary characteristic of concrete and is tested for the absorption rate and therefore the water capability of the concrete.

LITERATURE REVIEW

Amual (2005)Carried out the practical experiment and reported that Egg Shell Powder (ESP) can be used as a supplement for industry lime on an expansive clay soil and also reported that the combination can be used where high subgrade performance is not necessary.

Freire and Holanda (2006) Conducted investigation on egg shell waste and found out its use in a ceramic wall tile paste. Based on the presence of caco3 in egg shell it can be used as a alternative raw material in the production of wall tile materials they Also found that egg shell can be used as an excellent alternative for material reuse and waste recycling practices Lau Yih Bling (2010) Carried out the investigation in egg-shell and reported that foamed concrete were prepared by egg-shell wastewhich has reduce the cost and time of project. 1 per cent and 5 per cent Egg-Shell-Powder were used. From the investigation it is concluded that 5 per cent of esc consists of unstable compressive strength and high flexural strength with increased density when compared with control foamed concrete which was 64% and 35%. In this study it is proved that Egg-shell Concrete (ESC) can produce light weight concrete which ismore environment friendly and improved properties.

Okonkwo et al., (2012) have concluded in his research that Egg Shell ash can be used as an alternate for cement which resulted in higher compressive strength on expensive soil. Constant Cement of 6 and 8% added with the egg ash powder of 0-10 per cent at 2 per cent intervals shows increase in 35 per cent of compressive strength but fell short of the strength requirements the durability. Finally they found that soil-cement egg shellmixture can be used for road pavements.

Several industrial wastes, such as flyash , quarry dust waste, recycled aggregate, used soft drink bottle caps as fibre reinforced concrete have been tried by various researches. The results have been encouragingly increased in terms of improvement in strength parameters like compressive strength, split tensile strength and flexural strength.

B.Vidivelli et.al., had studied on flyash concrete using SEManalysis as partial replacement to cement and had reported a significant increase of 20% compressive strength respectively. Lalit Gamashta et.al., developed the concrete strength by using masonry waste material in concrete mix in construction to minimize the environmental damages due to quarrying.

M.L.V. Prasad et.al., had studied mechanical properties of fiber reinforced concretes produced from building demolished waste and observed that target mean strength had been achieved in 100% recycled concrete aggregate replacement.

M. Mageswari et.al., using the combination of waste sheet glass powder (sgp) as fine aggregate and portland cement with 20% optimum replacement of fly ash as cementations binder offers an economically viable technology for high value utilization of industrial waste. Using of sgp in concrete is an interesting possibility for economy on waste disposal sites and conservation of natural resources. Natural sand was partially replaced (10%, 20%, 30%, 40% and 50%) with sgp and 20% optimum replacement of fly ash in portland cement. Compressive strength, tensile strength (cubes and cylinders) and flexural strength up to 180 days of age were compared with those of concrete made with natural fine aggregates. Fineness modulus, specific gravity, moisture content, water absorption, bulk density, percentage of voids, percentage of porosity (loose and compact) state for sand and sgp were also studied. The test results indicate that it is possible to manufacture low cost concrete containing sgp with characteristics similar tothose of natural sand aggregate concrete provided that the percentage of sgp as fine aggregate up to 30% along with fly ash 20% optimum in cement replacement can be used respectively.

Ustev.J et.al., determined the performance of concrete made with coconut shell as a replacement of cement. Cement was replaced with coconut shell in steps of 0%, 10%, 15%, 20%, 25% and 30%. The results obtained for compressive strength was increased from 12.45 N/mm2 at 7days to31.28 N/mm2 at 28 days curing and it met the requirement for use in both heavy weight and light weight concreting. Amitkumar D. Raval et.al., explained the compressive strength by replacing cement with ceramic waste and utilizing the same in construction industry.

MATERIALSCEMENT

Portland cement is that the most standard cement employed in the globe and it's typically employed in concrete and mortar severally. Standard cement is such consistent with Malaysian commonplace MS 522. Mixed proportion of aggregates, sand, water, cement kind the concrete that is use in construction development of buildings, bridge, roads, et al structure. The association method o computer leads to hardening and increase strength gain once mixed with water. Quality of concrete created depends on the standard of the raw materials used, like cement, combination and water, the mixture, ways in which and means that of transport its compactions.

If the raw materials used are of quality, then the ensuing concrete can have low standards and can end in concrete not sturdy and doesn't meet their specification.

COARSE AGGREGATES

According to Navy (2008), aggregates are granular materials like sand and crushed stones. Most combination have a selected gravities within the vary of two.6 to 2.7. The role of combination is to produce far better dimensional stability and wear resistance. While not combination, massive castings of neat cement paste would basically destruct upon drying. Coarse aggregates are particles larger than four.75 mm, however usually vary between nine.5 mm to 37.5 millimeter in diameter. They will either be from primary, secondary or recycled sources. Combination compose concerning seventy fifth of the degree of concrete, thus their properties have an oversized influence on the properties of the concrete (Alexander et al., 2005). Hence, the choice of combination is extremely necessaryto the concrete mixture also because it can effects the workability within the concrete.

FINE AGGREGATES

The finer combination have a much better positive result on the properties of recent concrete and hardened in high performance concrete. Thus, fine combination is enjoying a crucial role within the concrete mixture (Chang et al., 2001).

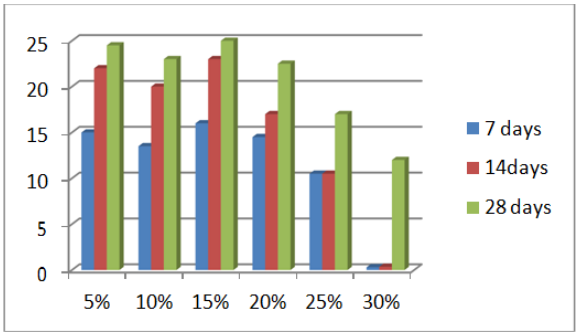
WATER

Water is a necessary part to supply an honest and quality concrete. Unhealthy quality of water might cause corrosion to the steel reinforcement. Therefore it's necessary to confirm that water used for concrete production ought to be free from harmful substances particularly oil, acid, alkali, salt, sugar, slit and organic matter. Normally rule, if the water is drinkable, it's think about appropriate for concrete production. Neville (2005)

urged that the water used for concrete ought to be clean, free from organic material and having hydrogen ion concentration starting from half-dozen to eight.

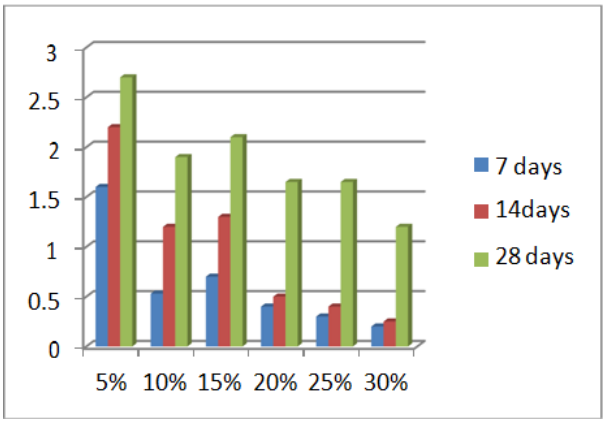
TESTS CONDUCTED COMPRESSION STRENGTH

ES added %	7 days N/mm^2	14 days N/ mm^2	28 days N/ mm^2
5	15	22	24.5
10	13.5	20	23
15	16	23	25
20	14.5	17	22.5
25	10.5	10.5	17
30	0.3	0.35	12



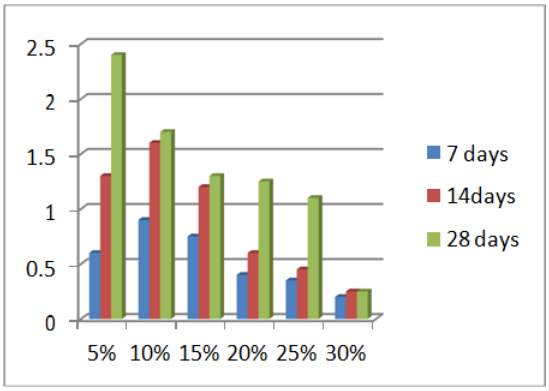
SPLIT TENSILE STRENGTH

EG added %	7 days N/ mm2	14 days N/ mm2	28 days N/ mm2
5	1.6	2.2	2.7
10	0.53	1.2	1.9
15	0.7	1.3	2.1
20	0.4	0.5	1.65
25	0.3	0.4	1.65
30	0.2	0.25	1.2



FLEXURAL STRENGTH

ES added %	7 days N/mm^2	14 days N/mm^2	28 days N/mm^2
5	0.6	1.3	2.4
10	0.9	1.6	1.7
15	0.75	1.2	1.3
20	0.4	0.6	1.25
25	0.35	0.45	1.1
30	0.2	0.25	0.25



CONCLUSION

It was fully discovered that the replacement of fifty Egg shell powder + twenty the problems little silicon dioxide is more without reducing the compressive strength features of regular cement. Egg shell powder is extra in various ratios for cement replacement. Here, replacing cement with 50% egg shell powder and 100% tiny silicon dioxide replacement results in concrete that has a similar flexural strength. Additionally, compared to completely distinct compositions, cement substitution with ball egg shell powder plus 100% replacement of little silicon dioxide offers higher split enduringness.

REFERENCES

1. Sathish Kumar.R, "Experimental Study on the Properties of Concrete Made With Alternate Construction Material", International Journal of Modern Engineering Research(IJMER), Vol. 2, Issue. 5, Sept.-Oct. 2012, pp-3006-3012.
2. C Freeda Christy, D Tensing, "Effect Of Class F – Flyash As Partial Replacement With Cement And Fine Aggregate in Mortar", Indian Jour-nal Of Engineering and Material Science, Vol 17, April 2010, pp. 140-144.
3. C.Marthong, "Sawdust Ash (SDA) as Partial Replacement of Cement", International Journal of Engineering Research and Applications (IJERA), Vol. 2, Issue4, July-August 2012,pp.1980-1985.
4. Nilforoushan, Mohammed Reza, the Effect Of Micro Silica On Permea-bility And Chemical Durability Of Concrete UsedIn The Corrosive Envi-ronment, Iran J. Chem and Chem Eng, vol 24 ,No 2, 2005.
5. Mohammed Razzaq, Ahmed Namah Hadi, "Effect Of Egg Shells Powder On Some Mechanical And Physical Properties Of Natural Rubber", The Iraqi Journal For Mechanical And Material Engineering, Vol.12, No.3, 2012.
6. Phil Glatz, Zhihong Miao and Belinda Rodda, "Handling and Treatment of Poultry Hatchery Waste: A Review", Vol 3, 12 January 2011.
7. M.O.A. Mtallib and A. Rabiu, "Effects Of Eggshells Ash On The Setting Time Of Cement", Vol 3, 12 January 2011.
8. JayrajVinodsinh Solanki, Jayeshkumar Pitroda, "Flexural Strength of Beams by Partial Replacement of Cement with Fly Ash and Hypo Sludge in Concrete" International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, Issue 1, January 2013.
9. Arash Barazesh, Hamidreza Saba, Mehdi Gharib, Moustafa Yousefi Rad, "Laboratory Investigation of the Effect of Eggshell powder on Plasticity Index in Clay and Expansive Soils ", European Journal of Experimental Biology, 2012, 2 (6):2378-2384.
10. Isaac O. Igwe, Genevive C. Onuegbu," Studies on Properties of Egg Shell and Fish Bone Powder Filled Polypropylene ", American Journal of Pol-ymer Science 2012, 2(4): 56-61.
11. O.O. Amu, A.B. Fajobi and B.O. Oke , "Effect of Eggshell Powder on the Stabilizing Potential of Lime on an Expansive Clay Soil", Research Jour-nal of Agriculture and Biological Sciences 1(1): 80-84, 2005.
12. L. O. Ettu, K. C. Nwachukwu, J. I. Arimanwa, C. T. G. Awodiji, and H. E. Opara "Variation of Strength of OPC-Saw Dust Ash Cement Composites with Water-Cement Ratio" International Refereed Journal of Engineering and Science,Volume 2, Issue 7 (July 2013), PP. 09-13.