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THE ENDURINGNESS MODERATOR IN CONCRETE BY EGG SHELL POWDER, AGRO WASTE AND E-WASTE

P.Kalpana[1], M.Chandu[2]

[1]*M.Tech (Structural Engineering) Assistant professor in civil department, Sarada institute of science, technology and management.*

[2]*M.Tech (Transportation Engineering) Assistant professor in civil department, Sarada institute of science, technology and management.*

ABSTRACT:

In the present environmental conditions, the lack of construction materials and step-up cost of materials is the main problem, on the other side the growth of environmental pollution is also one of the problem. The main ingredients of concrete in construction industries are Cement, Sand and Aggregates. To tolerate these problems, the study is made on the utilization of Eggshell Powder in cement, Agro waste in fine Aggregate and E- Waste in coarse Aggregate in concrete with a percentage replacement ranging from 0% to 15% (i.e. 0%,5%,10% and 15%) on the strength criteria of M25 Concrete. In this research different tests conducted on materials such as egg shell powder, agro waste, E-waste with cement, sand ,coarse aggregate respectively to evaluate their properties. Materials able to produce workable concrete with partial replacement of eggshells, Agro waste and E- waste is compared with the conventional concrete. In this study the compressive strength of concrete is carried out. These materials are recommended to increase the strength of concrete compared to conventional concrete.

Keywords: Egg shells, Agro waste, E-waste, M_{25} concrete, Compressive strength.

I. INTRODUCTION

Already many investigations have been going on the partial replacement in concrete, In the present investigation has been used as partial replacement of cement with egg shell powder, fine aggregate with agro waste and coarse aggregate with E-waste in concrete respectively based on its strength criteria. These waste materials are also available in large quantities. Agro waste ,E-waste and egg shell waste causes pollution to environment, our study reduces this problem and make the step-down cost of materials by using these waste materials.

1.1OBJECTIVES

The main objectives of this study

1. To improve the compressive strength of concrete.

2.To study the tests are carried out by replacing cement with eggshell powder, replacing fine aggregate with agro waste and replacing coarse aggregate with E-waste for 5%, 10%, 15% for M25 grade of concrete.

3. It was proposed to investigate the behavior of egg shell powder as cement replacement, agro waste as fine aggregate and E-waste as coarse aggregate in concrete and it is compared with the regular mix.

II.LITERATURE REVIEW

2.1 Work carried out by authors on partial replacement of cement by egg shell powder, fine aggregate by agro waste& coarse aggregate by E-waste.

2.1.1 Amu et al., (2005) carried out the practical experiment and reported that Egg Shell Powder (ESP) can be used as a supplement for industrial lime on an expansive clay soil and also reported that the combination can be used ,where high sub grade performance is not necessary.

2.1.2 Lau yih bling (2010) conducted the investigation in egg albumen and reported that foamed concrete were prepared by egg albumen which has reduce the cost and time of project. In this study it is proved that Egg Albumen Foamed Concrete (EAFC) can produce light weight concrete which is more environment friendly and improved properties.

2.1.3 Jnyanendra Kumar Prusty ,Sanjaya Kumar Patro, S.S. Basarkar (2016) conducted the investigation on the Agricultural wastes used as fine aggregate in con- crete are sugarcane bagasse ash, groundnut shell, oyster shell, sawdust, giant reed ash, rice husk ash, cork and tobacco waste. The maximum compressive strength of concrete contains- ing groundnut shell and giant reed (both GRA and GRF) was achieved at 5% and 7.5% respectively.

2.1.4 Bala Subramanian B, Gopala Krishna GVT and Saraswathy V carried out investigation The objective of the present research work is to get the characteristics of concrete which are replaced by E-Waste as a coarse aggregate.. By comparing the results with conventional concrete at 28 days strength it is observed that the compressive strength of concrete is found to be 27% higher when coarse aggregate is replaced by 15% with E-Waste. From this study we can conclude that use of E- Waste in to the concrete by replacing coarse aggregate is possible.

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III.METHODOLOGY & EXPERIMENTAL STUDY

The scope of present investigation is to study and evaluate the effect of egg shell powder, agro waste and E-waste in concrete . cube of standard size 150mmx150mm x150mm(length x width x depth) were cast tested for 7,14,28 days compression test.

3.1 Objectives

1. To partially replace concrete content with egg shells, agro waste and E-waste as it directly influences economy in construction.

2. To evaluate the egg shells, agro waste and E-waste comprssive strength at 7,14,28 days by replacing in concrete .

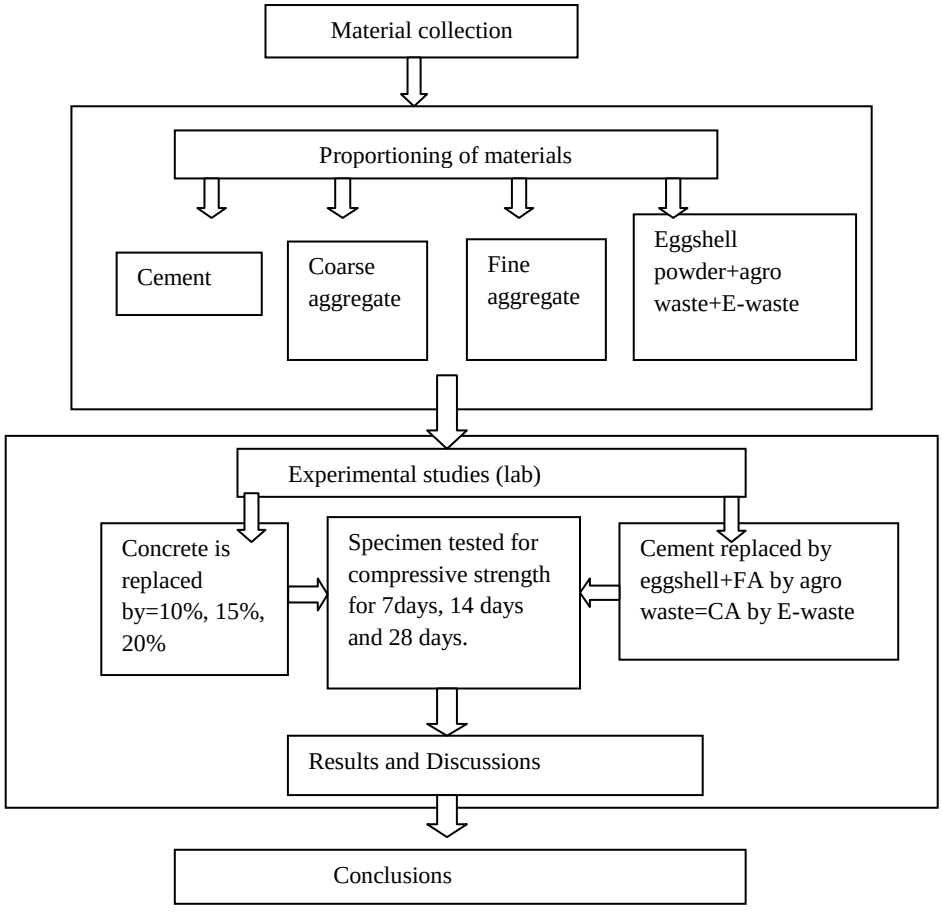
3. These materials decreases the construction cost of the buildings.

4. We should evolutes the aggregate properties of (coarse aggregate + E-waste)

5. Environmental friendly disposal of waste.

6. To boost the use of industrial waste.

3.2 Methodology:



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IV. MATERIAL USED

Three basic materials are used for this study are cement replace by cockle shell powder, replacement of coarse aggregates by cockle shells & replacement of fine aggregates by E-waste.

4.1. Cement: Ordinary Portland cement 53 grade is used.

4.2. Aggregates: Fine aggregates

Coarse aggregates

4.3. E-waste: Electronic waste is informally known as e-waste for the electronic products nearing the end of their useful life. The e- waste products contain materials that are hazardous to the human beings, depending on their condition & density. Fridge, cell phones, discarded computers, mobiles & batteries etc, if not disposed properly, can leach lead & other substances to soil & underground water.

4.4. Eggshell powder: Eggshell Powder consists of several mutually growing layers of CaCO3. The top layer is a vertical layer covered by the organic cuticle. The eggshell primarily contains calcium, magnesium carbonate (lime) and protein. In many other countries, it is the accepted practice for eggshell to be dried and use as a source of calcium in animal feeds. The quality of lime in eggshell waste is influenced greatly by the extent of exposure to sunlight, raw water and harsh weather conditions. It is the fine grained powder with suitable proportion which is sieved to the required size before use with concrete/mortar.

4.5. Agro: This is the waste from agriculture field like acha husk ash (AHA), rice husk ash (RHA), groundnut husk ash (GHA), wood ash (WA), palm oil shell ash (POSA) and bone powder ash (BPA). This creates environmental pollution.

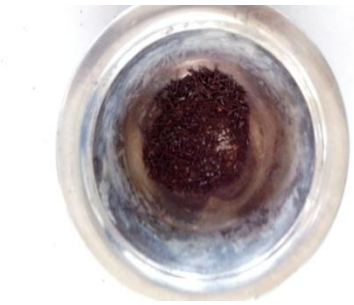


Fig: 1 E-waste

Fig: 2 Egg shell powder

Fig: 3 Agro waste

V.TESTS CONDUCTED ON MATERIALS

5.1. Tests on aggregates:

Table 1 :(aggregates+E-waste) properties in percentage

Percentage of E-waste in aggregate	Crushing value	Impact value	Abrasion values
0	22%	21%	23%
5	18%	19%	20%
10	15%	16%	18%
15	16%	18%	19%

5.2. Tests on cement:

Table 2: cement properties

S.NO.	PROPERTY	VALUES
01	**Specific gravity**	3.15
02	**Fineness of cement by sieving**	2.5%
03	**Normal consistency**	31%
04	**Setting time** **Initial setting time** **Final setting time**	 31 min 412 min
05	**Soundness**	6mm
06	**Compressive strength** 7days 14 days 28 days	 37 N/mm2 48N/mm2 55N/mm2

5. Mix design for M-25 grade:

Design stipulations

i) Characteristic compressive strength required

In the field at 28 days	:	25Mpa
ii) Maximum size of aggregates	:	20mm
iii) Degree of workability	:	0.90 compacting factor
iv) Degree of quality control	:	Good
v) Type of exposure	:	Mild

Test data for materials

i) Specific gravity of cement	:	3.15
ii) Specific gravity of coarse aggregate	:	2.6
iii) Specific gravity of fine aggregate	:	2.7

Table 3: Quantity of materials required for cube preparation:

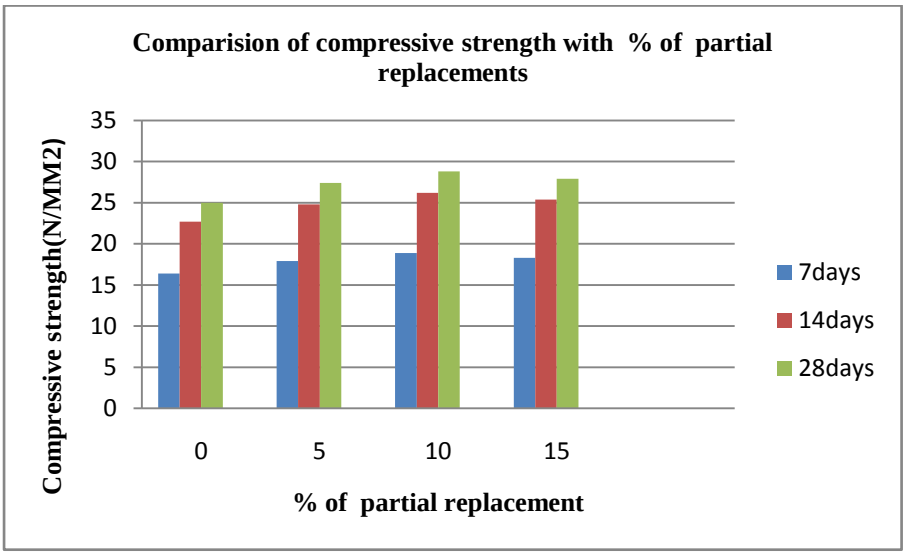
Material	Water	Cement	F.A	C.A
Kg/cum	230.86	491.2	568.9	1058.4
Ratio	0.47	1	1.1	2.1

VI.RESULTS AND ANALYSIS

6.1 Compressive strength results for partial replacement of eggshell powder:

Replacement of cement by eggshell powder(Mix)	7 Days strength (N/mm^2)	14Days strength (N/mm^2)	28Days strength (N/mm^2)
0	16.4	22.7	25
5%	17.9	24.8	27.4
10%	18.0	26.2	28.8
15%	18.3	25.4	27.9

Table 6.1 compressive strength of concrete with partial replacement of egg shells powder

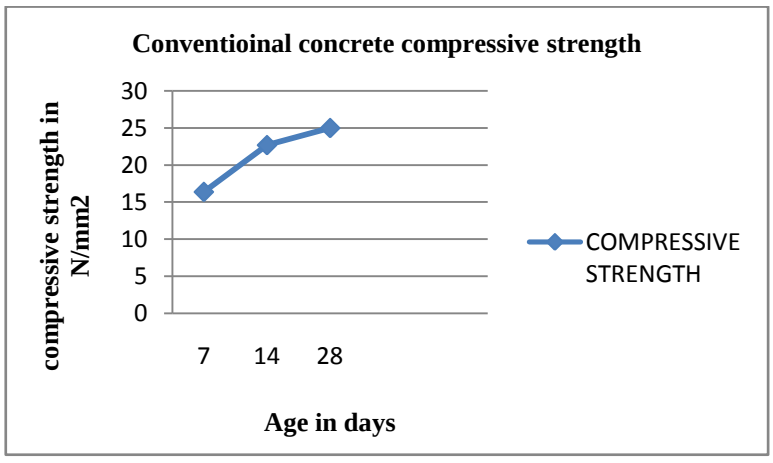


GRAPH: 6.1 compressive strength of concrete with partial replacement of cement by eggshells powder

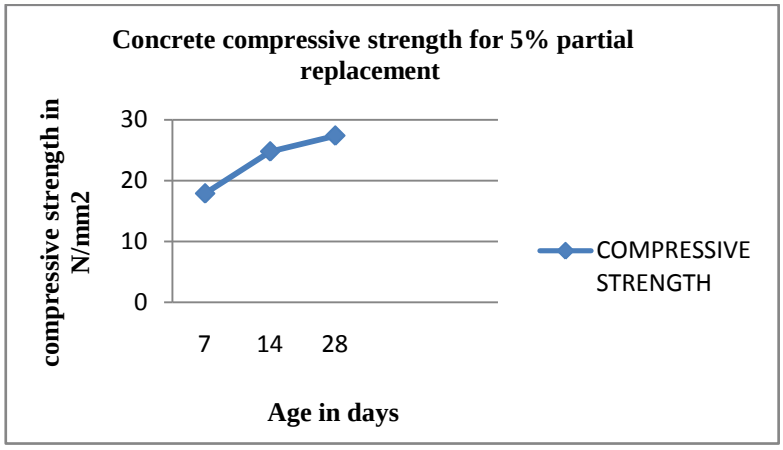
The above graph shows that, the 28 days compressive strength of concrete for 5% of partial replacement of eggshell powder, agro waste and E-waste is increased 10% when compared to conventional concrete compressive strength.

The above graph shows that, the 28 days compressive strength of concrete for 10% of partial replacement of eggshell powder, agro waste and E-waste is increased 5.1% when compared to 5% of partial replacement of concrete compressive strength.

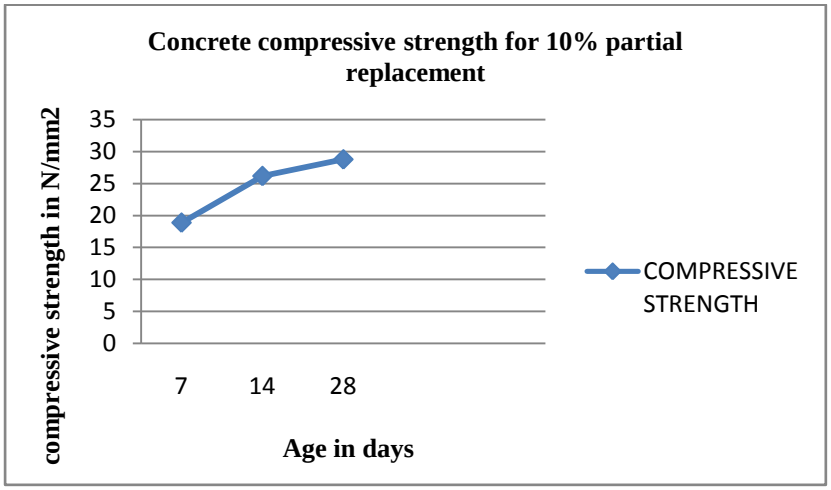
The above graph shows that, the 28 days compressive strength of concrete for 15% of partial replacement of eggshell powder, agro waste and E-waste is decreased 3.1% when compared to 10% of partial replacement of concrete compressive strength.



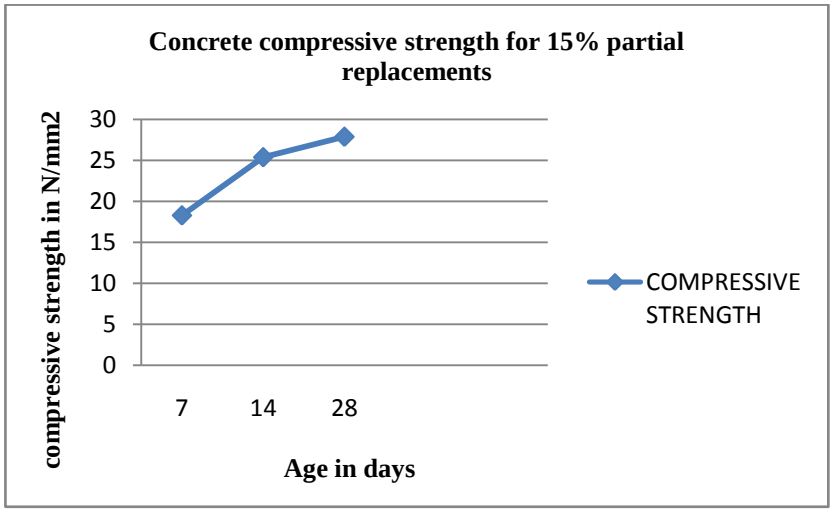
GRAPH: 6.2 conventional concrete compressive strength for 0 % of concrete



GRAPH: 6.3 Conventional concrete compressive strength for 5% of concrete



GRAPH: 6.4 Conventional concrete compressive strength for 10% of concrete



GRAPH: 6.5 Conventional concrete compressive strength for 15% of concrete

The above graph shows that, the compressive strength of concrete for 5, 10% of partial replacement of egg shell powder, agro waste & E-Waste is increased to 10&15.2% when compared to conventional concrete.

The compressive strength of concrete for 15% of partial replacement of eggshell powder, agro waste& E-Waste is increased 11.6% when compared to conventional concrete compressive strength but it was decreased 3.1% when compared to 10% of partial replacement of concrete.

VII. CONCLUSIONS

The conclusions derived from the present study listed below

1. Compressive strength of concrete with partial replacement of cement by egg shell powder, coarse aggregate by E- waste and fine aggregate by Aggro Waste has gradually increased up to 5 %, 10% and then decreased at 15%.
2. The compressive strength of concrete with 10% partial replacement of cement by egg shell powder, fine aggregate by agro waste and coarse aggregate by E-waste has increased 15.2% than the conventional concrete compressive strength.
3. The compressive strength of concrete with 15% partial replacement of cement by egg shell powder, fine aggregate by agro waste and coarse aggregate by E-waste has increased 11.6% than the conventional concrete compressive strength.
4. Compressive strength is increased with inclusion of cement replacement by Eggshell powder, coarse aggregate by E-waste and Fine aggregate by Aggro Wastes compared with conventional concrete compressive strength.
5. Hence for economical view 15% is preferable and in the perspective of compressive strength 10% was suggested.

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MISS. PILLA KALPANA, M.Tech (Structural Engineering) Assistant professor in civil engineering, Sarada institute of science technology and management (JNTUK).Srikakulam.

MISS. METTA CHANDU, M.Tech (Transportation Engineering) Assistant professor in civil engineering, Sarada institute of science technology and management (JNTUK).Srikakulam.