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AN EXPERIMENTAL INVESTIGATION ON PARTIAL REPLACEMENT OF CEMENT WITH EGG SHELL POWDER AND LATHE WASTE IN CONCRETE

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Abstract : *This thesis presents the results of experiment evaluating the employment of Egg Shell Powder as partial replacement for cement and Lathe Scrap for overall concrete. The study determines the strength of concrete when the cement is replaced by 5%, 7.5%, 10%, and 12.5% of Egg Shell Powder and Lathe Waste of 0.5%, 0.75%, 1% and 1.25% for overall concrete. The Grade designation used in the experiment is M20 and M30. An Experimental investigation is carried out on the Compressive Strength, Split Tensile Strength and Flexural Strength. The results indicated that ESP and LW can be used in concrete.*

Keywords **-** Eggshell powder(ESP), LatheWaste(LW).

1. INTRODUCTION

In this study, the materials which are generally considered as a waste product are used in concrete. The LW is a waste obtained from the Lathe machine is being used and is replaced for the weight of overall concrete with various amount, The (ESP) which is obtained by grinding the Egg Shell into a small particle to obtain cement fineness is being used to reduce cement content and is replaced for the cement in concrete with various amount. In the analysis, the materials are replaced with the proportion of 5%,7.5%, 10% and 12.5% of ESP and also the LW of about 0.5%,0.75%,1% and 1.25% was replaced .

2. EGG SHELL POWDER

It is seen that India stands at the third position in the world with the annual production of Eggs. Many egg shells out of these are waste. Egg shells have similar composition as that of limestone because they are very rich in calcium content. Instead of using natural lime in cement, cement can be removed partially if the ESP can be used in cement, having the benefits like minimal usage of cement. The egg shells were collected from various sources and washed, dried, cleaned and grinded. The powdered ESP were sieved through 75 micron sieve.

3. LATHE WASTE

The lathe scrap is the waste given out by the lathe machine. These lathe wastes are obtained from the waste given out by the lathe machine. On daily basis tons of lathe waste are generated in India,. The size of the lathe waste varied from 50mm to 100mm after crushing. The lathe waste is being added with various percentages of 0.5%,0.75%,1% and 1.25% of weight of concrete. We all know that the concrete is weak in tension so by usage of this upto a level Tensile strength can be provided. These steel fibres(Lathe Scrap)provides gains in Tensile strength.

4. SCOPE OF THE STUDY

In this analysis, the waste materials like egg shell and the lathe scrap has been used in the concrete by replacing them partially. These materials are hazardous and not biodegradable easily , hence as effort has been made by using them in the construction industry without making any non environmental friendly act and also helping in reduction of cost (economical construction or low cost).

5. OBJECTIVE

Below are few objectives of the thesis:

1. To determine the best Mix proportion For the partial replacement of Egg Shell Powder for cement and the Lathe Scrap for overall concrete weight.
2. To determine the optimum value of the Egg Shell Powder replaced partially in cement and lathe waste in overall concrete
3. To investigate the feasibility of the materials replaced partially in concrete by checking for Compressive Strength, Split Tensile and Flexural Strength.
4. To compare M20 and M30 Grade of concrete (Replaced concrete) obtained value with the conventional concrete.

6. SPECIFICJGRAVITY

Specific Gravity of Egg Shell Powder - 2.56

Specific Gravity of Coarse Aggregates - 2.69

Specific Gravity of Fine Aggregates - 2.58

7. CASTING OF SPECIMEN

The specimens of cubical moulds of size 150mm X 150mm X 150mm and the cylindrical shaped moulds of size 150mm diameter and 300 mm height ,the beam of size 500mm x 100mm x 100mm were used to cast the

specimen. The mix was done as per the ratio obtained by the mix design for the grade M20 and M30 with proper water cement ratio. Various specimens of different dosage of egg shell powder and lathe waste was mixed. The moulds which were kept ready by applying the oil at the inner surfaces of the moulds, later the mix was poured into the moulds completely in layers of 3 by compacting each layer minimum of 25 times using the tamping rod. To avoid honey combing of the moulds they were kept on the vibrating machine which helps to avoid honey combing. Later these moulds were kept aside and de-moulding was done after 24hours, the specimens which were removed from moulds were kept into the curing tank. The specimens were tested for 7th day and 28th day and results were tabulated.

8. RESULTS, AND DISCUSSION

8.1. COMPRESSIVE STRENGTH TEST

Table 1 - Compressive Strength Test (M20)

Percentage of replacement		Compressive strength N/mm²	Compressive strength N/mm²
ESP in %	LW in %	7th day	28th day
0	0	17.4	26.96
5	0.5	18.29	29.48
7.5	0.75	20.29	30.64
10	1	15.92	24.56
12.5	1.25	13.33	21.25

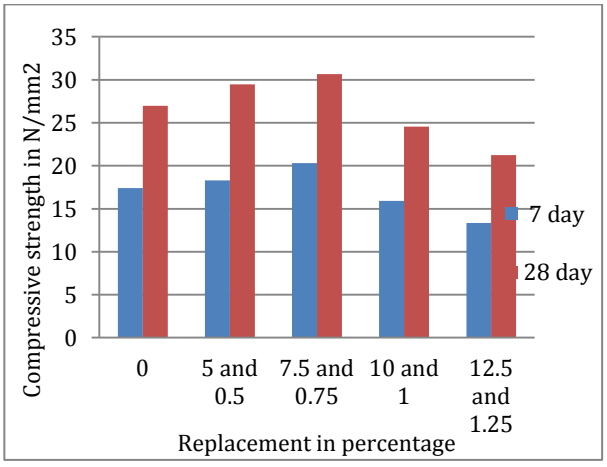

Chart 1 - Results of Compressive Strength (M20)

Table 2 - Compressive Strength Test (M30)

Percentage of replacement		Compressive strength in N/mm²	Compressive strength in N/mm²
ESP in %	LW in %	7th day	28th day
0	0	24.88	36.88
5	0.5	26.66	38.36
7.5	0.75	27.7	43.10
10	1	22.22	32.75
12.5	1.25	21.03	30.95

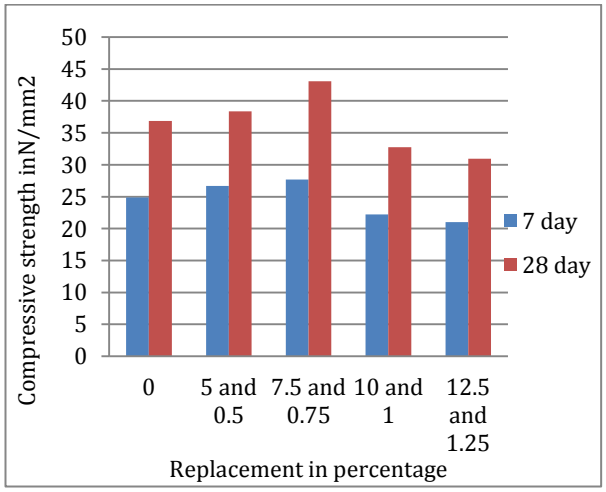

Chart 2 - Results of Compressive Strength (M30)

8.2. SPLIT TENSILE STRENGTH TEST

Table 3 - Split Tensile Strength Test (M20)

Percentage of replacement		Split tensile N/mm²	Split tensile N/mm²
ESP in %	LW in %	7th day	28th day
0	0	1.33	2.23
5	0.5	1.54	2.36
7.5	0.75	1.68	2.38
10	1	1.26	2.03
12.5	1.25	1.03	1.82

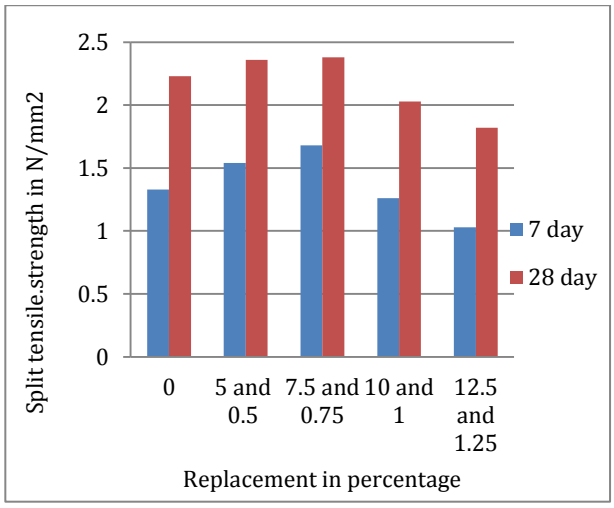

Chart 3 - Results of Split Tensile Strength (M20)

Table 4 - Split Tensile Strength Test (M30)

Percentage of replacement		Split tensile N/mm²	Split tensile N/mm²
ESP in %	LW in %	7th day	28th day
0	0	2.03	3.03
5	0.5	2.24	3.29
7.5	0.75	2.38	3.5
10	1	1.82	2.66
12.5	1.25	1.61	2.45

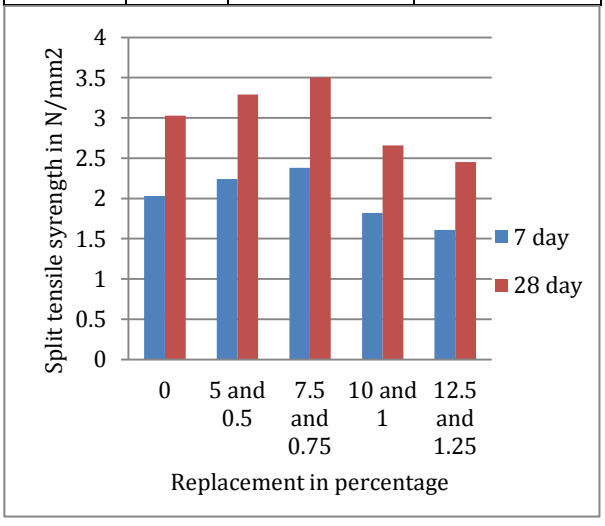

Chart 4 - Results of Split Tensile Strength (M30)

8.3. FLEXURAL STRENGTH TEST

Table 5 - Flexural Strength Test (M20)

Percentage of replacement		Flexural strength N/mm²	Flexural strength N/mm²
ESP in %	LW in %	7th day	28th day
0	0	2	3.14
5	0.5	2.13	3.25
7.5	0.75	2.20	3.31
10	1	1.91	2.885
12.5	1.25	1.74	2.56

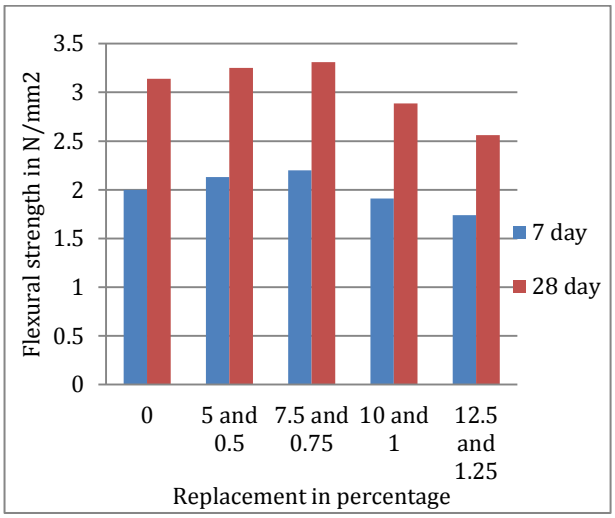

Chart 5 - Results of Flexural Strength (M20)

Table 6 - Flexural Strength Test (M30)

Percentage of replacement		Flexural strength N/mm²	Flexural strength N/mm²
ESP in %	LW in %	7th day	28th day
0	0	2.81	3.64
5	0.5	2.95	3.93
7.5	0.75	3.15	4.19
10	1	2.71	3.5
12.5	1.25	2.54	3.20

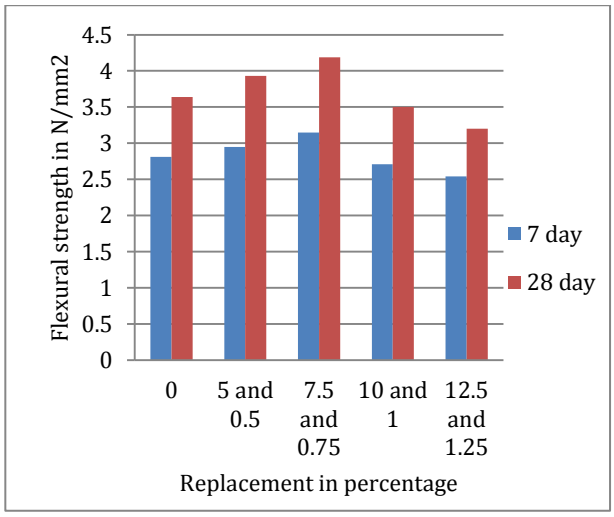

Chart 6 - Results of Flexural Strength (M30)

Fig -1: Mixing of materials

9. CONCLUSIONS

The research mainly deals with replacement of ESP for cement content and the LW for overall concrete.

1. For Grade M20 specimen under Compression, Split Tensile and Flexural test the optimum value obtained for ESP is 7.5% and for LW is 0.75%. It was seen that further increase in the percentage provided lower strength.

2. The specimen of Grade M30 under compression, Split Tensile and Flexural test the optimum value obtained for ESP replacement is 7.5% and Lathe Waste is 0.75%. Further-more increase in % of replacement lowered the strength of the specimen.

3. In Compression it was seen that there was an increase in strength of around 12% for M20 Grade and around 14% increase for M30 Grade, when compared with normal concrete.

4. In Split Tensile the strength increased about 6% for M20 and around 10% for M30 Grade of concrete.

5. In Flexure the strength is increased for about 6% for M20 Grade and for M30Grade it was found to be around 12% increase.

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