A study on Experimental Investigation on Pervious Concrete by Partial Replacement of Cement with Rice Husk Ash

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***Abstract* - This research was studied to check the workability and strength properties of an pervious concrete along various percentage mix of rice hush ash with cement. The RHA was added partially to the cement to increase the strength of pervious concrete. In general RHA is an agricultural waste considering that 20% of the grain is husk and those 20% is combusted and made in RHA and it can be utilized in the partial mixing with cement. RHA has contain silica. Silica is a good chemical admixture to increase the strength of concrete. By using this RHA we can reduce the environmental impact and also eco friendly and free of cost. since india is the largest producer of rice we can obtain in plenty. In this study components used for pervious concrete is opc M53 grade cement RHA, 12.5mm and 20mm coarse aggregate & water. Since pervious concrete don't have proper mix ratio so we have obtained mix ratio by trial and error method. So we considered different mix proportion such as 1:1, 1:2, 1:3, 1:4, 1:5, 1:6, 1:7& 1:8 among this mix we have got better strength in 1:4 mix ratio of cement and coarse aggregate and 0.3 water cement ratio. in this study we are going to compare the strength of pervious concrete by different mix % of 20%, 25%, 30% of RHA with various size of 12.5mm & 20mm coarse aggregate.the pervious concrete was casted in cubes of 150 x 150 x 150mm moulds and beam of 170 x 150 x 150mm to find compressive and flexural strength of concrete. When the RHA content is increased beyond 30% the compressive & flexural strength of concrete reduced comparing to the conventional pervious concrete.**

***IndexTerms* - Rice husk ash, workability, sustainability, mix design, compressive, flexural**

I. INTRODUCTION

Pervious concrete is otherwise known permeable membrane. it is a combination of cement, coarse aggregate, water, admixtures and less or no fine aggregate. Pervious concrete contains larger void spaces in which storm water can easily penetrate through it and makes an surface dry without stagnant of storm water. Pervious concrete is mainly used in the parking lots, driveway and light vehicle traffic areas. due to presents of interconnected voids it can be used in the storm water management to increase the ground water level. It also reduces flash flooding, facilitate biodegradation of oils from vehicles etc.

II. MATERIALS AND METHODOLOGY

Rice husk was burnt upto 48 hours under uncontrolled ignition process. The burning temperature should be in the limit of 600 to 700^0C. then the casting and testing of specimen by adding 20%, 25%, and 30% of rice husk ash.

Materials Used

Table 1 Materials Used

Cement used	Ordinary Portland cement
Cement specific gravity	3.15
Coarse aggregate specific gravity	2.75
Water cement ratio	0.3
Rice husk ash addition	20%, 25% & 30%

Workability

In this study workability of an concrete was done by trail and error method. To find slump value of concrete slumpcone test is done and to find consistency compaction factor test is done. The water cement ratio used in concrete is 0.3.

Specimen Preparation

The dry cement and aggregate was mixed properly by hand mixing and rice husk ash was added and mixed further for more than one minute until it get mixed properly, then 80 percent of water is added and then mixing is continued for another one minute and then remaining water was added and mixed properly. Compaction should be done by using suitable tamping rod and care should be taken to avoid segregation of concrete takes place through moulds. After 24 hours concrete specimen should be demoulded and curing should be done.

Strength test

- Compressive Strength- the casted cubes were tested to find compressive strength by using compression testing machine
- Flexural strength- the casted Beams were tested to find flexural strength by using compression testing machine.

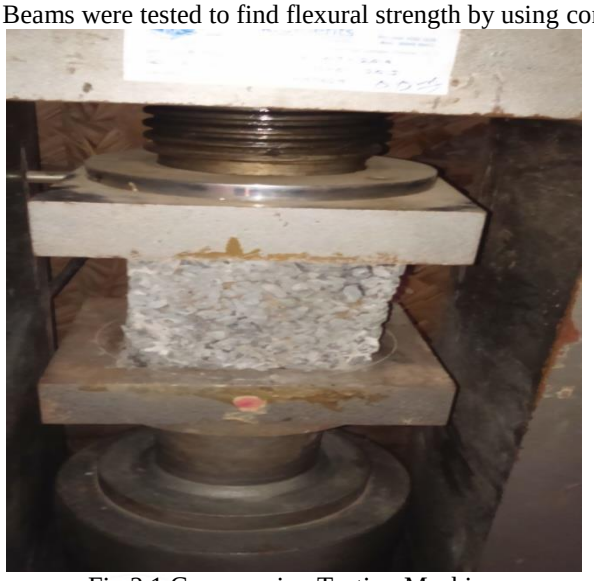

Fig 2.1 Compression Testing Machine

III. RESULTS AND DISCUSSION

Compressive strength

Table 2 Test with cement motor without RHA

Test	7 days	14 days	28 days
Limitations	27Mpa	37Mpa	53Mpa
Motor cube	33.68Mpa	40Mpa	55Mpa

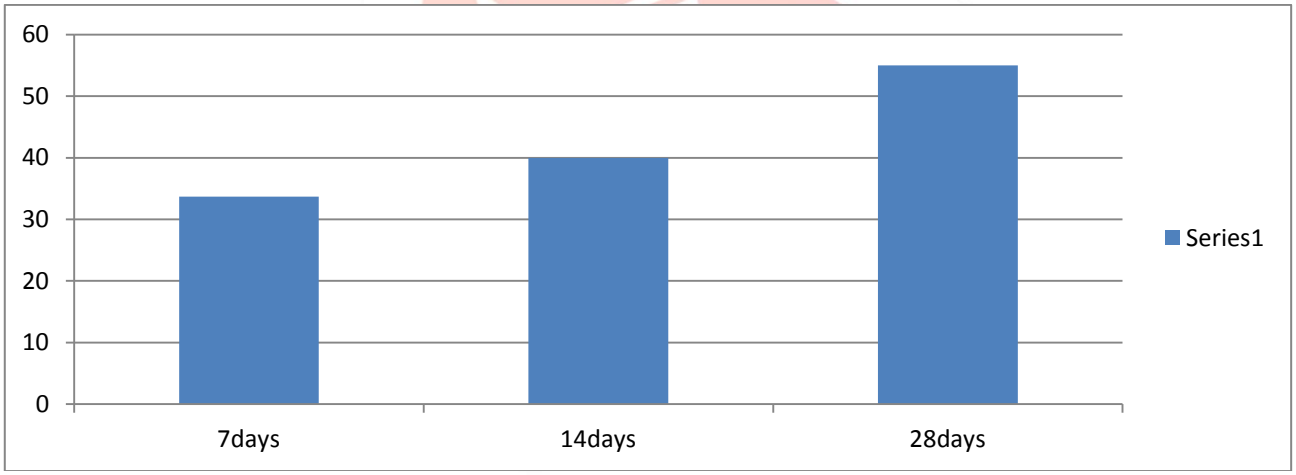

Fig 3.1 Graphical Representation Of Cement Motor

Table 3 Test with cement motor cube with replacement of RHA

Replacement	7days	14days	28days
20% replacement of RHA	17.7Mpa	35.6Mpa	54.25Mpa
25% replacement of RHA	15.4Mpa	33.8Mpa	53.75Mpa
30% replacement of RHA	13Mpa	31.5Mpa	53Mpa

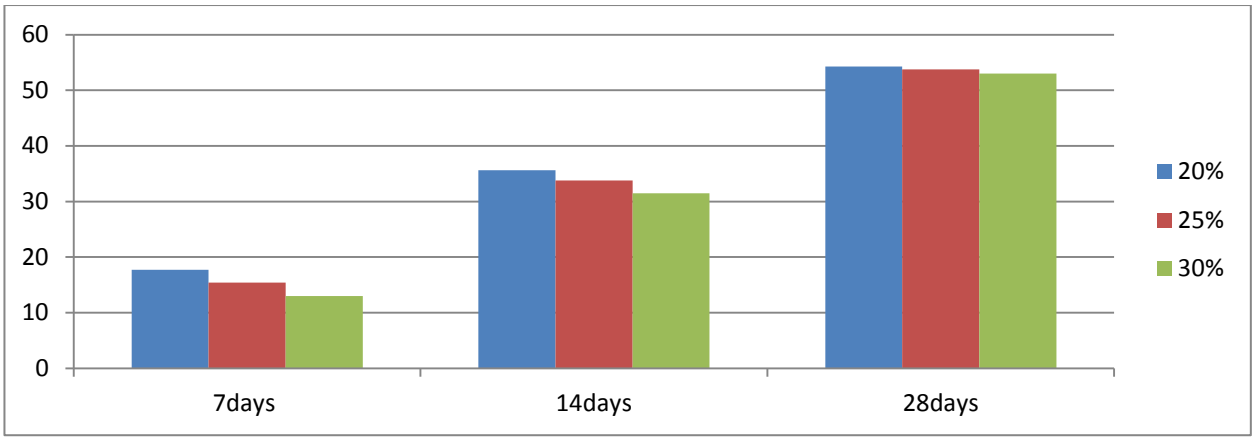

Fig 3.2graphical Representation Of Cement Motor With Replacement Of Rha

Table 4 Test with 100% cement & 0%RHA for 20mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	20.60
14days	22.68
28days	25.55

Table 5 Test with 80% cement & 20%RHA for 20mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	19.54
14days	22.24
28days	24.55

Table 6 Test with 75% cement & 25%RHA for 20mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	15.65
14days	17.36
28days	21.6

Table 7 Test with 70% cement & 30%RHA for 20mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	13.13
14days	15.79
28days	17.61

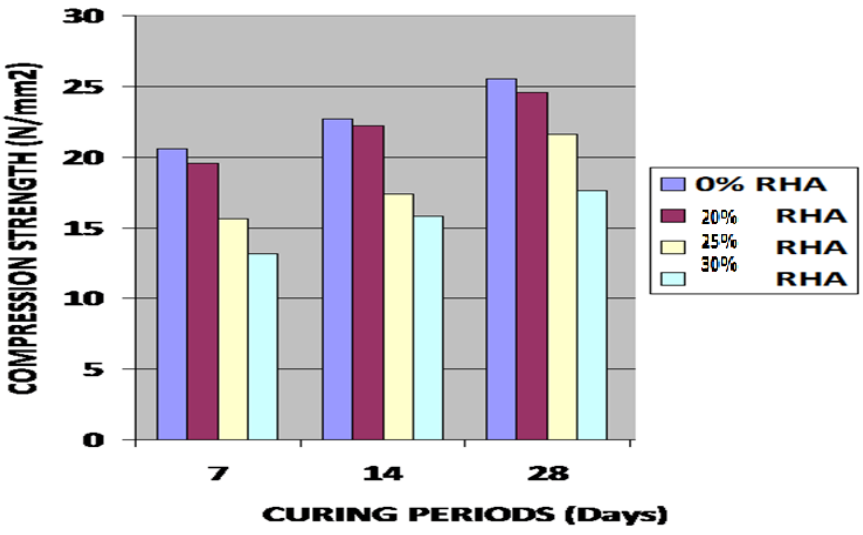

Fig 3.3 Graphical Representation On Compressive Strength On 7th, 14th, & 28th Day For Cement With Rha For 20mm Aggregates

Table 8 Test with 100% cement & 0%RHA for 12.5mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	22.6
14days	24.5
28days	26.76

Table 9 Test with 80% cement & 20%RHA for 12.5mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	20.59
14days	22.56
28days	24.79

Table 10 Test with 75% cement & 25%RHA for 12.5mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	18.51
14days	20.57
28days	22.81

Table 11 Test with 70% cement & 30%RHA for 12.5mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	15.56
14days	17.23
28days	19.81

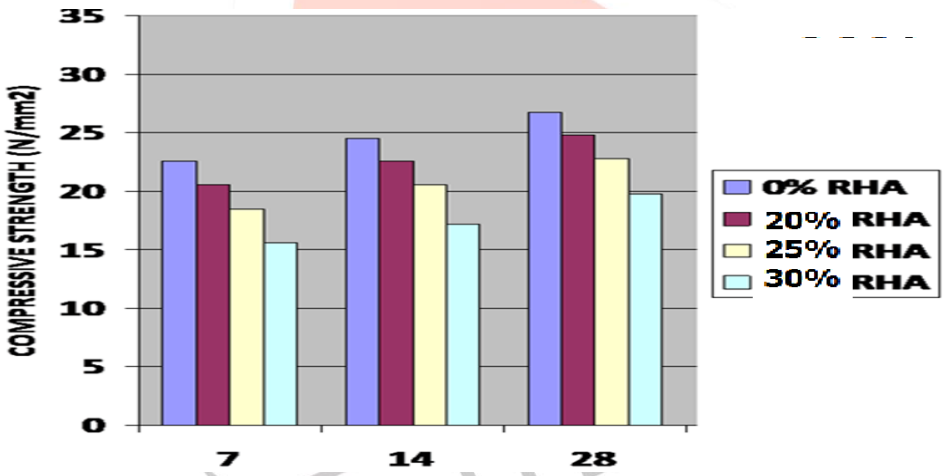

Fig 3.4 Graphical Representation On Compressive Strength On 7th, 14th, & 28th Day For Cement With Rha For 12.5mm Aggregates

Flexural strength

Table 12Test with 100% cement & 0%RHA for 20mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	2.31
14days	3.01
28days	3.8

Table 13Test with 80% cement & 20%RHA for 20mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	2.02
14days	2.51
28days	3.4

Table 14 Test with 75% cement & 25%RHA for 20mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	1.99
14days	2.31
28days	3.2

Table 15 Test with 70% cement & 30%RHA for 20mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	2.08
14days	2.81
28days	3.25

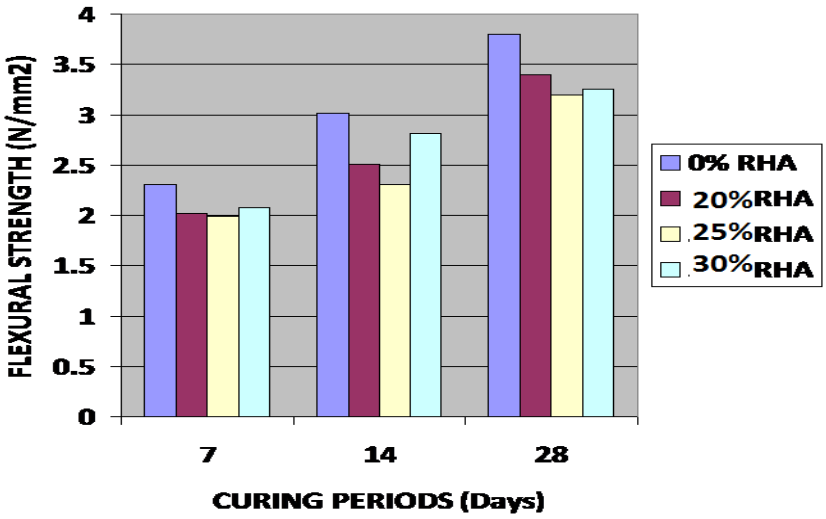

Fig 3.5 Graphical Representation On Flexural Strength On 7th, 14th, & 28th Day For Cement With Rha For 20mm Aggregates

Table 16 Test with 100% cement & 0%RHA for 12.5mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	2.13
14days	2.91
28days	3.92

Table 17 Test with 80% cement & 20%RHA for 12.5mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	2.02
14days	2.71
28days	3.71

Table 18 Test with 75% cement & 25%RHA for 12.5mm coarse aggregate

Curing days	*Average strength (N/mm^2)*
7days	2.01
14days	2.61
28days	3.52

Table 19 Test with 70% cement & 30%RHA for 12.5mm coarse aggregate

Curing days	Average strength (N/mm^2)
7days	20.6
14days	2.81
28days	3.37

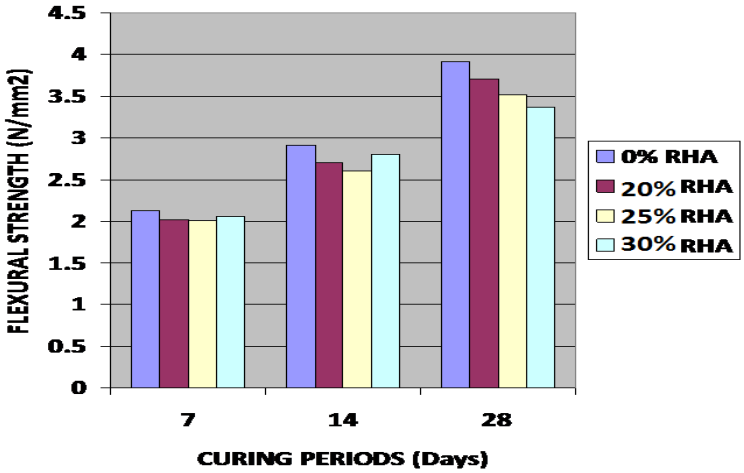

Fig 3.6 Graphical Representation On Flexural Strength On 7th, 14th, & 28th Day For Cement With Rha For 12.5mm Aggregates

IV. CONCLUSION

The study was done to find compressive and flexural strength of pervious concrete. Comparing to conventional concrete, compressive strength of 20% partial replacement of cement with RHA along with 12.5mm coarse aggregate has obtained 96.08% of conventional concrete, for 25% of cement with RHA has obtained 84.90% and 30% of cement with RHA has obtained has 69.22% and for 20mm coarse aggregate with 20% replacement has obtained 92.63%, for 25% it has obtained 85.23% and for 30% replacement it has obtained 74.02% of compressive strength. For flexural strength of beam, the 20mm coarse aggregate along with 20% replacement of RHA has obtained 89.47%, for 25% it has obtained 84.21% and for 30% it has obtained 85.52%of conventional concrete. For 12.5mm coarse aggregate for 20% has obtained 94.64%, for 25% it has obtained 89.79%, for 30% of replacement it has obtained 85.96% of conventional concrete. Thus the study of replacement of RHA on pervious concrete shows, increases in size of coarse aggregate decreases the strength of concrete.

V. ACKNOWLEDGMENT

I wish to express my sincere thanks to the management, **Dr.T.P. Ganesan**, ProVice Chancellor (P&D) and **Dr.C. Muthamizhchelvan**, Director (E&T), SRM University for providing all the facilities for carrying out this work.
I express my heartfelt gratitude to **Dr. R. ANNADURAI,** Professor and Head, Project Coordinator **Dr.V.THAMILARASU,** Professor, and my Class advisor **Ms.M.INDIRA** Assistant Professor (O.G), Department of Civil Engineering SRM University of their consistent encouragement, valuable guidance, timely suggestions and support in successful completion of the project.
I express my deep love and warm regards to **My Parents** and **My Friends** for their support, constant encouragement and timely help.

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