COMPRESSIVE STRENGTH BEHAVIOR OF CONCRETE USING RICE HUSK ASH AS SUPPLEMENTARY TO CEMENT

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ABSTRACT

Throughout the world cement, mortar and concrete cubes are the most widely used construction material the expanded use of the technologist for its use in aggressive. Concrete is a composite material composed of aggregate bonded together with a fluid environments cement which hardens over time. Concrete refers to Portland cement concrete or to concretes made with other hydraulic cement, such as cement found. However, road surfaces are also a type of concrete, "Asphaltic concrete", where the cement material is bitumen. The main aim of the study is to select the most effective proportion of rice husk ash that can be used in replacing cement in concrete. In this study a total 45 no. of 4inch concrete cubes were casted with fresh water using water cement ratio 0.485 with different replacement level of cement (100:0, 95:5, 90:10, 85:15, and 80:20). Concrete cubes were tested for compressive strength at 3 days, 7days &28 days. The compressive strength of the various concrete specimens is observed to increase with the age of curing and decrease as the percentage of RHA content increase among the different concrete mix, the optimum partial replacement of RHA continent is found to be 10%.

Keywords: Rice Husk Ash (RHA); cement; water cement ratio; cubes; compressive strength

INTRODUCTION

Concrete is a composite material composed of coarse granular material (the aggregate or filler) embedded in a hard matrix of material (the cement or binder) that fills the space between the aggregate particles and glues them together. Concrete is the most widely used construction material in the world. It is used in many different structures such as dam, pavement, building frame or bridge. Also, it is the most widely used material in the world, far exceeding other materials**.** Rice husk ash is an industrial waste possess some of the cementing properties that can be economically utilized as the replacement of cement in producing concrete. RHA is collected from rice mills but it may be obtained using basket burner whereas rice husk burned at 250 degree centigrade temperature. RHA is a carbon neutral green product. Lots of ways are being thought for disposing them by making commercial use of this RHA. RHA is a good super-pozzolan. This super-pozzolan can be used in a big way to make special concrete mixes (Concrete –Chapter 5). There is a growing demand for fine amorphous silica in the production of special cement and concrete mixes, high performance concrete, high strength, low permeability concrete, for using in bridges, marine environments, nuclear power plants etc. This market is currently filled by silica fume or micro silica, being imported from Norway, China and also from Burma. Due to limited supply of silica fumes in Bangladesh and the demand being high the price of silica fume has risen to as much as US$ 500 ton in Bangladesh. From RHA we can manufacture organic micro-silica / amorphous silica, with silica content of above 89%, in very small particle size of less than 35 microns – Sillica-pozzolan for application in High Performance Concrete (Obilade, I.O.). The goal of the study is to reduce the construction cost as well as to utilize the environmental polluted material and also to introduce a new binding material as a partial replacement of cement which is environmentally benefitted.

METHODOLOGY

Out of many tests applied to the concrete, compressive strength test is the most important which gives an idea about all the characteristics of concrete. By this single test one judge that whether concreting has been done properly or not. In this study 4in. Cubes of concrete were used in this study. Casting and curing of concrete cubes have been completed by using fresh water. Various parameters have been used in this laboratory investigations such as concrete mix ratio: Cement-Sand-aggregate ratio is 1:1.5:3; Percentage of rice husk as a partial replacement of cement: 0%, 5%, 10%, 15%, 20%; Percentage of rice husk ash as a partial replacement of cement: 0%, 5%, 10%, 15%, 20%; Exposure period: 3 days, 7 days, 28 days. For mixing, water-cement ratio 0.485 has been used in this experimental work. At first some specimens were carried out from curing water in this study. Then each one was put in the open air for 24 hours for drying. After drying, the cubes were scaled by an inch scaled and then placed in the compressive strength testing machine. In the testing position, the cube was at right angles to the as-cast position so that the weaker and stronger parts (Parallel to one another) were extended from plate to plate. The load on the cube should be applied at a constant rate of stress equal to 0.2 to 0.4 Mpa/second (30 to 60psi/second). Finally, the data would be recorded which was got from compressive strength testing machine.

RESULTS AND DISCUSSIONS

Compressive strength values of test specimen's in compressive strength testing machine (for different mix ratio, curing period) have been shown in Table 1:

Table 1: Compressive Strength value of test Specimen

Rice Husk	Curing Period	3 days			7 days			28 days		
Plane	Compressive Strength(psi)	1690	1619	1619	1831	1690	1479	2816	3520	3661
	Average	1642.66			1666.66			3332.33		
5% Rice Husk Ash	Compressive Strength(psi)	1084	1549	1436	1513	1197	1408	2535	2323	3732
	Average	1356.33			1372.33			2863.33		
10% Rice Husk Ash	Compressive Strength(psi)	1619	1197	1338	1338	1831	2183	3943	4506	3732
	Average	1384.66			1784			4060.33		
15% Rice Husk Ash	Compressive Strength(psi)	1349	1319	1338	1253	1331	1842	2464	3661	3520
	Average	1335			1475			3215		
20% Rice Husk Ash	Compressive Strength(psi	1197	1056	774	1338	1127	1056	2064	3561	3520
	Average	1009			1173.67			3048		

Variation of compressive strength vs curing period and compressive strength vs different cement, rice husk ash ratio are given below:

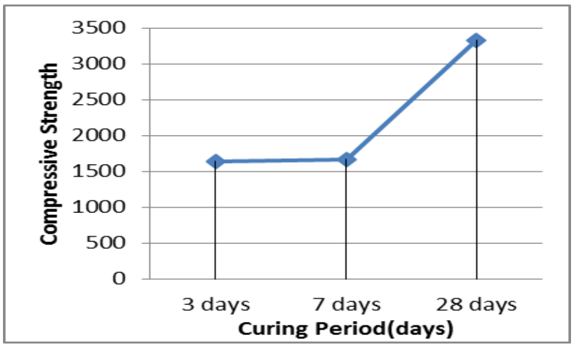

Fig. 1: Compressive Strength VS Curing Period relation for concrete specimen {C:RHA=100:0, Sand: Cement=1:1.5}

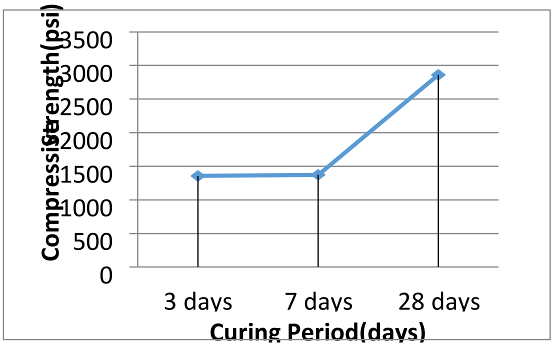

Fig. 2: Compressive Strength VS Curing Period relation for concrete specimen {C:RHA=95:5, Sand: Cement=1:1.5}

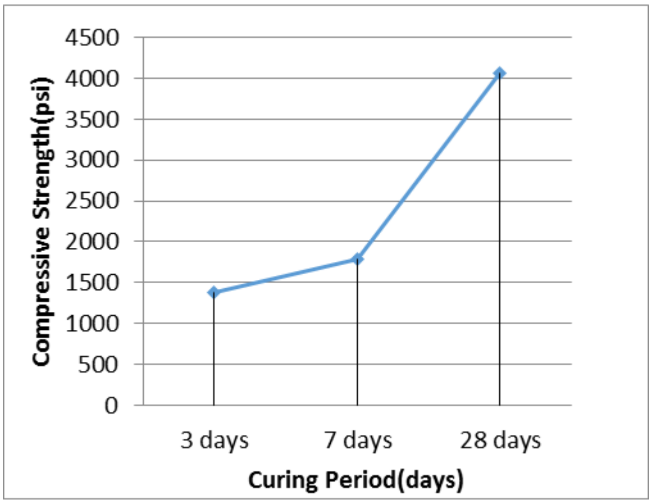

Fig. 3: Compressive Strength VS Curing Period for concrete specimen {C:RHA=90:10, Sand: Cement=1:1.5}

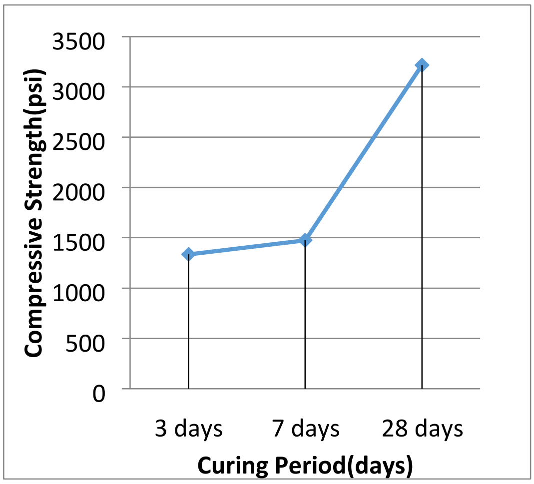

Fig. 4: Compressive Strength VS Curing Period for concrete specimen {C:RHA=85:15, Sand: Cement=1:1.5}

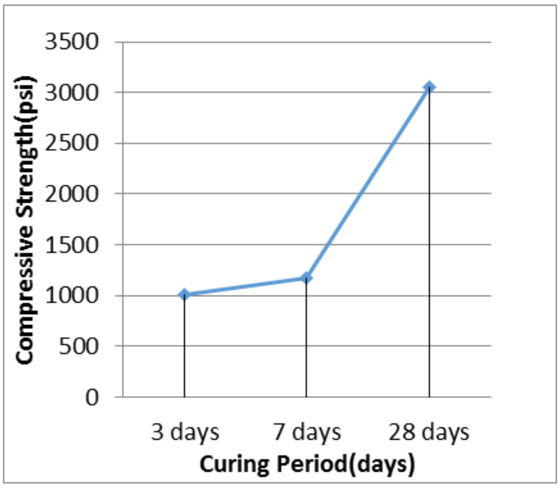

Fig. 5: Compressive Strength VS Curing Period for concrete specimen {C:RHA=80:20, Sand: Cement=1:1.5}

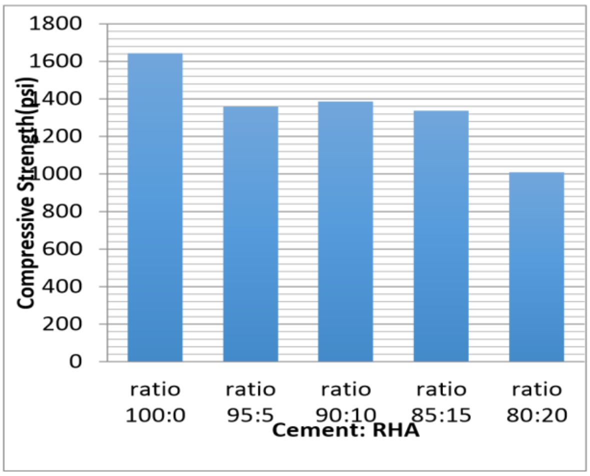

Fig. 6: 3 days compressive strength of concrete with various C:RHA ratio (Cement:Sand=1:1.5)

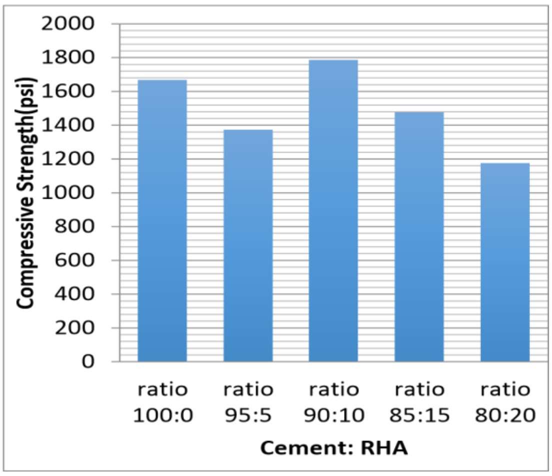

Fig. 7: 7 days compressive strength of concrete with various C:RHA ratio (Cement:Sand=1:1.5)

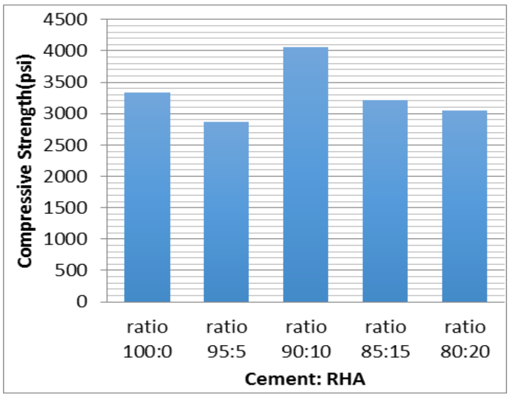

Fig. 8: 28 days compressive strength of concrete with various C:RHA ratio (Cement:Sand=1:1.5)

CONCLUSION

Based on studies following results are made: For all mixes the compressive strength of the specimen increases with the age of curing and decreases as the RHA content increases. The replacement of cement content of the mix by 10% RHA is very close and greater in some case to 100% cement mix with regards to its compressive strength. The optimum replacement level of cement with RHA is found as 10%.

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