EXPERIMENTAL INVESTIGATION OF PARTIAL REPLACEMENT OF CEMENT WITH MARBLE DUST AND RICE HUSK ASH IN MORTAR

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Abstract-This paper presents the study of mortar using Rice Husk Ash and Marble Dust. The problems of disposal of the Marble Dust and RHA are also sort out to some extent. Compressive strength test are conducted on Marble Dust and RHA mortar. The mortar with RHA and marble Dust in various percentage, then properties like compressive strength are studied. Compressive Strength Test will carry for all the mix proportions and for all the replacement For compressive strength test will testing for 7, 14 and 28 days for all the replacements. The studygiving comparative results for mortar compressive strength test. In this project we use mortar proportion 1:3, 1:4 and 1:5.

Key words-MarbleDust, Rice Husk Ash, compressive strength, sand.

I. INTRODUCTION:

The marble has been commonly used as a building material since ancient times. Disposal of the waste materials of the marble industry, consisting of very fine powders, is one of the environmental problems worldwide today. In India, natural river sand (fine aggregate) is traditionally used in mortars. Now-a-days the cost of material is increasing so if we use the waste material in the production of the mortar so we decrease the price. Wastes from marble industries are being released from marble cutting, polishing, processing and grinding. Exposing the waste material to the environment directly can cause environmental problems

Rice Husk Ash (RHA) is an agricultural waste product, and how to dispose of it is a problem to waste mangers. While mortar today has assumed the position of the most widely used building material globally. The ash collected was sieved through BS standard sieve size 75μm and its colour was grey. There is an increasing importance to preserve the environment in the present day world. This material is actually a super pozzolan. RHA use in the civil construction field may be a best solution to its disposal as waste on the environment. Both waste material using partial replacement of cement in mortar.

II. LITERATURE REVIEW

BabooRai, Khan Naushad (2011) studied the influence of marble powder in cement concrete mix. In this paper the effect of use of marble powder and granules has been studied by partially replacing with mortar and concrete constituents. And check the different properties like relative workability and compressive and flexure strengths. By partial replacing the constitution it reveals that increased waste powder or waste marble granules ratio result in increased workability and compressive strengths of the mortar and concrete. [1]

Shirule et al: studied the ―Partial Replacement of cement with Marble Dust Powder‖. It can be concluded that for M20 grade concrete The Compressive strength of Cubes are increased with addition of waste marble powder up to 10% replace by weight of cement and further any addition of waste marble powder the compressive strength decreases. The Split Tensile strength of Cylinders are increased with addition of waste marble powder up to 10% replace by weight of cement and further any addition of waste marble powder the Split Tensile strength decreases.[2]

Harunur&Keramatinvestigated the ―durability of cement mortar in presence of Rice Husk Ash (RHA)‖. The strength and durability of mortar with different replacement level (0%, 10%, 15%, 20%, 25% and 30%) of Ordinary Portland Cement (OPC) by RHA is investigated .It is concluded from the paper that the mortar incorporating rice husk ash is more durable than OPC mortar up to 20% replacement level. [3]

Maurice &Godwininvestigated the effects of partially replacing OPC with RHA . It is concluded that Adding RHA to concrete resulted in increased water demand, increase in workability and enhanced strength compared to the control sample. This results show that an addition of RHA from 5-10% will increase the strength. [4]

Kartini& Mahmud reported on the ―Improvement on Mechanical Properties of Rice Husk Ash Concrete with Super plasticizer‖. Without super plasticizer RHA concrete attained lower compressive strength than that of the control due to the higher amount of water for similar workability. RHA concrete improves the durability of concrete. It is concluded from the paper that by adding super plasticizer to the RHA mixes, higher replacement levels are possible. Concrete containing up to 30%RHA can attain strength of 30 N/mm2 at 28 days. [5]

DaoVan&PhamDuypresented several key properties of high strength concrete using RHA. RHAs obtained from two sources: India and Vietnam. India RHA was much better than that of the Vietnam RHA. The acceptable content is 10% to replace for cement with an acceptance of reduction in compressive strength. It is concluded that Rice husk is an abundant waste generated from agriculture product in Vietnam. Investigations in manufacturing high quality RHA in Vietnam is necessary.[6] **Ramezanianpour&khani**investigated ―The effect of rice husk ash on mechanical properties and durability of sustainable concretes‖. RHA replaced with cement by weight are 7%, 10% and 15%. Results show that concrete incorporating RHA had higher compressive strength, splitting tensile strength and modulus of elasticity at various ages compared with that of the control cement concrete. In addition, results show that RHA as an artificial pozzolanic material has enhanced the durability of RHA concretes and reduced the chloride diffusion.[7]

III. MATERIALS USED:

Under this experimental investigation, following materials are using which are given as below:-

- Cement
- Sand
- Rise husk Ash (RHA)
- Marble Dust

A. Cement: Grade: 43

Type: Ordinary Portland Cement

Table 1:- Properties of Cement:

Sr. No.	Physical Properties	Value
1	Specific gravity	3.14
2	initial setting time	155
3	Final setting time	270
4	Standard consistency	33%

B. Fine Aggregates:

The material which passed through I.S. Sieve No. 4.75mm is termed as fine aggregates. The source for fine aggregate used is form natural river bed. The fine aggregate used which have specific gravity of 2.62.

C. Rice Husk Ash:

Table 2:-Properties of Rice Husk Ash

Sr. No.	Particulars	Properties
1	Colour	Gray
2	Shape Texture	Irregular
3	Mineralogy	Non Crystalline
4	Particle Size	< 45 micron
5	Odour	Odourless
6	Specific Gravity	2.3
7	Appearance	Very fine

D. Marble Dust:

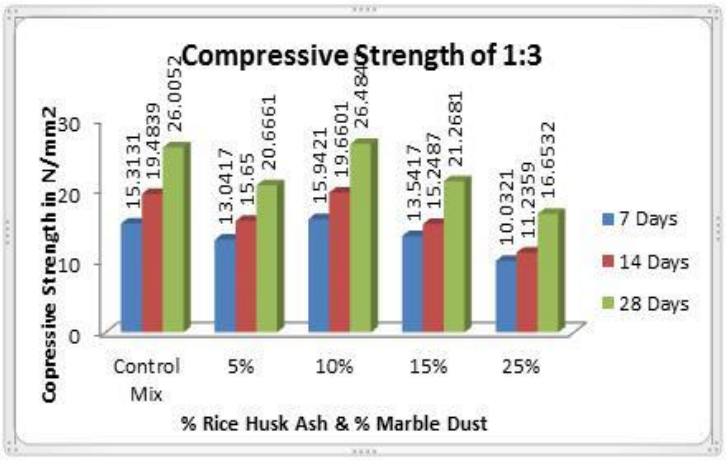
Table 3:- Properties of Rice Husk Ash

Sr. No.	Properties	Value
1	Colour	White
2	Form	Powder
3	Specific Gravity	2.64

IV. RESULT AND DISCUSSION:

Table:- Compressive Strength:

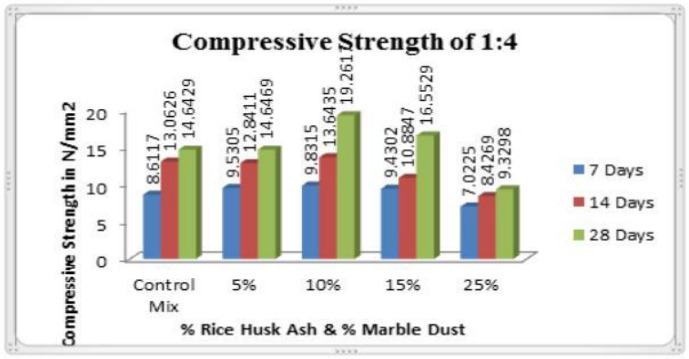
Sr. No.	Percent Replacement		Curing Days	Compressive Strength in N/mm2								
	RHA	MD		1:3			1:4			1:5		
				1	2	Avg	1	2	Avg	1	2	Avg
1	0%	0%	7 Days	17.5835	13.0426	15.3131	9.0418	8.1816	8.6117	5.8812	4.8209	5.3511
			14 Days	17.6435	21.3243	19.4839	13.0226	13.1026	13.0626	8.5817	9.7819	9.1818
			28 Days	25.1250	26.8854	26.0052	14.7229	14.5629	14.6429	10.0220	10.8821	10.4521
2	5%	5%	7 Days	12.0385	14.0449	13.0417	10.0321	9.0289	9.5305	7.0225	8.2263	7.6244
			14 Days	15.2487	16.0513	15.6500	12.0385	13.6436	12.8411	8.8283	8.0257	8.4270
			28 Days	19.2616	22.0706	20.6661	16.4526	12.8411	14.6469	12.0385	13.2424	12.6405
3	10%	10%	7 Days	16.4526	15.2487	15.9421	9.2295	10.4334	9.8315	8.0257	7.0225	7.5241
			14 Days	20.4655	18.8603	19.6601	14.0449	13.2423	13.6435	9.2295	10.0321	9.6308
			28 Days	26.4801	25.6821	26.4847	18.4591	20.0642	19.2617	12.0385	14.0449	13.0417
4	15%	15%	7 Days	12.0385	14.0449	13.0417	8.8283	10.0321	9.4302	9.6308	12.8411	11.2359
			14 Days	14.0449	16.4526	15.2487	11.2359	10.5334	10.8847	16.4526	12.0385	14.2456
			28 Days	20.4654	22.0706	21.2681	13.0417	20.0642	16.5529	18.0578	16.0514	17.0546
5	25%	25%	7 Days	9.6308	10.4334	10.0321	8.0257	6.0193	7.0225	8.0257	7.6244	7.8251
			14 Days	12.4398	10.0321	11.2359	8.0257	8.8282	8.4269	8.2263	8.4269	8.3266
			28 Days	19.2616	14.0449	16.6532	9.0288	9.6308	9.3298	7.6244	9.2295	8.4269



Observation:

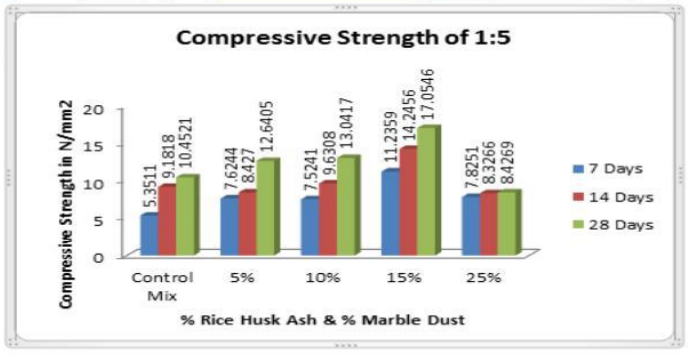
From this graph we can concluded that, the compressive strength of 1:3 proportion of mortar for mix proportion 10% of rice husk ash and marble dust is maximum than control mix.

The strength increased as compare to control mix. After increasing the percentage of RHA & MD in mortar the strength is reduced.



Observation:

In this graph we can see that the 10% of rice husk ash and marble dust the compressive strength is maximum than the control mix. After that increase the percentage of rice husk ash and marble dust the compressive strength is reduced.

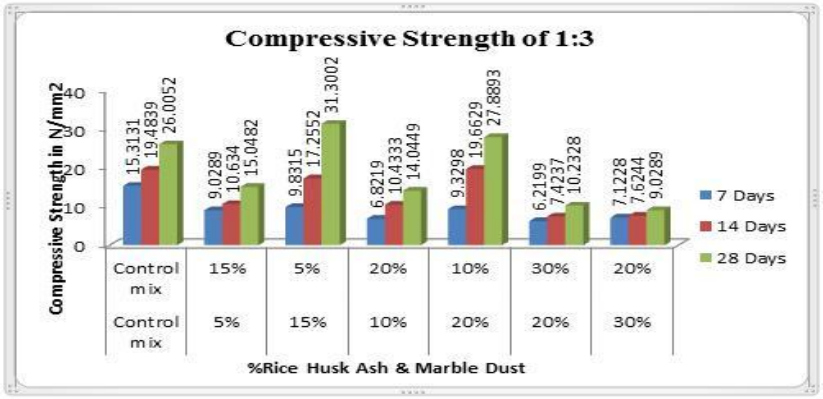


Observation:

In this graph we can see that the 10% and 15% of rice husk ash and marble dust the compressive strength is maximum than the control mix. After that increase the percentage of rice husk ash and marble dust the compressive strength is reduced.

Table:-Compressive Strength:

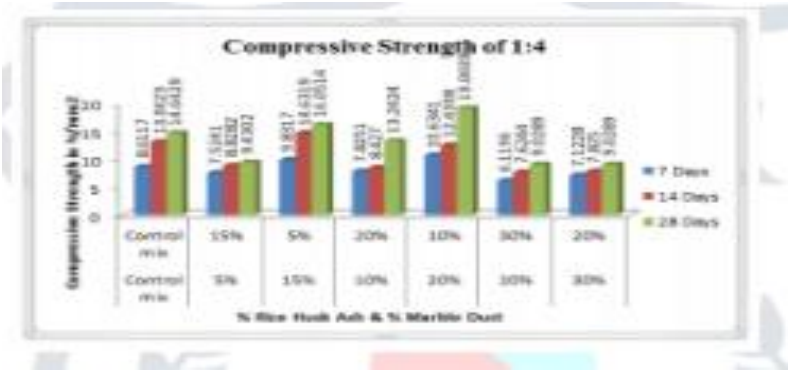
Sr. No.	Percent Replacement RHA	Percent Replacement MD	Curing Days	Compressive Strength in N/mm2 1:3			1:4			1:5		
				1	2	Avg	1	2	Avg	1	2	Avg
1	0%	0%	7 Days	17.5835	17.6435	17.6135	9.0418	8.1816	8.6117	5.8812	4.8209	5.3511
			14 Days	13.0426	21.3243	17.1835	13.0226	13.1026	13.0626	8.5817	9.7819	9.1818
			28 Days	25.1250	26.8854	26.0052	14.7229	14.5629	14.6429	10.0220	10.8821	10.4521
2	15%	5%	7 Days	10.0321	8.0257	9.0289	7.0224	8.0257	7.5241	6.0193	7.2231	6.6212
			14 Days	10.0321	11.2359	10.6340	9.2295	8.4269	8.8282	8.0257	7.6244	7.8251
			28 Days	16.0514	14.0449	15.0482	10.0321	8.8283	9.4302	8.4269	9.2295	8.8282
3	5%	15%	7 Days	11.2360	8.4270	9.8315	9.2295	10.4338	9.8317	10.0321	8.0257	9.0289
			14 Days	18.0578	16.4526	17.2552	19.2316	10.0321	14.6319	9.6308	12.4398	11.0303
			28 Days	32.1027	30.4976	31.3002	20.0642	12.0385	16.0514	18.0578	10.4338	14.2458
4	20%	10%	7 Days	7.2231	6.4205	6.8219	7.6244	8.0257	7.8251	6.4205	6.4205	6.4205
			14 Days	9.2295	11.6372	10.4333	9.6308	7.2231	8.4270	7.6244	8.4270	8.0257
			28 Days	16.0514	12.0385	14.0449	14.0449	12.4398	13.2424	12.0385	10.6340	11.3363
5	10%	20%	7 Days	8.4270	10.2327	9.3298	11.2360	10.0321	10.6341	7.6244	8.4270	8.0257
			14 Days	20.4664	18.8603	19.6619	12.0385	12.8411	12.4398	11.6372	7.6244	9.6308
			28 Days	28.0899	27.6886	27.8893	18.0577	20.0642	19.0609	16.0514	14.0449	15.0482
6	30%	20%	7 Days	6.4205	6.0193	6.2199	5.0161	7.2231	6.1196	5.2167	6.4205	5.8186
			14 Days	6.4205	8.4269	7.4237	6.4205	8.8283	7.6244	6.4205	7.4238	6.9222
			28 Days	11.6372	8.8283	10.2328	9.6308	8.4269	9.0289	8.0257	9.2295	8.6276
7	20%	30%	7 Days	6.2199	8.0257	7.1228	7.2231	7.0225	7.1228	7.2231	8.0257	7.6244
			14 Days	7.2231	8.0257	7.6244	7.2231	8.4269	7.8250	7.8250	8.0257	7.9254
			28 Days	9.6308	8.4269	9.0289	8.8283	9.2295	9.0289	8.0257	8.4269	8.2263



Observation:

From the above results we found that the compressive strength is better with replacement at 10%RHA and 20% MD.

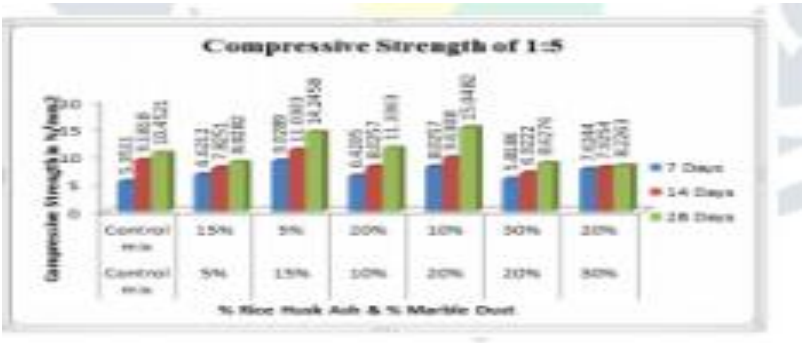
- The strength of mix proportion at 7 days is decreased as compared to control mix.
- The strength of mix proportion at 14 days is increased as compared to control mix.
- The strength of mix proportion at 28 days is increased as compared to control mix



Observation:

From the above results we found that the compressive strength is better with replacement at 5% and 15% of RHA and MD

- The strength of mix proportion at 7 days is increased as compared to control mix.
- The strength of mix proportion at 14 days is increased as compared to control mix.
- The strength of mix proportion at 28 days is increased as compared to control mix



Observation:

From the above results we found that the compressive strength is better with replacement at 5% of RHA and 15% of MD and, 10% RHA and 20% MD.

- The strength of mix proportion at 7 days is increased as compared to control mix.
- The strength of mix proportion at 14 days is increased as compared to control mix.
- The strength of mix proportion at 28 days is increased as compared to control mix

V. CONCLUSION:

1. The rice husk ash and marble dust waste can be utilized in mortar and hence solve a potential disposal problem and might be cost effective because this material is available in waste. By use of this aspect we can convert waste into wealth.
2. The compressive strength of cube with addition of 10% of Rice Husk Ash and Marble Dust is maximum than the compressive strength of control mix.
3. The compressive strength of cube for 14 days and 28 days with addition of 10% RHA and 20 % MD is maximum than the compressive strength of control mix, but 7 days of compressive strength is minimum than the control mix.
4. The use of rice husk ash and marble dust in construction might be cost effective because the RHA is by product of agricultural so its cost is negligible and MD waste is available at halt the rate of cement.
5. Increasing the proportion of marble dust 20% gives higher compressive strength but gives adverse effect for rice

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