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AN EXPERIMENT INVESTIGATION ON RICE HUSK AS PARTIAL REPLACEMENT OF SAND IN CONCRETE

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Abstract - *The main objective of this study is to utilize the rice husk in concrete to enhance the physical and mechanical property of the concrete. As rice husk is an natural abundant material this can also be used in concrete by replacing fine aggregate. In this investigation rice husk is added 10%,20% and 30% instead of natural sand. The demand for sand is increasing day by day as natural sand is used for all construction work. Rice husk can be examined for physical and chemical parameters compare with natural sand and can be replaced for natural sand.The maximum strength was attended at 20% replacement of fine aggregate by rice husk.*

KEYWORDS:-Rice husk, Fine Aggregate, Physical and Mechanical Parameters, Alternative Construction materials.

1. INTRODUCTION:-

Due to increase in demand for construction (like houses, dams etc) new technique has been developed and they are more effective and have excellent properties. This project deals about the organic waste ie. Rice husk which are used as a replacement for fine aggregate. As there is demand for conventional construction materials there is a need to find an alternative construction technique. One of the main reason for choosing rice husk is it is environmental friendly, pollution free and does not harm anything related to environment. These are just the waste which are not considered as they are the covers of rice with diameter 1.60mm, Density=564 kg/m^3, Specific gravity 0.4 and the main part water absorption which is 123.7%. But still there are areas were rice husk is not used ie., is just simply dumped in water or being burned. Using these cheaply or free material which are available in very large amount in our environment which can have a very useful work in concrete. These materials when used in concrete with different percentage

ie.10%, 20%, 30% does not only increase the structure but also helps in keeping a proper maintaince of environment by using waste materials as a part in concrete. But this is not an easy task to take any materials as a waste material while considering this the main focus is to check its different parameters like physical, chemical, and mechanical parameters. Using these environmental waste contributes to both economical and working knowledge. Using these environmental resources helps in balancing the ecosystem and to maintain a sustainable balance. By using these properties there are many properties which make it better like weight replacement so it will be light weight, replacement of volume which is being occupied by fine aggregate ie.rice husk and many other factor. So this is a very good contribution to the concrete as they are cheaply available in rice cultivation area. So using Rice husk in concrete provides a light weight concrete and definitely a low cost concrete. The main focus of this investigation is to examine the properties related to engineering, their causes and their effect on concrete.

2. EXPERIMENTAL INVESTIGATION

2.1 MATERIALS USED:-

- **Cement:-**

The cement used in this investigation is Ordinary Portland Cement of Grade 53 confirming to IS 12269-1987 was used for this investigation. The specific gravity is 3.12, Initially Setting time 35min and Fineness Modulus is 1.5% respectively

- **Fine Aggregates:-**

Natural sand:

These are locally available river sand conforming to grading zone-II as per IS: 383-1970 dried, cleaned respectively.

Table 1: PROPERTIES OF RIVER SAND

TEXTURAL COMPOSITION	%BY WEIGHT
Coarse sand (4.75-2.00mm)	6.6
Medium sand (2.00-.425mm)	73.6
Fine sand (.425-.075mm)	19.8

TABLE:2 PHYSICAL PROPERTI

PHYSICAL PROPERTIES	Natural Sand
Appearance	Grainy and White
Specific Gravity	2.78
Bulk Density	2.7g/cc
Water Absorption	2.3%

Table 3: THE PHYSICAL PROPERTIES OF RICE HUSK

PROPERTIES	VALUES
Diameter (mm)	1.60
Aspect ratio	12.5
Density (kg/m^3)	564
Specific Gravity	0.4

2.2 COURSE AGGREGATE:-

Normally available coarse aggregate which are quarried with specific gravity 2.7 and having a 0.3% of water absorption and maximum size of 20mm aggregate.

2.3 WATER:-

Water used was normal water from the tap which was free from salt and conforming the requirement of IS: 456-2000.

2.4 MIX PROPORTION AND MIX DESIGN

In this experiment the mix proportion is calculated for M20 grade of concrete for w/c ratio of 0.50 respectively by using IS: 10262:2009 method of mix design. Maintaining a constant w/c ratio for control mix and by replacing 0,10%,20% and 30% of rice husk in concrete is as shown in the table below:

Table 4: MIX PROPORTION

MIX NO:	MIX DESIGN	W/C RATIO	CEMENT (kg/m³)	FINE AGGREGATE (kg/m³)		COARSE AGGREGATE (kg/m³)	WATER (kg/m³)
				NATURAL SAND	RICE HUSK		
M1	Conventional Concrete	0.5	384	794	0	1076	192
M2	10% of rice husk & 90% of OPC	0.5	384	714.6	79.4	1076	192
M3	20% of rice husk & 80% of OPC	0.5	384	635.2	158.8	1076	192
M4	30% of rice husk & 70% of OPC	0.5	384	555.8	238.2	1076	192
Moisture Content		1.3%					

2.5 RISK HUSK: The main constituent in the concrete on which the investigation was fully done was rice husk. These are obtained from paddy waste.

2.6 TEST RESULTS

The test conducted for fresh and hardened concrete for various mix from M1 to M4 results are listed below.

2.7 FRESH CONCRETE

The tests for fresh concrete are Slump Cone test, Compaction Factor, Vee Bee Consistency and Flow. Below table is shown for this experimental investigation and the results are as follows

Table 5: WORKABILITY TEST RESULT

Mix No:	Slump (mm)	Compaction factor (%)	Vee Bee (sec)	Flow%
M1	78	0.87	8.6	37
M2	82	0.84	9	36
M3	85	0.88	9.4	36
M4	76	0.85	9.6	34

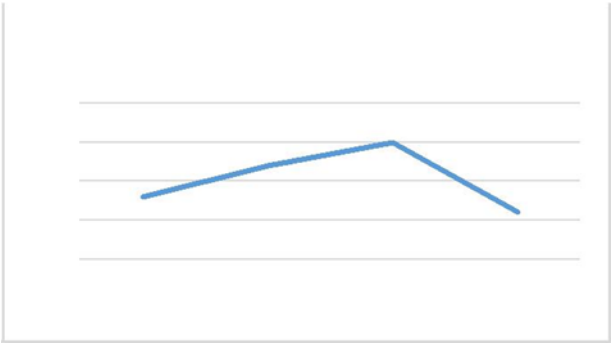

Fig 1: Slump cone test graph

Fig 2: Compaction factor test graph

Fig 3: Vee Bee Test

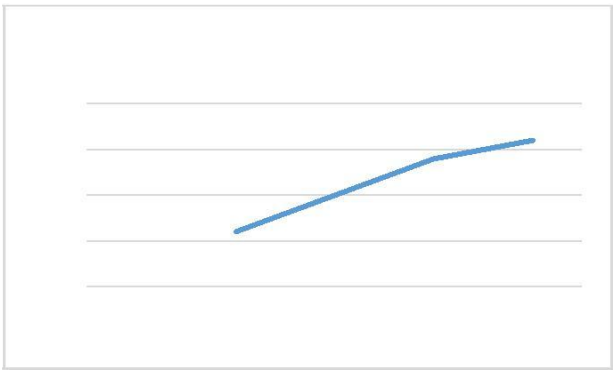

Fig 4: Flow Test

Fig 5: Compression Test

2.8 HARDENDED CONCRETE:

The hardened concrete is tested after 7,14,28 days for compression test, split tensile strength and the dimensions are 150mm cube, 150 x 300mm of cylinder were casted and the following results are as follows

Table 6: COMPRESSION TEST

MIX NO	COMPRESSION STRENGTH (N/mm²)		
	7 DAYS	14 DAYS	28 DAYS
M1	16	19.50	23.25
M2	18	23.54	27.8
M3	20	25.62	30.64
M4	19	23.72	28.72

Table 7: SPLIT TENSILE STRENGTH TEST

MIX NO	COMPRESSION STRENGTH (N/mm²)		
	7 DAYS	14 DAYS	28 DAYS
M1	1.6	1.93	2.45
M2	1.6	2.08	2.67
M3	1.8	2.0	2.54
M4	1.7	2.1	2.2

COMPRESSION STRENGTH

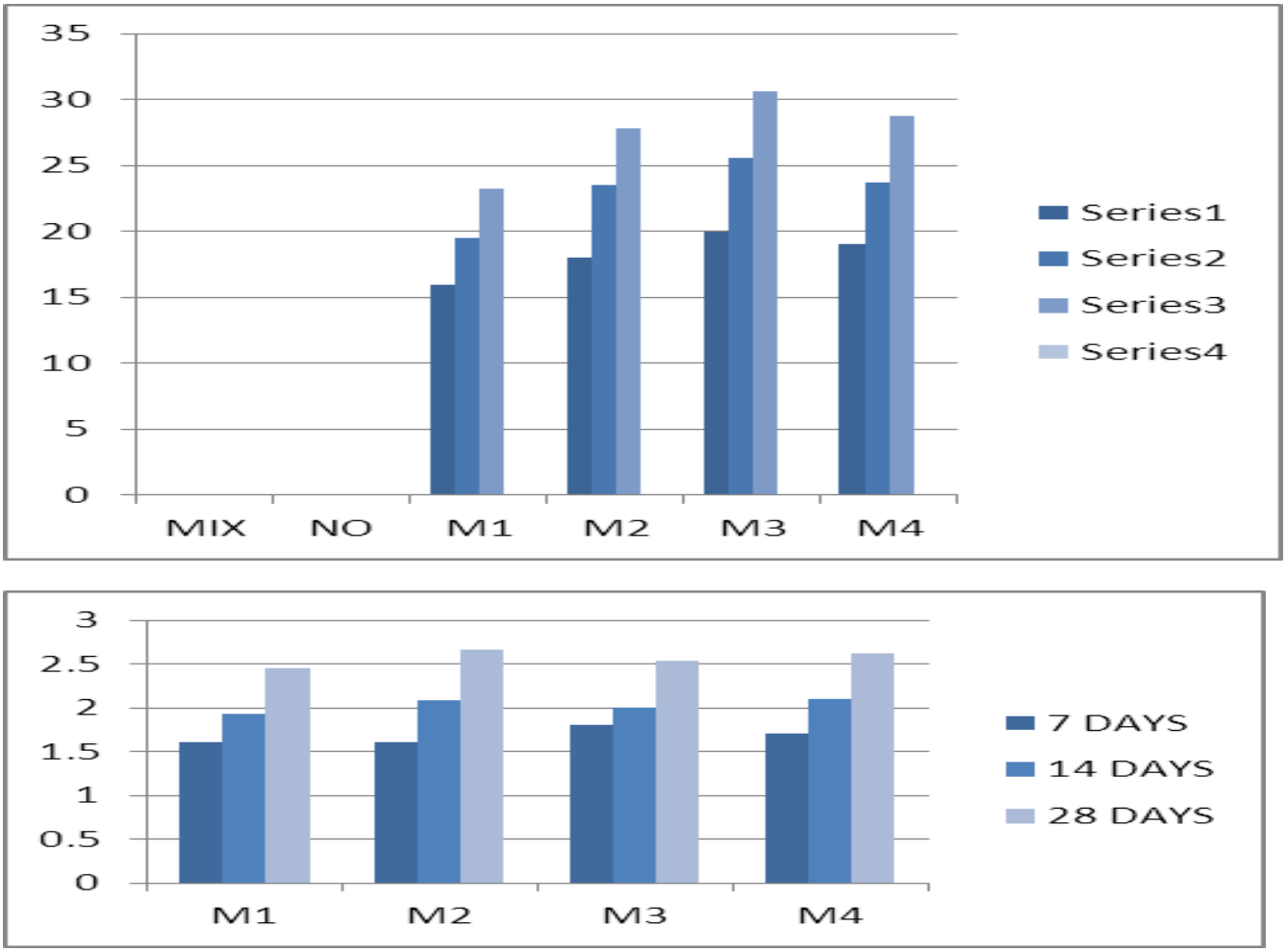

FIG6: SPLIT TENSION STRENGTH

3. RESULTS AND DISCUSSION: -

Rice husk can be used as alternative material for the partial replacement of fine aggregate. Rice husk can be replaced up to a max of 20% so that it gives a highest strength at 28 days compare to normal concrete with M20 mix.

- By replacing fine aggregate with 20% of rice husk gives the maximum strength as compared to conventional concrete. At 28 days the compressive strength was 30.64% when concrete was replaced by rice husk for 20% as fine aggregate as compared to conventional concrete which gave the strength of 23.25% at the 28 days.
- Similarly for split tensile strength test the strength increased for 20% replacement of rice

4. CONCLUSION: -

- An eco-friendly construction material is identified.
- Rice husk can be used without damaging the environment.
- By using rice husk sand usage can be minimized and thus these sands are thus conserved.
- Thus rice husk can be used for the construction of concrete

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