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ANALYSIS OF RICE HUSK ASH AS A SECOND STRINGER OF CEMENT IN CONCRETE STRUCTURE

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Abstract - *Due to rapid growth in population, some technologies are made for usage of waste and to reduce cost in industrial processing by using rice husk ash as a good material to partial replace cement. Rice husk act as adsorbent for removing heavy metals from wastewater. In mostly countries of the world biomass used for bioethanol production because it is a renewable and environment friendly fuel. In present study we use RHA at 7, 14, 21 and 28 % by replacing it with cement. My work included to find various properties like compressive strength, flexural strength, consistency, initial & final setting time etc. and to find outs how different contents of Rice Husk Ash added to concrete may influence its physical and mechanical properties. Sample Cubes were tested with different percentage of RHA replacing in mass the cement. Due to the pozzolanic reactivity, rice husk ash (RHA) used as supplementary cementing material in mortar and concrete and has demonstrated significant influence in improving the mechanical and durability properties of mortar and concrete. It has economical and technical advantages to use in concrete.*

Key Words: **Rice husk ash, Compressive Strength, Concrete, Flexural Strength**

1.INTRODUCTION

The population increase more generated source and waste, one of source is need shelter used to cement, 1 ton generated cement approximately 0.6 ton CO_2 gas emission produced ,which causes to global warming 7% Total produced CO_2 gas emission in atmosphere, reduces CO_2 gas emission is cement replacing some waste or ash, used waste in concrete. Waste as well as controlled to pollution. One of the major causes of CO_2 emission in the world is caused by construction. This is due to the fact that the construction industry uses untreated materials which are considered as major elements in generating noise, dust and considerable amount of waste. Furthermore, the production and use of concrete has an enormous environmental effect this is because Cement is an energy consumer and CO_2 fabricated material.

1.1 Rice Husk Ash

Rice milling generates a by-product known as husk. This surrounds the paddy grain. During milling of paddy about 78% of weight is received as rice, broken rice and bran. Rest 22% of the weight of paddy is received as husk. This husk is used as fuel in the rice mills to generate steam for the boiling process. This husk contains about 75% organic volatile matter and the remaining 25% of the weight of this husk is converted into ash during the firing process, known as Rice Husk Ash (RHA).

1.2 Objectives

1) To determine the effect of rice husk ash on the compressive and flexural strength of concrete.
2) To study the effect of rice husk ash in concrete when mix design.
3) To study the effect of rice husk ash on workability of concrete.
4) To study the some physical property like initial setting time, final setting time, consistency etc.

2. LITERATURE REVIEW

Salas et al. 1986 The low strengths achieved, even with negligible proportions of husk, of 22.96% and 32.4% should be noted. One possibility put forward for achieving greater strengths with the same proportion of husk is to only substitute sand, instead of sand and gravel.
(Rao et al. 2012) showed that the unconfined compressive strength of the expansive soil has been increased by 48% with addition of 20% RHA+5% lime + 3% Gypsum after 28 days curing. It was also noticed that the CBR value of the expansive soil was increased by 1350% with the addition of 20% RHA+5% lime + 3% Gypsum after 14 days curing
(Ramesh et al. 2016) showed that the compressive strength of blended concrete with replacement of RHA increase up to optimum level of 25 percentages. Also the workability will be reduced due to crystalline nature of RHA, so that to increase workability of the concrete in requires high dosage of super-plasticizers.

3. EXPERIMENTAL PROGRAMME

The experimental program are carried out with an objectives to study the effects of using rice husk partial replacement of cement, and also to study the effects of using rice husk cement on the performance of concrete. To achieve these objectives, two major experiments were designed. The experiment was done to determine the effects of replacing part of Ordinary Portland cement with rice husk ash with different percentage on various properties of cement such as water requirement or normal consistency, setting time, soundness, compressive strength and flexural strength.

3.1 Material Used

Concrete is a variable material. It is not practical to expect that the characteristics of a concrete mix can be identically replicated on a consistent basis. One of the main reasons for the variability in the concrete is because of the variability in the materials used to make the concrete. The basic constituents of ordinary Portland cement concrete are:

1) Cement
2) Rice Husk Ash
3) Water
4) Fine aggregate
5) Coarse aggregate

3.2 Tests on Materials

Tests on Portland pozzolona cement with rice husk ash as an additive in various percentages are:

1) Consistency test
2) Soundness test
3) Setting time test
4) Specific gravity test
5) Particle Size Distribution
6) Slump test
7) Compressive strength test
8) Flexural Strength Test

Five Samples of 0, 7, 14, 21 and 28% of rice husk ash is used as partial replacement of cement is prepared as shown below

3.3 Consistency Test

The basic aim is to find out the water content required to produce a cement paste of standard consistency as specified by the IS: 4031 (Part 4) – 1988. The principle is that standard consistency of cement is that consistency at which the Vicat plunger penetrates to a point 5-7mm from the bottom of Vicat mould.

Apparatus:- Vicat Apparatus Conforming to IS: 5513-1976, Balance of capacity 1Kg and sensitivity to 1gram, Gauging trowel conforming to IS: 10086-1982.

Fig -1: Vicat Apparatus

3.4 Workability of Concrete Specimens

Workability is the property of freshly mixed concrete that determines the ease with which it can be properly mixed, placed, consolidated and finished without segregation. Workability depends on water content, aggregate, cement content and age and can be modified by adding chemical admixtures. The workability of fresh concrete was measured by means of the conventional slump test as per IS: 1199-1989. Before the fresh concrete was cast into moulds, the slump value of the fresh concrete was measured using slump cone.

Fig -2: Slump Test Apparatus

3.5 Compression Test

The compressive strength test is the most common test which is conducted on the hardened concrete, partly because it is easy to perform and partly because of desirable characteristic properties is qualitatively related to compressive strength. For compressive strength testing 150mm X 150mm X 150mm cubes are casted from the reference mix and kept in a curing pound up to 28-days. The specimens are tested after 7-days, 14-days and 28-days, using a calibrated compressive strength testing machine of 2000KN capacity as per IS: 516-1959.

Compressive strength of concrete = P/A

Where,
P= load at failure of cube,
A= cross-section area of cube

Fig -3: Compressive Strength Test Machine

4. ANALYSIS OF RESULTS AND DISCUSSION

An Experimental study on the behavior of rice husk ash based concrete has been conducted for various loading conditions. The results of the present investigation are compared with the other investigation. A good agreement between the compression, workability test and flexural strength has been obtained. The results of the present investigation are discussed under the following heads

4.1 Consistency Test

Normal consistency tests, for the blended cements, are conducted, by Vicat apparatus, to observe the changes in water requirement of pastes due to the presence of rice husk ash . Test result on cement paste replaced with rice husk ash is show in table given below. In present study no. of sample casted are big in number so it is decided to nomenclature each sample with particular code.

Table -1 Consistency of Rice Husk Blended Cement Pastes

S. No.	Code	Consistency (%)
1	MIX 1	30
2	MIX 2	32.5
3	MIX 3	35
4	MIX 4	35.5
5	MIX 5	32

From the above table we find there is variation on cement paste up to 21% of addition of rice husk ash and after more addition there is no change in consistency. The above change in consistency at initial stage is due the particle size of rice husk ash. The particle size of rice husk ash is less as compare to cement so it fill maximum voids of the paste, which help in increase in consistency of the paste.

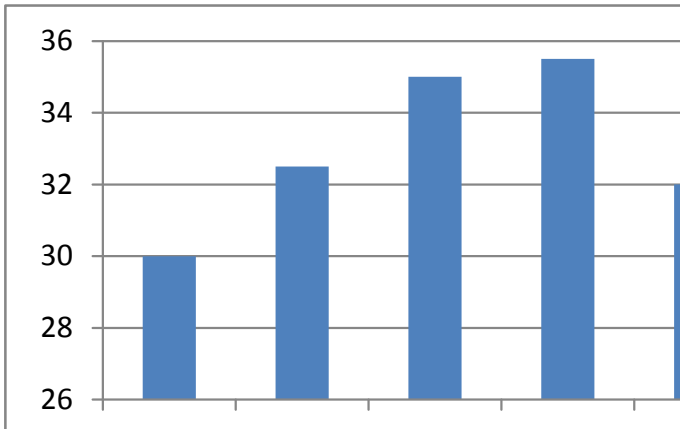

Figure -4: Consistency Graph

4.2 Workability Test

The test result of workability show that there is some increment in workability of concrete after addition of rice husk ash. There is some decrease in workability till 21 % addition of rice husk ash after more addition of this waste increase in concrete workability.

Table -2 Workability Test Result

Mix Designation	Slump Value (mm)
MIX 1	85
MIX 2	75
MIX 3	70
MIX 4	60
MIX 5	65

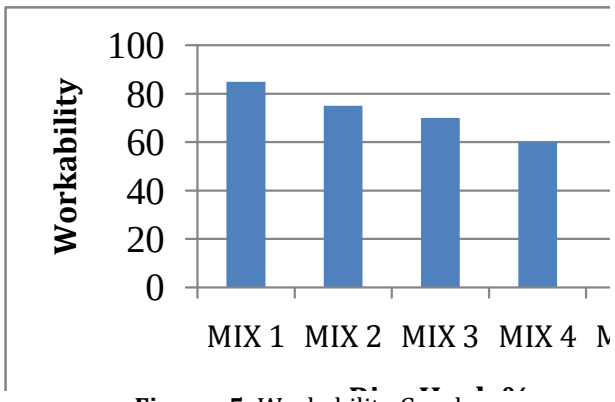

Figure -5: Workability Graph

4.3 Compressive Strength

The unconfined characteristic compressive strength is generally the foremost specification for concrete. It is also usually the most important property of the concrete. Whether it is the primary consideration of a concrete mix or not the compressive strength is always specified and tested, to a high standard of quality control. Not only is the compressive strength an important test it is also generally considered the most easily obtained test for hardened concrete on site, thus most preferable.

Table -3: Detail of compressive strength of mixes

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Rice husk ash content	Mix designation	7 day N/mm²	14 day N/mm²	28 day N/mm²
0	MIX 1	26	33.5	39.8
7%	MIX 2	28	34.8	40.7
14%	MIX 3	29.8	35.8	44.3
21%	**MIX 4**	**28.1**	**36.7**	**45.5**
28%	MIX 5	27.5	34.2	42.2

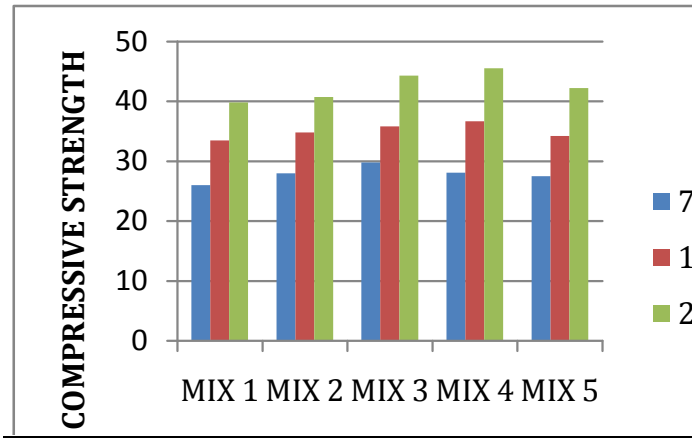

Figure -6: Comparison of Compressive Strength for various mix

5. CONCLUSIONS

Present investigation was undertaken to study the effect of rice husk ash on strength characteristic strength of concrete. To achieve the objectives of the present study, the cement were replaced 7%, 14%, 21% and 28% respectively. The compressive strength and the flexural strength test were determined for the mixes at the curing age of 7 days, 14 days and 28 days. The results obtained for the above mixes were compared to investigate the effects of partial replacement of cement by rice husk ash on the above strength parameters of concrete. The conclusion drawn from this study is presented in this chapter

5.1 CONCLUSIONS

Based on the results obtained in the present investigation, the following conclusion can be drawn. The results obtained in the present study indicates that it is feasible to replace the cement by rice husk ash for improving the strength characteristics of concrete, thus the rice husk ash can be used as an alternative material for the production of concrete to address the waste disposal problems and to minimize the cost of construction with usages of rice husk

1) The Experimental work shows that properties of concrete M35 gets improved due to incorporation of rice husk ash.
2) M35 concrete produced from cement replacement upto 21% rice husk ash leads to increase in compressive strength of concrete at the end of 7, 14 & 28 days respectively. Beyond 21% there is a decrease in compressive strength of concrete.
3) M35 concrete produced from cement replacement upto 21% rice husk ash leads to increase in flexural strength of concrete at the end of 7, 14 & 28 days respectively. Beyond 21% there is a decrease in flexural strength of concrete.
4) It can be concluded that the workability of fresh concrete is 85 mm and the workability of concrete is decrease as the percentage of rice husk ash upto 21% after more addition there is increament in workability of concrete

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