

Behaviour of Cement Concrete using Rice Husk As A Replacement of Fine Aggregate

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Abstract— Concrete is one of the widely used construction material nowadays. The concrete is a mix of fine aggregate, coarse aggregate and cement. For increasing strength of concrete as well as reduce the cost of concrete the replacement of fine aggregate is done with chopped rice husk and plastic fiber. Then the concrete is tested with compression test and checked whether the desired strength is achieved or not. By using rice husk and plastic fiber which are cheap and readily available and gives strength to concrete. By this we can use this kind of concrete for the building to reduce the cost of concreting.

Keywords: Concrete, Fine aggregate, Rice husk

I. INTRODUCTION

Concrete is one of the basic component in the field of construction. The concrete has very high strength which makes the building strong. The concrete contains the fine aggregate, coarse aggregate, cement and admixtures. Nowadays the material cost for concreting is increased due to many factors. So many people are suffering due to the increase in the cost of concreting. So for reducing cost new innovative ideas are used and that is by using the chopped rice husk and plastic fibre as replacement material for the fine aggregate. The rice husk is mostly available from the paddy field in bulk amount and available in cheap price. So by using these materials and replacing the fine aggregate with these materials by following suitable Indian Standard codes. So by using these components we can reduce the cost of concrete and economical constructions can be practised through out.

II. LITERATURE REVIEW

The studies bring about the salient points of published literatures and other reported works.

Mochmad solikin, Naufal ikhsan: study characteristics of brick made by partial substitution of fine aggregate with Styrofoam. partial substitution of fine aggregate with styrofoam in proportion of 0%, 30%, 40% & 50%. meets slump properties with appropriate superplasticizers. Increase water absorption, decrease compressive strength & structural strength but reduce dead weight

VARUN YADHAV, NITHIN RAJPUT: To find the strength absorbance of brick constructed using plastic rice straw and fly ash. The purpose is to identify the change of characteristic of brick when the waste and fine aggregate are replaced with other material. Adding more waste plastic & chopped rice straw would result in high compressive strength, high water absorption

RAVI KIRAN, RAJKAMAL D H, RAHUL M: To replace plastic with some other fine aggregates, to provide low cost cement brick in market, to increase life of brick.

Minerals: Cement sand water gravel. PET plastic
Concrete mix: Portland cement, msand gravel, water, PET plastic. By using plastic we can reduce plastic waste. Reduce clay in brick. Less water absorption.

III. OBJECTIVES OF WORK

- To reduce the cost of concrete for economic construction.
- To increase the strength of concrete.
- To reuse the waste rice husk to reduce the pollution

IV. METHODOLOGY

The rice husk being collected from the paddy field And other components like fine aggregate ,course aggregate, cement and admixtures. The design mix of m25 grade is been prepared in the proportion of **1:1.67:2.76** using IS-10262-2019. Then the percentage of rice husk is been prepared as follows **0%,0.5%,1%,1.5%,2%,2.5%**(IJET-2021). The concrete cube is prepared with mould in different proportion and kept it for curing for 7 days and 28 days. And after the curing period the concrete cube being tested using compression test machine.

V. MATERIALS USED

The materials used are:

- Fine aggregates
- Course aggregate
- Cement
- Rheoplast



Fig1: Chopped rice husk

VI. MIX DESIGN

Target strength(m25)

$$F_{ck}' = f_{ck} + 1.65S$$

$$= 25 + (1.65 \times 4)$$

$$= 31.6 \text{ N/mm}^2$$

Selection of water cement ratio

For 31.6 N/mm² W/c=0.45

For 20mm size aggregate water content =186L

$$\text{Cement content} = 186 \div 0.45 = 413 \text{ kg/m}^3$$

Proportion of volume of Course aggregate and fine aggregate

For w/c 0.5, volume of CA=0.62

But in the present case it is "0.45"

To lower the w/c by 0.45, by 0.005

The volume of CA is increased by 0.01

$$\text{Therefore the volume of CA} = 0.62 + 0.01 = 0.63$$

$$\text{Volume of FA} = 1 - 0.63 = 0.37$$

$$\text{Total volume} = 1 \text{ m}^3$$

$$\text{Volume of entrapped air in wet concrete} = 0.01 \text{ m}^3$$

$$\text{Volume of cement} = (\text{mass of cement} \div \text{sp cement}) \times (1 \div 1000)$$

$$= (413.33 \div 3.13) \times (1 \div 1000)$$

$$= 0.1248 \text{ m}^3 = 0.125 \text{ m}^3$$

$$\text{Volume of water} = (186 \div 1) \times (1 \div 1000)$$

$$= 0.186 \text{ m}^3$$

Volume of all in aggregate

$$= (a-b) - (c+d)$$

$$= (1 - 0.01) - (0.125 + 0.186)$$

$$= 0.99 - 0.311$$

$$= 0.679 \text{ m}^3$$

$$\text{Mass of CA} = 0.679 \times 0.63 \times 2.67 \times 1000$$

$$= 1142.14 \text{ kg}$$

$$\text{Mass of FA} = 0.679 \times 0.37 \times 2.75 \times 1000$$

$$= 690.8 \text{ kg}$$

For 1 cube

$$\text{Volume} = 0.15 \times 0.15 \times 0.15 = 0.0034 \text{ m}^3$$

$$\text{Volume of 4 cubes} = 0.0135 \text{ m}^3$$

$$10\% \text{ extra} = 0.0135 \times 1.1 = 0.0149 \text{ m}^3$$

$$\text{FA} = 10.412 \text{ kg}$$

$$0.5\% \text{ FA} = 0.0521 \text{ of rice husk}$$

$$\text{Therefore FA} = 10.359 \text{ kg}$$

$$1 \text{ m}^3$$

$$\text{Cement} = 413.3 \text{ kg}$$

$$\text{Water} = 186 \text{ L}$$

$$\text{CA} = 1142.14 \text{ kg}$$

$$\text{FA} = 698.3 \text{ kg}$$

$$w/c = 0.45$$

VII TESTS TO BE CONDUCTED

The test conducted for the concrete cube is the compression test. This test is carried out by compression testing machine.

The test is done after 7th day and 28th day and the result is being checked to check whether the target strength achieved or not.



Fig 2: compression test machine

VIII. OBSERVATIONS&RESULT

Following are the observations obtained while testing the samples,

Percentage of husk	Strength in N/mm ²
0%	6
0.5%	6.66
1%	8.88
1.5%	12.88
2%	15.55
2.5%	10.23

Table 1 strength of concrete in 7 days

The optimum value of rice husk can be taken as 2% with strength of 15.55

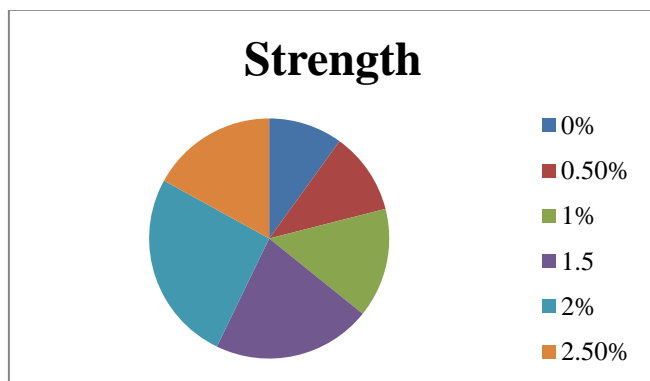


Fig 3 pie diagram showing strength

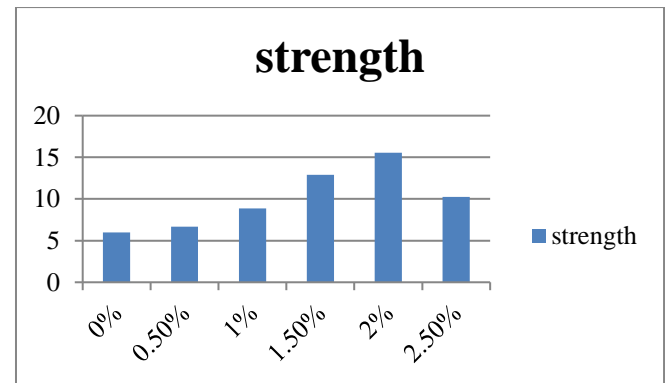


Fig 4 graph showing the strength of concrete

CONCLUSION

By the addition of the rice husk in the concrete as mentioned above using suitable mix and mix design we got the optimum value of the rice husk as 2% and by taking this value for the preparation of concrete which will make the concrete economical, strengthened and waste saving.

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