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EXPERIMENTAL STUDY ON CONCRETE OF GRADE M20 AND M25 BY USING OF RICE HUSK ASH AND WASTE GRANITE POWDER M20 AND M25

1Karri mohan, 2G.GOWRI SANKAR RAO

1PG STUDENT, 2ASSOCIATE PROFESSOR

1AITAM, TEKKALI,

2AITAM, TEKKALI

ABSTRACT: Rice Husk ash [RHA] Is extracted from Rice Husks, which is usually coming from agricultural waste. And Granite powder [GP] is obtained from granite crushing factories. This paper take in the results from the experimental work attempted to evaluate the appropriateness of rice husk ash to be utilised as the partial replacement for cement in both normal grade of M20 and Design concrete mix of M25 at 28days including and excluding of rice husk ash. Granite powder is then replaced in the mixes with varying percentages ranging from 0% to 50%. The compressive strength, split tensile strength are monitored for 28 days and the tests are conducted. Depends on the results, the mixes containing 25 % RHA of concrete in terms of compressive strength and mixes containing 25 % RHA replacement and 40 % granite powder replacement is preferred in terms of Tensile strength. These findings assets the granite powder along with Rice husk ash can be replaced together partially in place of sand and cement.

KEY WORDS: RHA – Rice husk ash

GP -- Granite powder

INTRODUCTION

Rapid increase in construction activities are resulted in shortage of conventional construction materials in the present scenario, The cost of conventional building materials are very high, It is the major factor affecting housing delivery in the world. This has necessitated research into alternative materials of construction. The effective housing techniques deal with reduction in cost of construction as well as providing strength to buildings. Mainly: gravel, sand and cement are used in the preparation of conventional concrete. while the use of agricultural by – product i.e.rice husk ash as a partial replacement with the cement is expected to serve the purpose of encouraging housing developers in building construction. Rice husk is produced in about 100 million tons per annum in India twenty to Twenty-two kgs of rice husk are obtained from 100 kg of rice. It contains organic substances and 20% inorganic materials. Ash from rice is obtained as a result of combustion of rice husk at suitable temperature. Proper utilisation of it aims to save the environment, encourages the government to find solutions regarding disposal to landfills of waste materials, and provides new knowledge

to the contractors and developers on how to improve the construction industry by using rice husk, to sustain good product performance to meet recycling goals. The rice husk ash concrete aims to prepare light weight structural concrete which may reduce considerably the self-weight of structures and permits large precast units to be handled. The Main object is to therefore to encourage the use of these seemingly waste products as construction materials in low cost housing the various basic properties of rice husk concrete are received in the paper

1 Rice Husk Ash [RHA]

Rice husk ash as a pozzolanic reactive material can be used to improve surface area of transition zone between the microscopic structure of cement paste and aggregate in the high-performance concrete. These results drastically increases the durability and resistance of concrete constructions and their service life. RHA fineness enhanced the strength of blended concrete when compared to coarser RHA and to control ordinary portland cement [opc]. RHA concrete gave excellent improvement in strength for 10% replacement, it is up to 20% of cement could be valuably replaced with RHA without affecting the strength. Since rice plants absorb silica from the soil, their husks contain up to 20% of the mineral. According to a recent article, published in physical sciences and reviews, RHA is considered to be one of the most promising and environment friendly sources for the production of silicon-based materials

The adding of RHA to concrete decreases the mass of concrete by 60–65%. So, RHA concrete will be used in the concrete by the construction

2.**Granite Powder**

Granite belongs to igneous rock family. The density of the granite is between 2.65 to 2.75 g/cm3 and compressive
strength will be greater than 200MPa. Granite powder obtained from the polishing units and the properties were found.
Since the granite powder was fine, hydrometer analysis was carried out on the powder to determine the particle size
distribution. From hydrometer analysis it was found that coefficient of curvature was 1.95 and coefficient of uniformity
was 7.82. The specific gravity of granite powder was found to be 2.5.

OBJECTIVES OF THE STUDY

- The strength of the concrete along with the inclusion of Granite powder replacing fine aggregate and Rice Husk Ash in place of cement.
- Strength comparison of conventional and Non-conventional concrete.

LITERATURE REVIEW

1.Priyanka A.Jadhas & Dilip K. Kulkarni. This paper mainly alloborates the effect of water cement ratio on hardened properities of cement mortar with a partial replacement natural sand by manufactured sand. Paper gives experimental study on change in various water cement ratio at 0.5 and 0.55. In this paper compressive test on mortar cubes. The Maximum compressive test comes at 50% of replacement of natural sand by manufactured sand. It also helps to find a viable solution to use the waste in a eco friendly way to the environment

2.Dahiya et al (2015) [India] carried out partial replacement of grade 53 portland cement with 20% RHA. In their result, they discovered that the initial setting time increased from 30 minutes to 60 minutes. The concrete samples were cast using 150mm*150mm*150mm mould, and the target strength was M25. The compressive

strength of M25 (0% RHA) concrete a 3,7, and 28 days are 14.50, 20.50 and 30.3 respectively. Whereas on replacing cement with 20% of RHA it comes out to be 13.40, 21.60 and 30.70 respectively. In the highlight of his research, water demand increased from 0.6 to 0.8 to achieve a slump 75mm – 100mm, but strength gain was almost the same at 20% replacement.

MATERIALS

Locally available ordinary Portland cement, river sand, granite fine aggregate, and RHA are the prime constituents utilised in this experiment. The granite powder, a Outcome of the granite triturate process, is procured from an industry located about 10 km from Tekkali, Srikakulam, Andhra Pradesh, India. Granite sludge is available in the form of wet as an industrial by-product comes directly from the sediments of granite factories, and that forms concerning the sawing, shaping, and polishing processes of granite. The wet granite sludge is dried up preceding the preparation of the samples. The dried substance is sieved and at last, the granite powder is existed to be utilised in the experiments as fine aggregate.

Portland cement gives a more amount of lime. By the addition of a pozzolana substance, like RHA mixes to lime and by the addition of water, gives a sturdy and more amorphous hydrated calcium silicate. The lab examination and field examination exhibited that the employing pozzolana is extremely helpful in reduction the issues of cement. The RHA isn't utterly a "filling material, besides gives strength and accomplishment. The unrefined rice husks is procured from a rice mill in Tekkali, Andhra Pradesh, India. RHA is procured by burning the unrefined rice husks at steady temperature in a furnace and grind them in a "Los Angeles machine" in order to get the required fineness.

MIX PROPORTIONS

M20: The mix proportion for M20 grade concrete is done using the Indian standard code 10262:2019. For whose, the water-cement proportion is kept as the least value of 0.45 (0.55 maximum according to code IS 10262:2019) for the slump value is 150mm, the coarse aggregate of 20mm size and below. The proportion for the mix is 1:1.5:3

M25: The mix proportion of M25 grade concrete is done by utilizing the Indian standard code 10262:2019. For whose the water-cement proportion is kept as the minimal estimation of 0.35 for the slump value is 150mm, the coarse aggregate of size 20mm and below. The proportion for the mix is 1:1.1:2.15.

STRENGTH TESTS ON CONCRETE

1.COMPRESSIVE STRENGTH TEST

The compressive strength tests on concrete are carried out on a compression testing machine accompanied by a range of 2.5 KN/s. The specimen utilised is a 150 mm cube and is cast and cured for 7,14 and 28 days. The specimens are tested after taking the cubes from the curing tank in surface dry condition.

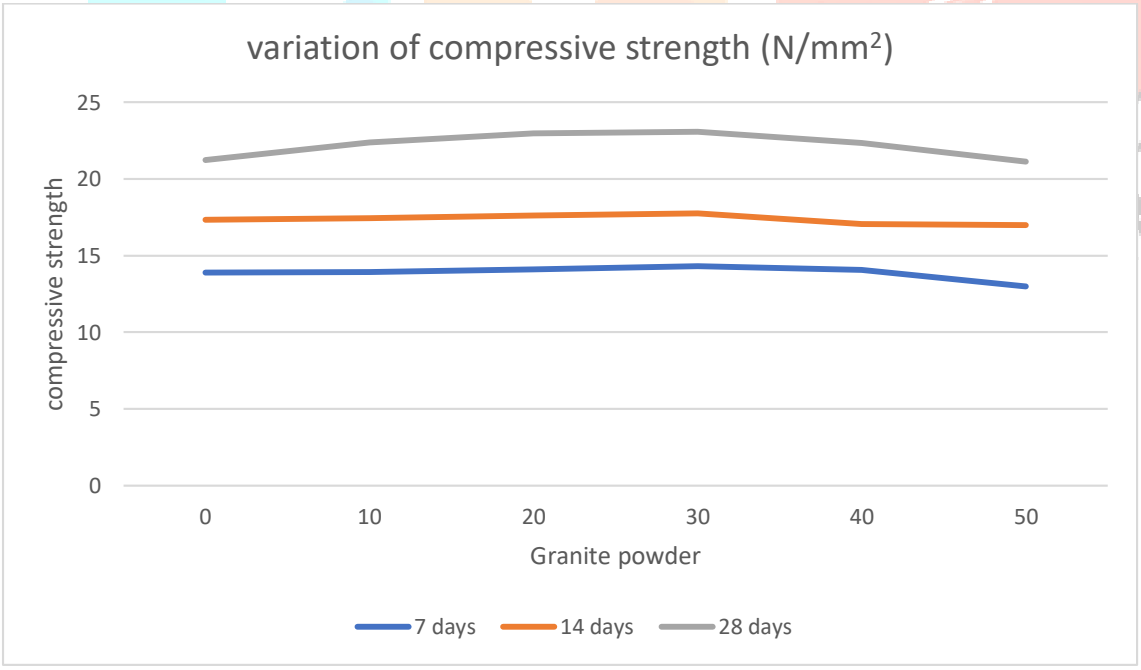
2.SPLIT TENSILE STRENGTH TEST

The split tensile strength test is executed on a universal testing machine accompanied by a range of 2.5KN/s. A cylinder specimen of 150mm dia and 300 mm height are cast and cured for 7,14 and 28 days. The specimens are tested after taking out from curing tank.

RESULTS

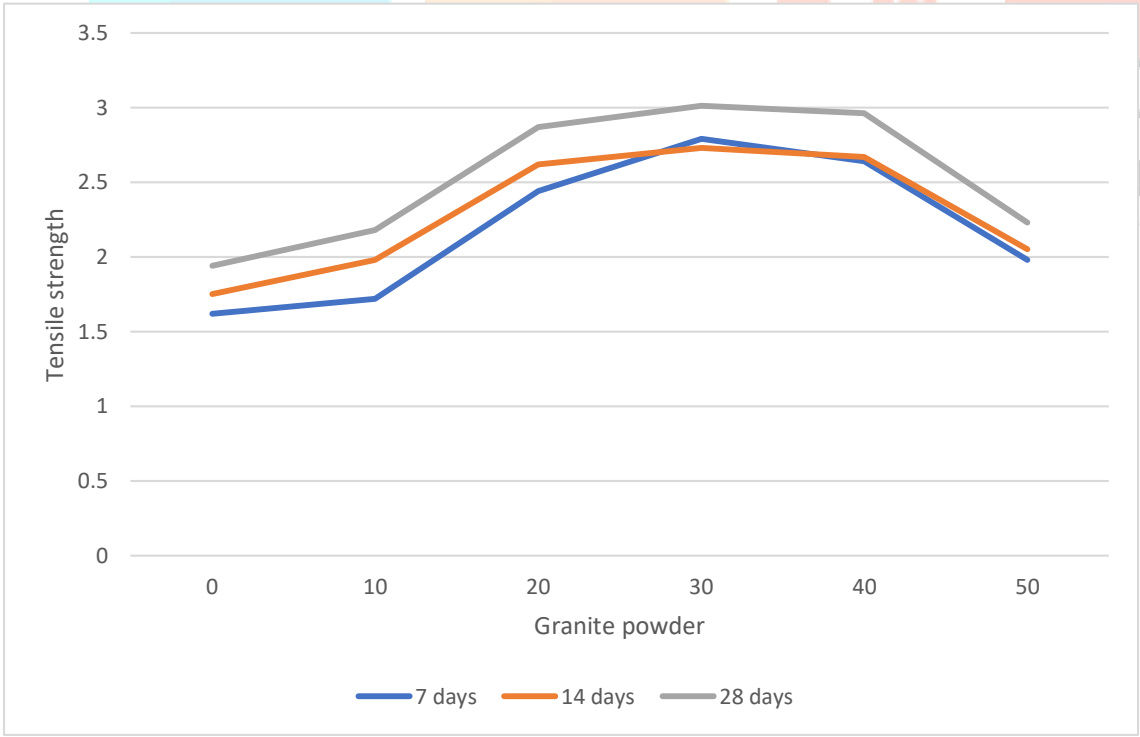
AVERAGE COMPRESSIVE SRENGTH OF M20 GRADE CONCRETE (N/mm^2)

Replacement of RHA in %	Replacement of Granite powd In %	Compressive strength (N/mm^2)		
		7 days	14 days	28 days
0	0	13.90	17.34	21.25
25	10	13.92	17.43	22.38
25	20	14.11	17.63	22.97
25	30	14.30	17.75	23.10
25	40	14.07	17.06	22.35
25	50	12.98	16.98	21.15



AVERAGE SPLIT TENSILE STRENGTH OF CYLINDER M20 GRADE CONCRETE (N/mm^2)

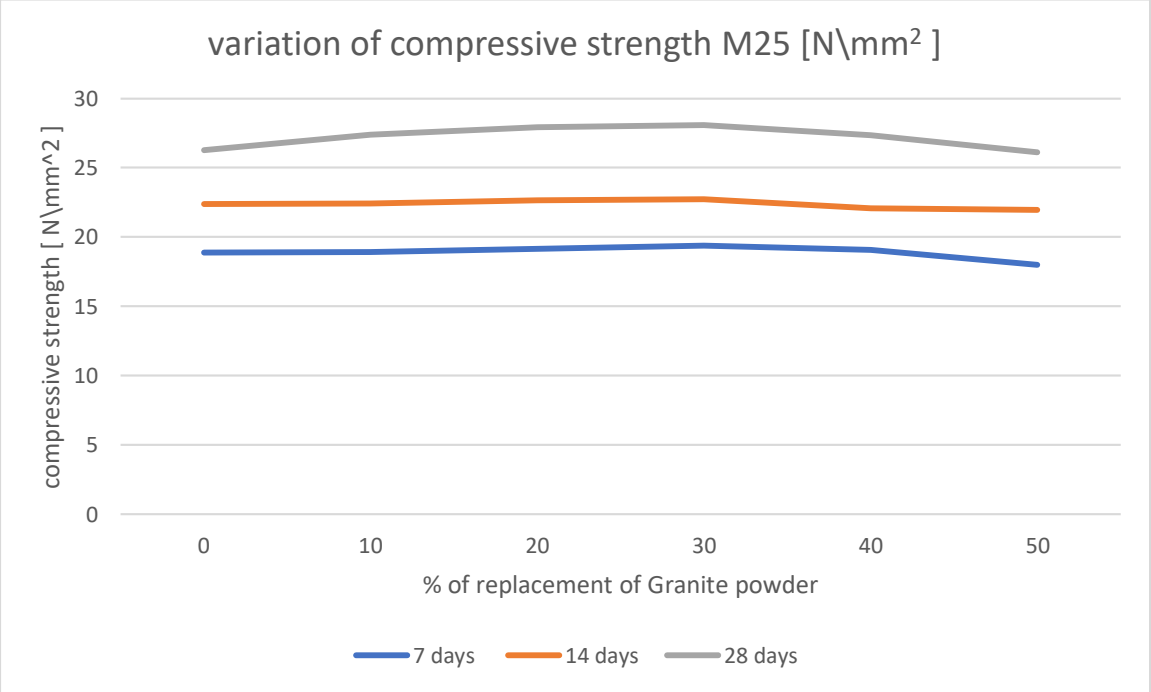
Replacement of RHA in %	Replacement of Granite powde %	Split Tensile Strength (N/mm^2		
		7 days	14 days	28 days
0	0	1.62	1.75	1.94
25	10	1.72	1.98	2.18
25	20	2.44	2.62	2.87
25	30	2.79	2.73	3.01
25	40	2.64	2.67	2.96
25	50	1.98	2.05	2.24



Variation of split tensile strength (N/mm^2)

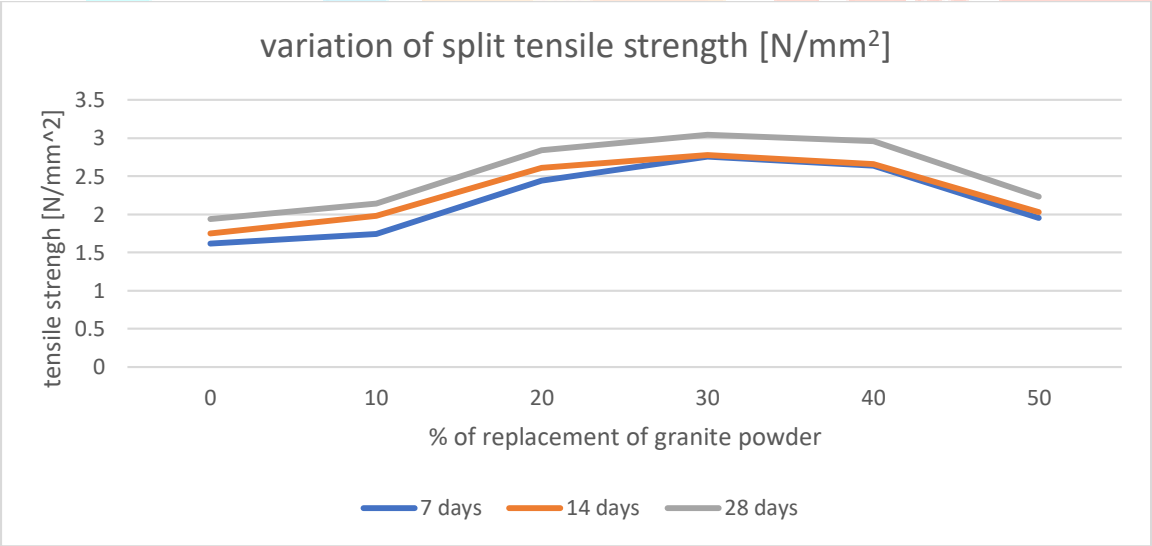
AVERAGE COMPRESSIVE STRENGTH OF CUBES M25 GRADE CONCRETE (N/mm^2)

% of replacement of RHA	% of replacement of Granite powder	Compressive strength [n/mm^2]		
		7 days	14 days	28 days
0	0	18.87	22.39	26.28
25	10	18.91	22.44	27.37
25	20	19.15	22.67	27.92
25	30	19.38	22.74	28.07
25	40	19.07	22.08	27.35
25	50	17.98	21.96	26.14



AVERAGE SPLIT TENSILE STRENGTH OF CYLINDER M25 CONCRETE {N/mm^2}

% of Replacement of RHA	% of Replacement of Granite powder	Split Tensile strength (N/mm^2)		
		7 days	14 days	28 days
0	0	1.62	1.75	1.94
25	10	1.74	1.98	2.14
25	20	2.44	2.61	2.84
25	30	2.76	2.78	3.04
25	40	2.64	2.66	2.96
25	50	1.95	2.03	2.24



DISCUSSION

The cube compressive strength results are obtained after the curing process of 7, 14, and 28 days for different replacement levels of 0%, 25% weight replacement of cement with RHA and 0%, 10%, 20%, 30%, 40%, and 50% of fine aggregate with granite powder. The Strength thus developed for the given different mixes is plotted as a graph and is shown in Figures. From the test results, it is noticed that the strength increased up to 30% of Replacement of sand with waste granite powder and then decreases, while it is more than 30% for M20 and M25 mixes,the strength increased till 40% replacement and then decreased, at 25% replacement of cement with RHA. Thus, the maximum strength is obtained for a mixture of 25% of RHA and 30% of granite powder replacement at the water-binder ratio of 0.45 for M20 and 0.35 for M25 mixes in case of compressive and split tensile strengths.

CONCLUSION

1) Comparative study on waste granite powder concrete with various percentage replacements of granite powder showed that replacement percentage of 30% shows better results in terms of compressive and split tensile strengths replacement of 40% in terms of flexural strength

2) Utilization of Rice husk ash and Waste granite powder together can be utilised to manufacture conventional concrete

FUTURE SCOPE

The future study can be carried out by fixing the replacement percentage of the granite powder as 30% and varying the RHA replacement percentage and conducting the strength and durability tests on concrete.

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