

AN EXPERIMENTAL INVESTIGATION ON PARTIAL REPLACEMENT OF FINE AGGREGATE BY TWO WASTE MATERIAL (Marble Powder and Rice Husk)

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Abstract -Concrete is the important component used in the construction field all over the world, where the fine aggregate is generally natural sand. Leaving the waste materials to the environment directly can cause environmental problem. Hence the reuse of waste material has been in current industrial trend Marble stone industry generates both solid waste and stone slurry. Marble is one of the important materials used in the construction industry. In India the amount of marble waste produced is 6 million tones/year. And also rice husk also a waste material produced in large amount nearly 4.5 million tones/year finding that it will use in construction are no In that marble powder and rice husk is replace by sand the research is carried out by using M25 grade concrete with replacement of 0%, 5%, 10%, 15% marble powder and rice husk by sand respectively and is carried out to determine the optimum percentage of replacement at which maximum compressive strength There are several reuse and recycling solutions for this industrial by-product, both at an experimental phase and in practical applications. In this replacement 10% has given highest compression.

Keywords: marble powder, rice husk,

1. INTRODUCTION

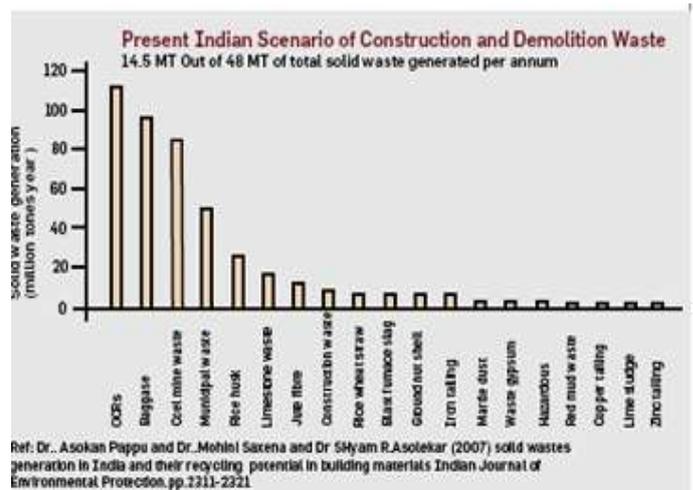
Leaving these waste materials to the environment directly can cause environmental problem. Waste can be used to produce new products or can be used as admixtures so that natural resources are used more efficiently and the environment is protected from waste deposits. There are several reuse and recycling solutions for this industrial by-product. Waste marble dust powder and rice husk or rice husk ash is one such material which can be used to replace sand as fine aggregate.

1.1 Objectives

The present study is aimed at utilizing Waste marble powder as fine aggregate in concrete. Marble is one of the most important materials used in buildings since ancient and the rice husk are the protective material covering grains of rice husk, husk can be used as building materials fuel and fertilizer insulation it can also be used in the construction field. In order to determine the effect with respect to the curing age, standard mechanical properties of concrete are to be analyzed at the curing ages of 28 days.

1.2 WASTE PRODUCTION IN INDIA

In India 350 million tonnes are organic wastes from agricultural sources; 290 million tones are inorganic waste of industrial and mining in India, about 960 million tonnes of solid waste is being generated annually as by-products during industrial, mining, municipal, agricultural and other processes. To safeguard the environment, efforts are being made for recycling different wastes and utilise them in value added applications. Their recycling potentials and environmental implication are reported and discussed in details. The amount of waste generated in India per year



1.3 CONCRETE

Concrete is a composite material composed of coarse aggregate bonded together with fluid cement that hardens over time. Most concretes used are lime based concretes such as Portland cement concrete or concretes made with other hydraulic cements, such as cement found. However, asphalt concrete, which is frequently used for road surfaces, is also a type of concrete, where the cement material is bitumen, and polymer concretes are sometimes used where the cementing material is a polymer.

1.4 MARBLE DUST

Marble is a metamorphic rock composed of recrystallized carbonate minerals, most commonly calcite or dolomite. Marble may be foliated. Geologists use the term "marble" to refer to metamorphosed limestone; however, stonemasons use the term more broadly to encompass unmetamorphosed

limestone. Marble is commonly used for sculpture and as a building material. Marble is a rock resulting from metamorphism of sedimentary carbonate rocks, most commonly limestone or dolomite rock.

1.5 RICE HUSK

The **rice husk**, also called **rice hull**, is the coating on seed or grain of **rice**. It is formed from hard materials, including silica and lignin, to protect the seed during the growing season. Each kg of milled white **rice** results in roughly 0.28 kg of **rice husk** as a by-product of **rice** production during milling.

1.6 METHODOLOGY

- Mix design for concrete proportion has been developed as per IS 10262 – 1982.
- Casted and cured the concrete specimens as per Indian standards procedures.
- The characteristic strength of hardened concrete specimen was tested as per IS 456 – 2000.
- Finding the optimum strength of optimum replacement of rice husk and marble powder.

The cement used was Ordinary Portland Cement. It was sourced from Osun State, Nigeria and it conformed to the requirements of BS EN 197-1: 2000 and acronyms the first time they are used in the text, even after they have been defined in the abstract. The water used for the study was obtained from a freeflowing stream. The water was clean and free from any visible impurities. It conformed to BS EN 1008:2002 for preparing the rice husk concrete blocks.

2. LITREATURE REVIEW.

Increased workability and compressive strengths of the mortar and concrete Dr. Vijaya Sekhar Reddy Rai the author of a recent paper in this field of articles [2]. The replacement is done partially and fully in the various proportions like 0%, 25%, 50%, 75% and 100% and its effect on properties of concrete were investigated. The study indicated that waste marble dust can effectively be used as fine aggregate replacement (up to 50%) without substantial change in strength. Nitisha Sharma the author of a recent paper in this field of articles [3]. As marble powder is the waste product, obtained during the process of sawing and shaping of marble by parent marble rock, contains heavy metals which makes the water unfit for use. Marble powder creates environmental problems. Deepankar Kumar Ashish the author of a recent paper in this field of articles [4]. The compressive strength and ultrasonic pulse velocity were tested for seven different series prepared by partially replacing cement, sand with WMP at proportions of 0-15% by weight separately and in combined form. Finally, all of the data were compared with each other & it was observed that the addition of WMP such that would partially replace the

sand and cement separately at particular proportions. Pradeep Mehla the author of a recent paper in this field of articles [5]. The various tests conducted for this purpose were Compressive Strength, of concrete. The concrete mix for different specimens was made by taking 5% 10 % 15% against cement and sand individually and 30% against combined cement and sand.

3. Materials used

3.1. Cement

The most common cement used is an ordinary Portland cement grade 43. The Type 1 is preferred according to IS269-1976, which is used for general concrete structures. Out of the total production, ordinary Portland cement accounts for about 80% to 90%. Many tests were conducted on cement; some of them are consistency tests, setting tests, soundness test

Table 1: Properties of cement

Sl.NO	property of cement	value
1	grade of cement	53
2	fineness of cement	4
3	specific gravity	3.15
4	initial setting time	30min
5	final setting time	10min

3.2 Aggregates

Aggregates are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect Economy. One of the most important factors for producing workable concrete is good gradation of aggregates. Good grading implies that a sample fractions of aggregates in required proportion such that the sample contains minimum voids. Samples of the well graded aggregate containing minimum voids require minimum paste to fill up the voids in the aggregates. Minimum paste will mean less quantity of cement and less water, which will further mean increased economy, higher strength, lower shrinkage and greater durability. Aggregate comprises about 55% of the volume of mortar and about 85% volume of mass concrete. Mortar contains a size of 4.75 mm and concrete

a) Coarse Aggregate

The fractions from 80 mm to 4.75 mm are termed as coarse aggregate.

b) Fine aggregate

Those fractions from 4.75 mm to 150 microns are termed as fine aggregate. Contains aggregate up to a maximum size of 150 mm.

Table 2: Properties of fine aggregate and coarse aggregate

SL. NO	PROPERTIES	FINE AGGREGATE	COARSE AGGREGATE
1	specific gravity	2.30	2.69
2	fine modulus	2.60	8.64
3	bulk density	1724	1561
4	water	0.75	5.6

3.3 Rice husk

Rice husk are the coatings of seeds, or grains, of rice. The husk protects the seed during the growing season and is formed from hard materials, including opaline silica and lignin. The hull is hard to eat or swallow and mostly indigestible to humans because of its enriched fiber components. However, some poor people in ancient.

Properties	Values
Physical properties	
Specific surface	186
pH	6.0
Moisture content	0.7
density	2.20

Chemical properties	values
Sio2	95.3%
K	1.4%
Ca	0.7%
Fe	0.5%
Other impurities	2.1%

3.4 Marble powder

Marble is a metamorphic rock composed of recrystallized carbonate minerals, most commonly calcite or dolomite. Marble may be foliated. Geologists use the term "marble" to refer to metamorphosed limestone; however, stonemasons use the term more broadly to encompass unmetamorphosed limestone. Marble is commonly used for sculpture and as a building material. Marble is a rock resulting from metamorphism of sedimentary carbonate rocks, most commonly limestone or dolomite rock.

Table 3: Properties of marble dust

S.No	PROPERTIES	MARBLE DUST
1	Fine modulus	2.65
2	Specific gravity	2.60
3	Bulk density	1724

3.5 Water

Water is an important ingredient of concrete as it participates in the chemical reaction with cement. Since it helps to from

the strength giving cement gel, the quantity and quality of water is required to be considered very carefully.

4. Mix Design

A mix M25 grade was designed as per Indian Standard method and the same was used to prepare the test samples. The design mix proportion is done in

Table 4

Mix no	Mix ratio	Cement (kg/m ³)	Fine aggregate (kg/M ³)	Coarse aggregate (kg/m ³)
M1	Normal	3000gm	3000gm	6000gm
M2	5% replacement	3000gm	2850gm	6000gm
M3	10% replacement	3000gm	270gm	6000gm
M4	15% replacement	3000gm	2550gm	6000gm

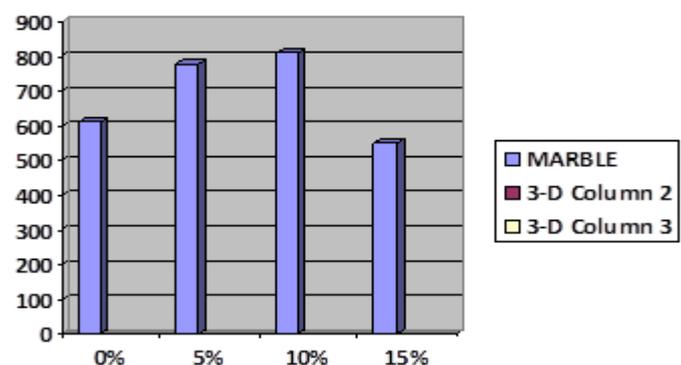
5. Details of the Experimental Study

150 mm × 150 mm × 150 mm concrete cubes were casting using M25 grade concrete. Specimens with ordinary Portland cement (OPC) and fine aggregate replaced with marble powder and rice husk at 5%, 10%, and 15%, individually levels were cast. During casting the cubes were mechanically vibrated by using a table vibrator. After 24 h the specimens were removed from the mould and subjected to water curing for only 28 days. After curing, the specimens were tested for compressive strength using a calibrated compression testing machine.

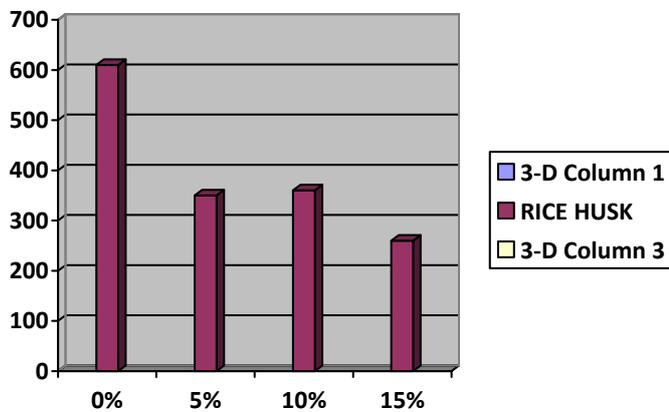
6. Results and Discussions

After the blocks are prepared and the compression test should conduct. Then in this investigation we find that the 10% replacement of fine aggregate with marble powder and 10% replacement of fine aggregate with rice husk got more strength.

Graph 1 for replacement of marble powder



Graph2: for replacement of rice husk



- Experimental Study of Properties of Concrete with Waste Marble Powder/Granules” - International Journal of Enhanced Research in Science Technology & Engineering, ISSN: 2319-7463 Vol. 4 Issue 6, June

CONCLUSIONS

- Up to 10 % replacement of Fine aggregate with waste, marble there is a increase in all mechanical properties.
- The replacement of 10 % of fine aggregate with waste marble powder and rice husk attains maximum compressive.
- The optimum percentage for replacement of marble powder and rice husk with fine aggregate and it is almost 10% cement for cubes.

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