An Experimental Study of Using Manufactured Sand In Concrete

Sakthivel S[1], G.Dinesh Babu[2], G.Gowtham[3], L.Hariharasudhan[4], S.Vivekanandan[5]
[1]Assistant Professor, Dept of Civil Engineering
[5]Dept of Civil Engineering
The Kavery Engineering College, Mecheri

Abstract- *Conventionally concrete is mixture of cement, sand and aggregate. Properties of aggregate affect the durability and performance of concrete, so fine aggregate is an essential component of concrete. The commonly used fine aggregate is natural river sand. Scarcity of good quality natural river sand due to depletion of resources and restriction due to environmental consideration as made concrete manufactures to look for suitable alternative fine aggregate. One such alternative is "Manufactured sand''. Through manufactured sand has been used in concrete manufacturing in india. The percentage of it's contribution is still very negligible. In many parts of india, good natural river sand is not available and this makes manufacturing of good quality of concrete very difficult. A well processed manufactured sand as partial or fully replacement to river sand is the made of the hour as a long term solution in indian concrete industry.*

Keywords- Concrete, Manufacturing sand, river sand replacement , Compressive strength.

I. INTRODUCTION

Concrete is the most widely used composite material today. The constituents of concrete are coarse aggregate, fine aggregate, binding material and water. Rapid increase in construction activities leads to acute shortage of conventional construction materials. It is conventional that sand is being used as fine aggregate in concrete. For the past two years, the escalation in cost of sand due to administrative restrictions in India, demands comparatively greater cost at around two to three times the cost for crusher waste even in places where river sand is available nearby. The function of the fine aggregate is to assist in producing workability and uniformity in the mixture. The river deposits are the most common source of fine aggregate. Now-a-days the natural river sand has become scarce and very costly. Hence we are forced to think of alternative materials. The Quarry dust may be used in the place of river sand fully or partly. A comparatively good strength is expected when sand is replaced partially or fully with or without concrete admixtures. It is proposed to study the possibility of replacing sand with locally available crusher waste without sacrificing the strength and workability of concrete.

II. METHODOLOGY

This project follows the steps given below:

- Collection and study the material properties required for making a concrete.
- Mix proportioning of concrete (M25).Investigation of strength parameter like Compressive, Tensile, and Flexural strength of conventional concrete Vsm sand concrete.

III. MATERIAL PROPERTIES

A. Cement Tests

Cement is binder, that can sets and hardens independently and is used to bind some other materials together. the volcanic ash and crushed pulverized brick additives are altogether added to burn lime to obtain a hydraulic binder were later called as, and cement. cement which is used in construction is characterized as hydraulic. Cement is obtained by pulversing clinker formed by calcining raw materials primarily comprising of lime (CaO), silica (SiO2), Alumina (Al2O3), and ferric Oxide (Fe2O3) along with some minor oxides the aggregate together to produce a continuous compact mass. concrete mass in a given condition depends on the type, quality, and quantity of cement.

Table 1

S No	Description	Value
1	Fineness of cement	3%
2	Standard consistency	32%
3	Soundness of cement	5mm
4	Initial setting time	22 min
5	Final setting time	9hours 44 min
6	Specific gravity	3.12

B. Aggregate Tests

The fine aggregate confirms to Zone II and is designated as fine sand. All tests are carried out as per IS: 383-2000.

Table 2

S.No	Name of the Test	Test Value
1	Specific gravity of fine aggregate	2.82
2	Sieve Analysis	3.12

C. Coarse Aggregate Tests

Aggregate are obtained by crushing various types of granites, schist, crystalline and lime stone and good quality sand stones.

Table 3

S. No	Description	Value
1	Crushing value	25.06%
2	Flakiness Index	55.45%
3	Elongation Index	44.96%
4	Impact value	26.99%
5	Sieve Analysis of coarse aggregate	3.9

D. Fresh Concrete Tests

Table 4

S. No	Title	Result
1	Slump cone test	150mm
2	Compaction factor	0.69

E. Mix Proportions

Table 5

Grade of Concrete	Cement (Kg/m^3)	Fine aggregate (Kg/m^3)	Coarse aggregate (Kg/m^3)	Water (liter)
M25	492	530.23	1061.12	0.45
	1	1.5	2.5	197.14

IV. EXPERIMENTAL INVESTIGATIONS

A. Compressive strength

The compressive strength of concrete is one of the most important properties of concrete. Comparative strength if M25 grade of concrete for the fully replacement of sand by crushed was found. In this test 150x150x150mm concrete cubes were cast, by using 30 Mpa concrete. The mixing was done by cubes were remolded and placed under water and cured for 28 days. Then the cubes were tested for their crushing strength at 7, 14 and 28 days.

$$\text{Compressive strength (Mpa)} = \frac{ultimate\ load}{cross-sectional\ area\ of\ cube}$$

B. Split tensile strength

The test is carried out in a cylindrical specimen of 150mm diameter and 300mm height. The cylindrical specimen is placed horizontally between the loading surface of a compression testing machine and the load is applied until failure of cylinder, along the vertical diameter. The split tensile strength is given by the formula,

$$\text{Split tensile strength (Mpa)} = \frac{2P}{\pi LD}$$

Where,

D= diameter of the cylinder = 150mm
L= length of the cylinder = 300mm
P = Compressive load on cylinder

C. Workability as slump (mm)

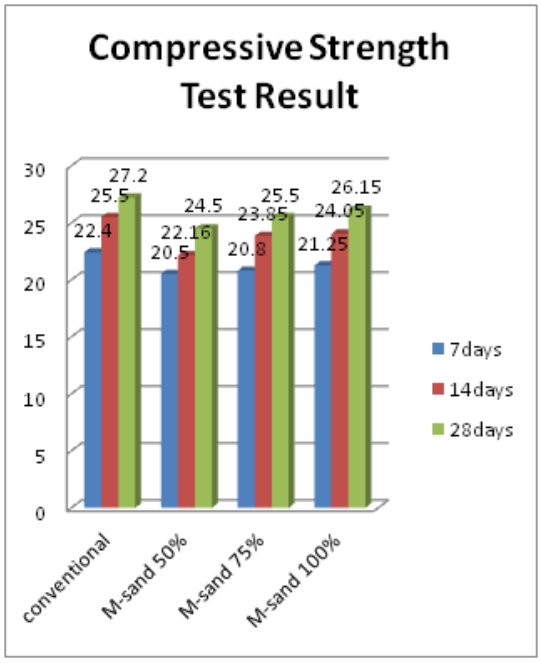
Each proportion of Experimental Concrete mix was tested for workability by slump test as per Indian Standard.

V. RESULTS AND DISCUSSIONS

A. Compressive strength

Table 6

S no	Mix (%)	Average Compressive strength (N/mm²)		
		7days	14days	28days
1	Conventional	22.4	25.5	27.2
2	M-sand 50%	20.5	22.16	24.5
3	M-sand 75%	20.8	23.85	25.5
4	M-sand 100%	21.25	24.05	26.15

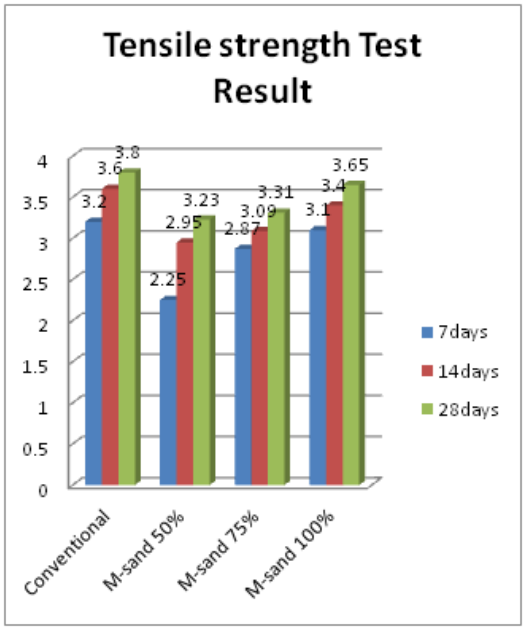


B. Split tensile strength

Table 7

S no	Mix (%)	Average Tensile strength (N/mm²)		
		7days	14days	28days
1	Conventional	3.2	3.6	3.8
2	M-sand 50%	2.25	2.95	3.23
3	M-sand 75%	2.87	3.09	3.31
4	M-sand 100%	3.1	3.40	3.65

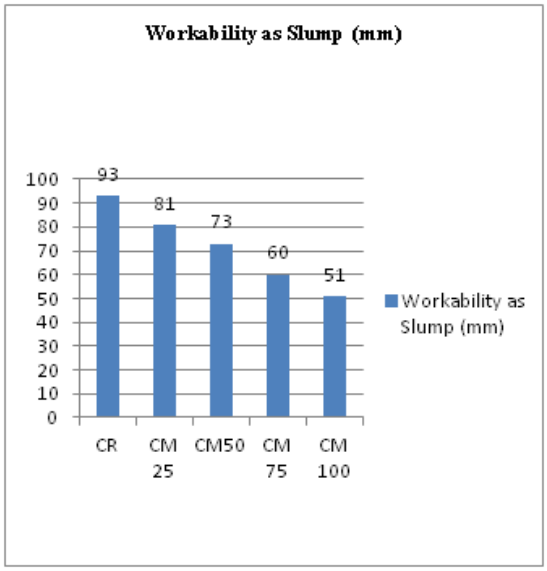
Grade of Concrete	Cement (Kg/m³)	Fine aggregate(Kg/m³)	Coarse aggregate (Kg/m³)	Water (liter)
M25	492	530.23	1061.12	0.45
	1	1.5	2.5	197.14
Grade of Concrete	Cement (Kg/m³)	Fine aggregate(Kg/m³)	Coarse aggregate (Kg/m³)	Water (liter)
M25	492	530.23	1061.12	0.45
	1	1.5	2.5	197.14
Grade of Concrete	Cement (Kg/m³)	Fine aggregate(Kg/m³)	Coarse aggregate (Kg/m³)	Water (liter)
M25	492	530.23	1061.12	0.45
	1	1.5	2.5	197.14

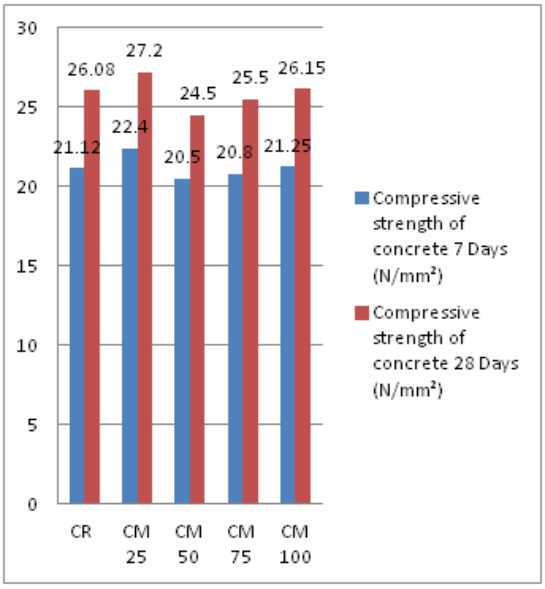


C. Workability as slump

Table 8

ID Mark	River sand	Manufactured Sand	Workability As slump (mm)	Compressive Strength of concrete (N/mm²)	
CR	100%	0%	93	21.12	26.08
CM25	75%	25%	81	22.4	27.2
CM50	50%	50%	73	20.5	24.5
CM75	25%	75%	60	20.8	25.5
CM100	0 %	100%	51	21.25	26.15





V. CONCLUSION

The Project should be done successfully by using fully replacement of Manufacturing Sand. In this project gaining Compressive Strength were check by making Cubes.

The Compressive Strength of concrete should be tested by using Compressive Testing Machine by adding Manufacturing Sand in Concrete Strength should be attain more less equally to normal sand. Effective Value should be calculated under the mix design of M25 Grade of concrete.

REFERENCES

[1] B T Halesh kumar, Anusha H S, Bhargavi S P "Replacement of Fine Aggregate by M-Sand "- International Journal of Science Technology & Engineering ; ISSN(online);239-784X-June 2017.

[2] Prof. B.V. Venkatarama Reddy "Suitability of manufacturing sand (M-Sand) as fine aggregate in mortars and concrete"-CSIC project ; Cp 6597-july 2011.

[3] V.Syam Prakash "Ready mixed concrete using manufactured sand as fine aggregate"- 32nd conference in Our World in Concrete & Structure; Augest 2007.

[4] J B jiang, S Loh, S Q Zhang "Admixture for use of manufacturing sand in concrete"- 27th conference on Our World in Concrete & Strecture-Augest 2002.

[5] Mr.Bhaveshkumar, M.Kataria "An experimental study of using manufacturing sand in concrete"-I nternational Journal Of Advance Reasearce in Engineering Science & Management- September 2010.

[6] Nimitha Vijayaragavan, AS Wayal "Effects of manufactured sand on compressive strength and workability of concrete"-ISSN-6009-2013.

[7] M.Adams Joe, A.Maria Rajesh, P.Brighson "Exprimental investigation on the effect of m-sand in high performance concrete"-American journals of engineering research p- ISSN : 2320-0936.

[8] A.Priyanka, Jadhav and Dlip K. Kulkarni "An experimental investigation on the properties of concrete containing manufacturing sand"- june 2012.

[9] Dr.S. Elavenil and B.Vijaya "Manufacturing sand ,A solution and Alternation to river sand and in concrete manufucturing"-february 2013.

[10] Ion Dumitru "Manufacturing sand research in Australia "- Effect of shape, texture and grading of manufacturing sand on concrete, Aggman- may 2000.