

Experimental Study on Durability of Concrete Using Waste Foundry Sand

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ABSTRACT: Nowadays good quality natural river sand is not readily available; it is to be transported from a long distance. These resources are also exhausting very rapidly. So there is an urge to find some alternative to natural river sand. Natural river sand takes millions of years for its formation and is not renewable. Now a day's good quality Natural River sand is not readily available. It is to be transported from a long distance. These resources are also exhausting very rapidly. So there is a need to find alternative to natural river sand. Natural river sand takes millions of years for its formation and is not renewable. As a substitute to natural sand, artificial sand is used as a complete replacement. In this project the behavior of concrete is assured by partially replacing the natural sand with foundry sand which is a waste product from machine industries. The experimental work is mainly concern with the study of different properties like compressive strength, split tensile strength and as well as flexural strength of concrete by partial replacement of artificial sand by foundry sand as fine aggregate. Tests over carried out on cubes, cylinders to studies the different properties concrete using foundries and compare with concrete with natural sand as fine aggregate. Artificial sand was replaced with five percentages (0%, 5%, 10%, 15% & 20%) of Waste Foundry Sand by weight. A concrete mix proportions are made with and without foundry sand. Compression test, splitting tensile strength test and flexural strength test were carried out to evaluate the strength properties of concrete at the age of 3, 7 & 28 days. Carbonation test, acid attack test, water absorption test and non-destructive test can be carried out to age of 28 days of concrete.

KEYWORDS- Waste Foundry Sand, fine aggregate, Carbonation test, acid attack test, water absorption test and non-destructive test, compressive strength, split tensile strength, flexural strength

I. INTRODUCTION

1.1 GENERAL

Now-a-days the construction sector is exploring rapidly on a large scale and also involves new techniques for rapid and comfort works on the field. The concrete as a building material plays an important role in this sector. The consumption of natural resources as constituents of concrete, costs high also it is on the verge of extent. These problems alarm us to recover the natural resources or to find an alternative option to overcome this problem. Presently, the large production of waste foundry sand as a by-product of metal casting industries causes various environmental hazards. Usage of this waste foundry in building material would help in reduction of stress on environment. Metal industries use foundry sand which is uniformly sized, high quality silica sand that is bound to form a mould for the casting of ferrous as well as non-ferrous metal. Finer sand than normal sand is used in metal casting process. The burnt sand after the casting process of metal is reuse for many times but when it cannot be longer used it is removed from foundry as a waste for disposal known as Waste foundry sand. In India, an estimated 2 million tons of waste foundry sand is produced every year. Concrete is the most widely used construction material in the construction industry and offers a number of advantages including good mechanical and durability properties, low cost and high rigidity. Over the past several decades the demand for concrete has been increasing rapidly due to growth in infrastructure development. River sand is one of the main ingredients in concrete production and it is used as a fine aggregate. The heavy demand for concrete has resulted in the over-exploitation of river sand in the river bed and this has led to a range of harmful consequences, including increased river bed depth, water table lowering and the intrusion of salinity into rivers. The restriction in the extraction of sand from the river increases the price of sand and has severely affected the stability of the construction industry. As such finding an alternative material to river sand has become imperative. Over the past several decades an enormous amount of research has been carried on the use of industrial waste as a substitute/replacement material for fine aggregate. The research findings revealed that the substitution of an alternative material in concrete could improve both the mechanical and durability properties and the practice led to the sustainable concrete development. Foundry Sand (FS) is a by-product from the metal alloys casting industry with high silica content. Silica sand is bonded with clay or chemicals, and is used for the material casting process. Foundries recycle the sand many times and when the

sand is no longer recyclable, it is disposed of this is called foundry sand. About 15% of sand used by foundries is ultimately disposed of amounting to millions of tons. In India many foundries dump this waste in nearby vacant areas. Which creates an environmental problem? With increased restrictions on disposal in nearby areas industries are constrained to find alternative ways to reuse waste. Past few decades FS have been utilized in highway applications but the amount of waste re-utilized in this way is still negligible. For this reason there is a need to utilize FS in other ways become very imperative. Recently research has been carried out on the utilization of FS in concrete and concrete related products.

1.2 OBJECTIVES

The main objectives of the present experimental work are discussed below:

1. To find the efficiency of the Foundry Sand for civil constructions.
2. To know the fresh concrete properties of foundry sand concrete.
3. To know the behavior of compressive and split tensile strength of foundry sand.
4. To analyses the different areas of civil engineering in which Foundry Sand can be used efficiently.
5. Utilization of foundry sand will reduce the disposal problem of foundry sand. It shows that WFS is creating a trend to force the Green concrete construction.
6. Concrete from WFS is gain strength at a limit as well as it resolve environmental disposal problem and land fill also.

1.3 SCOPE OF WORK

There is a large-scale production/availability of used/spent foundry sand from foundry industries in the world. Though used/spent foundry sand has been extensively investigated as constituent materials for controlled low-strength materials (CLSM) it possible utilization in concrete has not been investigated thoroughly. In this work, effects of utilization of used-foundry sand as partial replacement for regular sand (fine aggregate) in concrete were investigated. The data obtained in this investigation will be used to establish mixture proportions for concrete and construction applications.

II. REVIEW OF LITERATURE

2.1 GENERAL

In this chapter the available published literature on concrete is presented. This chapter presents the background which boosted the use of some alternative source of fine aggregate by the use of waste foundry sand in concrete. The available published literature also briefly reviewed.

2.2 LITERATURE SURVEY

Effect of waste foundry sand (WFS) as partial replacement of sand on the strength, ultrasonic pulse velocity and permeability of concrete & Abrasion resistance and strength properties of concrete containing waste foundry sand (WFS) was studied by **Gurpreet Singh and Rafat Siddique (2012)**^[4] the strength and durability properties of concrete mixtures, in which natural sand was replaced with five percentage (0%, 5%, 10%, and 15% and 20%) of waste foundry sand (WFS) by weight. Compression test and splitting tensile strength test were carried out at the age of 7, 28 and 91 days sand Modulus of elasticity. ultrasonic pulse velocity and Rapid Chloride Permeability test were conducted at the age of 28 and 91 days. The abrasion resistance of concrete containing WFS was also investigated. Based on the results obtained they concluded that (i) Maximum increase in compressive strength, splitting tensile strength and modulus of elasticity of concrete was observed with 15% WFS, both at 28 and 91 days. (ii) WFS increase the ultrasonic pulse velocity values and decreased the chloride ion penetration in concrete; (iii) Abrasion resistance of concrete increased with the increase in WFS content. They also added that WFS can be suitably used in making structural grade concrete, as well as for applications where abrasion is also important parameter.

Effect of used-foundry sand on the mechanical properties of concrete is presented by **Siddique et al (2009)**. determined the compressive strength, splitting tensile strength, flexural strength and modulus of elasticity of concrete containing WFS at 28, 56, 91 and 365 days. Fine aggregate were replaced with waste foundry sand with 10%, 20% and 30%. They concluded that. (a) Compressive strength, splitting tensile strength, flexure strength and MOE of concrete mixtures increased with increase in waste foundry sand content. (b) Mechanical properties of concrete mixtures increase with age for all the foundry sand content. (c) 8% to 19% compressive strength increased depending upon WFS% and testing

age. (d) 6.5% to 14.5% splitting tensile strength, 7% to 12% flexure strength and 5% to 12% modulus of elasticity increased with age and waste foundry sand content.

Effect of spent foundry sand as partial replacement of fine aggregate on the properties of concrete was studied by **Siddique et al (2007)**^[16]. Compressive strength, splitting tensile strength and MOE tests were carried out at the age of 28 and 56 days. Replacement% of natural fine sand with WFS was 10%, 20% and 30%. Based on test result they concluded that (a) Compressive strength increased slightly with increase in WFS at all replacement%. (b) Compressive strength increased by 4.2%, 5.2% and 9.8% at the age of 28 days when compared with ordinary concrete mix where as 1.0%, 5.18% and 14.3% increased at the age of 56 days. (c) Splitting tensile strength increased with an increase in the WFS. (d) The MOE of waste foundry sand concrete at all age was higher than the ordinary concrete. They also concluded that MOE of all concrete mixtures were increased with age.

Re-usage of spent foundry sand in high strength concrete was studied by **Guney et al (2010)**^[3] observed that re-usage of spent foundry sand in high strength concrete by replacing natural sand with SFS (0%, 5%, 10%, and 15%), resulted in reduction strength properties, water absorption, void ratio.

Capillarity of concrete incorporating waste foundry sand was studied by **Khatib et al (2013)**^[11] presented the results of an experimental investigation into concrete produced by replacing the fine aggregates (natural sand) with various (0%, 30%, 60%, and 100%) amounts of WFS. The results indicate that there is systematic increase in water absorption by capillary action a decrease in compressive strength and ultra sonic pulse velocity (UPV) with increasing amounts of WFS in concrete. There seems to be a linear relationship between strength and capillary water absorption. Also an exponential relationship exists between strength and UPV.

The effect of waste foundry sand (WFS) as partial replacement of sand on the mechanical, leaching and micro-structural characteristics of ready-mixed concrete was studied by **Basar et al (2012)**^[1] investigated the potential re-use of waste foundry sand (WFS) in ready-mixed concrete (RMC) production by replacing regular sand with five percentages (0%, 10%, 20%, 30%, and 40%) of WFS by weight and solidification/stabilization (S/S) process was applied to all concrete mixtures. It was concluded that WFS can be effectively utilized in making good quality RMC as a partial replacement of fine aggregates with no adverse mechanical, environmental and micro-structural impacts. however the partial replacement should not exceed 20%.

Effects of elevated temperatures on properties of self compacting concrete containing fly ash and spent foundry sand was studied by **Pathak and Siddique (2012)**^[14] studied the use of spent foundry sand and fly ash on the properties of self-compacting-concrete (SCC) at elevated temperatures. Fly ash (30–50%) has been used as partial replacement of cement, whereas spent foundry sand (10%) as partial replacement of sand.

Effect of two different sources and washing treatment on the properties of UFS by-products for mortar and concrete production was studied by **Monosi et al (2013)**^[13] explored the possibility of reusing two types of used foundry sands (UFSs), from two different processing stages of the same foundry in the production of mortars and concretes for structural applications as fine aggregate replacement at increasing dosages (ranging from 0% to 30% by weight). It was concluded that at these percentages of use, mortars and concrete for structural applications can still be manufactured and the use in construction is beneficial over disposal.

Experimental study of mechanical properties of concrete blended with used foundry sand was studied by **Kumbhar Et Al (2011)**^[12] investigated the various mechanical properties of concrete containing used foundry sand. Concrete was produced by replacing natural sand with UFS in various percentages (10%, 20%, 30% and 40%). Based on the test results they concluded that (i) workability goes on reducing with increase in UFS content. (ii) At 28-days, Compressive strength, splitting tensile strength for different replacement levels of UFS is increased whereas flexural tensile strength goes on reducing for UFS content more than 20%. (iii) At 28-days, the modulus of elasticity values increases with replacement of UFS up to 20%. They also concluded that the UFS can be utilized as a replacement to regular sand in concrete up to about 20%.

Influence of foundry sand residues on the fresh and hardened properties of mortars produced with Portland cement was studied by **L Da Silva Et Al (2011)**^[17] and their team investigated the influence of the use of foundry sand waste (FSW) on concrete properties. The properties on the fresh state were evaluated by means of flow table test and the determination of the incorporated air content. On the hardened state compressive strength tests were performed. Their initial results have shown that the use of FSW leads to an increase in the air content and cracking, caused by expansive reactions. As a result of that a reduction in the compressive strength has been noticed. They added that the application of mixtures made with FSW becomes risky as to the structural and durability requirements. However they also added

that their work may not be generalized, because the FSW composition varies according to the manufacturing process and in all cases it is advisable to carry out preliminary tests in order to verify the effects caused by the use of FSW in the concrete production.

Effect of two different sources and washing treatment on the properties of UFS by-products for mortar and concrete production was studied by **Saveria Et Al (2010)**^[15]; investigated properties of mortars and concrete containing different doses of used foundry sand as partial replacement of sand. The results showed that (i) used foundry sand gives low slump. (ii) mortars containing UFS at water cement ratio equal to 0.5 show a compressive strength lower by about 20-30% compared to that of the reference mix. (iii) the modulus of elasticity doesn't vary significantly. (iv) Drying shrinkage increases with the decrease of mechanical performances.

III. MATERIALS AND METHODOLOGY

3.1 GENERAL

Material used in this context of investigation are foundry sand, cement, water, fine aggregate and coarse aggregate and the same are tested in the environmental conditions and their various test parameters like compressive strength, split tensile strength are determined. Also fresh concrete test like test for workability of concrete such as slump cone test are carried out.

3.2 MATERIALS USED

The materials used in this present work are foundry sand, Ordinary Portland cement (53 grade), coarse aggregates and fine aggregates.

3.2.1 Foundry Sand

3.2.2 Cement:

3.2.2 Aggregate

3.2.3.1 Fine Aggregate:

3.2.3.2 Coarse Aggregate:

3.2.3 Water

TESTING OF SPECIMENS

Testing of hardened concrete plays an important role in controlling and confirming the quality of raw materials, which help to achieve higher efficiency of material used and greater assurance of performance of concrete. In the present study test conducted on hardened concrete were carried out by using Compressive Testing Machine (CTM) of capacity 200kN and Universal Testing Machine (UTM) of capacity 2000 KN as per IS 516:1959.

1. Workability Test: (IS 7320-1974)
2. Compressive Strength Test: (IS 516:1959)
3. Flexural Strength Test: (IS 516:1959)
4. Split Tensile Test: (IS 5816:1999)
5. Rebound Hammer:- IS 13311-2 (1992)
6. Pull out Test (IS 2770 (Part I)-1967)
7. Ultrasonic Pulse Velocity Method: - IS 13311-1 (1992)
8. Water Absorption Test: (IS 2185 part I 1979)
9. Carbonation Test
10. Acid attack test

IV. RESULTS AND DISCUSSION

The results obtained from the experimental investigations are tabulated in tables. The results have been analyzed and the graphs showing the strength variations are plotted. The effect of partial replace of sand with waste foundry sand.

4.1 Workability Test

4.1.1 Slump Cone Test (IS 1199-1959):-

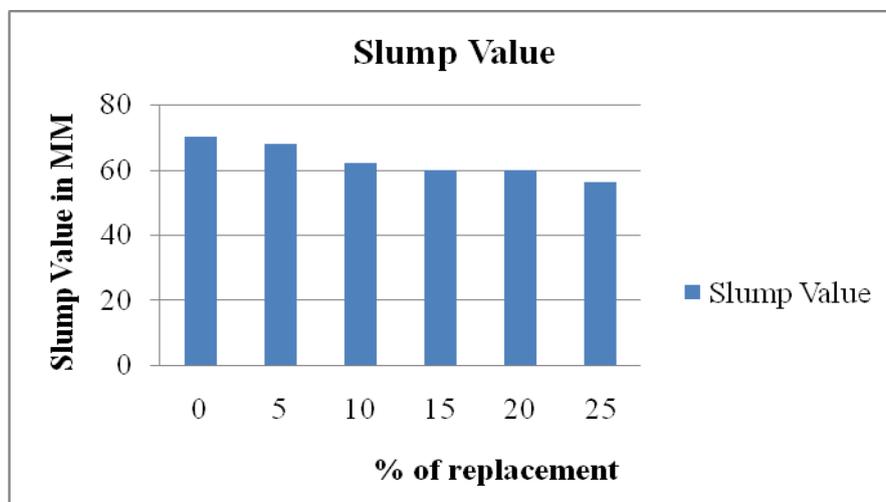
Slump Cone test was conducted for investigation of workability of fresh concrete. Natural sand partially replaced with 0%, 5%, 10%, 15%, 20% & 25% waste foundry sand with a constant water cement ratio 0.45.



Photo 4.1: Slump Cone Test.

Serial No	% of Replacement	Slump Value in mm
1	P1 (00)	70
2	P2 (05)	68
3	P3 (10)	62
4	P4 (15)	60
5	P5 (20)	60
6	P6 (25)	56

Table 4.1: following table shows the slump value for all proportion



Graph 4.1: % of replacement of WFS Vs slump value.

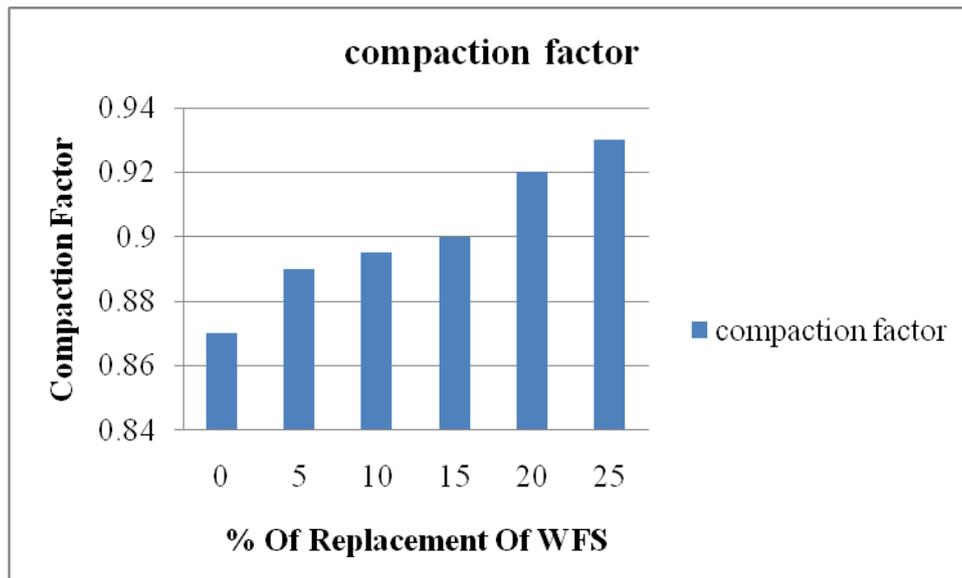
- As WFS content increases. Therefore slump value of concrete decreases

4.1.2 Compaction Factor Test [IS 5515-1983]:

Compaction factor test is used to measure the degree of compaction obtained by doing a standard amount of work on the concrete. It works on the principle that the amount of applied work required to compact concrete to its maximum density. It is suitable for all mixes but widely used in laboratory only.

Sr. No.	% Of Replacement Of WFS	Compaction Factor
1	0	0.87
2	5	0.89
3	10	0.895
4	15	0.90
5	20	0.92
6	25	0.93

Table 4.2: following table shows the Compaction Factor for all proportion



Graph 4.2: Comparative Compaction Factor values of concrete with sand replacement WFS.

- In workability of compaction factor test. Compaction factor increases with the addition of WFS.

4.1.3 Vee-Bee Consistometer Test: [Is 5512-1983]

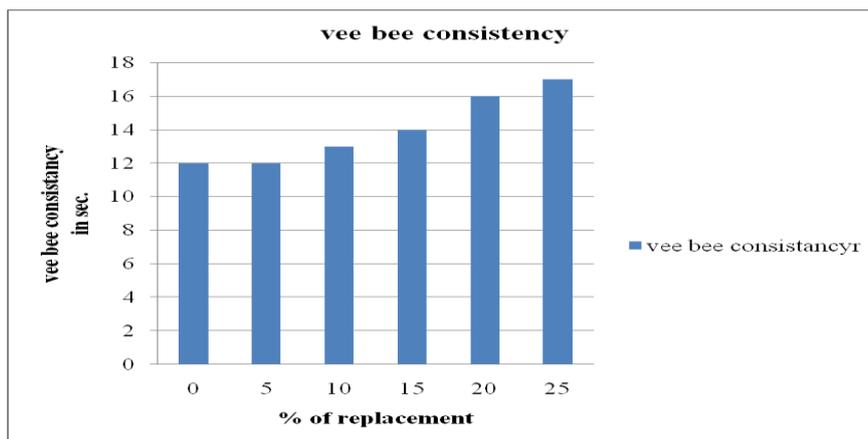
Vee -Bee consist meter is used in laboratory to measure indirectly the workability of concrete. It consists of vibrating table, a sheet metal cone, and a standard iron rod. Vee-Bee consistometer is used to determine the consistency of a freshly prepared concrete mix. The time required to transform a concrete specimen in the shape of a conical into a cylinder by vibration is a measure of consistency of the mix



Photo 4.3: Vee-Bee Consistometer Test.

Sr. No.	% Of Replacement Of WFS	Time required to convert concrete specimen from conical shape in to cylindrical shape In sec.
1	0	12
2	5	12
3	10	13
4	15	14
5	20	16
6	25	17

Table 4.3: Following table shows the Vee-Bee Consistometer for all proportion



Graph 4.3: Vee-Bee Consistometer values of concrete with sand replacement WFS.

- In workability of Vee bee consistency time required for conical shape are increases with addition of WFS

4.2 Compressive Strength Test (IS: 516- 1959) :-

Compression test on the 150 mm x 150 mm x 150 mm cube specimens were conduct on the 1000 KN compressive testing machine. The specimens were cured in water for 28-days. The cube compressive strength is calculated as crushing load per unit area

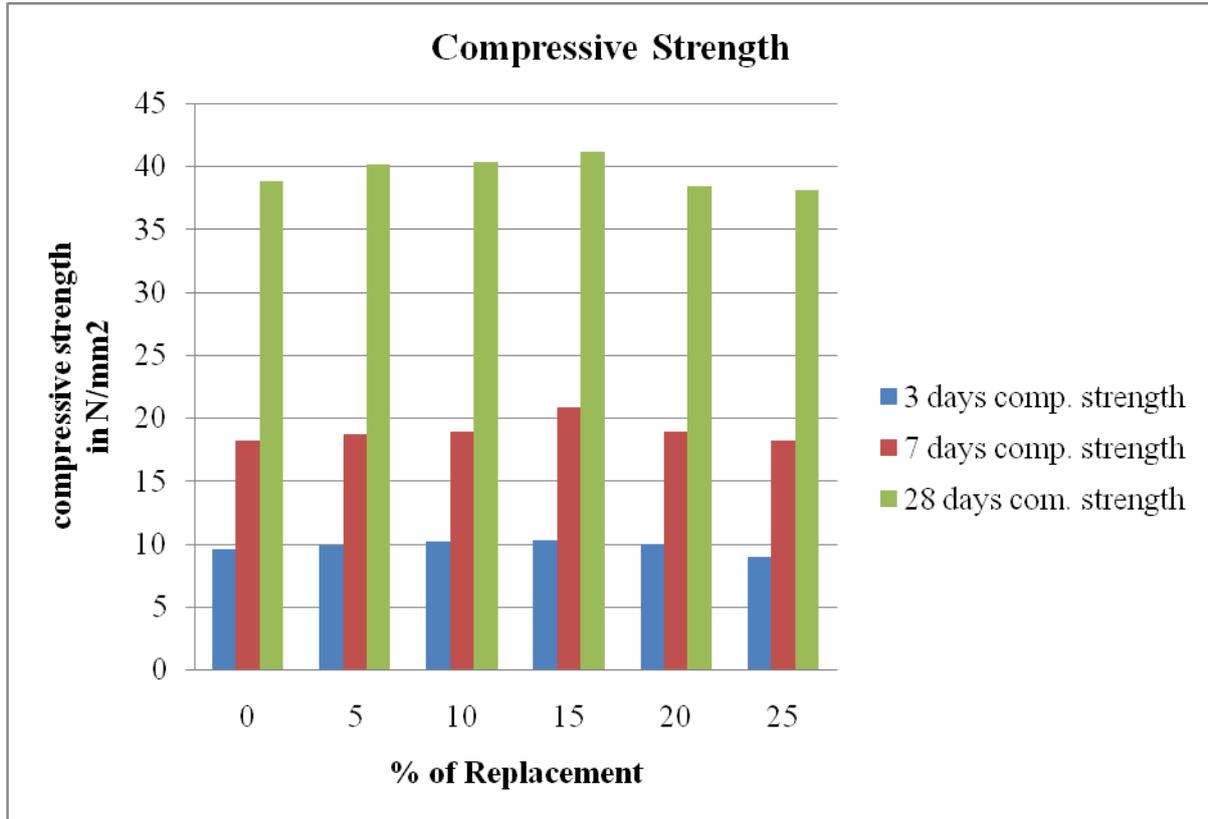
$$f_{cu} = P_c / A$$



Photo 4.4: Compressive Strength Test

No	% of replacement	3 days Strength	7 days Strength	28 days Strength	% of strength Increase 3 days	% of strength Increase 7 days	% of strength Increase 28 days	Remark
1	0	9.56	18.23	38.85	0	0	0	As per clause No. 3.2, Page no.1 of IS: 10262-2009 Target mean compressive strength at 28 days for M25 concrete is 31.60MPa
2	5	9.82	18.64	40.09	2.71	2.24	3.19	
3	10	10.11	18.93	40.36	5.75	3.83	3.88	
4	15	10.27	20.85	41.15	7.42	14.24	5.92	
5	20	9.94	18.90	38.39	3.97	3.67	-1.32	
6	25	8.93	18.18	38.09	-6.58	-0.5	-2.0	

Table No.4.4 Conventional concrete using Waste foundry sand Compressive Strength after 28 Days of Curing.



Graph no.4.4 Conventional concrete using waste foundry sand Compressive Strength after 3, 7 & 28 Days of Curing.

- The maximum compressive strength of concrete is observed at natural sand replacement by 15% of waste foundry sand at 3,7 & 28 days.

4.3 Flexural Strength (IS: 516- 1959)

Flexural strength test on the 150x150x700mm were casted and cured for 28 days. The flexural strength is determined by the

$$fcr = P_f L / bd^2$$

Where,

fcr = Flexural strength, MPa

P_f = Central load through two point loading system, N

L = Span of beam, mm

b = Width of beam, mm

d = Depth of beam, mm

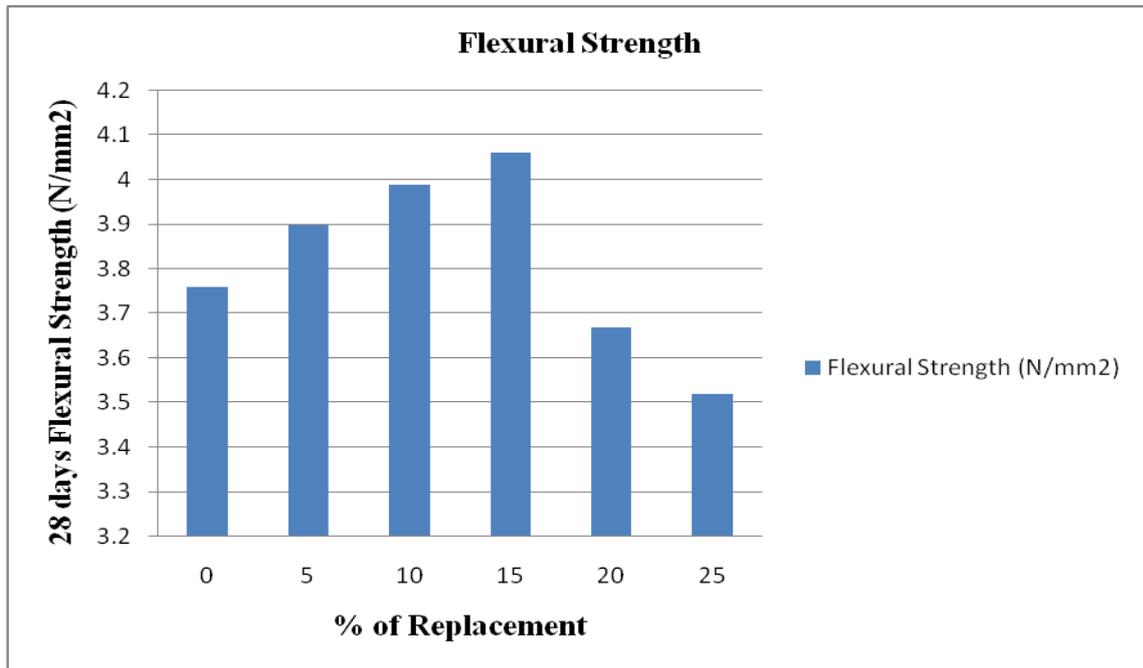


Photo 4.5: Flexural Strength of Concrete.

Three cubes of conventional concrete using basalt fiber were casted and their 28 days Flexural strength was estimated. The results for 28 day flexural strength test for concrete specimen are shown below in Table No. 4.4 and Graph No. 4.5:

Serial No	% of Replacement	Force In KN	28 days Flexural Strength (N/mm ²)	Mean Flexural Strength (N/mm ²)	% strength Increase 28 days	Remark
1	P1 (00)	65.13	13.47	13.02	00.0	As per clause no.6.2.2 page no. 16 of IS: 456-2000 Split Flexural Strength of M25 grade concrete is 3.5 MPa.
		61.25	13.58			
		58.22	12.92			
2	P2 (05)	66.21	14.698	13.18	1.22	
		54.90	12.18			
		57.19	12.96			
3	P3 (10)	52.40	13.63	13.23	1.61	
		55.60	12.35			
		52.90	13.74			
4	P4 (15)	67.90	14.07	13.94	7.06	
		69.75	14.48			
		58.90	13.29			
5	P5 (20)	61.82	13.72	13.122	1.00	
		53.67	12.91			
		57.42	12.74			
6	P6 (25)	55.18	12.25	12.57	-3.45	
		54.98	12.20			
		59.05	13.10			

Table No.4.5 Conventional concrete using Waste foundry sand Flexural Strength after 28 Days of Curing.



Graph no.4.5 Conventional concrete using waste foundry sand Flexural Strength after 28 Days of Curing.

- The flexural strength of WFS concrete increases by 1.22%, 1.61% and 7.06% at the replacement of 5%, 10% and 15% respectively when compare with conventional mix.

4.4 Spilt Tensile Strength

The split tensile strength test are carried on diameter 150 mm and length 300 mm were casted and cured for 28 days. The split tensile strength of cylinder is calculated by the following formula:

$$f_{cys} = 2P_{sp} / \pi D L$$

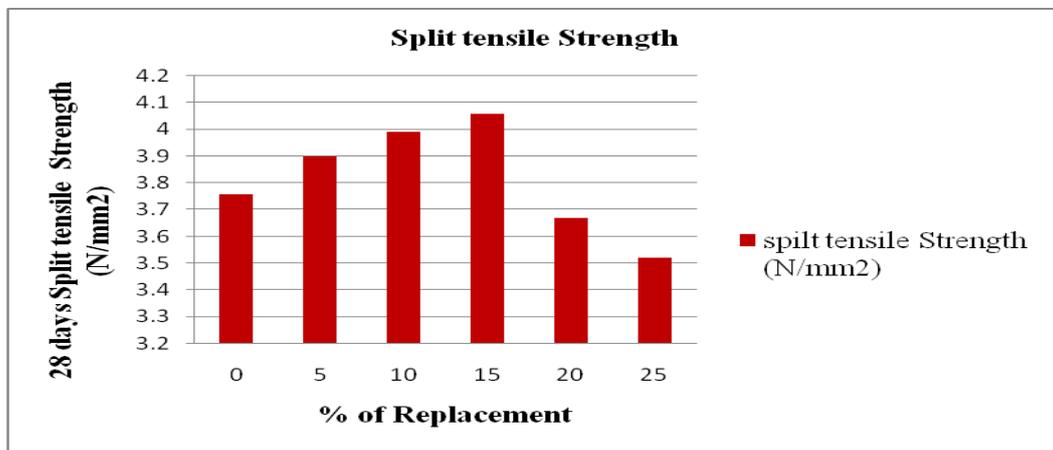
Where,

- f_{cys} = split Tensile strength, Mpa
- P_{sp} = Load at failure, N
- L = Length of cylinder, mm
- D = Dia. Of cylinder, mm

Serial No	% of Replacement	Force in KN	Mean Split tensile Strength (N/mm ²)	Mean Split tensile Strength (N/mm ²)	% strength Increase 28 days	Remark
1	P1 (00)	302	4.27	3.76	0.0	As per clause no.6.2.2 page no. 16 of IS: 456-2000 Split Tensile Strength of M25 grade concrete is 3.5
		252	3.52			
		255	3.60			
2	P2 (05)	284	4.08	3.90	3.72	
		281	3.90			
		282	3.92			
3	P3 (10)	265	3.99	3.99	6.11	
		322	3.84			

		315	4.05			MPa.
4	P4 (15)	269	4.10	4.06	7.97	
		274	4.17			
		276	3.09			
		254	3.60			
5	P5 (20)	265	3.75	3.67	-2.39	
		261	3.69			
		260	3.68			
6	P6 (25)	251	3.55	3.52	-6.38	
		253	3.57			

Table 4.6: Split Tensile Strength of Concrete with Partially Replacement of Foundry Sand.



Graph No.4.6 Conventional concrete using waste foundry sand Split tensile Strength after 28 Days of Curing.

- Increase of 3.782 %, 6.11 % and 7.97% strength can be achieved when 5%,10% and 15% WFS was replaced by natural sand in concrete when water/ cement ratio was maintained constant.

4.5 Rebound Hammer Test (IS: 13311 (Part 2) – 1992).

Rebound hammer test is used to be finding the compressive strength of concrete members. It consist s for every rebound of spring control hammer that slides on a plunger within a tubular housing. After impact the hammer rebounds. The distance traveled by mass, is called as rebound number.

Conversion Curves, Concrete Test Hammer Model N/NR
Concrete pressure resistance of a cube after 14 – 56 days

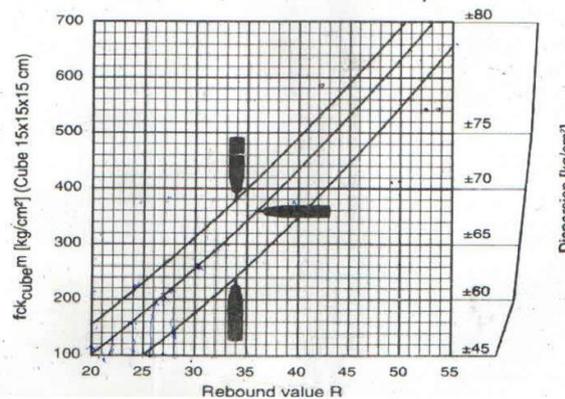


Fig. 4.1 Conversion curves of rebound no. to compressive strength.



Serial No	% of replacement	Rebound Number	Rebound Compressive Strength	Mean compressive Strength (N/mm ²)	Remark
1	P1 (00)	35	33.35	32.19	As per clause No. 3.2, Page no.1 of IS: 10262-2009 Target mean compressive strength at 28 days for M25 concrete is 31.60MPa
		33	29.43		
		35	33.35		
2	P2 (05)	36	35.32	34.66	
		37	37.28		
		34	31.40		
3	P3 (10)	38	39.24	35.97	
		35	33.35		
		36	35.32		
4	P4 (15)	37	37.28	36.62	
		35	33.35		
		38	39.24		
5	P5 (20)	37	37.28	34.00	
		34	31.40		
		35	33.34		
6	P6 (25)	34	31.40	30.74	
		33	29.43		
		34	31.40		

Table No4.7 Conventional concrete using waste foundry sand compressive Strength by rebound hammer after 28 Days of Curing.



Graph 4.7 % of replacement of WFS Vs rebound comp. strength

- For 28 days increase of 7.67%, 11.74% and 13.76% strength can be achieved when 5%, 10% and 15% cement was replaced by WFS in concrete.

V. CONCLUSION

The present experimental research work was carried out to evaluate the suitability of waste foundry sand as a partial replacement of river sand in concrete. Experiment was conducted by replacing river sand with waste foundry sand in varying percentages in concrete. Based on the analysis of test results we can conclude. Natural sand can be possibly replaced partially waste foundry sand in concrete. It has been observed that the workability of slump value of concrete decreases with the addition of waste foundry sand. In workability of compaction factor test. Compaction factor increases with the addition of WFS In workability of vee bee consistency time required for conical shape are increases with addition of WFS. The compressive strength of concrete from 0% to 15% replacement of sand by waste foundry sand is satisfactory. The maximum compressive strength of concrete is observed at natural sand replacement by 15% of waste foundry sand at 28 days. Replacement of natural sand with waste foundry sand showed increases in the split tensile strength and flexural strength up to the 15% replacement then after split tensile strength reduced. Water absorption of concrete reduces as the percentage of waste foundry sand in concrete increases. As voids in the concrete reduce water absorption goes on reducing. Also unit weight of concrete goes on reducing with the replacement of cement due to lower specific gravity of WFS. Use of Phenolphthalein indicator changed the colour of hardened concrete to pink which indicates that concrete was not affected by the atmospheric carbon dioxide. Velocity of an ultrasonic pulse passing through the concrete is more than 3.5 km/second which suggest that concrete quality is good. Due to good filling effect voids from the concrete reduces which increases velocity of ultrasonic pulse through glass powder concrete Use of foundry sand in concrete will be minimizing the disposed problem of waste foundry sand and it's an eco-friendly. Waste foundry sand is more available than any other raw material thus the cost of waste foundry sand is considerable lower than that of similar material. Thus, from above overall study it is concluded that, Waste foundry sand is a waste released from metal casting industry is good material for replacing fine aggregate upto certain percentage in construction industry. It is very good material to be use in building temporary structures. Replacement of sand by foundry sand beyond 15% leads to decrease in strength and causes bleeding in concrete

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