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AN EXPERIMENTAL INVESTIGATION ON REPLACEMENT OF FINE AGGREGATE WITH FOUNDRY SAND

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ABSTRACT Solid waste management has become one of the global environmental issues, as there is continuous increase in industrial by-products and waste materials. Due to lack of land filling space and its ever increasing cost, utilization of waste material and by-products has become an attractive alternative to disposal. Waste foundry sand (WFS) is one of such industrial by-product which could be used in various applications including construction materials such as Controlled Low-Strength Material (CLSM) and concrete. The beneficial use of such by-products in construction materials results in reducing the cost of from such materials may contain hazardous compounds, which may possibly effect the environment. So, it is important to know the characteristics of leachate obtained from waste foundry sand.

Understanding the leachate characteristics ofWFSis essential in its disposal, environmental impact, and potential development for beneficial utilization towards solid waste management. This paper describes the physical, chemical properties of WFS, various leachate test methods, and research published on leachate characteristics of waste foundry sand..

KEYWORDS : Dexmedetomidine , Intranasal, Midazolam , premedication

1. INTRODUCTION

Waste foundry sand consist of Primarily of uniformly sized, High quality silica Sand i.e. bonded to form molds for ferrous [IRON & STEEL] and nonferrous [COPPER, ALLUMINIUM] metal casting foundries use high quality size specific silica sand for use in their molding and casting operations. The Waste foundry sand Normally higher quality than bank run or natural sand used in fill construction sites.

In casting process, molding sands are recycled and reused multiple times however the recycling sands degrades to the point that it can no longer be reused in the casting process.

The Automotive industry and its parts suppliers are the major generations of Waste foundry sand. The physical and chemical properties of Washed Bottom Ash are depending on the casting process.

Waste foundry sand was first introduced by Chinese for making of pots now a day's INDIA is the second place in the world for manufacturing of Waste foundry sand

2. PROBLEM STATEMENT

Now–a-days, the use of Fine aggregate for concrete production has increased rapidly due to increase in number of construction industries. The increase in rate of production of concrete leads to increase in demand for raw materials which in turn leads to price hike of raw materials. Also this demand may be due to scarcity in availability of raw materials mostly the Fine aggregate. This problem of importing normal water from other places at a higher price has brought the idea of using the locally available natural waste material in the place of this Fine aggregate. So, by using the Waste foundry sand ash which is abundantly available at the thermal power plant from source of coal. Much of the economy of construction could be saved.

So, by using Waste foundry sand from the thermal power plant as a normal fine aggregate replacement in preparation of concrete will save our earth for a sustainable environment.

3. AIM AND OBJECTIVE

The objectives of this study are:

1. To determine the performance of using Waste foundry sand as a

fine aggregate in concrete.
2. To determine the most economic material that can be suitably replaced for construction.
3. To fulfil safe environment by using waste materials.
4. To investigate the basic properties such as Flexural Strength, Compressive strength of Waste foundry sand replaced concrete in comparison with Normal water sand used concrete.

4. SCOPE OF THE STUDY

The scope of the study will be focused on the performance of concrete using Waste foundry sand as a partial replacement with Fine aggregate. In this study Waste foundry sand is collected from Kurnool district, Andhra Pradesh, India. The sample was taken on the Quarry at ragamayuri near Kurnool.

5. MIX DESIGN

Mix design can be defined as the process of selecting suitable ingredients of concrete and determining their relative propositions with the object of producing concrete of certain minimum strength and durability as economically as possible. The mix design is based on as IS: 10262-2009.

Water Ml	Cement	Fine aggregate	Coarse aggregate
186	375	630	1092
0.49	1	1.63	2.91

Table - 1: Shows Mix Design for M30 grade

6. TEST ON MATERIALS

6.1 Cement

PSC of JSW PLUS was used in this study. The following physical test should be conduct in the laboratory as per IS codes

SL. NO.	PHYSICAL TESTS	OBTAINED RESULTS	REQUIREMENTS AS PER IS CODES
1	Fineness	5%	Not >10% as per IS 4031 part 1
2	Standard Consistency	35%	IS 4031 part 4
3	Initial Setting time	35min	Not less than 30 minutes as per IS 4031 part 5
4	Final setting time	252 min	Not more than 600 minutes as per IS 4031 part 5
5	Specific gravity	3.15	IS 2720 part 3

Table – 2: Physical Test results of cement

6.2 Aggregates

The aggregate used in this study was clean river sand and crushed stone aggregate collected from near Kurnool.

Sl. No	Physical Tests	Obtained results	Requirements as per IS 383
1	Specific gravity		
	a)Coarse Aggregate	2.4	2.6-2.9
	b) Fine Aggregate	2.8	2.6-2.8
2	Water absorption		Not>2%as per IS:2386-Part 3
	a) Coarse Aggregate	0.8%	
	b) Fine Aggregate	0.6%	

Table – 3: Physical Test of aggregates

7. TESTS ON

7.1 Slump Test

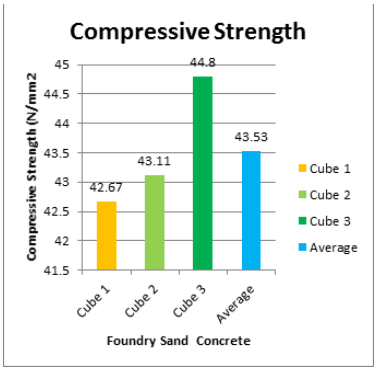
SL NO	Percentage addition of Waste foundry sand to concrete	Slump Values in mm.
1	0%	100
2	5%	95
3	10%	93
4	15%	90
5	20%	88

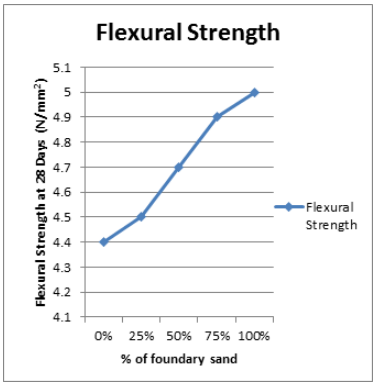
8. RESULTS AND DISUSSIONS

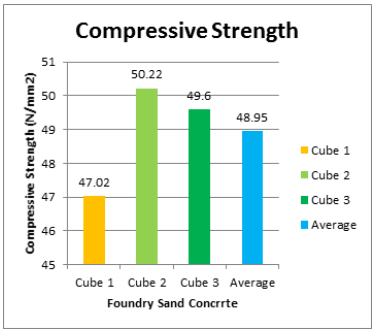
All specimens will be moist cured for one day and after moist curing the specimens will be water cured for required days. Traditional curing the cubes moulded with the cement concrete is subjected to curing in the water Tank and then checks the strengths at the age of 7 days and 28 days.

Percentage of Waste foundry sand added in concrete mix	Compressive strength in Mpa			Flexural Strength in Mpa		
	Age in days			Age in days		
	07	14	28	7	14	28
0%	26.7	29.6	26.8	27.2	28.9	27.8
5%	28.9	31.2	27.2	27.8	30.9	28.3
10%	30.3	33.4	28.4	28.6	32.6	28.9
15%	28.2	32.7	27.8	26.3	31.7	27.3
20%	27.6	30.8	26.4	25.8	30.6	26.8

Table – 4: Shows the Compression and Flexural strengths of sea sand used concrete cubes and beams







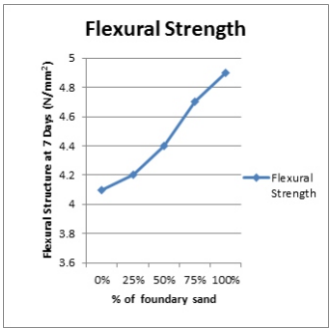


Chart-1, Chart-2, Chart-3, Chart-4

9. CONCLUSIONS:

1. Waste foundry sand is waste material from foundries which exhibits lower unit weight, higher water absorption and higher percentage of void compared to regular sand.
2. Waste foundry sand could be conveniently used in making good quality concrete, white ware bodies, construction materials, soil amendments, flow able fills and embankment. Strength properties of concrete mixtures increase with the increase in foundry sand content.
3. Waste foundry sand often demonstrate soil like qualities making them potentially attractive components in manufactured soil sand useful for enhancing soil blend, physical and chemical properties.
4. Leach ate is the liquid that drains or 'leaches' from industrial waste or by-products which contain both dissolved and suspended material. It may be characterized as a water-based solution of four groups of contaminants; dissolved organic matter(alcohols, acids, aldehydes, short chain sugars,etc.), inorganic macro components (common cations and anions includingsulfate,chloride,Iron, aluminum, zinc and ammonia), heavy metals(Pb, Ni, Cu and Hg) andxenobiotic organic compounds such as
alogenated organics.
5. Leachate can be analyzed by various leaching methods i.e. TCLP,SPLP, shake extraction method (ASTM D3987), NEN 7343, NORDTEST, 1995 and NEN 7341. TCLP is more aggressive leaching protocoland tends to yield more metallic chemicals than SPLP andASTM D3987 as results shown by Deng (2009).
6. It was found that all spent/waste foundry sands contain PAH(poly aromatic hydrocarbon) compounds. The PAHs in greensands are much higher than those in chemical binder spent
sands, even though phenolic/ester sands have higher PAHs thanfuran/acid and silicate sands.
7. Results showed that TCLP extracts of used foundry sand withoutany additives contain high concentrations of copper, lead andzinc lead well over the regulatory limits for hazardous waste of5mg/L.
8. It also concluded that WFS contains little organics; leachatederived from each material was analyzed for inorganic constituentsin accordance withWDNR requirements. Clean foundry sand met both the WDNR preventive action limits and theenforcement standards of Ground Water Quality Standards (GWQS but spent foundry sand met all parameters of ES, butit exceeds the PAL for lead and chromium.

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