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Environmental Impact of Dumping Ggbfs on Lands in Coimbatore

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Abstract: ***In recent times the increasing amount of waste generated from the various industries such as metal industries plays a vital role of waste disposal problems in and around Coimbatore. The foundry waste which is dumped near ponnaiyangoundanpudur, somayapalayam, thennampalayam, arasur, sundrapuram affects the natural mineral contents of soil. Unengaged lands are destroyed and they become unfit to use, the metal properties in the foundry contaminate the water resources and it turns as toxic, when used it causes severe health problems to the public and cattle.M-sand is manufactured by mining the rocks, which is economically high of cost due to the labour charges and high mining equipments for blasting. Whereas GGBFS (Ground Granulated Blast Furnace Slag) can be obtained as free of cost. By cleaning the GGBFS the pollution caused in land and even water can be reduced. They are very useful for the reduction of waste disposal problems. Due to the lack of river sand and its increasing cost is the major problem which we are facing every day. GGBFS (Ground Granulated Blast Furnace Slag) are successfully regenerated from the metal casting process, where the and after several times of usage is considered as waste. Such waste which is rich in iron content is termed as GGBFS. [1]Based on literature study it is shown that waste foundry sand can be used as a partial replacement for M-sand which would reduce the economic level of the construction and also increases the compressive strength, split tensile strength and modulus of elasticity.***

Key words: GGBFS (Ground Granulated Blast Furnace Slag), Replacement, M-sand, Pollute

I. INTRODUCTION

In many areas of India the development of industries leads to the increase of pollution and environmental problems. Coimbatore is the southern Manchester of India and it is one of the foremost leading industrial places with well capable sources for development of industries. It is located at 11º1'6N 76º58'21''E surrounded by the Western Ghats at west and at north with Nilgiri biosphere reserve. The total area of Coimbatore is about 7469sq.km, which receives an annual rainfall of about 700mm. It is an metropolitan city of 246.75km^2 and ranked at the 16th position of metro cities among India. It is mostly well known for its textile mills, motor industries, machinery productions etc… Among these industries, the metal industries pollute the land and the major water resources the originates from noyal river, on which the whole city is depended for water in every day to day purpose. There is a risk, these industries face every day that they are not allowed to dump their utilized sand in quarry and the sand recovery plants are high in cost. So these industries dump the wastes in vacant lands near the somayapalaym, arasur, thennampalaym, sundrapuram. The foundry waste is not disposed from these places for many decades, so it destroys the agricultural lands and water resources. Thus it also results in the decrease of water table level and its quality.

II. SPECIFIC BACKGROUND

The foundry waste was collected from the disposal system of metal casting in and around Coimbatore. It has totally three clusters joining together 1.)Manickkapalayam-Annurtaluk covering an area of 45 acres with 45 industries 2.)Arasur-palladamtaluk covers an area of 110 acres with 102 industries 3.)pallapalayam by COFIA-palladamtaluk covers an area of 27acres with 25 industries. Coimbatore district consist of totally 448 number foundries. These clusters were mostly located in thanneerpandal, kalapatti, ganapathy, singanallur, sarkarsamakulam and karamadai area.

Table No. 1: Group of foundry industries

Group of foundry industry	Distance from KAHE (kms)	Duration (mins)
Kalapatti	29	47
Ganapathy	20	47
Singanallur	13	27
Sarkarsamakulam	35	55
Karamadai	40	80
Thanneerpandal	34	48

Table No. 2: Based on scale

Based on scale	Numbers
Large	28
Medium	49
Small	371
Total	448

The production of foundry waste generates approximately 800 tones/month I and around Coimbatore for many decades. There was no solution obtained for disposal of foundry wastes from these industries.

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The major barrier to the further usage of GGBFS (Ground Granulated Blast Furnace Slag) is large difference in physical and chemical properties. Recent options for the management of GGBFS include recycling and regeneration of metal. Another option of utilizing GGBFS is by partial replacement of sand. It is possible to reuse a waste by product material beneficially.

III. GGBFS AS A SAND REPLACEMENT

It provides high compressive strength M-sand. GGBFS (Ground Granulated Blast Furnace Slag) is a non degradable material which causes environmental problems. So it can be used as a replacement for M-sand, which minimizes environmental problems. It is available in the bulk quantity and at free of cost.

IV. NEED OF PRESENT OF STUDY

GGBFS (Ground Granulated Blast Furnace Slag) is rich in silica, ferrous, lime, alumina, silicon dioxide which can pollute air and water. It is classified as hazardous waste due to risk and harmful effects. The usage of GGBFS (Ground Granulated Blast Furnace Slag) as a replacement of fine aggregate which is environmental concern and also will reduce the chances of pollution.

V. IMPACTS

- The dumping of the foundry wastes makes the water resources dry and turns unfit for use.
- It results harmfulness to the public's health and the cattle's welfare.
- The waste of the foundry thatis dumped pollutes the fields and their agricultural land.
- The water sources are polluted due to the dumping of these wastes.
- The ponds and the bore wells are the main water sources for the drinking purpose to these villages.
- The villages such as telungapalayam, kariyapalayam, was mostly effected due to these harmful dumping.
- The quality of land, soil properties and mineral contents will be degraded.
- There are only few faculties in charge for focusing of foundry disposal, that leads to affect the environment of the city and the air gets polluted.
- Rather than the high scale industries there are more than 250 small and medium scale industries, which are in the major warning for the environmental pollution.

VI. RESULT AND DISCUSSION

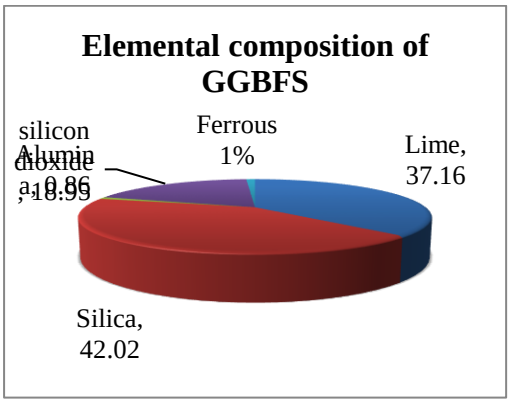

Fig 1: Elemental Composition of GGBFS

VII. MINERAL AND MORPHOLOGICAL CHARACTERISTICS OF GGBFS

GGBFS(Ground Granulated Blast Furnace Slag) was subjected to the scanning electron micrograph (SEM) at x10000 magnification. The foundry waste samples are irregular in shape having unsmooth surfaces; it was similarly like spherical in shape. The chemical composition of GGBFS was found by the energy-dispersive x-ray spectroscopy(EDAX). It is absorbed that the O k proportions are greater in atomic percentage than C K, Al K, Si K, Fe K. Minimum K in atomic percentage is Al K which is 0.86.

VIII. SEM ANALYSIS OF GGBFS

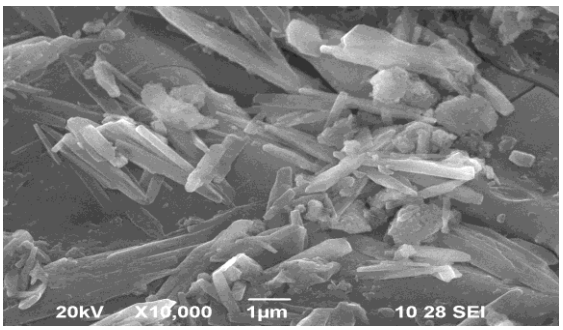

Fig 2: SEM Analysis of GGBFS

IX. EDAX TEST

After the formal test with magnet, foundry sand was taken to the Karunya University for EDAX test. Elemental composition of foundry sand was compared with composition of cement.

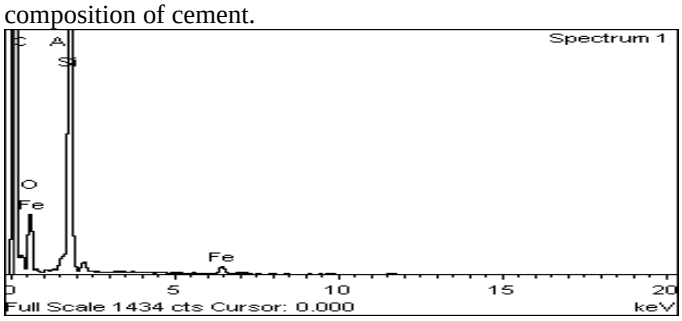

Fig 3: Testing of samples (foundry sand)

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X. TESTING OF SAMPLES (FOUNDRY SAND)

Full Scale 1434 cts Cursor: 0.000 keV
Spectrum 1
Spectrum processing: Peaks possibly omitted: 2.163, 9.680 keV
Processing option: All elements analyzed (Normalized)
Number of iterations = 5
Standard:
C CaCO3
O SiO2
Al Al2O3
Si SiO2
Fe Fe

Table No. 3Percentage of minerals contents

Element	Intensity	Weight (%) sigma	Atomic (%)
C K	0.285	2.66	37.16
O K	0.646	1.72	42.02
Al K	0.905	0.19	0.86
Si K	0.947	1.26	18.95
Fe K	0.808	0.38	1.01
	Totals	100	

Table No.4: Comparing with cement

Minerals	% in cement	%in foundry sand
Lime	60 to 67	38
Silica	17 to 25	60
Alumina	3 to 8	1
Iron	0.5 to 6	1

XI. PARTICLE RESULT OF SIZE DISTRIBUTION OF FOUNDRY SAND:

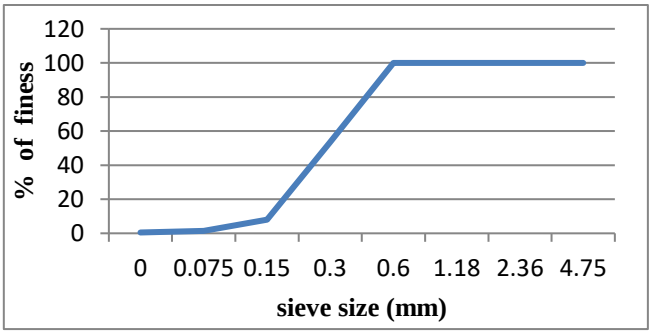

Fig 3: Particle size distribution of sand

Table No. 5: Comparison between M-sand and Foundry sand

Description	M-Sand	Foundry sand
Specific gravity	**2.43**	**2.65**
Particle size distribution	**4.63**	**3.6**

XII. CONCLUSION

By utilizing the GGBFS as a replacement of M-sand for construction purpose, the environmental pollution such as land and water can be reduced. Also the chances of harmfulness to the cattle and public can be controlled. It was clear that when GGBFS used as a replacement of fine aggregate the flexural strength, modulus of elasticity and split tensile strength can be increased. This provides the structure an additional strength and durability.

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