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FEASIBILITY STUDY ON BUILDING MATERIALS USING FOUNDRY WASTE AND FAL-G TECHNOLOGY

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***Abstract*— Fal-G is the product name given to a cementitious mixture composed of fly ash that are obtained from the thermal power plants which is a by-product of coal used in power generation process. This project leads to the technology of making Fal-G brick with dry fly ash from thermal power plant and foundry waste sand. The main aim of this study is to analyse the strength and durability characteristic of the Fal-G brick. This can help in controlling the environmental pollution to greater extent in the surroundings areas of thermal power plant and foundry industries. The main intension of this study is to utilize the industrial wastes in making building products. Also, if this bricks are able to replace the burnt clay bricks and it will be helpful in reducing the carbon foot print generated during the clay brick manufacturing process. Similar to fly ash, foundry waste sand is being accumulated as industrial waste in large quantity in the foundry industries and creating serious environmental problems. This study implies that the compressive strength of Fal-g brick is found to increase with age.**

***Index Terms*— Fly ash, Gypsum, Ordinary Portland Cement and Foundry waste sand.**

I. INTRODUCTION

The scope of the project is to utilize the industrial waste such as fly ash and foundry waste in making sustainable building materials. The disposal of the increasing amounts of solid waste from coal-fired thermal power plant (Fly ash) I becoming a serious concern to the environment. The amount of coal burns to produce 1MW of electricity is nearly 4000 tons per annum. The waste generated from the thermal power plant is around 750 kg or 0.75 ton as fly ash when 1 ton of coal for power generation. Foundry waste sand is industrial waste that obtained from the metal industries. Gypsum is a by-product produced from chemical industries and industry generates nearly 2 tons of waste as gypsum.

It is also important to study the strength and durability properties of the brick when industrial waste and by-product is used in manufacturing process. Compare to normal clay brick, Fal-G brick has eco-friendly product for building construction. Normal clay bricks are produced by fuel burning and it cause pollution to the environment. Utilization of Fal-G Brick instead of clay bricks leads to reduce the pollution and may also cause increase in strength and durability. It is also to find whether the Fal-G brick economical when compare to burnt clay brick. With use of industrial waste for making of sustainable building material, the landfill area occupied by waste are reduced.

II. LITERATURE REVIEWS

Venktesh Mane, Om Magatrao, Ganesh Mane, Akshay Ohol & Amol Hire & Padwal "Eco-Friendly High Strength Concrete by Using Foundry Sand and Pond Ash". This paper deals with utilization of foundry waste and pond ash as a replacement with cement materials. Foundry sand is partially replaced with fine aggregate. Foundry waste is replaced upto 30% with fine aggregate and pond ash is replaced with cement. A comparative analysis has been carried out for conventional concrete as well as for high strength concrete in relation to compressive strength. When compare to normal conventional concrete, it attains high strength at early stage and durability is more.

Prof. JayeshkumarPitroda, Prof.Jaydevbhai, J.Bhavsar "Used Foundry sand for Development of Eco-Friendly Low Cost Concrete". This paper contributes to use the foundry sand in the concrete as a replacement of fine aggregate and to reduce landfill area also prevent from causing pollution problem due to foundry sand. It is replaced by fine aggregate with ratio of 0%, 10%, 20%, 30% and 50% by weight for M20 trial mix. As a comparative analysis it shows that the cost is reduced upto 3.39 for 50% replacement of using foundry sand. It also shows that strength and durablitity of concrete increased and leads to reduce the waste disposed in the landfill area.

SaveriaMonosi, Daniela Saniand Francesca Tittarelli "Used Foundry Sand in Cement Mortar and Concrete Production". This paper shows that use of foundry waste sand in cement mortar reduced high amount of solid waste generated by foundries. The workability of concrete is reduced while using the foundry waste sand and it is maintained by superplastizers. It is replaced by fine aggregate with the ratio

upto 50% foundry sand. As per result analysis, the compressive strength of foundry concrete more than 15% as compared to conventional concrete. It also says that cost of concrete is reduced while using foundry sand.

Shruthi.N, R.B.Gadag "Utilization Of Waste Foundry Sand, Demolished Aggregate & Waste Plastics to Making Pervious Concrete". This paper deals with use of foundry waste to produce pervious concrete to increase the strength. The foundry waste sand replaced fine aggregate with ratio from 0-60% by 10% interval respectively. Materials used are natural coarse and demolished aggregate for making M25 grade of concrete with water-cement ratio of 0.37. Testing the concrete specimen shows that highest compressive strength attains at 60% replacement of foundry waste sand and Tensile strength is 0.68Mpa and Flexural strength is 1.7Mpa. It leads to reduce the permeability by filling the pores in the concrete by using foundry waste sand.

EknathP.Salokhe, D.B.Desai "Application of foundry waste in manufacture of concrete" This paper contributes to the use of foundry sand in concrete as a replacement of fine aggregate. The percentage replacement of foundry sand is 0%, 10%, 20% & 30% by weight of fine aggregate and tests were performed for M20. The compressive strength at 7 days of both ferrous and non-ferrous increases as compared to ordinary mix.Split tensile strength gives maximum valves with 20% FWS for both ferrous and non-ferrous materials.

III. MATERIALS AND ITS APPLICATION

A. Foundry Waste Sand

Metal foundry waste sand is used large amounts of sand as part of the metal casting process. Foundries successful as recycle and reuse the sand many times in casting process. When the sand can no longer be reused in the foundry, it is removed from the foundry and is termed as "foundry waste sand". Foundry sand can be used in concrete to improve its strength and their durability factors. It consists of silica sand coated with a thin film of burnt carbon, residual binder and dust. Since materials are industrial waste/by-product obtained from foundry industry.

B. Fly ash

Fly ash is a type of industrial by-product that obtained from coal-based thermal power plants. In India, the country consumes 75% of electricity through coal burn production. Fly ash that used for brickwork is purchased from "THERMAL POWER PLANT". Depending upon the source and makeup of the coal being burned, the components of fly ash are used as a replacement of cement for certain extent for construction work.

C. Gypsum

Gypsum is a soft sulfate mineral composed of calcium sulfate dehydrate, with the chemical formula CaSO42H2O. It is widely mined and is used as a fertilizer, and as the main constituent in many forms of plaster, blackboard chalk and wallboard. It is a co-product obtained from the manufacture of Anhydrous Hydrofluoric acid process.

D. Mix Proportions

After the selection of material, the mix proportions were tried based on the chemical analysis and can take number of mix proportions randomly and calculated the percentage of chemical content present in the proportions equivalent to percentage of chemical present in the standard brick.

E. Mix Ratio

Table 1- Different trial mix for casting

No	Property	Trial mix (%)				
		1	**2**	**3**	**4**	**5**
1	FA	75	67.5	60	52.5	45
2	Gypsum	4	4	4	4	4
3	OPC-53	21	21	21	21	21
4	FWS as replace of FA	0	10	20	30	40
5	Water	Required amount for consistency				

FA*- Fly ash
FWS*- Foundry waste sand

F. Casting and Curing of bricks

For this study we have casted bricks with standard dimensions of 19cm x 9cm x 9cm respectively. This bricks are formed using the above mentioned by using brick mold method. It is necessary to makes the surface smooth on all the six sides and provide it setting for a day. After 24 hours, the bricks are removed from mold and it is covered with wet gunny bags for avoiding dehydration. Curing is done daily by applying water over the brick surface.

G. Testing on Bricks

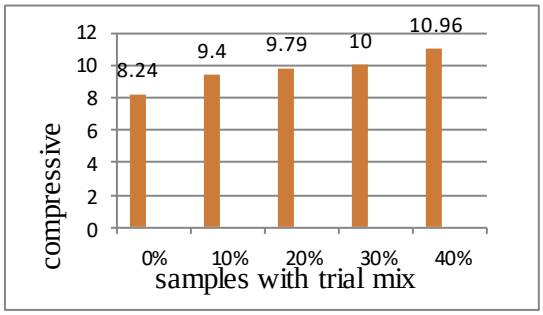
After the curing process, the samples are taken for testing process for analyzing of strength and durability. The bricks with different proportions are tested as per IS: 3495-1976, Fal-G bricks shall be test for

1) *Compressive strength*
2) *Water absorption*

IV. RESULTS AND DISCUSSION:

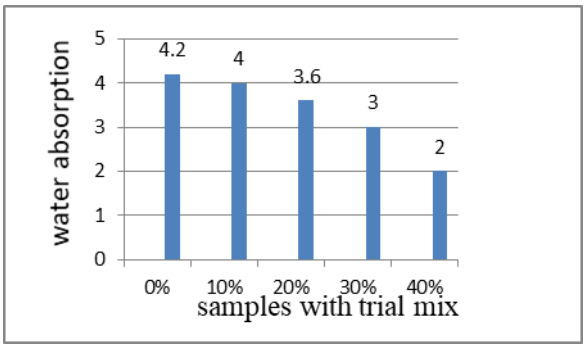
A. Compressive strength:

It is necessary to withstand high amount of compressive stress, so the strength in compression is an important one for good quality brick. As per IS code 3495-1976, with references to the given guide lines the specimen should be immersed in water for 24 hours for curing.



B. Water Absorption:

Water absorption is also important for finding the quality of the brick. This test deals with amount of water that is to be absorbed by the brick and it shows that indicate the porosity and permeability of the material. Here the water absorption for the Fal-G brick with different trial mix as follow:



C. Discussion:

The compressive strength of the Fal-G while replacing fly ash with foundry waste sand, it led to increases in the strength when compared to normal burnt clay brick. From the above compressive strength, we can able to justify that replacing the fly ash with FWS also decreases the water absorption and reduction in permeability of the brick compared to normal burnt clay brick.

V. COMPARISION BETWEEN NORMAL CLAY BRICK & FAL-G BRICK

As per IS code, the compressive strength of the normal clay brick less than 3.15N/mm2 but in case of Fal-G brick its strength will be thrice the compressive strength of clay brick. Due to presence of very fine particles in the fly ash and foundry waste sand, the permeability of Fal-G brick is reduced and leads to less water absorption nearly 6% which is much better than first class burnt clay brick respectively. Another advantage in Fal-G brick is Nil Efflorescence. The surface and color of the brick are smooth and uniform throughout the brick area. Since the Fal-G brick has varies advantages, the cost of the brick is slightly more than normal burnt clay brick..

VI. CONCLUSION

Foundry industry generates a huge amount of waste mold sand shows that it can be used further. From the results and discussion it is found that foundry waste sand can be utilized as a replacement material for the Fal-G brick. From the reading obtained from the compressive strength, the brick attains its strength later when compared to fly ash brick and normal bunt clay brick. For earlier strength the brick is mixed with OPC and this bricks are called as PORTLAND FAL-G BRICKS.

The following are the advantages while using the waste in the manufacture of brick are

- Reduce the environmental pollution
- Reuse and recycling of the wastes
- Decreases the land filling area occupied by the wastes
- Cost effective & no skilled labor required

Thus the industrial waste and by-product such as fly ash, foundry waste sand and gypsum are used as effectively alternate material for manufacturing of brick.

REFERENCES

[1] Bhanumathidas N & Kalidas N: The Renaissance of Mediaeval Age Cement: FaL-G; Civil Engineering & Construction Review; April 1993.

[2] Bhanumathidas N & Kalidas N: Portland FaL-G: A New Pozzolanic Blend; Civil Engineering & Construction Review; May 1994.

[3] Bhanumathidas N & Kalidas N: Enlarged Scope of FaL-G Technology : Cement (OPC) as Source of Lime; Civil Engineering & Construction Review; September 1998.

[4] Veerabhadra Rao P & Veerabhadram K: The First Monumental FaL-G Structure of the World – Structural Aspects; Proceedings of National Conference on Cement & Building Materials from Industrial Wasrtes; JNTU, Hyderabad; Tata Mc-Graw-Hill Publishing Co. Ltd., Delhi, July 1992.

[5] Padmapriya I: Analysis, Characterisation and Durability Studies on Water Tanks

[6] Constructed with FaL-G Concrete by RWS, Panchayatraj Dept., ACT Foundation Fellowship Study, 2004.

[7] Dushyant Rameshbhai Bhimani, Prof. Jayeshkumar Pitroda,and Prof.Jaydevbhai J. Bhavsar "Used Foundry Sand For Development Of Eco-Friendly Low Cost Concrete",Pitroda et al.,

[8] Shruthi.N, R.B.Gadag. "Utilization Of Waste Foundry Sand, Demolished Aggregate & Waste Plastics To Making Pervious Concrete".