CHARACTERIZATION OF SOIL CEMENT BRICKS WITH IN CORPORATION OF USED FOUNDRY SAND

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Abstract : A foundry is a manufacturing facility that produces metal castings by pouring molten metal into a preformed mold to yield the resulting hardened cast. Foundry sand consists primarily of silica sand, coated with a thin film of burnt carbon, residual binder (bentonite, sea coal, resins) and dust. Foundry sand can be used in concrete to improve its strength and other durability factors. Foundry Sand can be used as a partial replacement of cement or as a partial replacement of fine aggregates or total replacement of fine aggregate and as supplementary addition to achieve different properties of concrete.

In the present study, effect of foundry sand as fine aggregate replacement on the compressive strength of cement mortar having mix proportions was investigated. Fine aggregates were replaced with four percentages of foundry sand. The percentages of replacements were 0 ,40, 50,60 % by weight of fine aggregate. Test were performed for compressive strength test for all replacement levels of foundry sand at different curing periods (7,14,21,28-days).

IndexTerms - used foundry sand, building ceramics, solid industrial waste.

I. INTRODUCTION

Foundry sand is high quality silica sand with uniform physical characteristics. It is a by-product of ferrous and nonferrous metal casting industries, where sand has been used for centuries as a molding material because of its thermal conductivity. It is a by-product from the production of both ferrous and non-ferrous metal castings.

The physical and chemical characteristics of foundry sand will depend in great part on the type of casting process and the industry sector from which it originates. In modern foundry practice, sand is typically recycled and reused through many production cycles. Industry estimates that approximately 100 million tons of sand is used in production annually of that 6- 10 million tons are discarded annually and are available to be recycled into other products and in industry. The automotive industries and its parts are the major generators of foundry sand. Foundries purchase high quality size-specific silica sands for use in their molding and casting operations.

The raw sand is normally of a higher quality than the typical bank run or natural sands used in fill construction sites. The sands form the outer shape of the mold cavity. These sands normally rely upon a small amount of bentonite clay to act as the binder material. Chemical binders are also used to create sand "cores". Depending upon the geometry of the casting, sands cores are inserted into the mold cavity to form internal passages for the molten metal. Once the metal has solidified, the casting is separated from the molding and core sands in the shakeout process. In the casting process, molding sands are recycled and reused multiple times. Eventually, however, the recycled sand degrades to the point that it can no longer be reused in the casting process. At that point, the old sand is displaced from the cycle as by- product, new sand is introduced, and the cycle begins again. A schematic of the flow of sands through a typical foundry is shown in Fig.1.1. Although there are other casting methods used, including die casting and permanent mold casting, sand casting is by far most prevalent mold casting technique. Sand is used in two different ways in metal castings as a molding material, which focuses the external shape of the cast part and as cores that form internal void spaces in products such as engine blocks. Since sand grains do not naturally adhere to each other sobinders must be introduced to cause the sand to stick together and holds its shape during the introduction of molten metal into mold and cooling of casting.

EXPERIMENTAL PLAN

In the present study, effect of foundry sand as fine aggregate replacement on the compressive strength of cement mortar having mix proportions was investigated. Fine aggregates were replaced with four percentages of foundry sand. The percentages of replacements were 0 ,40, 50,60 % by weight of fine aggregate. Test were performed for compressive strength test for all replacement levels of foundry sand at different curing periods (7,14,21,28-days).

Mixture proportions

The evaluation of Used Foundry Sand is used as a replacement of fine aggregate material begins with the bricks testing. bricks contains cement, water, fine aggregate, foundry sand. The percentages of materials are used as follows, i.e. 40%, 50% and 60% of the foundry sand,30%,20%,10% of fine aggregates,30%,30%,30% of cement, the data from the used foundry sand is compared with data from a standard bricks without used foundry sand. Eight cube samples were cast on the mould of size 300*150*150 mm .bricks mix with partial replacement of fine aggregate with water is 25% were also cast. After about 24 hours the specimens were de-moulded and water curing was continued till the respective specimens were tested after 7, 14,21,28 days for compressive strength and water absorption tests.

Table 1: Mixture proportions and fresh Properties

S.NO	DESIGNATION	CEMENT IN %	FINE AGGREGATE IN %	FOUNDRY SAND IN %	WATER IN%
1.	M1	30	30	40	20
2.	M2	30	20	50	20
3.	M3	30	10	60	20
4.	M4	30	70	0	20

RESULTS AND DISCUSSIONS

Table 2: **COMPRESSIVE STRENGTH FOR 7 DAYS**

NO.OF DAYS	MIX	COMPRESSIVE STRENGTH (MPa)
7	0	4.74
	40	4.13
	50	4.36
	60	4.67

: COMPRESSIVE STRENGTH FOR 14 DAYS

NO.OF DAYS	MIX	COMPRESSIVE STRENGTH (MPa)
14	0	5.9
	40	5.34
	50	5.5
	60	5.8

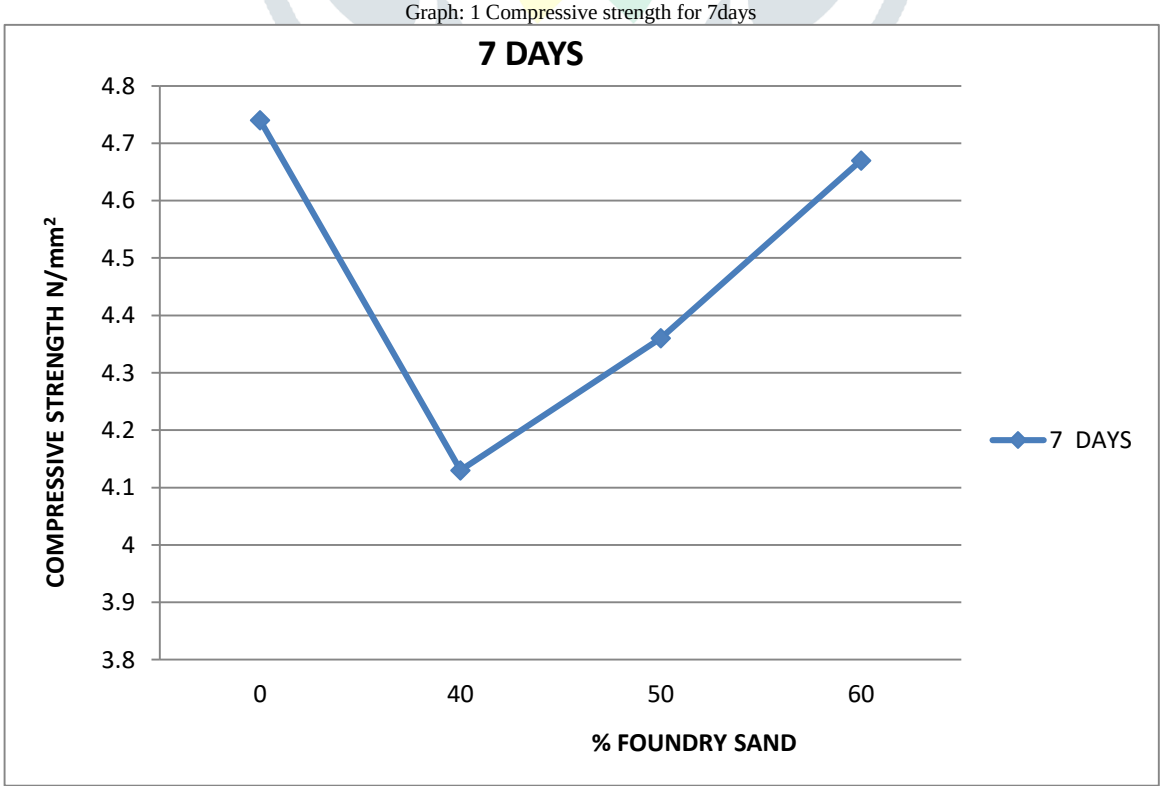
COMPRESSIVE STRENGTH FOR 21 DAYS

NO.OF DAYS	MIX	COMPRESSIVE STRENGTH (MPa)
21	0	6.74
	40	6.13
	50	6.36
	60	6.67

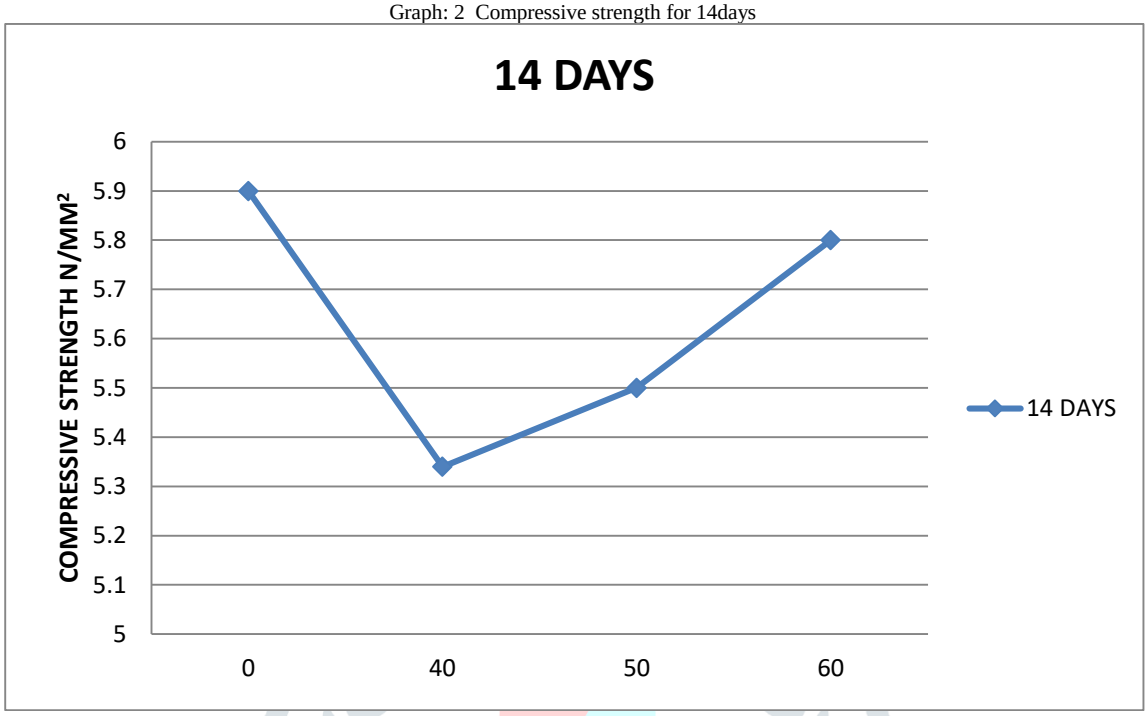
COMPRESSIVE STRENGTH FOR 28 DAYS

NO.OF DAYS	MIX	COMPRESSIVE STRENGTH (MPa)
28	0	7.89
	40	7.34
	50	7.5
	60	7.9

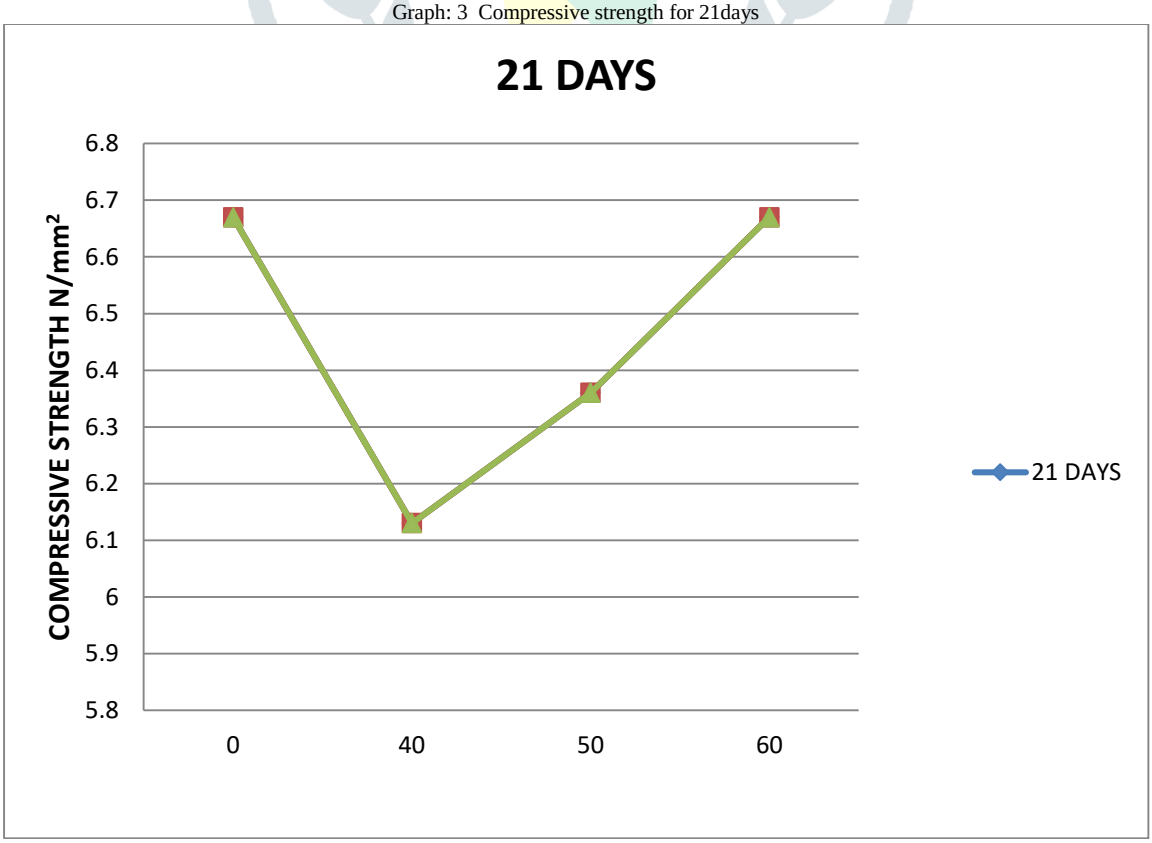
Graph: 1 Compressive strength for 7days



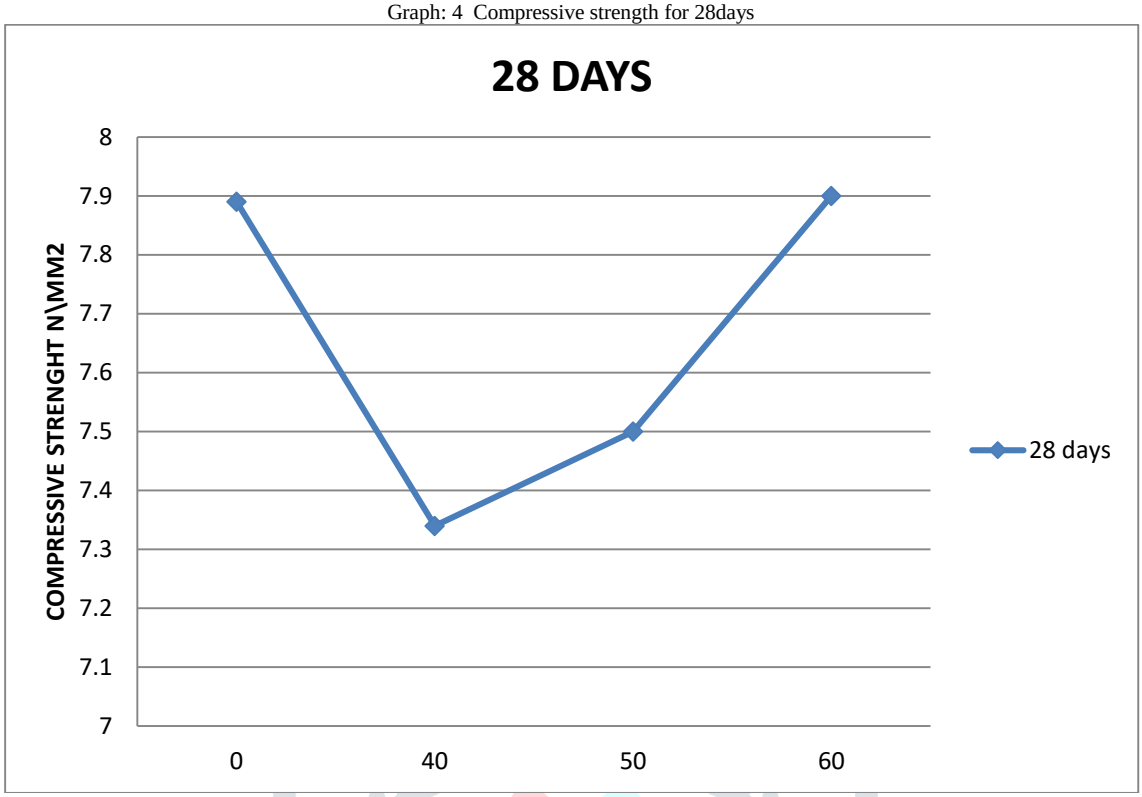
Graph: 2 Compressive strength for 14days



Graph: 3 Compressive strength for 21days



Graph: 4 Compressive strength for 28days



CONCLUSIONS

Based on above study the following observations are made regarding the properties and behaviour of bricks on partial replacement of fine aggregate by waste foundry sand:

- The success of using foundry sand depends upon economics
- Availability of the foundry sand and availability of similar natural aggregates in the region.
- If these issues can be successfully resolved, the competitiveness of using foundry sand will increase for foundries and for end users of the sand
- This is true of any recycled material.
- From physical analysis the physical properties are somewhat similar to the natural sand
- Compressive strength increases on increase in percentage of waste foundry sand as compare to normal brick.
- In this study, maximum compressive strength is obtained at 60% replacement of fine aggregate by waste foundry sand.
- Use of waste foundry sand in bricks reduces the production of waste through metal industries i.e. it's an eco-friendly building material
- The problems of disposal and maintenance cost of land filling is reduced
- Application of this study leads to develop in construction sector and innovative building material

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