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EFFECT OF WASTE FOUNDRY SAND ON THE DIFFERENT PROPERTIES OF CONCRETE

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ABSTRACT

Used-foundry sand is a by-product of ferrous and nonferrous metal casting industries. Foundries successfullyrecycle and reuse the sand many times in a foundry. When the sand can no longer be reused in thefoundry, it is removed from the foundry and is termed used/spent foundry sand. In an effort to utilizeused-foundry sand in large volumes, research is being carried out for its possible large-scale utilizationin making concrete as partial replacement of fine aggregate.This paper presents the results of an experimental investigation carried out to evaluate the mechanicalproperties of concrete mixtures in which fine aggregate (regular sand) was partiallyreplaced with waste-foundry sand (WFS). Fine aggregate was replaced with three percentages (5%,10%,15%, 20%, and 25%) ofUFS by weight. Tests were performed for the properties of fresh concrete. Compressive strength, splitting-tensile strength, flexural strength, and modulus of elasticity were determined at3,7and 28 days. Test results indicated a marginal increase in the strength properties of plain concrete by theinclusion of UFS as partial replacement of fine aggregate (sand) and that can be effectively used in makinggood quality concrete and construction materials.

KEYWORDS: Foundry sand,waste-foundry sand,

INTRODUCTION

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.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 .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

OBJECTIVE

- To know the fresh concrete properties of foundry sand concrete.
- To know the behavior of compressive and split tensile strength of foundry sand.

LITERATURE REVIEW

GurpreetSingh[etal]Maximum increase in compressive strength, splitting tensile strength and modulus of elasticity of concrete was observed with 15% WFS (ii) WFS increases the ultrasonic pulse velocity values and decreased the chloride ion penetration in concrete

Kumbhar[etal]workability goes on reducing with increase in WFS content; (ii) At 28 days, Compressive strength, splitting tensile strength for different replacement levels of WFS is increased whereas flexural tensile strength goes on reducing for WFS content more than 20%.

Siddique[etal]Compressive strength, splitting tensile strength, flexure strength and MOE of concrete mixtures increased with increase in waste foundry sand content. Mechanical properties of concrete mixtures increase with age for all the foundry sand content

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Monosi[etal]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

METHODOLOGY

Waste Foundry Sand

- Waste Foundry Sand (WFS) is generated by industries that use sand to form molds and Cores for castings.
- It is a bi-product from the production of both ferrous and non-ferrous metal casting.
- The annual generation of WFS in India is about 2,00,000 tons.
- It is non-hazardous.
- It is used as a earth fill material in the construction industries.
- Cheapest & suitable appropriate alternative to Natural sand.

fig.1waste foundry sand

Physical properties of waste foundry sand

Characteristics	Value
Color	Grey (Blackish)
Specific Gravity	2.49
Bulk relative Density	2592 kg/m^3
Water Absorption	0.43%
Moisture contain	0.11%
Plastic limit	Non-plastic
Fineness Modulus	1.89

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Chemical properties of WFS & Fine Aggregate

Constituents	WFS% by Weight	Fine Aggregate
Silica (SiO_2)	78.81–95.10	80.78
Iron Oxide (Fe_2O_3)	0.94–5.39	1.75
Alumina ($Al2O_3$)	0.81–10.41	10.52
Calcium Oxide (CaO)	0.14–1.88	3.21
Magnesium oxide (MgO)	0.30–1.97	0.77
Titanium Dioxide (TiO_2)	0.04–0.22	Nill
Sodium Oxide (Na_2O)	0.19–0.87	1.37
Potassium Oxide (K_2O)	0.25–1.14	1.23

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 cube,beam, cylinders to studies the different properties concrete using foundries and compare with concrete with natural sand as fine aggregate. Artificial sand was replaced with six percentages (0% ,5%,10%,15%, 20%&25%) 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.

CONCLUSION

Compressive strength, splitting-tensile strength, flexuralstrength, and modulus of elasticity of concrete mixturesincreased with the increase in foundry sand contents.Compressive strength, splitting-tensile strength, flexuralstrength, and modulus of elasticity of concrete mixturesincreased with age for all the foundry sand contentsIncrease in compressive strength varied between 8% and 19%depending upon UFS percentage and testing age, whereas itwas between 6.5% and 14.5% for splitting-tensile strength, 7%and 12% for flexural strength, and 5% and 12% for modulus ofelasticity.

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