THE EFFECT OF FERROCHROME SLAG AS PARTIAL REPLACEMENT OF CEMENT IN CONCRETE

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ABSTRACT:

Concrete is the second mostused material in the world after water. In 21st century, world is progressing at a breath-taking pace and rapid construction helps us to cope up with the pace. Cost of concrete and its environmental impact both depends on the constituent materials. It has become a key concern to make concrete more and mg environment friendly by replacing conventional materials. Ferrochrome slag is a waste material obtained from the manufacturing of high carbon ferrochromium alloy. This slag is formed as a liquid at 1700 °C and its main components are SiO₂, Al₂O₃ and MgO. Additionally, it consists chrome, ferrous/ferric oxides and CaO. Ferrochrome slag has many ill effects on environments such reduced growth of trees and animals, less n productive capacity in mammals and also so me diseases like Cancer. The ill effects of Ferrochrome slag can be controlled by using it in construction industry. There have been many theories proving the benefits of ferrochrome used as partial or complete replacement of Aggregates. This project aims towards the use of Ferrochrome slag (powder form) as partial cement replacement in concrete to study its effect on Compression, Tensile and Flexural Strength of Concrete

KEY WORDS: Concrete. Ferrochrome slag.

I. INTRODUCTION:

Slags are the unit vital wastes and by-products of metallurgic trade that are treated, recycled and utilization of the varied slags from metallic element and non-ferrous metal production, in addition as waste combustion, and use of salt fluxes in secondary metal production. The metallurgic compound slags have stonelike properties and, thus their major applications area unit in applied science field worldwide. The slags ought to be recycled, changed and processed in an exceedingly correct means, by taking the environmental impact into thought

errochrome slag is the by-product of waste nerated from the ferrochrome steel plant. Globally, prochrome slag is 6.5 to 9.5 million tons eration of F i increased by 2.8 to 3 6 per annum. It contains 13a 39% 2, 10-29% of Mg0, 16-43% of Al₂O₃, 1-6% of CaO, 6-189 of Chromium, 3-11% of Iron and other aw materials used in the ferrochrome ninerals. aded lumpy ore and fine concentrate roduction are up rom the Kemi mine. Fine concentrate is first ground and made into pellets in the sintering plant. The pellets are then sintered in the sintering furnace at a temperature of 1400°C. The charge of the smelting furnaces consists pellets, upgraded lumpy ore, reducing metallurgical ke and fluxing quartzite. Before smelting the material s preheated up to 500–800°C by burning carbon monoxide gas in a shaft preheater

II METHODOLOGY:

Test specimens are prepared by doing tests on cement and aggregate according to IS specification

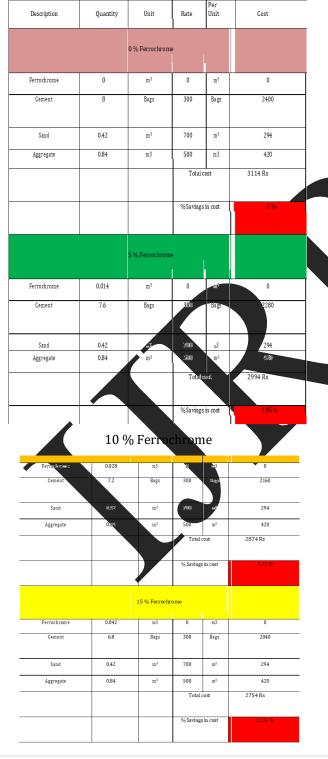
Sr.	Compound	Percentage
No.		
01	Chromium Oxide	7.98 %
	(Cr ₂ O ₃)	
02	Silicon Di-oxide	1.68 %
	(SiO ₂)	
03	Aluminium Oxide	66.87%
	(Al ₂ O ₃)	
04	Carbon (C)	0.0006%
05	Phosphorous (P)	0.011%
06	Sulphur (S)	0.005%

CASTING OF TEST SPECIMEN:

The project consists of Compression test on Cubes, Split Cylinder test on Cylinders and Flexural Strength on Beams Standard specimens are selected as per IS: 516-1959 as follows.

Sr. No.	Test of concrete	Test specimen
01	Compression Test on cube	Length = 150 mm Width = 150 mm Height = 150 mm
02	Tensile Test on cylinder	Diameter = 150 mm Height = 300 mm
03	Flexural Strength on beams	Length = 500 mm Width = 100 mm Height = 100 mm

III COST CALCULATION



IV RESULTS:

While conducting the experiments, precautions were taken to take the readings of dial gauges at particular load intervals. During load application attention was paid to crack formation in specimens. The results of the tests on various Specimens are explained below:

The average compressive strength of control sample (0% Ferrochrome) is 22.963 N/mm² while with the ferrochrome replacement CB10 has vielded a highest average compressive strength as 21.219 N/mm². The average tensile stren gth of control sample (0% Ferrochrome) N/mm² while with the ferrochrome lacement CL10 has vielded a highest average tensile strength as **N/mm²**. The average rupture strength of control sample (0% Ferrochrome) is 3.678N/mm² while with the ferrochrome replacement 10 has yielded highest average rupture strength as 49N/mm².

CONCLUSION:

Partial cement replacement has been studied. The experimental studies have resulted in following conclusion:

The res from Compressive test shows that the 28-day compressive strength of concrete is maximum at 10% ferrochrome slag, whereas the percentage replacement of 5% and 15% ferrochrome ng leads to decrease in compressive strength. The sults from Split Cylinder test is also optimum with 0% ferrochrome slag as compared to 5% and 15% ferrochrome slag. Flexural Strength of the sample with 10% ferrochrome slag specimen is more than control sample (0% Ferrochrome slag). The replacement of ferrochrome slag partially to the cement in concrete will not only conserve the cement but also reduces the environmental impacts of it. The replacement of ferrochrome slag partially to the cement in concrete minimizes total cost of concrete

FUTURE SCOPE:

The project was carried out with partial replacement of cement using Ferrochrome Slag. However, the study can be further continued with addition of fly ash with ferrochrome slag. And also, instead of cement replacement, ferrochrome slag can be used to replace fine aggregate in varying percentages.

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