Effect of Various Industrial Waste on Mechanical Properties of Concrete

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Abstract- *From decades it is common in construction to Consume natural resources. In construction industries, demand of construction materials is never come down and that is why there is need to focus on alternative construction material. If waste material like waste foundry sand, silica fume, glass powder is used as an alternative construction material then it can help to reduce the amount of disposal material. The research is conducted to compare concrete performance between conventional mix trial and a mix with addition of Waste Foundry Sand, Silica fume & Glass powder in different concrete mix trial and check how concrete behave by addition of these (Waste Foundry Sand, Silica fume & Glass powder in different concrete mix trial). By utilizing waste like waste foundry sand as a partial replacement of natural sand in concrete mix to create eco-friendly environment so that we can reduce the consumption of our natural resources. Silica fume can be replaced with cement as it reacts with calcium hydroxide that is formed in the hydration of Portland cement. The strength and durability properties are evaluated with conducting experimental study, where total of 4 concrete mix trial will be prepared and evaluate. First concrete mix trial will be made as a conventional mix trial. Second concrete mix trial will be made as a replacement of natural sand with waste foundry sand by weight (10%,20%,30%). Third mix trial will be made by taking the optimum value of WSF from trial second and silica fume is added with replacement of cement by weight (5%, 10%, 15%). Fourth trial mix will be made as a replacement of natural sand with waste foundry by weight (taking optimum from trial second) and glass powder is added with a replacement of cement by weight of cement (5%,10%, &15%). Compression, split-tensile strength & flexural strength test will be carried out on 7th, 14th, 28th, & 56th day. After evaluating the test result of each trial mix, finally we will compare the final result of each trial mix and see how concrete behaves in each concrete mix trials.*

Keywords **–** Concrete, Waste Foundry Sand, Silica fume, Glass powder, Compressive strength, Tensile strength, Flexural strength.

INTRODUCTION

Beside water concrete is the most usable material used in the world. Concrete is a mixture of Cement, Fine aggregates, Coarse aggregates and water. The cement is generally categorized as Ordinary Portland Cement and Pozzolana Portland Cement. The major part of cement comprises of Lime. The color of cement depends upon the oxides present in it. Concrete is mainly used in every construction field for the construction of Plain cement concrete structures and Reinforced cement concrete structures. Concrete possess high compressive strength and low tensile strength. It provides high rigidity and stiffness to a structure so that it sustains a longer life under uncertain loading condition. There are incredible researches carried out on the concrete by replacing it with some other materials like silica fume, fly ash and many more to accomplish high strength under cost-effective condition. In concrete the natural sand which is used as fine aggregate is taken from rivers directly. In order to accomplish the regular need and to decrease the consumption of natural sand, waste foundry sand can be partially substituted to natural sand by weight. As foundry sand is used in metal manufacturing factories as a mould in casting the ferrous and non-ferrous materials. Repetitively use of foundry sand as a mould leads it to loss of its binding property and then it is disposed as waste. But due to it is rich in silica it can be used as replacement of natural sand by weight to reduce the use of natural resources and contributing towards eco-friendly environment. It is estimated that the cement industries emit about 522 million tons of CO_2 in the year 2016 also one ton of cement production generates approximately 0.8 ton of CO_2. As demand of cement is increasing day by day one can use silica fume which is one such richly available material which can be used in spare of cement. As the silica fume has fine size particle which allows it to act as a filler and it also improve packing by entering the spaces between cement particles. Waste glass is another such richly available material which can be used in spare of cement. Whole of the glass waste can't be reused for making new glass, in fact most of the glass waste is usually disposed because of impurities present in it.

1.1 Waste Foundry Sand

Foundry sand is rich in silica sand and it is a by-product from the metal casting production of both non-ferrous and ferrous. As compared to natural sand which is used in construction the raw sand is normally of a higher quality.

1.2 Silica Fume

Silica fume is a ultrafine powder which contains silicon content 75% or even more than this. The cement can be replaced partially by the silica fume as the ultrafine particle size will allow it to act as filler and also enhances the packing as it enters in the space between cement particles. Due to the high reactivity of silica fume with calcium

hydroxide the silica fume can replace the cement. The silica fume has pozzolanic properties and it is good in physical filling due to this effect makes it is largely acceptable as additional cementitious material.

1.3 Glass Powder

Waste glass is another such richly available material which can be used in spare of cement. Whole of the glass waste can't be reused for making new glass, in fact most of the glass waste is usually disposed because of impurities present in it. In the year 2010, about 4.25 lakh t of waste glass was produced out of which the recycled waste glass was just 192,000 t. Crushed waste glass contains silicon in large amount. The waste glass has pozzolanic properties so the crushed waste glass can be used instead of cement partially. In the production of float, sheets, or containers soda lime glass are the common type of glasses.

2. CONCLUSIONS

Following conclusion can be drawn from the present investigation:

- The Compression, split-tensile and Flexural strength rises by partial replacement of natural sand with Waste Foundry Sand.
- By utilising Waste Foundry Sand, the abrasion resistance of concrete can be improved.
- Addition of silica fume as a spare of cement increases slump flow in concrete.
- Addition of glass powder increases the workability of concrete.
- Addition of glass powder increase hydration and pozzolanic reaction

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