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Experimental Analysis of Quarry Dust and Metallic Dust as a Partial Replacement of Fine Aggregate in Concrete

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Abstract: In earlier stage sand has been differentially replaced by 5% of Mild Steel Scrap or Quarry Dust having 10%, 15%, 20%, 25%, 30% partial replacement. In second stage sand has been differentially replaced by Mild Steel Scrap proportion of 10%, 15%, 20%, 25%, 30% and Quarry Dust by 40%, 35%, 30%, 25% and 20% partial replacement.

I had also done various trial of mix, control mix etc. Compressive Strength test was done on mould size cube 150 mm x150mm x 150mm for 7th or 28th days and Split Tensile Strength is also done by UTM machine. The entire concrete cube specimen was cured for 7th or 28th days in deep water tank on standard temperature of 27oC.

This experiment results indicated considerable Increasing in the Strength of Concrete with addition of Mild Steel Scrap and Quarry Dust up to 40 percentage replacement of sand and after further increases the % of Mild Steel Scrap and Quarry Dust, a drop in strength of concrete was noted. This thesis study shows Compressive Strengthening and Split Tensile Strengthening of different Mixes of group I and group II.

Keywords — Cube Compressive Strength, Mix Design, Mild Steel Scrap, Workability, Quarry Dust, metallic dust, Split Strength, UTM.

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I. INTRODUCTION

Naturally available sand is most prominent for fine aggregate element of concrete, but heavily use of this material leading atmospheric concerns. Then its desire to attain cheap, environmental friendly substitutes for river sand. World average consumption of sand is generally around 1000 million tons per year. The extreme or non-scientific methods of mining sand creating the problem and as well as its also responsible for lower down water level and sinking of bridge. And its also creating environmental degradation like removal of minerals from topsoil due to erosion and making soil infertile so its directly affects the crop production, and leading to flood. Therefore civil engineers search alternative source in construction industry where we should be partly or completely replacing naturally available sand in concrete by using unwanted or unused materials which is obtained by recycling, and don't compromise the properties and quality of product. In the recent years, construction industries searched out many waste materials like fly ash, slag, limestone powder or silicious stone powder use in traditional concrete.

II. LITERATURE REVIEW

Kothai et al The work relates to the use of steel slag, a waste inexpensive material used as fine aggregate in M20 grade concrete, and suggests that the material be approved for use in concrete as a fine aggregate replacement material. Natural aggregates can be partially replaced in concrete to

increase compressive, tensile, and flexural strength as well as modulus of elasticity by up to 30%.

Cheten khajuria et al In comparison to the control mix, adding 10% iron slag to the concrete mix results in a 26 percent rise after 7 days, a 43 percent increase after 28 days, and a 50 percent increase after 56 days. The compressive strengthening of concrete is reduced when more than 30% is added.

Iyyappan et al When compressive strengthening of concrete was comparing to the normal concrete after 28th days of curing, it showed an increase of 6.34 percent and 8.68 percent with the addition of lathe metal scrap into concrete by 2 percent and 3 percent correspondingly. However, if there is more than 4% of lathe metal debris in the concrete, compressive strengthening is lowered by 7.21 percent.

Anchal Jain, Nitin Thakur; (2018) have discovered a series of experiments conducted for a comparative analysis of glass powder and steel powder as partial replacements for sand in Experimental Analysis of Quarry Dust and Metallic Dust as a Partial Replacement of Fine Aggregate in Concrete Page 10

various quantities in their investigation. Glass powder and steel powder are used to replace sand in 10 percent, 15 percent, 20 percent, and 25 percent of concrete mixes, respectively.

Various numbers of concrete cubes have been made by replacing 10%, 15%, 20%, and 25% of the sand by weight. Cement, sand, aggregate mixed together in proportions of 1:1.5:3 to make M-20 mix. Casting cubes was done with 15 x 15 x 15 cm cube moulds. According to this study strength was reached at a low level on the 7th and 14th days, but increased on the 28th day. According to this investigation, high strength values were discovered at a replacement rate of 38 percent in strength parameters.

Shankar Meena Rashmi Sakalle Nitin Tiwari (2018); They employed samples cast with 10%, 20%, 30%, 40%, and 50% substitution of F.A. using stone dust or steel powder in their study, which were tested at varied curing times of 7 days, 14 days, and 28 days. They discovered an experimental research of concrete utilising dust and steel powder as half substitution of sand. The outcome of their study was flexural strength was increased by 9.23% and 10.38% respectively as compare to traditional concrete mix at 28 days. By this high strength values found at 39% replacement in strength parameters based on results it can be concluded that stone dust and steel powder may be utilized in concrete mix.

Zainb Hashim Abbas Alsalami (2017); The effect of employing pistachio shells as half substitution of sand on the characteristics of cement mortar was investigated using different proportions of pistachio shells (10, 20, 30, 40, 50, or 60% by wt. of fine aggregate). The impact of cement mortar density, absorption, and compressive strength was also investigated. Ordinary Portland cement were used. At varied percentage replacement levels, compressive strengthening of mortar cubes was measured at 7, 14, and 28 days, yielding values of 6.78, 8.92, and 14.1 MPa, respectively, at 20 percent replacement.

B. Pujitha N. Swathi Sk. Jain Saheb (2017) have discovered an experimental inquiry on concrete to investigate the impact of unwanted plastic or shredded rubber in concrete. They used Portland cement of grade 53, graded C.A.,sand, superplasticizer, pozzollanic material, plastic waste, and waste tyre rubbers, as well as water. They used M30 grade concrete to cast cubes, which were then examined using a compression testing machine. For cubes casting, materials substitution percentages of 0%, 5%, 10%, 15%, and 20% are used. According to test results, strength was reached at a very low level on the 7th, 14th, and 28th days. It demonstrates that M30 grade concrete cannot withstand good strength when 20% of the material is replaced. As the percentage of replacement increased, the strength gradually declined. As a result, it may be Experimental Analysis of Quarry Dust and Metallic Dust as a Partial Replacement of Fine Aggregate in Concrete Page 11

used as a pavement concrete, and the results reveal that it is non-structural.

Baskaran.P,Karthickkumar.M,Krishnamoorthy. N,Saravanan.P,HematNaveen(20 17) Have found investigation on M25 grade of concrete with half substitution of F.A. by GGBS with different % of 0%, 5%, 10% and 15%..The specimens were casted for 7th, 14th or 28th days after that its tested. The maximum flexural strength achieved by 15% of half substitution of F.A. with GGBS is shown to be higher than conventional concrete. Strength was attained very well on the 7th, 14th, and 28th days, according to the test results of this study. High strength values were discovered at 15% replacement of GGBS, according to the findings.

K. Karthika, G. Snekha, R Sinduja, S Priyadharshini (2017); The use of quarry dust and metallic dust in concrete manufacturing has been studied experimentally. They were cast in M20 grade concrete with varying proportions of fine aggregate, including 0 percent, 20 percent, 30 percent, 40 percent, and 50 percent quarry dust and 2% metallic dust. The quarry dust fraction is utilised to boost the concrete's strength. Various concrete tests are performed, including sp.gravity, fineness, consistency, setting time, sand bulking, water absorption, impact value, slump value, compaction factor, and compressive strength.

N.Sreeivasulu, A.Roopa, M.Venkateswarlu, P.Pavani (2016) have discovered an experimental study on concrete using sand as a replacement Concrete was made from copper slag at various levels (0, 20, and 40%) and numerous tests were performed on it. The results show that increasing the copper slag replacement level enhanced the compressive strength, breaking tensile strength values of mixes, and that utilising copper slag as half substitution ofsand is cost effective.

Ananthayya M.B Prema Kumar W. P., Vijay K(2014); Have found a effect on sand partially replaced by IOT(iron ore tailing) 50% and cement by GGBFS(granulated blast furnace slag) to check compressive strengthening of concrete. According to the findings, increasing the replacement level of IOT and GGBFS increased compressive and splitting tensile strength. Replacement of sand are economical up to 60% and effective use can be made of the IOT, where concrete is basically subjected to compression without sacrificing the strengthening of concrete.

III. CONCLUSIONS

Half substitution of sand by Quarry Dust and mild steel scrap is very reliable method to recovering sustainability is to reduce the human consumption of expected resources. In order to look after the natural resources such as sand, this study has identified Quarry Dust and mild steel scrape is a waste product from stone crushing industry and lathe industry/work shop is available almost free of cost, as partial replacement of sand.

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