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Experimental Investigation in Concrete by Partial Replacement of Sand by Crusher Dust and Mild Steel Scrap in Concrete

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Abstract - *In present scenario as the construction activities increases, the demand of concrete also increased. In construction sector concrete is used in tremendous quantity and it requires large quantity of natural river sand as fine aggregate. As natural resources depleting due to excavation of river sand therefore natural resources is a serious threat to environment. On other side Mild steel scrap material which is available from the lathe is used as a steel fiber for innovative construction industry and pavement construction. Therefore this paper presents the review of some research papers which uses locally available waste replacing fine aggregate. Research in this field and positive results of their research work are important to study further in the sustainable construction activities by using other local industrial waste or mine waste.*

Key Words: concrete, Crusher dust, Mild steel scrap, partial replacement, sustainable construction, review paper

1. INTRODUCTION

Concrete is a most habitually used construction material which is a mixture of cement and filler mix along with water in desired proportion the term called concrete. It is used for construction of multi-story buildings, dams, road pavement, tanks, offshore structures, canal lining. The method of selecting appropriate ingredients of concrete and determining their comparative amount with the purpose of producing a concrete of the required strength durability and workability as efficiently as possible is termed the concrete mix design. For improving the properties of fresh concrete and harden concrete various engineer and scientist are trying to search a material which give equal strength to concrete and we called it spare(Additional) material which enhance the properties of harden as well as in fresh concrete . There are various purposes of applying additional materials as a substitute to Sand and other components in concrete – first is the financial saving obtained by replacing a considerable part of the sand or other ingredients with these materials and second is an improvement in the properties of concrete. The environmental aspects of Sand are now taking more concern of researchers, as Sand developing is responsible for about a large amount of total worldwide waste emissions from manufacturing sources. The trend of mixing several kinds of additional materials in building engineering is now growing. This has a double advantage to diminish the extent of deposited waste material and the second is to conserve natural resources for future generation.

2. LITERATURE REVIEW

[1]Ibrahim Almeshalab et al. (2020) This study aims to investigate the effects of utilising poly-ethylene terephthalate (PET) as a partial substitute for sand in concrete. . A group of six concrete mixtures containing PET was prepared as a partial substitute for sand with substitution levels 0%, 10%, 20%, 30%, 40% and 50%. Concrete was cast to determine the behaviour of fresh and hardened concrete in terms of workability, unit weight, compressive strength, flexural strength, tensile strength, pulse velocity and fire-resistant behavior. The fresh unit weight values of the PET concrete mixtures led to a 31.6% reduction for the PET50 mix below the reference concrete mixture. After 28 days of curing, the PET50 mix had the lowest dry unit weight (1806 kg/m3). As the proportion of plastic in concrete increased, the compressive strength decreased. For the 10%, 20%, 30%, 40% and 50% PET concrete mixes, the compressive strength decreased by 1.2%, 4.2%, 31%, 60% and 90.6%, respectively, compared with the reference samples at 28 days of curing.

As the replacement ratio of PET in concrete increased, the splitting tensile and flexural strengths decreased by 10.5%–85.5% and 2.4%–84.2%, respectively, for replacement levels of PET 10%–50%.Ultrasonic pulse velocity, which reflected the quality of the concrete, decreased with an increase in the proportion of PET. Pulse velocity decreased from 4.5 km/s to 1.9 km/s. This condition can reflect the poor quality of concrete in the presence of plastic. Furthermore, the residual compressive strength of PET showed strong correlation with the coefficients (R2) equal to 0.98.. Thus, although the PET concrete can be used for external work, it is not recommended for internal work due to its poor fire-resistant behavior, except in the case of concrete coating with insulating materials. Furthermore, the fire behavior test showed that the PET concrete had higher permeability than the normal concrete.

[2] Shankar Meena, Rashmi Sakalle, Nitin Tiwari (2018);have found an experimental study of concrete as a partial replacement of sand with query dust and steel powder. In This Study they had used samples casted with 10%, 20%, 30%, 40% & 50% replacement of fine aggregate using stone dust and steel powder tested at a different periods of curing 7 days, 14 days and 28 days . From the test results of this study improvement in flexural strength is

increased by 9.23% and 10.38% respectively as compare to conventional concrete mix at 28 days,. By results of this study high strength values found at 40% replacement in strength parameters based on results it can be concluded that stone dust and steel powder can be used as concrete ingredients.

[3]**Anchal Jain, Nitin Thakur ; (2018)** have found in their research a series of experiments performed to compare the use of glass powder and steel powder as partial replacement of sand in different proportions. concrete mixes are modified by 10%, 15% and 20% and 25% of glass powder and steel powder in partial replacement of sand .Several concrete cubes have been prepared by replacing 10%, 15%, 20% and 25%, sand by weight with these waste materials. For preparing mix the cement, sand, and aggregate have been batched as 1:1.5:3 proportions for forming M-20 mix. Cube moulds of 15 x 15 x 15 cm have been used for casting cubes. From the test results of this study, strength was achieved very less on 7th and 14th days but it increases at 28th day. By results of this study high strength values found at 40% replacement in strength parameters.

[4]**K. Karthika, G. Snekha, R Sinduja, S Priyadharshini (2017);** have found experimental analysis in concrete using of quarry dust and metallic dust in concrete production. They were casted M20 grade concrete with different proportion of fine aggregate with 0%, 20%, 30%, 40%and 50% of quarry dust and 2% of metallic dust. The fraction of quarry dust is used to increase its strength of concrete. Various tests like specific gravity, fineness, consistency, setting time, bulking of sand, water absorption, impact value, slump value, compaction factor and compressive strength of concrete is carried out. The result proves that there is an increase in fraction of quarry dust is used to increase its compressive strength of concrete and Concrete acquires maximum increase in compressive strength upto40% replacement of river sand in M20.

[5]**B. Pujitha N. Swathi Sk. Jain Saheb ;(2017)** have found experimental investigation on concrete to studying the effect of Plastic Waste And Waste Tyre Rubbers in Concrete. They were using the 53 grade Portland cement, graded coarse aggregate, river sand, super plasticizer, pozzollanic material, Plastic waste and waste tyre rubbers and water.In this experiment they were casted a cubes with M30 grade concrete and tested under Compression testing Machine. The replacement of materials 0%, 5%, 10%, 15%, 20% are taken for cubes casting. From test results, strength was achieved very less on 7th , 14th and 28 days . It show that M30 grade concrete cannot bear good strength at 20% replacement of partial material. As the percentage replacement increases the strength decreased continuously. So, it is useful as pavement concrete and the results show that it is non-structural concrete

[6]**N.Sreeivasulu, A.Roopa, M.Venkateswarlu, P.Pavani** have found on experimental investigation on concrete by replacing sand from copper slag at different levels (0%, 20% and 40%) and performed various test on concrete like specific gravity, fineness, consistency, setting time, bulking of sand, water absorption, impact value, slump value, compaction factor and compressive strength of concrete .From the results, it is concluded that the increased replacement level of copper slag) increased the compressive strength, splitting tensile strength values of mixes and optional using copper slag as partial replacement sand are economical.

[7] **Sumit L. Chauhan, Raju A.Bondre (2015);** Have found experimental study which investigated the partial replacement of sand with quarry dust. They were used various proportions of cement concrete + quarry dust (M 20, and M25) and performed various test on concrete like fineness, consistency, water absorption, impact value, slump value, compaction factor and compressive strength of concrete. The experimental results showed that the addition of quarry dust as fine aggregate ratio of 30%, 40% and 50% was found to enhance the compressive Strength at 7 days and 28 days , the value is high and it show that quarry dust suitable to use as sand replacement. All the value of compressive strength surpasses the minimum value of compressive strength for normal concrete and hence quarry dust can apply as sand replacement in concrete mix for construction industry.

CONCLUSION- On the basis of experimental work author deduced that the compressive strength of concrete is surpass to the minimum value of compressive strength upto the 40% of partial replacement of sand by different material like glass powder, copper slag, metallic dust, quarry dust. But when we replace a sand by plastic the compressive strength is decreased as the % of replacement increase .

NECESSITY OF STUDY- To assess optimum use of Crusher Dust and Mild Steel Scrap an industrial waste and reduce the emission of Dust and Suspended Particle and make environment clean and clear. Use both material as a by product of sand give the scrap value to producer and such kind of concrete is eco-friendly and economic.

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