Performance on compressive strengths of concrete with partial replacement of cement by ground granulated blast furnace and sand by quarry dust

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Abstract- **Concrete is the most widely used construction material in civil engineering industry because of its high structural strength and stability. Cement and sand is a major constituent material of the concrete which produced by natural raw material like lime and silica and natural sand respectively. Once situation may occurs there will be no lime on earth production of cement also natural sand. This situation leads to think all people working in construction industry to do research work on cement replacing material and natural sand for use of it. The construction industry is constantly looking for supplementary cement and natural sand material with the objective of reducing the solid waste disposal problem. Ground granulated blast furnace slag (GGBS), quarry sand are the solid wastes generated by Industry. To overcome from this crisis, partial replacement of Cement with GGBS, natural sand with quarry sand (QS) can be an economic Alternative. The cubes are tested for compressive strengths. Ordinary Portland cement was partially replaced by GGBS of 0%, 30%, 40%,50% and natural sand replacement by QS 0%, 40%, 50%, 60%.**

Keyword **- GGBS, QS, Compressive Strengths, Economic Alternative.**

I.INTRODUCTION

Concrete is a heterogeneous mix of cement, fine aggregate and coarse aggregate. It is the most widely used construction material in civil engineering industry because of its high strength. Most of the researchers working in concrete area to modify the concrete properties by using various cementitious materials along with optimizing the cost of concrete. GGBS in concrete is used for the purpose of economy and at the same time GGBS contributes in better durability, reduced permeability, reduction in W/C ratio, reduction in expansion due to alkali aggregate reaction, and improved long term strength and most important by reduction in cement content.

II.OBJECTIVE

- To utilize the ground granulated blast furnace slag in the concrete as a partial replacement of cement.
- To reduce the environmental problems.
- To reduce the consumption of natural sand.

III.LITERATURE REVIEW

Venu Malagavelli (2010) Investigated the characteristics of M30 concrete with partial replacement of cement with GGBS and sand with the ROBO sand (crusher dust). Compressive strength and split tensile strengths of cubes and cylinders were increased as the % of ROBO sand increased. The % of increase in compressive strength were 19.64 and 8.03% at the age of 7 and 28 days and % of increase in split tensile strength was 1.83% at the age of 28 days by replacing 30% sand with ROBO sand with 1.5% admixture. % of increase in compressive strength of concrete was 11.06 and 17.6% at the age of 7 and 28 days by replacing 50% of cement with GGBS and 25% of sand with ROBO sand.

M.C.Nataraja (2013) Investigates, shows that the compressive strength of cement mortar increases as the replacement level of GGBS increases. This increase is not substantial. However for 100% replacement the strength decreases marginally compared to 100% natural sand. From this it is clear that GGBS sand can be used as an alternative to natural sand from the point of view of strength. Use of GGBS upto 75% can be recommended.

Mahesh Patel (2013) Investigated the characteristics of M35 concrete with partial replacement of cement with GGBS and sand with crusher sand. Compressive & Tensile strength tests were carried out on cubes and cylinders. Based on the results the compressive strength and split tensile strength were increased as the % of crusher sand increased & 50% of cement can be replaced with GGBS. The % increase of compressive strength of concrete is 10.04 and 16.54% at the age of 7 and 28 days by replacing 40% of cement with GGBS and 20% of sand with crusher sand.

IV.MATERIALS USED

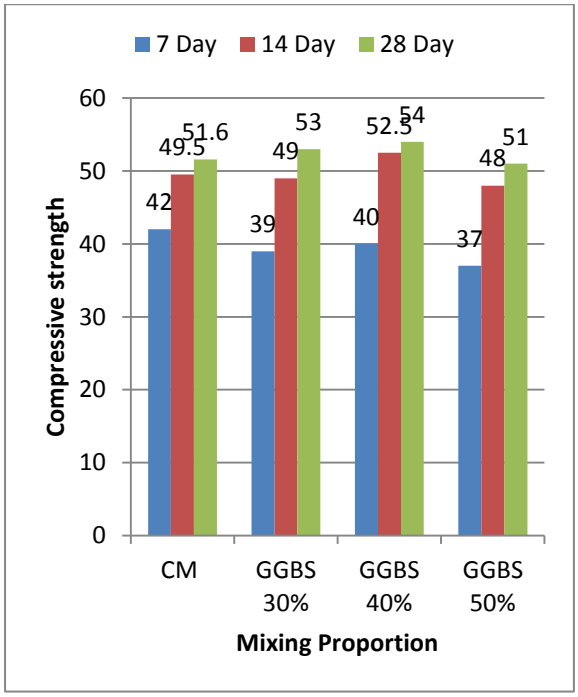
This Para is concerned with the used of the materials,

1. Cement-53 Grade (OPC)
2. Aggregates
    a) Coarse Aggregate
    b) Fine Aggregate

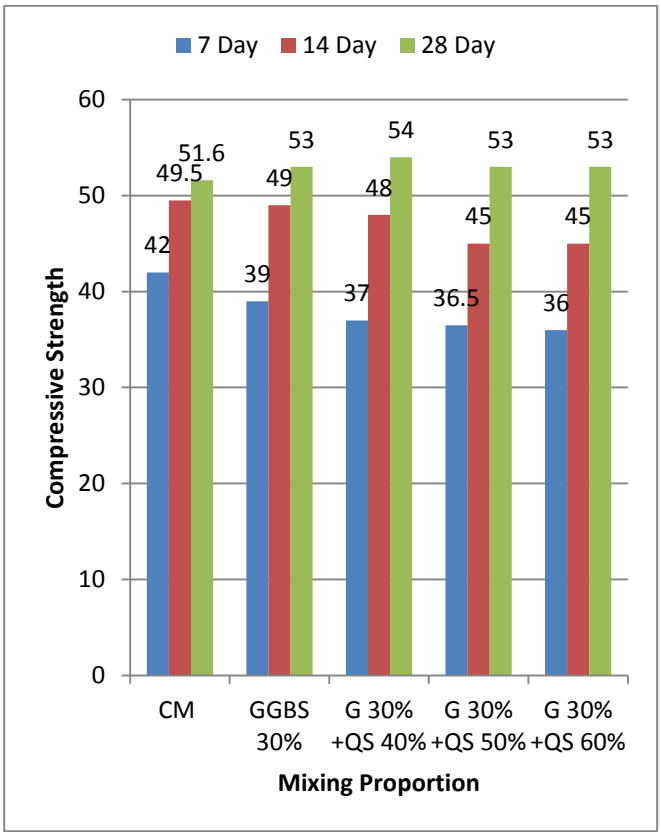
3. Ground Granulated Blast Furnace Slag (GGBS)
4. Quarry Sand

V.RESULT AND DISCUSSION

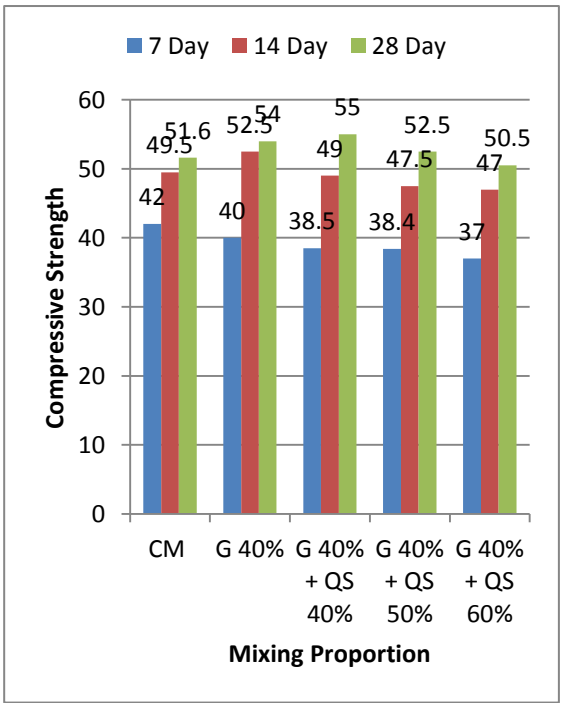
Mixing Proportion	Compressive strength		
	7 Day	14 Day	28 Day
CM	42	49.5	51.6
GGBS 30%	39	49	53
GGBS 40%	40	52.5	54
GGBS 50%	37	48	51



Mixing Proportion	Compressive strength		
	7 Day	14 Day	28 Day
CM	42	49.5	51.6
GGBS 30%	39	49	53
G 30% +QS 40%	37	48	54
G 30% +QS 50%	36.5	45	53
G 30% +QS 60%	36	45	53



Mixing Proportion	Compressive strength		
	7 Day	14 Day	28 Day
CM	42	49.5	51.6
G 40%	40	52.5	54
G 40% + QS 40%	38.5	49	55
G 40% + QS 50%	38.4	47.5	52.5
G 40% + QS 60%	37	47	50.5



Conclusion

- Maximum compressive and flexural strength has been obtained for replacement of cement by 40% GGBS.
- Maximum compressive strength obtained for replacement of cement by 40% GGBS and sand by 40% QS.

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