An Experimental Analysis on Effect of Pozzolanas on Fibre Reinforced Concrete

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Abstract- **In case of Portland slag cement it was observed that using Recron fiber from 0.0% to 0.1% the compressive strength is not incresed, but as the fiber percentage was increased from 0.1% to 0.2% the compressive strength was increased and on further increament of fibre content the strength reduces. The 28 days compressive strength of concrete is higher at with 0.2% fiber compared to other fibre composition but lower than unreinforced concrete. In addition to fiber silica fume was used as a partial replacement to cement. The different percentage of silica fume such as 10%, 20%, 30% replacement was used with 0.2% Recron fiber. The 20% replacement of slag cement with of silica fume gave maximum strength compared to other percentages of replacement, whereas the strength is higher with 30%replacement of silica fume in case of ordinary Portland cement.**

Index Terms- **Strength, concrete, FRC**

INTRODUCTION

In recent years, the terminology "High-Performance Concrete" has been introduced into the construction industry. The American Concrete Institute (ACI) defines high-performance concrete as concrete meeting special combinations of performance and uniformity requirements that cannot always be achieved routinely when using conventional constituents and normal mixing, placing and curing practices. A commentary to the definition states that a high-performance concrete is one in which certain characteristics are developed for a particular application and environment. Examples of characteristics that may be considered critical for an application are:

- Ease of placement
- Compaction without segregation
- Early age strength
- Long-term mechanical properties
- Permeability
- Density
- Heat of hydration
- Toughness
- Volume stability
- Long life in severe environments

RESULT AND DISCUSSION

Effect of GGBS in normal consistency of cement:

% of cement replaced by GGBS (%)	Consistency (%)
0	31.0
10	32.0
20	33.0
30	34.5
40	36.5

Effect of GGBS on Compressive strength of cement:

% of GGBS with cement replacement	3 days strength (MPa)	7 days strength (MPa)
0	11.176	24.31
10	9.66	15.63
20	7.117	10.85
30	6.10	9.15
40	4.74	7.46

Effect of RHA on Normal Consistency of cement:

% of cement replaced by RHA	Consistency (%)
0	31.0
10	45.0
20	48.0
30	52.0

Effect of RHA on Compressive strength of cement:

% of cement replaced by RHA	3 days strength (MPa)	7 days strength (MPa)
0	11.176	24.31
20% (RHA I)	2.23	4.74

20% (RHA II)	3.65	7.45

Effect of Recron fiber on Compressive strength using slag cement:

Fiber content (%)	7 days compressive strength (N/mm^2)	28 days compressive strength (N/mm^2)
0.0	29.036	37.77
0.1	24.63	27.4067
0.2	26.43	32.148
0.3	17.2	25.48

Effect of recron fiber on Splitting Tensile Strength using slag cement:

Fiber content(%)	7 days splitting tensile strength (N/mm^2)	28 days splitting tensile strength (N/mm^2)
0.0	2.523	2.873
0.1	2.12	2.452
0.2	2.569	3.018
0.3	1.533	2.280

Effect of recron fiber on Flexural Strength using slag cement:

Fiber content(%)	7 days flexural strength (N/mm^2)	28 days flexural strength (N/mm^2)
0.0	5.750	7.75
0.1	5.875	6.33
0.2	6.560	8.04
0.3	4.501	6.04

Effect of silica fume on normal consistency of cement:

% of cement replaced by silica fume	Normal consistency (%)
0	31.0
10	38.0
20	41.5
30	45.0

Effect of silica fume on Compressive strength with 0.2%fiber using slag cement:

Silica fume (%)	7 days Compressive strength (N/mm^2)	28 days Compressive
0.0	26.43	32.148
10.0	23.55	30.813
20.0	26.07	34.814
30.0	21.778	29.03

Effect of silica fume on splitting tensile strength with 0.2%fiber using slag cement:

Silica fume (%)	7 days splitting tensile strength (N/mm^2)	28 days splitting tensile
0.0	2.569	3.018
10.0	2.482	2.92
20.0	2.687	3.206
30.0	2.169	2.782

Effect of silica fume on flexural strength with 0.2%fiber using slag cement:

Silica fume (%)	7 days flexural strength (N/mm^2)	28 days flexural strength
0.0	6.56	8.04
10.0	6.50	8.00
20.0	6.625	8.458
30.0	6.04	7.875

CONCLUSION

1) In case of Portland slag cement with the use of Recron fiber, the 28 days compressive strength at 0.2% fiber content the result obtained is maximum. The 28 days splitting tensile and flexural strength also increases about 5% at 0.2% fiber content to that of normal concrete. Further if fiber percentage increases then it was seen a great loss in the strength.
2) As the replacement of cement with different percentages with Silica fume increases the consistency increases.
3) With Portland slag cement keeping 0.2% Recron fiber constant and varying silica fume percentage the compressive, splitting tensile, flexural strength affected remarkably. Using 20% silica fume with 0.2% fiber percentage the 28 days compressive strength increases 7% more than concrete with 0.2% fiber only. 28days split tensile and flexural strength increases further, about 12% and 10% that of normal concrete.
4) So it is inculcated that 0.2% Recron fiber and 20% SF is the optimum combination to achive the desired need.
5) In case of OPC the compressive strength is increasing as the percentage of silica fume increases from 0-30% and 0.2% Recron fiber and it is about 20% more than strength of normal concrete with OPC.
6) The splitting tensile strength increases about 15% at 10% SF and constant 0.2% Recron fiber, then decreases with increasing the SF

percentage. Flexural strength is not giving good indication and goes on decreasing and it is about 40% decrement as the SF percentage increases to 30%.

7) Ordinary Portland cement gives good compressive strength result as compared to Portland slag cement in case of mix with SF and 0.2% Recron.
8) The capillary absorption coefficient (k) with decreases great sign as SF percentage increases at constant fiber percentage i.e 0.2%. At 20% SF content the k value decreases progressively with 70% reduction that to without SF content concrete.
9) The porosity value also decreases as the SF value increases from 0-30% in Recron fiber reinforced concrete.

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