

A Laboratory Assessment of Replacement of Cement by Hypo Sludge as Green Concrete

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Abstract— The use of paper-mill pulp in concrete formulations was investigated as an alternative to landfill disposal. The cement has been replaced by waste paper sludge accordingly in the range of 0%, 2%, 4%, 6%, 8%, 10%, 12% and 14% by weight for M25 and M40 mix. By using adequate amount of the waste paper pulp and water, concrete mixtures were produced and compared in terms of slump and strength with the conventional concrete. The compressive strength increases with the increase in Hypo Sludge compared with normal concrete. The values that are obtained increased at 7 days and 28 days of curing for increase up to 12% and then decreased of Hypo Sludge replaced by cement. When the cement is replaced with 12% Hypo Sludge gives the optimum compressive strength. At 12% Hypo Sludge replacement to cement increases compressive strength than conventional concrete in 28 days about 21.08% in M-25 grade concrete and about 16.93% in M-40 grade concrete. And similar. The Flexural strength at 12% Hypo Sludge gives the optimum Flexural strength. Optimum flexural strength at M-25 grade is over conventional concrete in 28 days about 19.48% increase and M-40 is 18.34% increased. The workability of concrete decreases from medium to low with an increase in content of hypo sludge.

Key words: Hypo Sludge, Workability, Fresh Concrete; Harden Concrete, Grade of Concrete, Compressive Strength & Flexural Strength

I. INTRODUCTION

Concrete is one of the most widely used construction materials in the world. Many modifications and developments have been made to place industrial waste such as paper sludge on building construction. Utilization of waste materials for construction shall not solely solve waste issues; however conjointly provide a new source for construction functions. The introduction of paper sludge as fine aggregates replacement materials in concrete looks to achieve success recently. The use of paper sludge as a substitute for fine aggregates in concrete mix is one option that can alleviate sludge disposal problem. Research and development to convert paper sludge to useful application such as a construction material will provide more alternatives for the engineer to select the most suitable concrete replacement material for different environments. In this case, studies are needed to study the performance of concrete using paper sludge as fine aggregate as replacement materials.

The major disadvantage is that concrete develops small cracks throughout action. It's the speedy propagation of those small cracks underneath applied stress that's accountable for the low enduringness of the fabric. Different disadvantages quality comparatively low strength per unit weight.

II. LITERATURE REVIEW

Sumit A Balwaik and S P Raut (2013) the employment of paper-mill pulp in concrete formulations was investigated as an alternate to lowland disposal. The cement has been replaced by paper sludge consequently within vary of the range of 5% to 20% by weight for M-20 and M-30 mix. By victimization adequate quantity of the paper pulp and water, concrete mixtures were made and compared in terms of slump and strength with the traditional concrete.

R. Srinivasan, et.al. (2010) were finished that Experimental investigations in developing low value concrete from paper trade waste Over 300 million tons of business wastes are being made every year by chemical and agricultural method in Bharat. These materials cause issues of disposal and health hazards. The wastes like phosphogypsum, fluorogypsum and red mud contain unpleasant impurities that adversely have an effect on the strength and alternative properties of building materials supported them.

A.Oneret. al. (2007) investigated tests on concrete by replacement cement with Ground coarse furnace scoria (GGBS) at around 55% of the overall binder content and located out compressive strength of concrete mixture. That doesn't show any important improvement within the compressive strength of concrete? This could be explained by the presence of unreacted GGBS, acting as a filler material within the paste.

Kamran at. al. (2004) in his analysis used GGBS (Ground coarse furnace Slag) in concrete for various combine and investigated that result of replacement was mirrored on workability, compressive strength, lastingness, modulus of rupture and finished that value of concrete was reduced by 25 to 50 percent and therefore proved to be economical.

R. Siddique (2002) concluded that replaced fine combination (sand) with category F ash (10%, 20%, 30%, 40%, and 50%) by weight and located out mechanical properties of concrete like compressive strength, rending lastingness, flexural strength, and modulus of physical property at seven, 14, 28, 56, 91, and three hundred and sixty five days that indicates important improvement within the strength properties of plain concrete and may be effectively employed in structural concrete.

III. RESULTS

A. Compressive Strength Test (M-25)

Compressive strength test is carried out on specimen cubes of concrete blended with various percent replacements to cement by Hypo Sludge (varying percentages) and conventional concrete at 7, 14 and 28 days of curing with compression testing machine(M-25 Grade).

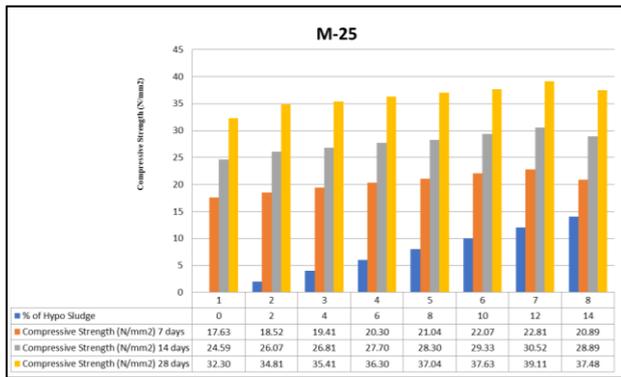


Fig. 1: Results of Compressive Strength (N/mm²) on M-25

B. Compressive Strength Test (M-40)

Compressive strength test is carried out on specimen cubes of concrete blended with various percent replacements to cement by Hypo Sludge (varying percentages) and conventional concrete at 7, 14 and 28 days of curing with compression testing machine(M-40 Grade).

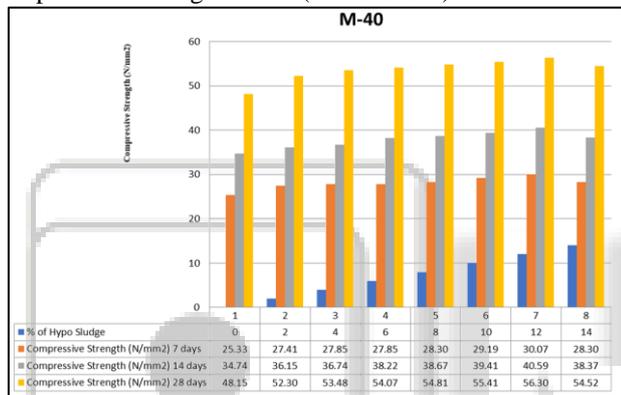


Fig. 2: Results of Compressive Strength (N/mm²) on M-40

C. Flexural Strength Test (M-25)

Compressive strength test is carried out on specimen cubes of concrete blended with various percent replacements to cement by Hypo Sludge (varying percentages) and conventional concrete at 7 and 28 days of curing with flexural testing machine (M-25 Grade).

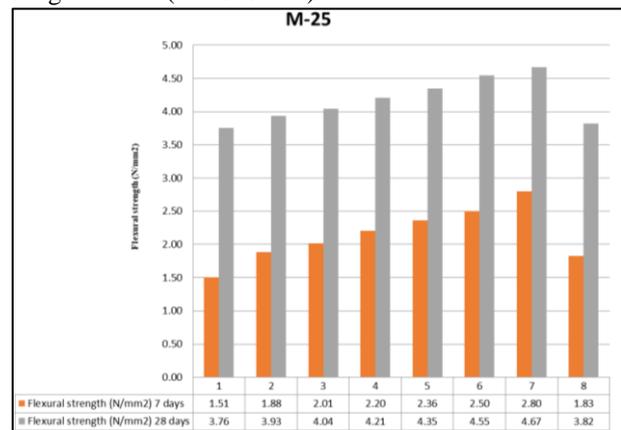


Fig. 3: Results of Flexural strength (N/mm²) on M-25

D. Flexural Strength Test (M-40)

Compressive strength test is carried out on specimen cubes of concrete blended with various percent replacements to cement by Hypo Sludge (varying percentages) and

conventional concrete at 7 and 28 days of curing with flexural testing machine (M-40 Grade).

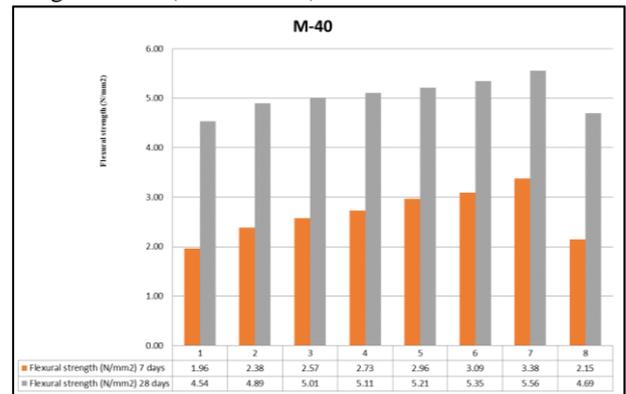


Fig. 4: Results of Flexural strength (N/mm²) on M-40

IV. CONCLUSION

- The compressive strength increases with the increase in Hypo Sludge compared with normal concrete. The values that are obtained increased at 7 days and 28 days of curing for increase up to 12% and then decreased of Hypo Sludge replaced by cement.
- When the cement is replaced with 12% Hypo Sludge gives the optimum compressive strength.
- At 12% Hypo Sludge replacement to cement increases compressive strength than conventional concrete in 28 days about 21.08% in M-25 grade concrete.
- At 12% Hypo Sludge replacement to cement increases compressive strength than conventional concrete in 28 days about 16.93% in M-40 grade concrete.
- The Flexural strength increases with the increase in Hypo Sludge compared with normal concrete. The values that are obtained increased at 7 days and 28 days of curing for increase up to 12% and then decreased of Hypo Sludge replaced by cement.
- When the cement is replaced with 12% Hypo Sludge gives the optimum Flexural strength.
- At 12% Hypo Sludge replacement to cement increases flexural strength than conventional concrete in 28 days about 19.48% in M-25 grade concrete.
- At 12% Hypo Sludge replacement to cement increases compressive strength than conventional concrete in 28 days about 18.34% in M-40 grade concrete.
- The workability of concrete decreases from medium to low with an increase in content of hypo sludge

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