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Flow time analysis of binary blended mixes with retarding superplasticizers

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Abstract - *Admixtures are common and essential components of modern concrete. Low water cement ratio, high workability , highly durable and saving in cost of cement many more desired properties that can be expected from concrete to made with chemical and mineral admixtures Admixture-Cement interaction in concrete is a complex blend of chemical and physical mechanism that are independent. Every admixture at optimum dosage gives good results when used with cement. The present investigation deals with the study of compatibility of chemical admixture with different blended mixes. The study also deals with the fresh and hardened properties of blended concrete.*

Key Words: *GGBS, PCE based admixture, Compatibility*

1. INTRODUCTION

Cement-chemical admixture compatibility is an essential parameter to ensure desired performance and durability of the concrete structures. However compatibility of blended mixes with chemical admixtures will ensure economy in construction along with desired performance and durability of the concrete structures. The hydration of cement involves series of reactions, which mainly depend on the cement composition, the water / cement ratio, surface area, particle size distribution, temperature and admixtures. Admixtures when added in small quantities make the hydration process much more complex. In recent times, advances in the field of cement products are related to the use of admixtures particularly organic polymeric materials. Many type of organic polymeric materials known as super plasticizers, are being used in construction industries to alter the flow behavior and the mechanical properties of concretes. Among various types of chemical admixtures, PCE based admixtures proved to enhance the flow fresh and hardened properties of concrete at low dosage.

2. LITERATURE REVIEW

The present investigation deals with the study of compatibility of chemical admixtures with different mixes. The study also deals with the fresh and hardened properties of blended concrete. The relevant literature available in this area has been critically studied and discussed.

Anshuman Dogra and Richa Bhardwaj (1) investigated the compatibility behaviour of superplasticizers with cement containing mineral admixtures like fly ash, alccofine. It was observed that Polycarboxylate Ether(PCE) based super plasticizers show greater compatibility and economical dosage as compared to sulphonated Napthalene Formaldehyde(SNF) based superplasticizers.

M.K.Maroliya (2) studied the change in ingredients contents of concrete like sand and cement under the influence of plasticizers and superplasticizers at various dosages level. It was also observed that plasticizers enhanced the compressive strength at reduced water-cement ratio in addition to improved workability at constant water cement ratio. Reduction in cement content was achieved with increase in sand content to overcome bleeding and segregation.

Janardhana Maganti and V.Silva Prasada Raju(3) studied compatibility of Sulphonated Naphthalene Formaldehyde and Lignosulphonates based superplasticizer with Portland slag cements. It was observed that the different brands of cements behaved differently even if the coarse and fine aggregates, water and family of chemical admixture and the method of concrete mix design were kept constant.

S.Sheela(4) studied the workability and strength behavior of superplasticized concrete and conventional concrete both in fresh and hardened states. It was also observed that the use of superplasticizer can increase the workability and strength without increasing the water cement ratio. It was also concluded that non destructive testing values were in good agreement with the strength behavior of superplasticized concrete for destructive testing.

Ravindra Gettu, Dr.Joana Roncero (5) studied some aspects related to the dosage of superplasticizer using the Marsh Cone test and the effect of the temperature in superplasticized pastes are evaluated. The study also included the loss of fluidity of cement paste with time. The study revealed that polycarboxylic acid based superplasticizers performed better than naphthalene and melamine based admixtures.

3. OBJECTIVE

- Study the characteristics of concrete ingredients.
- Study of flow characteristics of different types blended mixes sing Marsh Cone.
- Study the mix proportioning of flowable concrete using IS method.
- Study the fresh, strength and durability properties of different grades of concrete.
- Correlate flowtime, fresh properties and hardened properties

4. MATERIALS USED

- **Cement:** Ordinary Portland Cement **(OPC),**

  Ground Granulated Blast furnace slag**(GGBS),**
- **Chemical Admixtures:** Polycarboxylic ether based.
- **Water:** Potable water

5. METHODOLOGY

- Study on properties of different types of blended cement and cementitious materials.
- Study on flow time using Marsh Cone Apparatus.
- Mix design of concrete using IS method.

6. EXPERIMENTAL WORK

Study on properties of ingredients:

Binder:

The following tests have been carried out for the OPC

Specific gravity test

Fineness of cement

Mineral admixture (GGBS)

Specific Gravity test has been carried out for GGBS,OPC

Chemical Admixture

Specific Gravity test has been carried out for Chemical Admixture

Study on flow time(Marsh Cone Test)

Fresh Properties of concrete

Hardened properties of concrete

7. RESULTS

TEST ON INGREDIENTS

- **Specific gravity test**

Sl.No	Material	Specific Gravity
1	OPC	3.06
2	GGBS	2.86
3	Coarse Aggregates	2.75
4	Manufactured Sand	2.70
5	Chemical Admixture	1.09

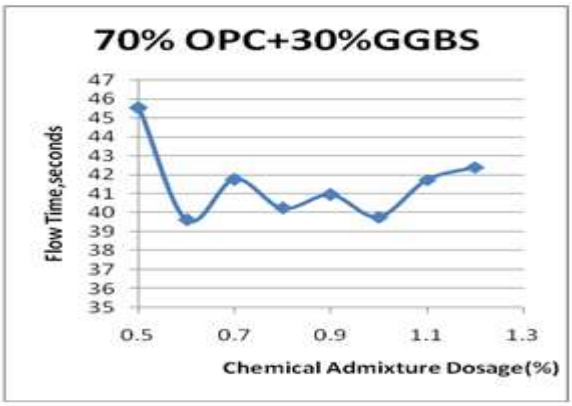
- **Water Absorption**

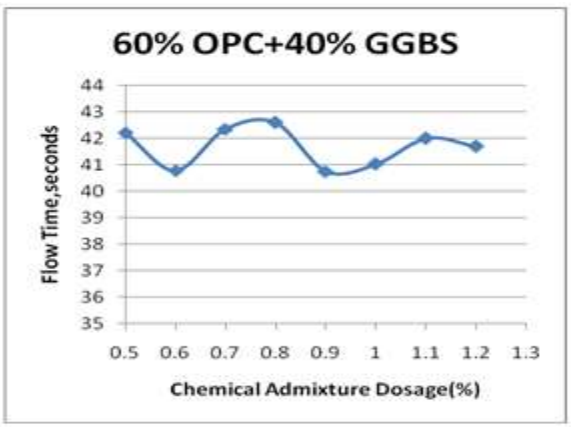
Sl.No	Material	Water Absorption
1	Coarse Aggregates	3.19%
2	Manufactured Sand	2.64%

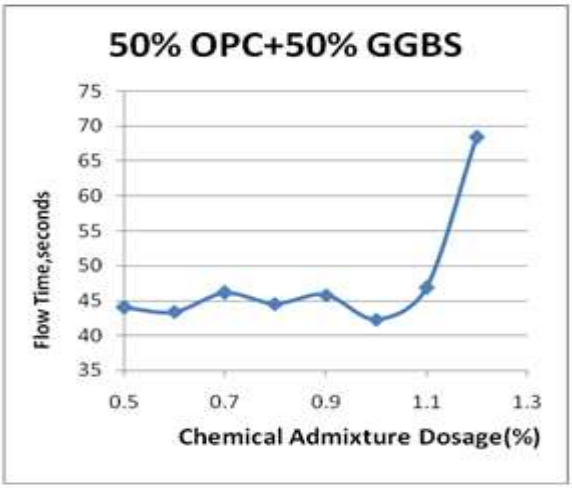
- **Fineness Modulus**

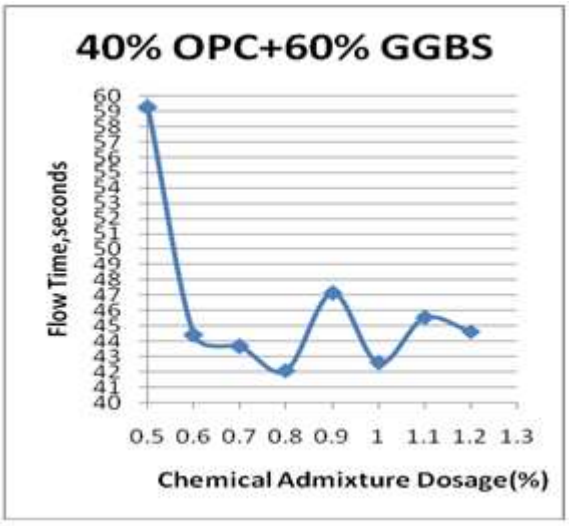
Sl.No	Material	Fineness Modulus
1	Coarse Aggregates	7.024 %
2	Manufactured Sand	4.01 %

GRAPHS OF FLOW TIME TEST









CONCLUSION

- Optimum Dosage of Chemical Admixture(PCE Based) For Various Combinations of Cement And Mineral Admixtures Is Around 0.6-1.2%.
- Increase in the water cement ratio. Flow retention upto 4 hours can be achieved.
- Compressive strength of concrete cubes prepared with cement and GGBS slightly increased with increase in GGBS content for 3 days and 7 days strength. However GGBS is responsible for strength gain in early stage, significant increase in strength can be observed earlier with increase in GGBS content.
- Strength gain inearly stage, significant increase in strength can be observed earlier with increase in GGBS content.
- Time of flow slightly increases with 0, 30, 60, 90, 120, 150, 180 minutes for all types of optimum dosage combination.
- The result confirms that the use of retarder can increase the workability and strength without increase in water content

9. REFERENCES

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BIOGRAPHIES

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