Behaviours of M25 using Fly Ash, Rice Husk Ash and Micro Silica

Prakhar Nigam[1] Dr. S. K. Jaiswal[2]
[2]M. Tech. Scholar
[1]Bhilai Institute of Technology, Durg, India

Abstract— This study explain the steps which taken to develop self-compacting concrete (SCC) mixes with locally available cementious material. For the self-compacting concrete mixes with the Fly ash, Rice husk ash, Micro-silica and combination of these, the fulfilment of the flow and strength criteria are found to be sufficient for the mix design. However, for the design of self-compacting concrete mixes with cementious material it is found that they must additionally meet the passing ability criterion.

Key words: Self – Compacting Concrete, Fly Ash, Rice Husk Ash, Micro Silica, Superplasticiser

I. INTRODUCTION

Self-compacting concrete was first introduced in Japan during 1980s, since it has been investigating to achieving desire properties in modern concrete. The admixtures and many more additives developed to reach the optimum result for precast and ready mix concrete industries. The addition of Fly Ash, Microsilica and Rice Husk Ash into self-compacting concrete may take advantage of extending the possibility of field application of SCC.

II. MATERIALS

A. Fly Ash

The fly ash has been used of class F type having specific gravity 2.08. Fly ash obtained from Purena Thermal Power Station, Somani, Rajnandgaon.

B. Micro Silica

The terms micro-silica, condensed silica fume, and silica fume are often used to describe by products extracted from the exhaust gases of ferrosilicon, silicon, and other metal alloy smelting furnaces. Micro Silica obtained from Forsoc chemical Pvt. Limited Nagpur.

C. Rice Hush Ash

Rice husk ash used was obtained from 1.5 MW Rice Husk Based Cogeneration Project at Rajaram Maize Products, Mohad, Dist. Rajnandgaon (CG), India, India .The specific gravity of rice husk ash is 2.14 and bulk density is 0.781 g/cc RHA, produced after burning of Rice husk (RHA) has high reactivity and pozzolanic property.

D. Cement

Grade 43 Birla cement was used for casting cubes and cylinders for all concrete mixes. The cement was of uniform colour i.e. grey with a light greenish shade and was free from any hard lumps.

E. Fine aggregate

The sand used for the experimental programmed was locally procured and conformed to Indian Standard Specifications IS: 383-1970. The fine aggregates belonged to grading zone III.

F. Coarse Aggregate

The crushed stone is generally used as a coarse aggregate. The nature of work decides the maximum size of the coarse aggregate. Locally available coarse aggregate having the maximum size of 10 mm was used in our work. The aggregates were washed to remove dust and dirt and were dried to surface dry condition. The aggregates were tested as per IS: 383-1970.

G. Superplasticiser

Nepthalene formaldehyde Fosroc SF430G8

III. EXPERIMENTAL PROGRAMME

A. Slump Flow Test

The slump flow test is used to determine the horizontal free-flow of SCC in the absence of obstructions and T50 which indicates the rate of deformation within a defined flow distance.

B. L-box Test

The passing ability of SCC can be investigated by this method. The minimum ratio of the height in the horizontal section relative to the vertical section is considered to be 0.8, if the SCC flows as freely as water, it will be completely horizontal, and the ratio will be equal to 1.0,Therefore,the nearer this ratio to 1.0, the better the flow potential of the SCC mixture.

C. Water Absorption Test

Cubical specimens of size 75 mm were cast for conducting water absorption tests, by completely immersing dried cube specimens in water at 25ºC for 96 hours and noting the amount of water absorbed per unit initial mass in percentage after the age of 28 days and 56 days. This gives percentage water absorbed.

D. Compressive Strength Test

Determining the compressive strength of concrete. The testing load at the specified rate.

IV. RESULT AND DISCUSSION

In order to study the effect on fresh concrete properties when fly ash, RHA & micro silica is added into the concrete as cement replacement, the SCC containing different proportion of RHA were tested for Slump flow, T- 50, L-box. From The above experiments which consider the both the aspect of strength and flow of concrete it's observed that the 8% of micro silica and the fly ash range between 15% - 30% give the better performance with the SCC. So this experiment performed with the variation of RHA ratio in SCC.

Concrete Type	Slump flow (mm)	T50 (sec)	L-Box (H2/H1)
SC (0%:0%)	625	6.2	0.79
SC (30%:0%)	637	7.2	0.80

SC (27.5%:2.5%)	645	7.35	0.85
SC (25%:5%)	655	7.40	0.82
SC (22.5%:7.5%)	640	7.30	0.9
SC (20%:10%)	570	7.4	0.9
SC (15%:15%)	510	8.2	0.77

Table 1: Fresh Concrete Property (Micro Silica 8%) @ 0.80% Superplasticiser
(The Ratio of Following Table SC Fly Ash: RHA)

The effect on compressive strength when Micro Silica (8%) is added into self-compacting concrete as cement replacement in table 2, the cube containing different proportion of fly ash and rice husk ash were prepared and kept for curing for 7 and 28 days.

MIX	Compressive strength (N/mm^2)	
	7 days	28days
SC (0%:0%)	20.6	28.9
SC (30%:0%)	20.7	29.85
SC (27.5%:2.5%)	22.2	32.6
SC (25%:5%)	21.85	32.3
SC (22.5%:7.5%)	23.4	33.2
SC (20%:10%)	23.05	33.15
SC (15%:15%)	19.75	30.4

Table 2: Compressive Strength of SCC Mixes with RHA, FA And Micro Silica

The water absorption was carried out at the age of 28 days and 56 days as per test procedure mentioned in above chapter.

Mix	Percentage of Water absorbed in 28 days	Percentage of Water absorbed in 56 days
SC (0%:0%)	0.206	0.396
SC (30%:0%)	2.240	3.120
SC (27.5%:2.5%)	2.235	2.970
SC (25%:5%)	2.160	2.870
SC (22.5%:7.5%)	2.260	3.170
SC (20%:10%)	2.295	3.310
SC (15%:15%)	2.410	3.570

Table 3: Percentage of Water Absorbed At Various Ages of SCC Mixes with Micro Silica

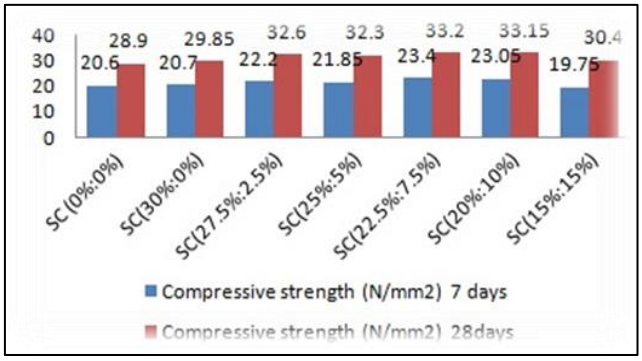

Fig. 1: Compressive Strength Of SCC Mixes With RHA, FA And Micro Silica In 7 Days And 28 Days.

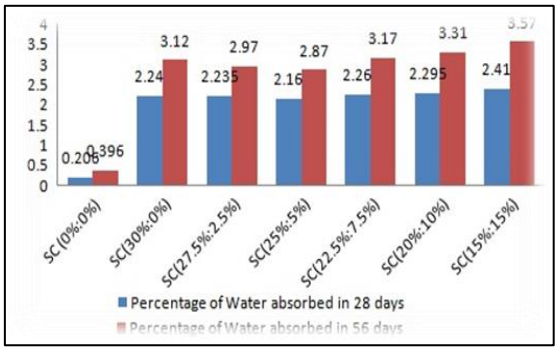

Fig. 2: Percentage of Water Absorbed At Various Ages of SCC Mixes with Micro Silica

V. CONCLUSION

The study was made by replacing fly ash with the cement so far as FA replacement is concern 25% is better than the 20% and 35% fly ash replacement with maximum use of supplements. Hence if we increase the FA replacement we can have a more workable concrete. An increase of about 10% strength at 7 days and 24% at 28 days was observed with the decrease of fly ash content from 35% FA to 15% FA. Absorption is mainly influenced by the paste phase primarily; it is dependent on the extent of interconnected capillary porosity in the paste. Concrete mixes with higher paste contents are bound to have higher absorption values than concretes with lower paste content, as observed 35% FA replacement shows higher absorption i.e. 2.67 % at the age of 28 days and 3.59 % at the age of 56 days than 15% FA replacement (0.46 % at the age of 28 days).

REFERENCE

[1] Nagamoto N., Ozawa K., Mixture properties of Self-Compacting, High-Performance Concrete, Proceedings, Third CANMET/ACI International Conferences on Design and Materials and Recent Advances in Concrete Technology, SP-172, V. M. Malhotra, American Concrete Institute, Farmington Hills, Mich. 1997, p. 623-637.

[2] Khayat K.H., Ghezal A., Utility of Statistical models in Proportioning Self-Compacting Concrete, Proceedings, RILEM International symposium on Self-Compacting Concrete, Stockholm, 1999, p. 345-359.

[3] Okamura, H. (1997). Self-Compacting High-Performance Concrete, Concrete International, pp.50-54.

[4] Okamura, H., Ouchi, M. (1999). Self-compacting concrete development, present use and future, In: The 1st International RILEM Symposium on Self-Compacting Concrete. Skarendahl A, Petersson O, editors, RILEM Publications S.A.R.L, France, pp. 3-14.

[5] Okamura H., Ozawa K., Mix Design for Self-Compacting Concrete, Concrete Library of Japanese Society of Civil Engineers, June 25, 1995, p. 107-120.

[6] Nagataki S., Fujiwara H., Self-Compacting property of Highly-Flowable concrete, Second Conference on advances in Concrete Technology, ACI SP-154,V.M. Malhotra, American Concrete Institute, June 1995, p. 301-304.

[7] Masahiro Ouchi, Applications Of Self-Compacting Concrete In Japan, Europe And The United States Kochi

University of Technology, Kochi, Japan, ISHPC 2003, p. 301-304.
[8] EFNARC, (2002). Specifications and Guidelines for Self-Compacting Concrete, EFNARC, UK (www.efnarc.org), pp. 1-32.
[9] European guidelines for self-compacting concrete (2005) – specification, production and use.
[10] Gebler, S.H., Klieger, P. (1987). Effect of Fly Ash on Some of the Physical Properties of Concrete, Portland Cement Association, R & D Bulletin 089.01T .International, Vol. 19, No. 8, pp.62-63.
[11] Halstead, W. J. (1986). Use of Fly Ash in Concrete, NCHRP Synthesis 127. High Reactivity Metakaolin (HRM). Advanced Cement Technologies, LLC. Metakaolin. http://metakaolin.com/metakaolin/metakaolin-description. Retrieved May 7, 2010.

