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Influence of Dosage of Chemical and Mineral Admixtures on the Compressive Strengh of Concrete

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ABSTRACT: *Utilization of mineral and chemical admixtures in concrete plays a major role in the strength enhancement of the concrete. With the utilization of mineral and chemical admixtures, the fresh properties of the concrete may differ from normal concrete. By using the chemical admixture, HI-FORZA 245, the fresh and hardened properties of the concrete were studied and also the usage of Ground Granulated Blast Furnace Slag(GGBS) mineral admixture by replacement of 10% was studied. In this study, an attempt has been made to study the influence of dosage of chemical and mineral admixtures on the compressive strength of concrete.*

I. INTRODUCTION

Concrete is the most widely used construction material in the world next to water. The strength and durability of the concrete plays a major role in the sustainability of the concrete. In order to increase the fresh concrete properties and the hardened properties of the concrete like strength and durability the effective utilization of mineral and chemical admixtures plays a major role in the enhancement of the properties of the concrete.

Salahaldein Alsadey [1] reported that the dosage of super plasticizer in concrete gains good ability in the regard of slump and strength properties. Luma Abdul Ghani[2] has concluded that the dosage levels of super plasticizer are lower than the optimum dosage, increase in admixture dosage may help to enhance the concrete characterstics. Noor Ahmed Memon[3] revaled that the compressive strength of concrete subjected to high temperatures are significantly affrected by the wet curing period and the increase in dosage of the chemical admixture.K. Sravani Roopa [4] assessed the properties of concrete by the partial replacement of GGBS to the cement in the replacement levels of 10%,20%,30%,40% & 50% to the cement and the mechanical properties were studied and concluded that the 10% replacement of GGBS to cement was found to be the effective replacement.

II. EXPERIMENTAL INVESTIGATION

Mix design was done for M35 grade concrete using the specifications of IS 10262:2009 by using the normal constitutent materials of the concrete like locally available Ultratech OPC 53 grade cement and the river sand confirming to Zone-II and mechanically crushed 20 mm conventional granite. The experimental investigation was divided into two phases. In the first phase of study, the effect of dosage of chemical admixture was studied and later in the second phase, the effect of mineral and chemical admixture on the fresh and hardened properties of the concrete.

III. TEST RESULTS AND DISCUSSIONS

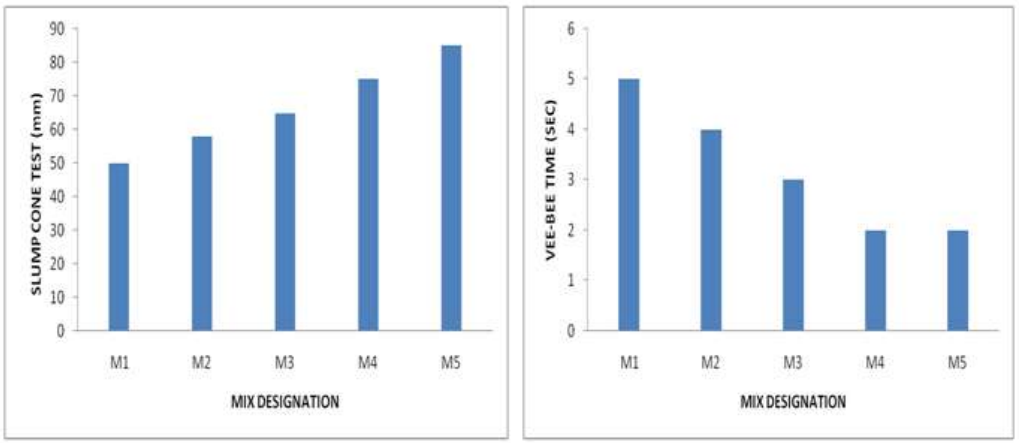
The following are the test results obtained for the specified M35 grade concrete with and without the addition of mineral and chemical admixtures

Phase – I of investigation

Table 1: Fresh properties of concrete

S.No	Mix Designation	% replacement of chemical admixture	Slump Cone test results (mm)	Vee-Bee time (sec)	Compaction Factor
1.	M35 – M1	0	50	5	0.84
2.	M2	0.5	58	4	0.85
3.	M3	1	65	3	0.83
4.	M4	1.5	75	2	0.80
5.	M5	2	85	2	0.79

Fig. 1 test results of slump cone and Vee-Bee time with chemical admixture



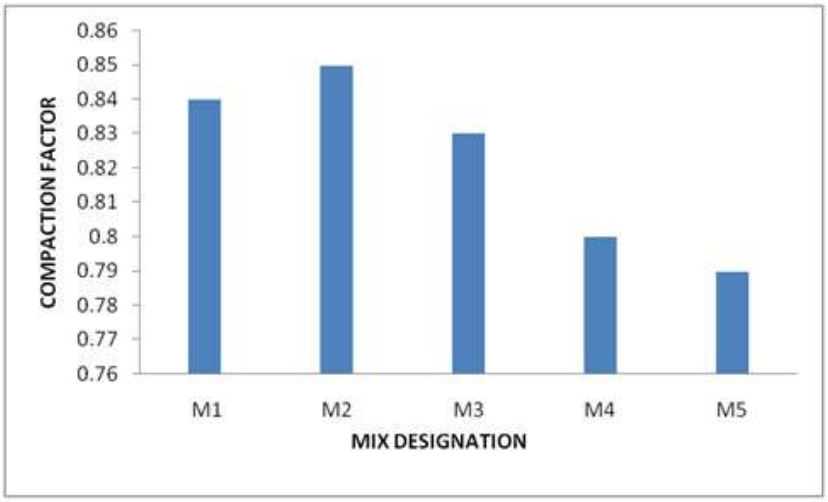


Fig. 2 test results of compaction factor test

Table 2: hardened property (compressive strength) of concrete

S.No	Mix Designation	% replacement of chemical admixture	Compressive Strength (MPa)
1.	M35 – M1	0	43.25
2.	M2	0.5	44.14
3.	M3	1	44.74
4.	M4	1.5	45.62
5.	M5	2	43.25

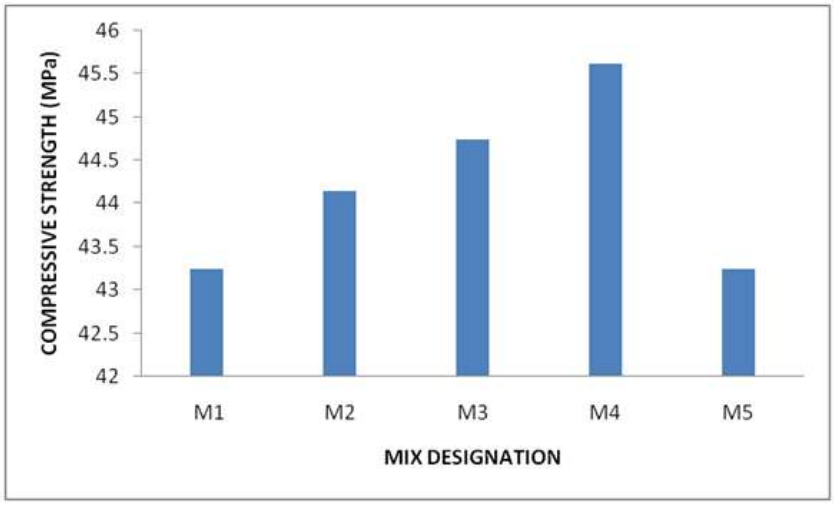


Fig.3 Compressive Strength of M35 grade concrete after 28 days of curing with varying percentages of super plasticizer

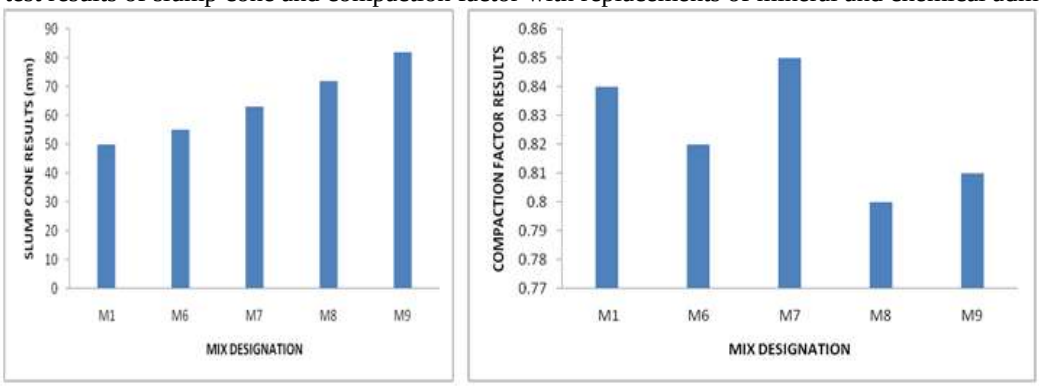
Phase – II of investigation

This section presents the test results of effect of both the mineral and chemical admixture with different percentages of replacements.

Table 3: Fresh properties of concrete

S.No	Mix Designation	% replacement of chemical admixture	Slump Cone test results (mm)	Vee-Bee time (sec)	Compaction Factor
1.	M35 – M1	0	50	5	0.84
2.	M6	0.5	55	4	0.82
3.	M7	1	63	3	0.85
4.	M8	1.5	72	2	0.80
5.	M9	2	82	2	0.81

Fig. 4 test results of slump cone and compaction factor with replacements of mineral and chemical admixture



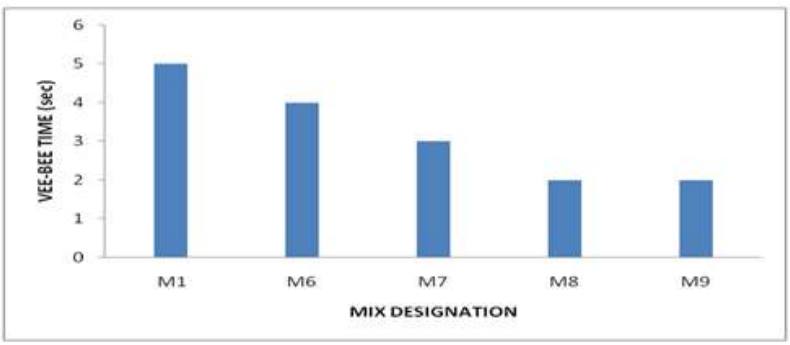


Fig. 5 test results of Vee-Bee time with replacements of mineral and chemical admixture

Table 4: hardened property (compressive strength) of concrete

S.No	Mix Designation	% replacement of chemical admixture	% replacement of mineral admixture	Compressive Strength (MPa)
1.	M35 – M1	0	0	43.25
2.	M6	0.5	10	45.03
3.	M7	1	10	45.62
4.	M8	1.5	10	46.51
5.	M9	2	10	44.73

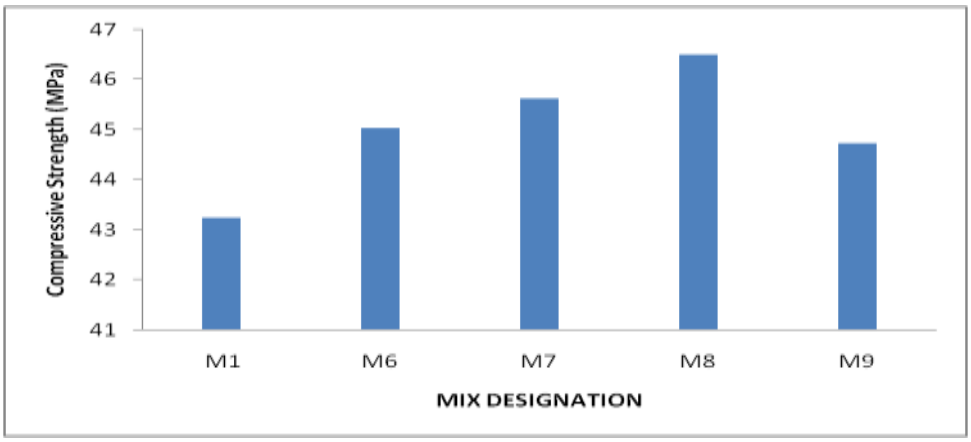


Fig.6 Compressive strength of concrete with both replacements of mineral and chemical admixture.

IV. CONCLUSIONS

1. The compressive strength of concrete was found to be higher for M35 grade concrete with the replacement of chemical admixture of dosage 1.5% and was found to be increased in the percentage of 5.20% when compared with the control mix.
2. The fresh properties were found to be reduced when the mineral admixture was used and also the compressive strength was found to be increased but little lesser than with the chemical admixture.

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