ENHANCEMENT THE PERFORMANCE OF FLY ASH REINFORCED CONCRETE BY ADDING ADMIXTURE

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ABSTRACT

The growing environmental concerns and proper disposal of construction and demolition waste is a challenge for construction industry. The use of demolition waste as a resource for recycling or recovery is gaining grounds in many countries. The proper selection and processing of demolition waste can be helpful in producing concrete. This thesis, aims to find the possibility of the structural usage of flyash in concrete as alternative of partially replacement of cement, by conducting a comprehensive laboratory investigation for better understanding of mechanical and durability properties of flyash and admixture in concrete. Limited work is done on use of flyash and admixture concrete. Various literatures have been reviewed to understand the influence of fly ash and admixture on fresh, hardened concrete. Taking advantage of fly ash and admixture characterization tools and materials, the simultaneous and also separate optimal use of fly ash and admixture will create a new concrete mixture that will result in long lasting concrete structures in the future.

Key words: *concrete mix, fly ash , admixture , Compressive Strength*

INTRODUCTION

Flyash otherwise called miniaturized scale silica is a by-item Ad of the decrease of high-virtue quartz with coal in electric heaters in the generation of silicon and ferrosilicon combinations. Be-reason for its superb fineness and high silica content, silicon oxide Fume is an passing powerful pozzolanic material. silicon oxide Fume is used as a region of cement to boost its properties like compressive quality, bond quality, and scraped space resistance; lessens penetrability; and during this manner aides in shielding strengthening steel from erosion.

FLY ASH

Source of fly ash obtain by the Power plants of Renukoot conjointly referred to as micro-silica, is an amorphous (non-crystalline) being of oxide, silica. Its associate ultrafine powder collected as a by-product of the silicon and ferrosilicon alloy production and consists of spherical particles with a median particle diameter of a hundred and fifty nm. The most field of application is as pozzolanic material for top performance concrete. The pozzolanic reactions happen once flyash is else to the concrete mixture, and therefore the amorphous silica, that is that the major part of the pozzolana, reacts with hydrated oxide fashioned from the association of the metallic element

FLYASH

ADMIXTURE

Superplasticizer based on modified acrylic polymer for concrete with strong water reduction for traditional and self-compacting concrete. Dynamon SX is a high performance admixture based on modified acrylic polymer. Dynamon SX is especially suitable for the ready mix concrete industry and wherever a strong water reduction is required along with an excellent slump retention and development of mechanical strengths of the mixture. Dynamon SX, in combination with the viscosity modifying agents Viscofluid SCC or Viscofluid SCC/10, can produce self-compacting concrete without bleeding and segregation. Add Dynamon SX directly to the mixture after all the other ingredients (cement, aggregates, water).concrete, mortar and other composite materials. It is a cold drawn wire fiber with corrugated and flatted shape. Admixture is generally available in two types

ADMIXTURE

FINE AGGREGATES

The material which passes through 4.75 mm sieve is termed as fine aggregate. Usually natural sand is used as a fine aggregate at places where natural sand is not available crushed stone is used as a fine aggregate. The sand used for the experimental works is Sone River Sand procured and conformed.

COARSE AGGREGATE

The source of the coarse aggregate is procured by Dagmagpur the broken 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 20 mm was used in the present work. Specific gravity of aggregate is 2.516

WATER

The pH value of water should be in between 6.0 and 8.0 according to IS 456-2000.

Water generally contains salinity of about 3.5% in which about 80% is sodium chloride. Many researchers have been conducted to study the corrosion problem of steel Embedded in concrete.

WATER

LITERATURE REVIEW

Nitin Kumar et al (2015) conferred the utilization of admixtures as reinforcement material with concrete. during this study, the blending of assorted materials weather chemicals natural or official for up the strength and sturdiness of parent substance. crucial investigation for M forty grade of concrete having combine proportion 1:4:3 with water cement quantitative relation zero.35 to review the compressive strength flexural strength, split enduringness of admixtures ferroconcrete containing fibers of 1/3, 1%, two and three volume fraction of hooks the result shown that admixture ferroconcrete increase strength toughness plasticity and flexural strength of concrete.

Gupta et al. (2015), were calculable the impact resistance of concrete containing waste rubber fibers and silicon dioxide fume. They use rubber fibers for partly replacement of fine mixture whereas silicon dioxide fume was wont to partly replacement of cement. 3 replacement levels of silicon dioxide fume (0%, five-hitter and 10%) and 6 replacement levels of rubber fibers (0%, 5%, 10%, 15%, 2 hundredth and 25%) were thought-about. Compressive check, flexural loading check and rebound check were administered as per connected standards for 3 totally different w/c ratios (0.35, 0.45 and 0.55). Compressive strength of management concrete while not rubber fiber and silicon dioxide fume will increase from fifty eight.97 N/mm2 to seventy five.20 N/mm2, 50.43 N/ mm2 to sixty two.70 N/mm2 and thirty three.70 N/mm2 to thirty-nine.70 N/mm2 for w/c ratios of zero.35, 0.45 and 0.55 severally, different hand on 100% replacement of cement by silicon dioxide fume, compressive strength of rubber fiber concrete with twenty fifth rubber fiber and 100% replacement of cement by silicon dioxide fume, will increase from twenty eight.43 N/mm2 to thirty seven.90 N/mm2, 23.60 N/mm2 to twenty nine.90 N/mm2 and fifteen.30 N/mm2 to nineteen.10 N/ mm2 for w/c ratios of zero.35, 0.45 and 0.55 severally.

Kumar & Dhaka (2016) write a Review paper on partial replacement of cement with silicon dioxide fume and its effects on concrete properties. the most parameter investigated during this study M-35 concrete combine with partial replacement by silicon dioxide fume with variable zero, 5, 9, twelve and V-day by weight of cement The paper presents a close experimental study on compressive strength, flexural strength and split enduringness for seven days and twenty eight days severally. The results of experimental investigation indicate that the utilization of silicon dioxide fume in concrete has enlarged the strength and sturdiness in any respect ages when put next to traditional concrete.

Alok (2016) write a look Paper on Partial Replacement of Cement in M-30 Concrete from silicon dioxide Fume and ash. Replacement levels of OPC by silicon dioxide Fume were 1/3, 2.5%, 5%and 7.5% wherever replacement levels of normal Portland cement by ash were 1/3, 5%, 100% and V-day by weight. a hundred and twenty fifth super-plasticizer was utilized in all the check specimens for higher workability at lower water cement quantitative relation and to spot the sharp effects of silicon dioxide Fume and ash on the properties of concrete. Water-cement quantitative relation was unbroken zero.43 all told cases.43.1 N/mm2 was the most compressive strength that was obtained at replacement level of seven.5% by weight of FA and 2 hundredth by weight of solfa syllable with cement.6.47 N/mm2 was the most flexural strength that was obtained at replacement level of seven.5% by weight of FA and 2 hundredth by weight of solfa syllable with cement.2.573 N/mm2 was the most split enduringness that was obtained at replacement level of seven.5% by weight of FA and 2 hundredth by weight of solfa syllable with cement.

Mohammed HaloobAl-Majidi etal (2017) were finished that Geopolymers ar aluminosilicate materials shaped by admixture by-product materials with basic solutions, and that have many fascinating properties compared to Portland cement concrete in terms of strength and sturdiness. Most of the previous analysis on admixture geopolymer concrete (FARGC) has targeted on the properties of single or binary mixes hardened beneath heat action conditions, that may be a severe limitation for on-site , cast-in-place applications. within the current study, a unique plain and admixture geopolymer concrete, containing numerous forms of business silicon dioxide Fume (densified, undensified and suspension silicon dioxide fume) and ranging Ground coarse furnace scoria content in an exceedingly ternary binder mixture, cured beneath close (room) temperature has been examined. The experimental results indicate that the mechanical characteristics of all the examined mixes are increased by increasing the admixture content,

METHODOLOGY

Material Properties

Cement, fine aggregates, coarse aggregates, recycled coarse aggregate, fly ash , admixture super-plasticizer and water is used for present investigation. The properties of these materials are discussed in the following sections.

Cement

Cement is a fine, grey powder. It is mixed with water and materials such as sand, gravel, and crushed some to make concrete. The ordinary cement contains two basic ingredients namely argillaceous and calcareous. In argillaceous materials, clay predominates and in calcareous materials calcium carbonate predominates. Ordinary Portland cement of grade – 43 (Ultratech cement) conforming to Indian standard IS: 8112-1989 has been used in the present study. The results of the various tests on cement properties are given in

Physical properties of ordinary Portland cement

Sr. No.	Characteristics	Values as per IS 8112:1989
1	Consistency	-
2	Initial setting Time	Not less than 30 minutes
3	Final setting time	Not greater than 600 Minutes
4	Fineness	Not less than 225 m^2/kg
5	Specific gravity	3.15
6	Compressive strength (MPa)	
	7 days	30.78
	28 days	50

IS code methods

1. Determine the mean target strength f_t from the specified characteristic compressive strength at 28-day f_{ck} and the level of quality control.
2. $f_t = f_{ck} + 1.65$ S
3. where S is the standard deviation obtained from the Table of approximate contents given after the design mix.

4. Obtain the water cement ratio for the desired mean target using the emperical relationship between compressive strength and water cement ratio so chosen is checked against the limiting water cement ratio. The water cement ratio so chosen is checked against the limiting water cement ratio for the requirements of durability given in table and adopts the lower of the two values.
5. Estimate the amount of entrapped air for maximum nominal size of the aggregate from the table.

6. Select the water content, for the required workability and maximum size of aggregates (for aggregates in saturated surface dry condition) from table.
7. Determine the percentage of fine aggregate in total aggregate by absolute volume from table for the concrete using crushed coarse aggregate.

$$V = \left[W + \frac{C}{S_c} + \frac{1}{p}\frac{f_a}{S_{fa}}\right] \times \frac{1}{1000}$$

$$V = \left[W + \frac{C}{S_c} + \frac{1}{1-p}\frac{C_a}{S_{ca}}\right] \times \frac{1}{1000}$$

Where V = absolute volume of concrete

= Gross volume ($1m^3$) minus the volume of entrapped air S_c = specific gravity of cement

a. W = Mass of water per cubic meter of concrete, kg
b. C = mass of cement per cubic meter of concrete, kg
c. p = ratio of fine aggregate to total aggregate by absolute volume
    i. f_a, C_a = total masses of fine and coarse aggregates, per cubic metre of concrete, respectively, kg, and
    ii. S_{fa}, S_{ca} = specific gravities of saturated surface dry fine and coarse aggregates, respectively

8. verify the concrete combine proportions for the primary trial combine.
9. Prepare the concrete exploitation the calculated proportions and forged 3 cubes of one hundred fifty millimeter size and take a look at them wet once 28-days damp natural action and check for the strength.

Slump cone test: The apparatus for conduction the slump test essentially consist of metallic mould in the form of a frustum of a cone having the internal dimension as under

Top Diameter = 10 cm

Bottom Diameter = 20 cm

Height = 30 cm

Calculate slump value

The thickness of the metallic sheet for the mould should not be less than 1.6mm For tamping the fresh concrete, a steel tamping rod 16 mm. diameter and 60 cm long with bullet end is used.

MATERIALS:

1) Cement,
2) Fine Aggregates (Sand),
3) Coarse Aggregates (Kapchi),
4) Water

PROCEDURE:

Figure shows the details of the slump cone apparatus. The internal surface of the mould is totally clean and free of superfluous wetness and unspecified set concrete before commencing the check. The mould is placed on a sleek, horizontal, rigid platform then stock up it in four layers every or so 1/4 of the peak of the mould. Every layer is tamped twenty five times by the tamping

IS CODE METHOD OF Concrete Mix Design of M35 Grade Concrete

Step 1 — Determining the Target Strength for Mix Proportioning

F'ck = fck + 1.65 x S

Where,

F'ck = Target average compressive strength at 28 days

Fck = Characteristic compressive strength at 28 days

S = Assumed standard deviation in N/mm^2 = 5 (as per table -1 of IS 10262- 2009)

= 30 + 1.65 x 5.0 = 38.25 N/mm2

Step 2 — Selection of water-cement ratio:-

From Table 5 of IS 456, Maximum water-cement ratio = 0.40

Note : Do not start with w/c ratio above 0.40,even though the other desired results like Strength, workability could be achieved.

Step 3 — Selection of Water Content

Maximum water content for 20 mm aggregate = 186 Kg (for 25 to 50 slump) i.e. Estimated water content for 100 Slump = 186+(6/100) X 186 = 197 litre Water content = 197 liters

Step 4 – Calculation of Cement Content

Water-Cement Ratio = 0.50

Water content from Step – 3 i.e. 197 liters

Cement Content = Water content / "w-c ratio" = (197/0.50) = 394 kgs From Table 5 of IS 456,

Minimum cement Content for moderate exposure condition = 300 kg/m3 394 kg/m3 > 300 kg/m3, hence, OK. As per clause 8.2.4.2 of IS: 456

Maximum cement content = 450 kg/m3, hence ok too.

Step 5: Proportion of Volume of Coarse Aggregate and Fine aggregate Content

From Table 3 of IS 10262- 2009, Volume of coarse aggregate corresponding to 20 mm size and fine aggregate (Zone I) = 0.60

Note 1: In the present case water-cement ratio is 0.5.So there will be no change in coarse agreegate volume i.e. 0.60 .

Note 2: Incase the coarse aggregate is not angular one, then also volume of coarse aggregate may be required to be increased suitably based on experience.

Step 6: Estimation of Concrete Mix Calculations

The mix calculations per unit volume of concrete shall be as follows:

- Volume of concrete = 1 m3
- Volume of cement = (Mass of cement / Specific gravity of cement) x (1/100) = (39/3.15) x (1/1000) = 0.125 m3
- Volume of water = (Mass of water / Specific gravity of water) x (1/1000) = (197/1) x (1/1000) = 0.197 m3
- Total Volume of Aggregates = 1- (b+c) =1- (0.125+0.197) = 0.678 m3
- Mass of coarse aggregates = d X Volume of Coarse Aggregate X Specific Gravity of Coarse Aggregate X 1000 = 0.678 X 0.60 X 2.80 X 1000 = 1139 kgs/m3
- Mass of fine aggregates = d X Volume of Fine Aggregate X Specific Gravity of Coarse Aggregate X 1000 = 0.678 X 0.40 X 2.70 X 1000 = 732 kgs/m3

Step-7: Concrete Mix proportions

Cement = 394 kg/m3

Water = 197 kg/m3

Fine aggregates = 732 kg/m3

Coarse aggregate = 1139 kg/m3

Water-cement ratio = 0.50

RESULT AND CONCLUSION

COMPRESSIVE STRENGTH

Comparison of compressive strength of concrete with Fly ash 10 % and 15%using admixture s

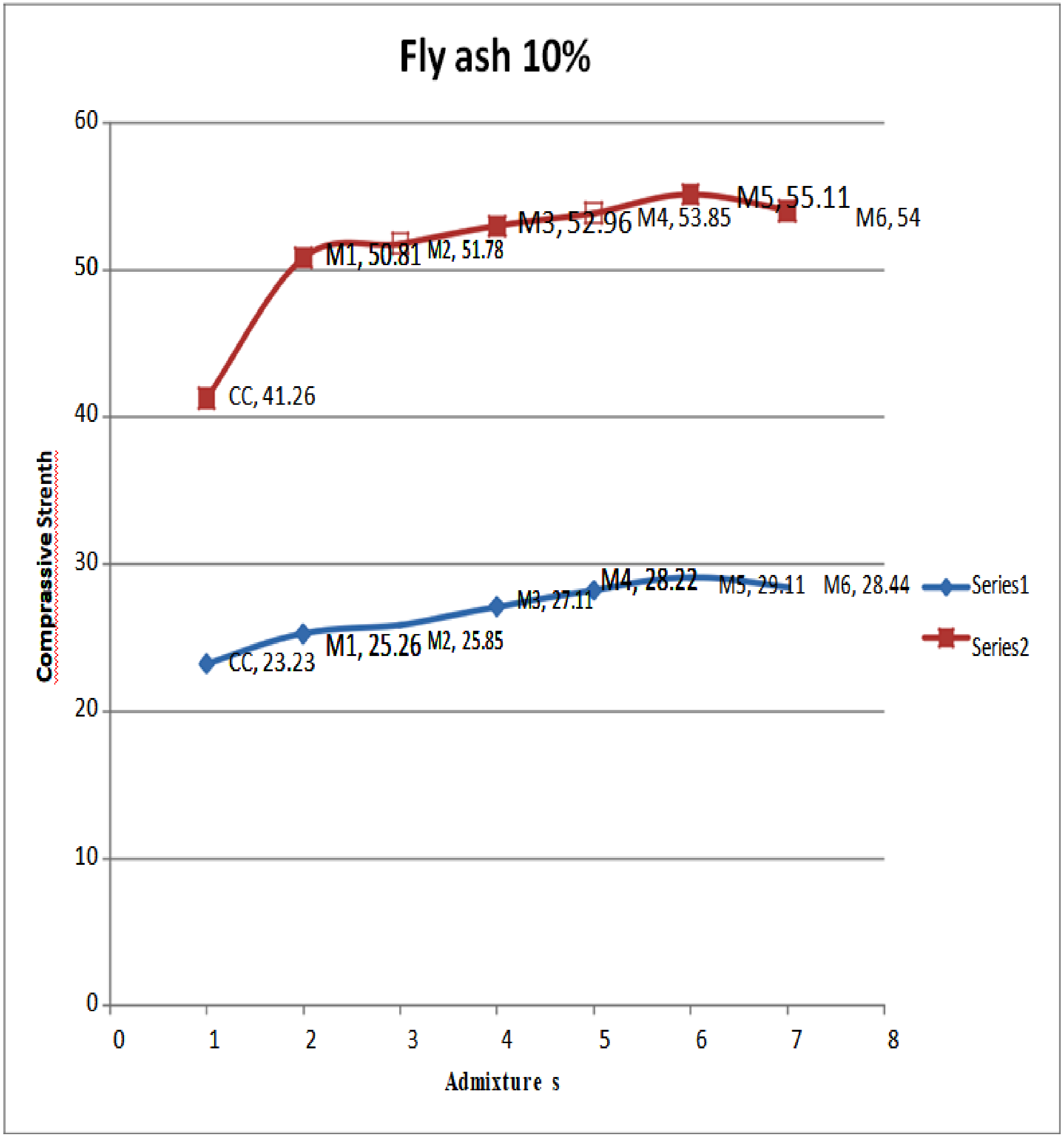

Figure5.1. Line chart comparison of compressive strength of concrete with Fly ash 10 % using admixture s

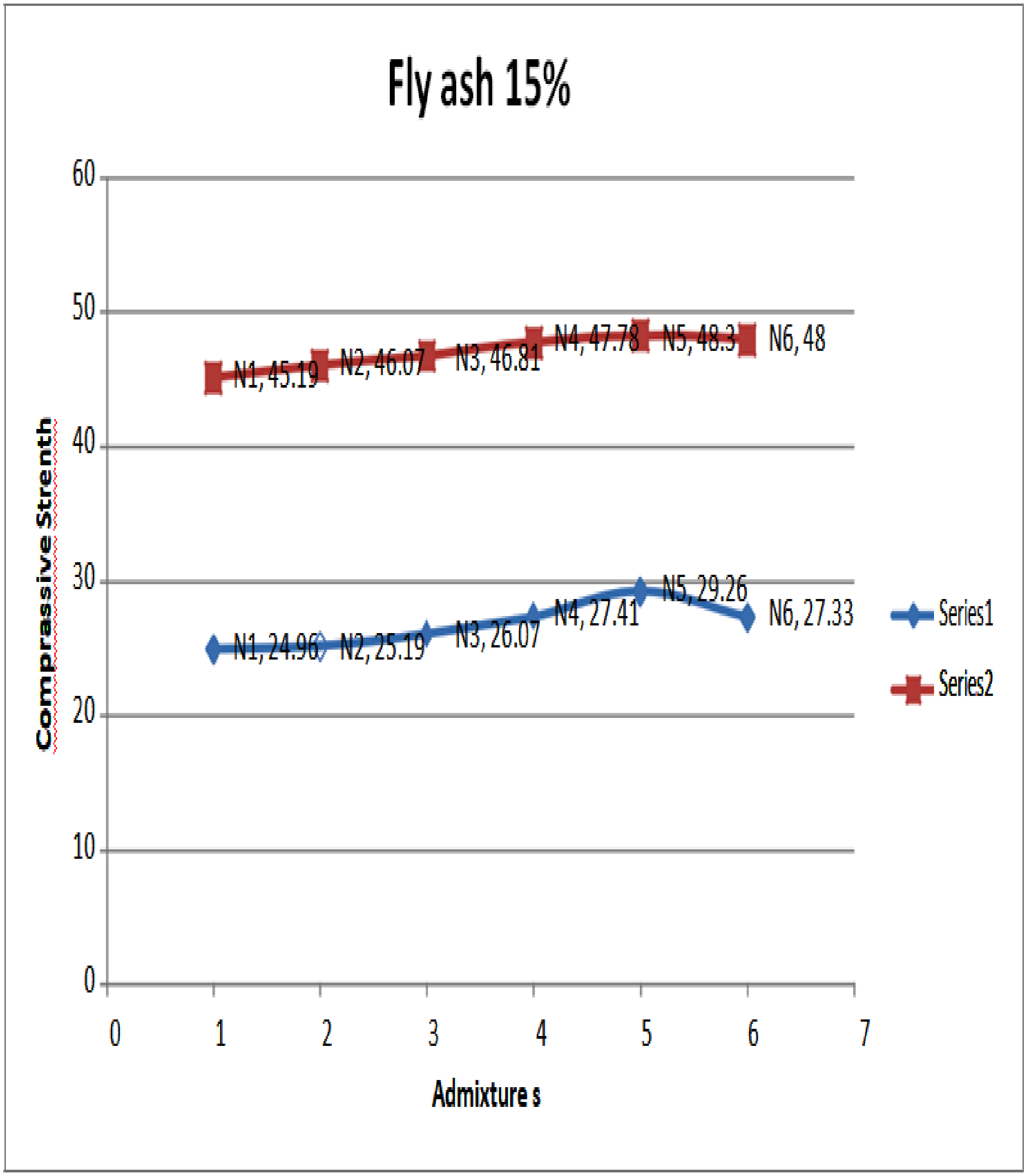

Figure5.2 Line chart comparison of compressive strength of concrete with Fly ash 15 % using admixture s

CONCLUSIONS

- The compressive strength increases with the increase in fly ash compared with normal concrete. The values that are obtained at 7 days and 28 days of curing for 10% of fly ash replaced by PPC cement. As compare to 15% of fly ash in replacement of cement.
- When the cement is replaced with 10% fly ash and 0.8% admixtures gives the optimum compressive strength.
- At 10% fly ash and 0.8% admixture and replacement to cement increases compressive strength than conventional concrete in 28 days.
- From the experimental results, the following conclusion can be drawn:
- At 10% fly ash and 0.8% admixtures replacement to cement increases compressive strength up to 25.13% than conventional concrete in 28 days.
- At 10% fly ash and 0.8% admixtures replacement to cement increases compressive strength up to 20.19% than conventional concrete in 7 days.
- At 15% fly ash and 0.8% admixtures replacement to cement increases compressive strength up to 14.58% than conventional concrete in 28 days.
- At 15% fly ash and 0.8% admixtures replacement to cement increases compressive strength up to 20.6% than conventional concrete in 7 days.
- On the basis of regression analysis of large number of experimental results showed in figures has been developed. The proposed model was found to have good accuracy in estimating the 28 days Compressive strength with their inter relationship at 10%, 15% Fly ash & 0%, 0.2%, 0.4%, 0.6%, 0.8%, 1.0% of Admixture s.
- Fly ash s less use material and cement is costly material so after making silica use can value the cost of constriction still further also waste material after using steel rebar we can reduce of the coast of construction

FUTURE SCOPE OF THE STUDY:

Below are some of the recommendations for further studies:

- In the present study experimental programs was devised to study the strength characteristics of mixes containing fly ash and admixture . The work can be extended to study the durability characteristics as well.
- More trials with different percentage of fly ash , admixture of replacement.
- More investigations and laboratory tests should be done on the durability of fly ash and other waste material in new concrete, and its creep and shrinkage characteristics.
- If additional research supports the use of concrete buildings then existing specification should be revised to permit and encourage the use of other waste material.

REFERENCES:

- Sridhar, C.K., Vanakudre, S.B. (2014), “Strength Efficiency Factor for Nano Silica at Different Age”, International Journal of Engineering and Advanced Technology (IJEAT),
3(6), 2249-8958.
- Ram Meghe et al "Glass fiber reinforced concrete and its properties." *International Journal of Engineering and Technology* 2, no. 12 (2014): 3544-7.
- Elson John et al et al. "Alfalfa discovery of the nearby gas-rich dwarf galaxy LEO PV Neutral gas dynamics and kinematics." *The Astronomical Journal* 148, no. 2 (2014): 35.
- Ahsana Fathima et al "A Comparative Study of Retrofitting of Beam Column Joint Using Concrete jacketing, Steel Plate Jacketing, Glass Fiber wrapping." (2016).
- Jain, Anurag, and P. Y. Pawade. "Characteristics of Silica Fume Concrete." International Journal of Computer Applications (2015).

- Hanumesh, B. M., B. K. Varun, and B. A. Harish. "The Mechanical Properties of Concrete Incorporating Silica Fume as Partial Replacement of Cement." *International Journal of Emerging Technology and Advanced Engineering* 5, no. 9 (2015): 270.
- Nitin Kumar et al "Scheduling traffic over aggregated bundles of links." U.S. Patent 8,937,865, issued January 20, 2015.
- Gupta, T., Sharma, R.K., Chaudhary, S. (2015), "Impact resistance of concrete containing waste rubber fiber and silica fume". International Journal of Impact Engineering, 83, 76-87.
- Kumar & Dhaka "An investigation into the solar light-driven enhanced photocatalytic properties of a graphene oxide–SnO 2–TiO 2 ternary nanocomposite." *RSC Advances* 6, no. 38 (2016): 32074-32088.
- Mohammed HaloobAl-Majidi etal (2017)"Steel fibre reinforced geopolymer concrete (FARGC) with improved microstructure and enhanced fibre-matrix interfacial properties" Construction and Building Materials, Volume 139, 15 May 2017, Pages 286-307
- M.S. Shetty, (2004), Concrete technology, Chand S. and Co Ltd, India.
- M.L. Gambhir, (2006), Concrete technology, Tata McGraw Hill Publishing Co. Ltd
- IS 10262:2009 Code for Concrete Mix Proportion, Bureau of Indian Standards, New Delhi, India.
- IS 12269:1987 Code for 53 grade of ordinary Portland cement, Bureau of Indian Standards, New Delhi, India.