International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-4, November 2019

Mechanical Properties of Fly Ash Based Concrete Aided With Recycled Aggregates and Manufactured Sand

E.Laxmi Prasanna, B.Tipraj, Sandela Haripriya, MdIkramullah Khan, Gobinath R

Abstract: ***Enhancement of concrete strength to shoot the need, demand and to make sustainable is being studied by bountiful researchers across the globe. Utilization of industrial waste and construction waste is an area being explored in the recent days properties of construction demolition waste is unique in nature and result of one research will not maintain with other due to heterogeneous nature of demolition waste. In this work a special type of demolition waste is obtained from building is utilized in concrete in tandem with fly ash instead of sand cost effective and sustainable mixed sand is used in this study in varying proportions. Four different mixes (M1 M2 M3 M4) is prepared using standard sampling procedures and tested for strength and durability. It is found that M2 shows considerable strength in with increasing curing period and it can be selected as optimum mixture. Graded mixed sand used in this study shows considerable increase in strength in coordination with recycled coarse aggregates.***

Keywords: Recycled aggregates, fly ash, stone dust.

I. INTRODUCTION

The properties of cement primarily rely upon the constituents utilized as a part of solid making. The principle imperative material utilized as a part of making concrete is bond, sand, squashed stone and water. Concrete is the most generally utilized development material having a few preferences, for example, high quality, great form capacity solidness climate and imperviousness to fire. The utilization of silica smoke and fly ash recycled coarse aggregate in mortar has expanded lately. Records show that fly ash and silica smolder was utilized for the solid amid the development of Ore sand Bridge [1-3]. Fly ash remains has been utilized as a constituent material of mortar for more than 29years and the instance of a portion of the stowed restrictive mortars for an even long stretch. These materials not just bestow specialized advantages to the both crisp and solidified properties of mortar they are likewise naturally benevolent. The two materials are items coming about because of modern procedures and there utilize, in this way, decreases the amount of essential crude materials that must be removed from the beginning [2]. Silica smoke and fly slag is delegated a dormant pressure driven material. These implies that is has intrinsic cementations properties, yet these must be initiated. The typical method for accomplishing these is to join the material with Portland bond. Pummeled fly ash recycled coarse aggregate is named a pozzolanic. These kind of materials does not by and large have characteristic cementations properties, but rather on the off chance that it is joined with a high basic material it frames a cementitious item. Utilization of reused coarse total in cement can be valuable for ecological assurance and efficient terms. In the meantime, vast number of old structures and different structures have achieved the finish of their administration life and are being annihilated, bringing about age of crushed cement. A portion of this solid waste is utilized as refill material, and much being sent to landfills [3]. Reusing concrete by utilizing it as substitution to new total in cement could diminish solid waste and preserve normal wellsprings of total. Over the most recent two decades, assortments of reusing strategies for development and pulverization squanders have been investigated and are in very much created organize. Reused coarse totals are involved pulverized, evaluated inorganic particles prepared from the materials that have been utilized as a part of the developments and devastation garbage. Prior investigations revealed that there was no critical variety in quality and other mechanical properties of reused total cement contrasted with regular total cement.

To decrease the utilization of bond we need to go for substitutes for concrete. Then again, tremendous amounts of pozzolanic materials like fly slag, silica smolder, rice husk and so on are produced each year. In this manner, diminishment of the amount of waste dumping, natural maintainability and declining CO2 emanation can be guaranteed by appropriate utilization or reusing of these materials at the same time as a supplement of bond or as an element of cement.

Fly ash , stone dust , recycled aggregates.SL Patil, J N Kale, S SumanDr studied about fly ash concrete[7]:

Manuscript published on November 30, 2019.
* Correspondence Author
E.LaxmiPrasanna*, Assistant Professor, Department of Civil Engineering, S R Engineering College, Ananthsagar,Warangal,(TS) India.
B.Tipraj, Assistant Professor, Department of Civil Engineering, S R Engineering College, Ananthsagar,Warangal,(TS) India
.**SandelaHaripriya**, Assistant Professor, Department of Civil Engineering S R Engineering College, Ananthsagar,Warangal,(TS) India
.**MdIkramullah Khan**Assistant Professor, Department of Civil EngineeringS R Engineering, College, Ananthsagar,Warangal,(TS) India
R GobinathProfessor, Department of Civil Engineering, S R Engineering College, Ananthsagar,Warangal,(TS) India

a technical analysis for compressive strength by studying this paper the results has been drawn as 5% fly ash has maximum rate of compressive strength development up to the age of 21 days and then after its rate decreases. Rate of strength development is large up to 21 days for 10% fly ash and then after its rate becomes negligible for few days and after 28 days it increases uniformly and it can be seen that 0% fly ash i.e. concrete with no replacement of cement with fly ash, has maximum rate of compressive strength development at 60 days and after it becomes nearly constant P. R.Wankhede and V. A. Fulari (2014) Studied abouteffect of Fly ash on Properties of Concrete [7]. This paper presents an Effect of Fly Ash on Properties of Concrete. In the present study, use of fly ash in concrete imparts several environmental benefits and thus it is eco-friendly[11-12]. It saves the cement requirement for the same strength thus saving of raw materials such as limestone, coal etc. required for manufacture of cement. Fly ash is pozzolanic material & it improving the properties of concrete like compressive strength & Durability. The results obtained are discussed and compared with the available literature. P.S.Rajput1and M.S.Chauhan (2014).studied about ability of Crushed Stone Dust as Fine Aggregate in Mortars[8].The main objective of the study was to examine the suitability of Crushed stone dust as fine aggregate in Mortars. Apart from characterizing the properties of Crushed stone dust, tests were performed on the mortars using Crushed stone dust as well as natural river sand.

II. MATERIALS

Cement

Ordinary Portland cement (OPC) 53 grade conforming to IS: 8112 – 1989. The cement used was fresh and without any lumps. The physical properties of cement are mentioned in table no. I.

Type of Test	Result
Normal Consistency	30%
Initial Setting Time	35 minutes
Final Setting Time	9.45 hours
Specific gravity of cement	3.15
Fineness	93%

Table- I: Cement Physical Properties

Fine Aggregates

Locally available sand of specific gravity, fineness modulus and zone of 2.60, 2.93 and Zone II respectively was used and it is conforming to IS: 383:1970.

Coarse Aggregate

Crushed stone of 20 mm size with specific gravity of 2.77 and its fineness modulus of 7.12 is used.

Fly Ash

Flyash used for the study was obtained from Ramgundam thermal power plant.

Manufactured sand

Stone dust used in this study was dry procured from Ananthasagar Warangal. This manufactured sand has bulk density 18.12kg/m^3 with specific gravity 2.69. Fineness modulus value 2.32 and water absorption 5.8%.

Recycled Coarse aggregates

Reused coarse totals are gotten from destroyed building situated in Warangal. Jaw Crusher is utilized to reduce size of reused totals. Mass thickness of reused coarse total is 1500 kg/m^3.water retention of reused totals is 2.6%.specific gravity of recycled coarse aggregates is 2.67 and its fineness modulus is 6.98.

Water

Potable water has been used in the experiment for mixing and curing. The quantity of water in the mix plays a vital role on the strength of the concrete. Water used for mixing and curing should be free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. The pH value of water shall be not less than 6.

III. METHODOLOGY

In the present experimental investigation M20 grade of concrete is used. Mix design confirming to IS10262 and IS456-2000.

- Concrete mix proportion 1:1.61:3.23
- Water Cement Ratio: 0.5
- Various percentages of crushed stone dust with 25%, 50 % and 75% in fine aggregate and 25 % of fly ash as Cement replacement
- Different percentages of recycled aggregates with 25%, 50% and 75% in coarse aggregate.

M1- Normal Concrete

M2- 25% of flyash, 25% of manufactured sand and 25% of recycled aggregates.

M3- 25% of flyash, 50% of manufactured sand and 50% of recycled aggregates.

M4- 25% of flyash, 75% of manufactured and 75% of recycled aggregates.

Type of Material	M1	M2	M3	M4
Cement	340	255	255	255
Flyash	-	85	85	85
Fine aggregate	547	410.25	273.5	136.75
Manufactured sand	-	136.75	273.5	410.25
Coarse aggregate	1098	823.5	543	274.5
Recycled coarse aggregate	-	274.5	543	823.5

Table- II: Mix design details

IV. RESULTS AND DISCUSSIONS

Compression strength

The variations of compression strength results for various combinations as shown in Fig. 1.

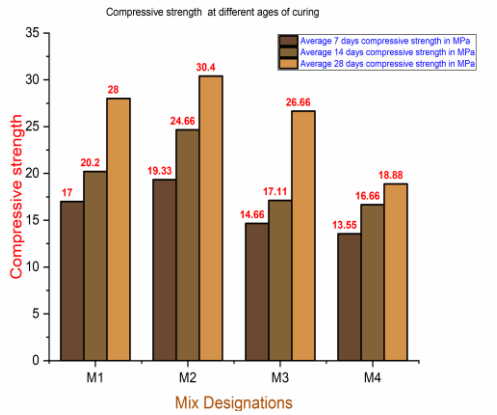

Fig. 1. Compressive strength results

Split Tensile strength

The variations of Split Tensile strength results for various combinations as shown in Fig. 2.

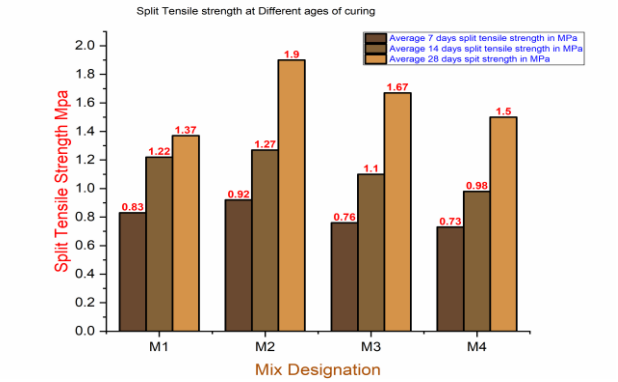

Fig. 2.Split Tensile strength results

Flexural strength

The variations of Flexural strength results of slurry infiltrated hybrid fibre reinforced concrete subjected to acidic attack for various combinations as shown in Fig. 3.

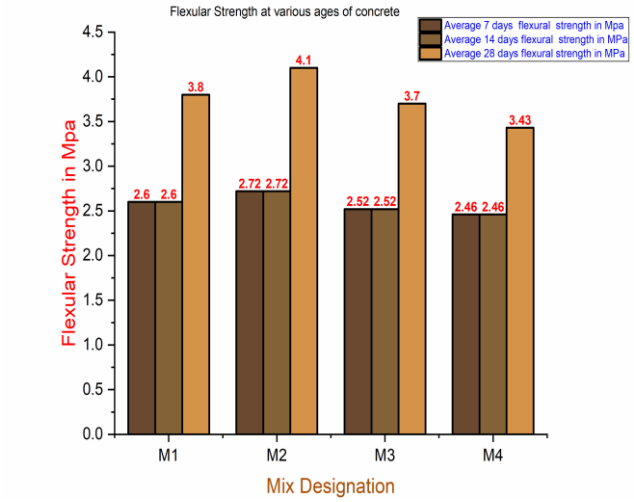

Fig. 3. Flexural strength results

V. CONCLUSIONS

The following are the conclusions derived by replacing the cement content with fly Ash and by using manufactured sand and recycled aggregate in different proportions varying up to 75%

Compressive strength of ternary blended concrete is increased by 8.57% by replacing 25% of cement with fly ash, fine aggregate with manufactured sand and coarse aggregates with recycled aggregates at 28 days.

Compressive strength of ternary blended concrete is decreased by 34 % by replacing 25% of cement with fly ash, 75% replacement of fine aggregate with manufactured sand and 75% replacement of coarse aggregate with recycled aggregates.

The tensile strength of ternary blended concrete is increased by 38.68 % by replacing 25% of cement with fly ash, fine aggregate with manufactured sand and coarse aggregate with recycled aggregates at 28 days.

The flexural strength of ternary blended concrete is increased 7.89% for 25% partial replacement of materials cement with fly ash fine aggregates with manufactured sand and coarse aggregates with recycled aggregates

Addition of recycled aggregates will reduce the pollution and helps in sustainable construction.

Addition of fly ash will enhance the mechanical properties off concrete and one hand and effective disposal on other hand.

By this study it can be concluded that there are no technical, economic, or environmental barriers that exist when using most ternary blended cement concrete mixtures. The technical performance of the ternary blended concrete mixtures that were studied was always better than normal concrete mixtures.

REFERENCES

1. A.K. Mullick. “Performance of concrete with Binary cement blends”. The Indian Concrete Journal, January 2007.
2. A.Siva Krishna “Design & testing of Fly-ash based Geo Polymer Concrete” International Journal of Civil Engineering & Technology (IJCIET) Volume 8 Issue 5 May, 2017.
3. Neville.A.M.”Properties of concrete”, Fourth Edition, PITMAN Publishing Ltd. London, 1997.
4. MEHTA, P. K., AND GJORV, O. E., 1982, “Properties of Portland Cement Concrete Containing Fly Ash and Condensed Silica Fume,” Cement and Concrete Research, V. 12, No. 5, pp. 587-595.
5. JAHREN, P., 1983, “Use of Silica Fume in Concrete,” Fly Ash, Silica Fume, Slag, and Other Mineral By-Products in Concrete, Proceedings of the First CANMET/ACI International Conference, SP-79, V.M. Malhotra, ed., American Concrete Institute, Farmington Hills, Mich., pp. 625-642.
6. Dr S L Patil, J N Kale and S Suman, 2012, ‘Fly Ash Concrete: A Technical Analysis For Compressive Strength’, International Journal of Advanced Engineering Research and Studies, Volume II, Issue I, Pages:128-129.
7. Wankhede P R and Fulari V A Effect of fly ash on properties of concrete 2014 Int. J. Emerg. Technol. Adv. Eng.
8. Dr. Sarvesh P.S Rajput, Dr. M.S Chauhan, Kamlesh k Ahirwar,2014, “Evaluation of Blast Furnace Slag as Alternative of Natural Sand in Cement Concrete and Cement Mortar”
9. MD Ikramullah Khan, M Sravanthi, E LaxmiPrasanna,“An experimental study of themechanical properties of s glass fiber reinforced high strength concrete partially replacing cement with nano silica”, Volume 9, Issue 4, April 2018, pp. 1398–1409.
10. Tipraj, E. Laxmiprasanna, “Experimental study on strength of concrete by partial replacement of cement by nano silica and fly”,Volume:9,Issue:11,Pages:1763-1771.
11. S.Haripriya and laxmi prasanna,2018.” Study Analysis on the High-Level Viaduct OverBondivagu Drain.

12. G.Swamyyadav, E.Vamshi Krishna, S.Yeshwanth Kumar, G.Hari Prasad, R.Pavankalian "Potential Use of Biochar as Construction Material" International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8, Issue-1, May 2019

AUTHORS PROFILE

E.LaxmiPrasanna,Assistant Professor, Department of Civil EngineeringSR Engineering College, Ananthsagar,Warangal,(TS) India

B.Tipraj, Assistant Professor, Department of Civil Engineering, S R Engineering College, Ananthsagar,Warangal,(TS) India.

SandelaHaripriyaAssistant Professor, Department of Civil EngineeringS R Engineering College, Ananthsagar,Warangal,(TS) India.

MdIkramullah Khan Assistant Professor, Department of Civil Engineering S R Engineering College, Ananthsagar,Warangal,(TS) India.

GobinathRProfessor, Department of Civil Engineering S R Engineering College, Ananthsagar,Warangal,(TS) India.