ISSN 2395-695X (Print)
ISSN 2395-695X (Online)
International Journal of Advanced Research in Biology Engineering Science and Technology (IJARBEST)
Vol. 2, Issue 3, March 2016

UTILIZATION OF INDUSTRIAL WASTES IN CEMENT MORTAR

BARVATHA.K[1] ,Dr.DHANALAKSHMI.G[2],MANIKANDAN.N[3]
M.E.,(Structural[1]), Professor & Head [2], Assistant Professor[3] ,
Department Of Civil Engineering College , Anna University , BIT Campus,Thiruchirappalli, Tamilnadu ,India[1]
kvbarvatha12@gmail.com[1]
civil.oxford09@gmail.com[2]

Abstract: Utilization of industrial waste materials in construction industry leads to several advantages including savings in the natural resources and green gases emissions. Industrial waste (Paper sludge and Fly ash) is facing problems regarding its disposal. The technology innovation has helped in used as an alternate to conventional resources for manufacturing of bricks, concrete blocks. Hence, in this proposed work, experiments have been planned to study the effective consumption of these Paper sludge and Fly ash in the construction industry. Paper sludge obtained from Paper mill, Fly ash obtained from mining are admixed with cement mortar at different percentages by mass and studied for Mechanical properties.

Key words: Paper Sludge, Fly Ash, Mechanical properties.

1. INTRODUCTION

The Management of wastes, in particular of industrial waste, in an economically and facing the issues of modern industry, mainly due to the increased difficulty in properly locating dumping works. In the industrial, mining, municipal, agricultural and other processes. The technology improvement has helped in using alternate manufacture resources as a alternate to conventional resources for manufacturing of bricks, tiles, aggregates etc.Environmental pollution is the main problem related with speedy industrialization, urbanization and increase in living standards of people. Large amount of waste are dumped in land mass and create the earth pollution. This pollutes the ground water and also surface water. To reduce the effect of this waste, it can be used for production field for the alternate of cement. Due to its (Paper Sludge and Fly ash) chemical properties it will act as a pozzolonic material mixed with cement.Paper making generally produces a large number amount of solid waste. Paper fibers can be recycled only a limited number of times before they become too short or weak to make high quality paper. It means that the broken, low quality paper fibers are separated out to become waste sludge. The paper mill and fly ash waste consumes a large percentage of local landfill space for each and every year.

2. MATERIALS USED

A.Cement

The Cement used for this study is Ordinary Portland Cement of 33 grade as per IS 12269-1987.

Fig.1 Ordinary Portland Cement

B.Fly Ash

Fly Ash is a fine, glass powder collected from the gases of burning coal. Fly Ash particles are nearly totally fine. That capability is one of the properties making fly ash a desirable admixture foe concrete.This fly ash is pozzolanic in nature and contain less than 20% lime (CaO). The fly ash have the pozzolanic properties, the glassy silica and alumina and also the fly ash contains a cementing agent

ISSN 2395-695X (Print)
ISSN 2395-695X (Online)
International Journal of Advanced Research in Biology Engineering Science and Technology (IJARBEST)
Vol. 2, Issue 3, March 2016

Fig.2 Fly Ash

Fig.3 Paper Sludge

S.NO.	PROPERTY	CEMENT
1	Initial setting time	33minutes
2	Final setting time	327minutes
3	Consistency	30%
4	Specific Gravity	3.13

C. Paper Sludge

Paper mill sludge is the material is a by product of the de-inking and re-pulping of paper. In functional terms, paper sludge consists of fibers, fillers such as calcium carbonate and china clay and residual chemical bound up with water. The moisture content of paper sludge is up to 40%.

3. PROPERTIES OF MATERIALS

Table 1 : Properties of Fly Ash and Paper Sludge

S.No.	PROPERTY	FLY ASH	PAPER SLUDGE
1	Initial setting time	130minutes	33 minutes
2	Final setting time	290 minutes	596 minutes
3	Consistency	28%	27.5%
4	Specific gravity	2.14	2.6

Table 2 : Properties of Cement

4.RESULTS AND DISCUSSIONS

For the determination of cube compressive strength of cement mortar with specimen of size 70.6mm x 70.6mm x 70.6mm were cast and cured for 7 days, 14 days and 28 days in tap water. After that specimens are dried in open air, subjected to cube compression testing machine.The compressive strength of cement mortar with different percentage of Paper Sludge and Fly Ash is given below.

Table 3 : Compressive strength of Cement Mortar with Paper Sludge and Fly Ash

ISSN 2395-695X (Print)
ISSN 2395-695X (Online)
International Journal of Advanced Research in Biology Engineering Science and Technology (IJARBEST)
Vol. 2, Issue 3, March 2016

% Of Addition Of Paper Sludge + Fly Ash	Compressive strength (f_{ck}) N/ mm^2		
	7th day	14th day	28th day
0%	16.3	21.39	25.13
5%	17.08	22.54	26.29
10%	16.1	21.5	25.19
15%	13.45	19.36	24.15
20%	12.3	16.09	21.79

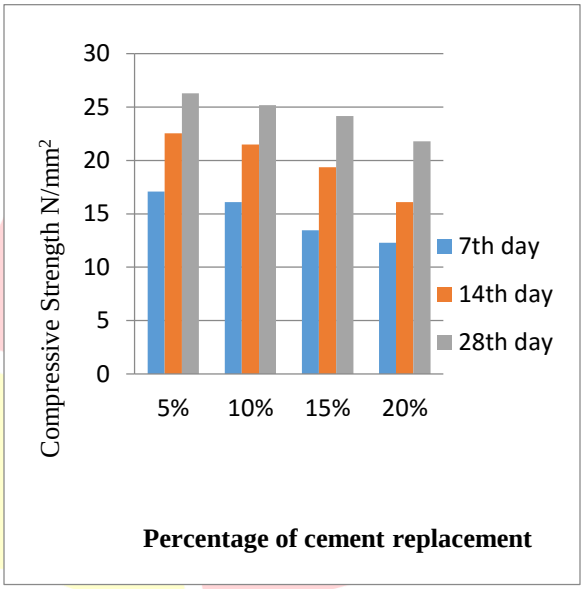

Fig.4 Compressive strength of Cement Mortar with Paper Sludge and Fly Ash

DISCUSSION

- In 7 days curing, the compressive strength value of the control mortar was 16.3MPa and the Compressive Strength value of Cement Mortar with PF–5% was 17.08 and beyond this percentage of replacement cement, the strength was gradually reducing and reaching 12.3MPa for PF- 20%.

- In 14 days curing, the Compressive Strength of control Mortar was 21.39 MPa and Compressive Strength value of Cement mortar with PF- 5% was 22.54 MPa and beyond this percentage of Cement replacement, the strength was gradually reduced and reaching 16.03 MPa with PF – 20%.

- Similarly in 28th day curing, the Compressive Strength of the cement mortar was 25.13MPa and Compressive Strength of Cement mortar with PF-5% was 26.29MPa and beyond this percentage of Cement replacement, the Strength was gradually reduced and reaching 21.79MPa with PF-20%.

- The reason for such variation for the first PF-15%, the Calcium oxide present in the Paper Sludge and Fly Ash. Excess amount of Paper Sludge do not react with fine aggregate and therefore the gradual reduction in strength was occurred with increasing the percentage.

5. CONCLUSION

The strength characteristic of Cement Mortar with various percentage of Paper Sludge and Fly Ash have been studied. The compressive strength of cement mortar was increased with 5%, 10% ofreplacement of cement with Paper Sludgeand Fly Ash, beyond thispercentage of replacement of cement is gradually reduced.

The reason for such variation for the first 10% the calcium oxide present in the paper sludge was utilized for the formation of C-S-H gel and excess amount of paper sludge do not react with fine aggregate and therefore gradual reduction in strength.

From the values of different curing, the compressive strength with 28th day curing has greater value than 7th day and 14th day curing.

REFERENCES

[1]. Balwaik, Sumit.A. S.P. Rawt "Utilization of waste paper pulp by partial replacement of cement in concrete" International journal of Engineering Research and Applications Vol.1, Issue 2, pp 300-309

[2]. Bhooma Nepal and Vantia Agarwal "Papercrte-A study on Green Structural material" International Journal of Applied Engineering Research ISSN 0973-4562, Volume 9, Number 3 (2014) pp. 253-260.

[3]. DallAra Alessandra Bonoli, "A bio remediation case of an ex-quarry area restored by paper sludge" International Journal of Biotechnology 157(2012) 499-504.

[4]. Ferrandiz Mas V, T.Bond, E,Garcia-Alcocel, C.R.Cheesman "Lightweighmortars containing expanded polystyrene and paper sludge ash" Construction and Building Materials 62 (2014) 285-292.

[5]. Gayathri.V,Vaishali Sahu, "The Use of Fly Ash and Lime Sludge as partial Replacement of Cement in Mortar" International Journal of Engineering and Technology Innovation, Vol.4,no.1(2014,pp.30-37.

[6]. Hashim M.D Safiuddin, Mohd Zamin Jumaat, M.A.Salam, and M.S.Islam "Utilization of solid waste in construction materials" International journal of the Physical sciences Vol.5(13) p.p 1952-1963, 2010.

[7]. Juraez M.C., P.Munoz, M.P.Morales, M.A.Mendivil "Improving the thermal transmittance of single brick walls built by clay bricks lightened with paper pulp" in Energy and Buildings 59 (2013) 171-180.

[8]. Leon Kaluza, MatejSustarsic, Vera Rutar, Gregor D. Zupancic "The re use of Waste Activated Sludge as part of a "zero sludge" strategy for wastewater treatments in the pulp and paper industry" Bio Source Technology 151 (2014)137- 143

[9]. Ozturan.T and N.U.Kockal "Characteristics of lightweight fly ash aggregates produced with different binders and heat treatments" International Journal of Cement and Concrete Composites, Vol.33,pp.61-67(2011)

[10]. Ozturan.T and N.U.Kockal "Characteristics of lightweight fly ash aggregates produced with different binders and heat treatments" International Journal of Cement and Concrete Composites, Vol.33,pp.61-67(2011).