International Journal For Technological Research In Engineering
Volume 5, Issue 4, December-2017 *ISSN (Online): 2347 - 4718*

TO STUDY THE CHARACTERISTIC OF PARTIAL REPLACEMENT OF CEMENT IN DRY LEAN CONCRETE WITH LIME AND RICE HUSK ASH

Sanjay Singh[1], Dr. Rajeev Chandak[2]
[1]M.E.-Scholar (Structural Engineering), [2]Head of the Department,
Department of Civil Engineering, Jabalpur engineering College, Jabalpur, Madhya Pradesh, India.

AIM:To study the characteristic of dry lean concrete with partial replacement of cement in dry lean concrete with lime and Rice Husk Ash.

ABSTRACT: Lime can be used as cement replacement in concrete. The first of this research looks at the change in physical properties of a standard concrete mix when lime is substituted for cement with respect to compressive strength. The result from this research shows a linear decline of strength with a linear increase in the percentage of lime to cement. The lime occurs as product of coal seam fires and in altered limestone xenoliths in volcanic eject the lime originates with its earliest use as building mortar and has the sence of sticking or adhering. These materials are still used in large quantities as building and engineering materials (including limestone products, cements, concrete, and mortar), as chemical feed stocks. Lime industries and the uses of many of the resulting products date from prehistoric times in both the old and new world. Uses of lime include lime mortar, lime plastar, lime render, lime ash floor, tabby concrete, white wash, silicate mineral paint and lime stone blocks which may be of many types. Lime has high reactivity and pozzollanic property. Indian standard code of practice for plain and reinforced concrete IS: 456-2000 recommends use of lime in concrete. So, uses of lime with cement improve workability and stability reduces heat evolution thermal cracking and plastics shrinkage. Lime minimizes alkali aggregates reaction reduces expansion refines, pore structure and binders diffusion of alkali ions to the surface of aggregates by micro structures.

MATERIALS KEY WORDS:Cement (ppc) Portland pozzollana cement is: 1498 (part1), natural sand, aggregate, lime, water etc.

I. INTRODUCTION

The purpose of this paper is to investigate the replacement of cement with lime in the production of concrete with the express objective of reducing the production of green house gases emission by manufacturers of pozzolans. In environmental terms, lime does not generate as much co2 in its production as does the production of Portland cement. Lime has been used as pozzollanic material in concrete for thousands of year. Lime has a number of properties that are of interest in the development of long term durability of materials, particularly the slow carbonation rate and resulting self- healing property. This paper deal with the physical strength properties of concrete when the Portland cement is replaced with hydrated lime of varying proportions.Presently large amount of lime are generated in the mines of lime in the nature in abundant with an important impact on environment and humans. This project describes the feasibility of using the lime in concrete production as partial replacement of cement in India the industry of lime are abundant because India has enriched in mineral deposits country and one of the mineral are lime. If varying lime contents on the physical and mechanical property of fresh and hardened concrete we have been investigated. This results show that this industrial bi products is capable of improving hardened concrete performance up to 30%. The compressive strength of concrete was measured for 7days.in order to evaluate the effect of lime onmechanical behavior of concrete.

II. OBJECTIVE

In this project our objective is to study the characteristic of partial replacement of cement in dry lean concrete with lime and RHA for road sub base and to compare it with the compressive strength of concrete. And also trying to find the 30% of lime replaced in dry lean concrete that makes the strength of the dry lean concrete for road sub base is maximum.Now a day lime has become a pollutant in the Lime in carving lime stones so by partially replacing cement with lime we are proposing a method that can be of great use in reducing pollution to a great extent.

III. MATERIALS

The materials used in the preparation of concrete are cement, sand, coarse aggregates, Rice Husk Ash, Lime, and water etc.

CEMENT: Portland Pozzollana Cement (PPC) IS: 1489 (Part-1) which is available in the market has been used.

SAND: The Narmada river sand available in the market and having specific gravity of 2.66 (Conforming to Zone II) has been used.

COARSE- AGGREGATES: Crushed granite conforming to IS 383:1987and having specific gravity 2.72has been used.

WATER: Water is an important ingredient of concrete as it actively participated in the chemical reaction with cement, clean portable water which is available in college campus has been used.

LIME: RHA is a carbon neutral green product. Lots of ways are being thought of for disposing them by making commercial use of this RHA. RHA is a good super-pozzolan . This super-pozzolan can be used in a big way to make

special concrete mixes . There is a growing demand for fine amorphous silica in the production of special cement and concrete mixes ,high performance concrete , high strength, low permeability concrete, for use in bridges, marine environments , nuclear power plants etc. This market is currently filled by silica fume or micro silica , being imported from Norway, China and also from Burma . Due to limited supply of silica fumes in India and the demand being high the price of silica fume has risen to as much as US$ 500 / ton in India.

FIGURE: 1 LIME

METHODOLOGY:

- Collection of Lime powder.
- Physical tests conducted on Lime.
- Preparation of standard mix of 1:12 PPC.
- Replace cement with Lime as 0%, 5%, 10%, 15%, 20%, 25% and30%.
- Making a number of samples of concrete cubes.
- Testing of cubes to 7days.

COMPRESSIVE TEST:

Out of many test applied to the concrete, this is the utmost important which gives an idea about all the characteristics of concrete. By this single test one judge that whether Concreting has been done properly or not.

Compressive strength of concrete depends on many factors such as water-cement ratio, cement strength, quality of concrete material, quality control during production of concrete etc.

Test for compressive strength is carried on cube. For cube test, specimens of size 15cm X 15cm X 15cm are used.

The prepared concrete is poured in the mould and tempered properly so as not to have any voids. The top surface of these specimen should be made even and smooth. After 24 hours these moulds are removed and test specimens are put in water for curing. This is done by putting cement paste and spreading smoothly on whole area of specimen.

These specimens are tested by compression testing machine after 7 days curing. Load should be applied gradually at the rate of 140 kg/cm^2 per minute till the Specimens fails. Load at the failure divided by area of specimen gives the compressive strength of concrete.

IV. RESULTS AND DISCUSSION

The quantity of water with respect to batch number, percent Lime replacement by weight and total pozzollanic content is presented. The quantity of Lime increased more water is required to maintain a consistent slump, thus increasing the water to pozzolan ratio. For the five batches of concrete for which the mixes design is presented in table.

Compression test carried out on sample cubes by using compression testing machine. The specimens were loaded at a constant strain rate until failure. The results of compressive strength cubes for7 days curing is given in Table-1, and its corresponding graph is shown in Figure-1.

5.2.2Compressive Strength at 7 days of Lime:

Table 5.2

S. NO.	Designation of mix	Compressive Strength in Tons					Average compressive strength in Tons	Average compressive strength in N/mm2
		Cube 1	Cube 2	Cube 3	Cube 4	Cube 5		
1	Lime 0%	23	24	23	24	24	23.6	**10.69**
2	Lime 5%	25	23	25	26	25	24.8	**11.23**
3	Lime 10%	26	25	26	27	25	25.80	**11.68**
4	Lime 15%	27	27	26	26	27	26.0	**12.05**
5	Lime 20%	24	23	22	23	24	23.02	**10.51**
6	Lime 25%	23	22	22	21	21	21.80	**9.87**
7	Lime30%	20	19	19	20	21	19.80	**8.97**
8	Lime 35%	17	15	17	16	15	16	**7.24**
9	Lime 40%	16	14	16	15	15	15.2	**6.88**

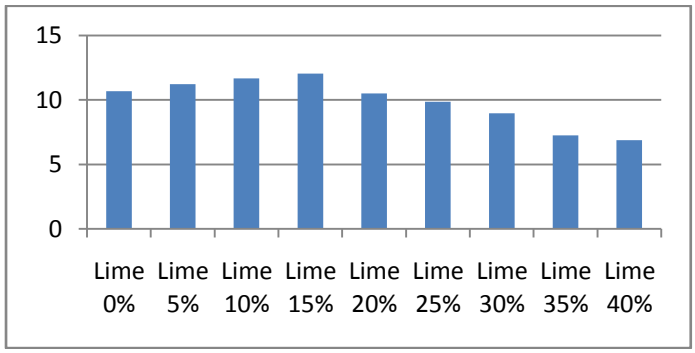

Figure 5.1 : Graph of Compressive Strength at 7 days Vs % 0f lime

COMPRESSIVE STRENGTH AT 7TH DAY:

V. CONCLUSION

Based on experiments and test results on fresh & hardened concrete the following conclusions are drawn:

The compressive strength decreases as the percentage of rice

husk ash replacing cement increases, this nature continues till end.

Improvement in Fresh Concrete Properties: a. Due to addition of rice Husk ash, concrete becomes cohesive and more plastic and thus permits easier placing and finishing of concrete.

1. As the replacement of cement by RHA in concrete increases, the workability of concrete decreases.
2. As the Rice Husk Ash is waste material, it reduces the cost of construction.
3. The utilization of RHA holds promising prospects in the country because it softens the impact on the environment & capital cost of the structure
4. It helps in reducing the pollution in environment.

As per the code IRC SP 49 : 2014, the compressive strength should not be less than 5.5 N/mm^2 at the 7th day curing after they were moulded. Thus, replacement of rice husk ash up to 20% is suitable for prepration of road sub base.

It also increases workability of concrete. b. The bulk density of RHA concrete is reducing with increase in RHA content. 2. Compressive Strength:

1. Due to addition of RHA it is observed that early strength gain is slightly increasing with addition of 10%, 20% & 30% RHA in normal concrete at 7 days.
2. But in 28 days tests results it is found that with addition of 20% RHA in normal concrete strength is running parallel or more than of normal concrete. Thus 20% RHA is the optimum content for getting nearly equal strength at 28 days.
3. As the replacement of cement by RHA in concrete increases, the workability of concrete decreases.
4. Replacement of cement with Rice Husk Ash leads to increase in the compressive strength improved the workability and achieved the target strength at 20% replacement for the grade of concrete.
5. The pozzolonic activity of rice husk ash is not only effective in enhance the concrete strength, but also in improving the impermeability characteristics of concrete.
6. The optimum replacement level of Rice Husk Ash is found to be to20% for M30 grade of concrete.
7. The use of rice husk ash as an alternative for cement & as additive to reduce corrosion and increase durability of concrete strength.
8. . 9. RHA is also use for manufacturing load bearing blocks bricks tiles in low cost.
10. As the Rice Husk Ash is waste material, it reduces the cost of construction.
11. It helps in reducing the pollution in environment.

REFERENCE

[1] Ghassan Abood Habeeb*; Hilmi Bin Mahmud. Study on properties of rice husk ash and its use as cement replacement material

[2] Zhang MH and Malhotra VM. High-performance concrete incorporating rice husk ash as a supplementary cementing materials. ACI Materials Journal (Detroit), 1996; 93(6):629-636

[3] Mehta PK. Rice husk as: a unique supplementary cementing material. In: Proceedings of the International Symposium on Advances in Concrete Technology; 1992 May; Athens, Greece. Canada: CANMET, 1992. p. 407-430

[4] P.K. Mehta, Rice husk ash—a unique supplementary cementing material, in: V.M. Malhotra (Ed.), Proceedings of the International Symposium on Advances in Concrete Technology, CANMET/ACI, Athens, Greece, May, 1992, pp. 407 – 430.

[5] Q. Yu, K. Sawayama, S. Sugita, M. Shoya, Y. Isojima, The reaction between rice husk ash and Ca(OH)2 solution and the nature of its product, Cem. Concr. Res. 29 (1) (1999) 37 – 43.

[6] Y. Yamamoto, S.M. Lakho, Production and utilization of rice husk ash as a substitute for cement, Proceedings of the Japanese Society of Civil Engineers, vol. 322, 1982, pp. 157 – 166.

[7] A.A. Boateng, D.A. Skeete, Incineration of rice rusk for use as a supplementary cementing material: the Guyana experience, Cem. Concr. Res. 20 (1990) 795 – 802.

[8] N.B. Singh, R. Sarvahi, S.P. Singh, A.K. Shukla, Hydration studies of RHA blended white portland cement, Adv. Cem. Res. 6 (21) (1994) 13 – 18.

[9] H.B. Mahmud, B.S. Chia, N.B.A.A. Hamid, Rice husk ash—an alternative material in producing high strength concrete, A. Al-Manaseer, S. Nagataki, R.C. Joshi (Eds.), Proceedings of International Conference on Engineering Materials vol. II, CSCE/JSCE, Ottawa, Canada, 1997, pp. 275 – 284.

[10] I.K. Cisse, M. Laquerbe, Mechanical characterization of sandcretes with rice husk ash additions: study applied to Senegal, Cem. Concr. Res. 30 (1) (2000) 13 – 18.

[11] D.J. Cook, R.P. Pama, S.A. Damer, Behaviour of concrete and cement paste containing RHA, Conference Proceedings on Hydraulic Cement Paste, Cement and Concrete Association, London, 1976, pp. 268 – 282.

[12] C.L. Hwang, D.S. Wu, Properties of cement paste containing rice husk ash, in: V.M. Malhotra (Ed.), Am. Concr. Inst. SP-114, 1989, pp. 733 – 765.

[13] M.-H. Zhang, V.M. Malhotra, High-performance concrete incorporating rice husk ash as a supplementary cementing material, ACI Mater. J. 93 (6) (1996) 629 – 639.

[14] N. Bouzoubaaˆ, B. Fournier, Concrete incorporating rice husk ash: compressive strength and chloride-ion durability, Report MTL 2001- 5(TR), CANMET, 17 pp.

[15] S.K. Chopra, S.C. Ahluwalia, S. Laxmi, Technology and manufacture of rice-husk ash masonry (RHAM) cement, Proceedings of ESCAP/ RCTT Workshop on Rice-Husk Ash Cement, New Delhi, 1981.

[16] V.M. Malhotra, Fly ash, slag, silica fume, and rice husk ash in concrete: a review, Concr. Int. (1993) 23 – 28.

