FLAS Compound used in Masonry Cement: A Review

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Abstract— Masonry cement is the compound which is form by lime components with cement, it is gives the better workability, less shrinkage and good finish in plastering and concrete work. The property of masonry cement will be increased by the use of FLAS compound and also reduce the cost of cement. In this compound lime is easy available in market, aluminium silicate is the chemical admixture, fly ash and surkhi is waste material which utilize in masonry cement to increase the binding property and reduce cost of cement. Cement is a binding material and very essential part of construction and the requirement of cement are too high in developing as well as developed countries. In India various housing scheme launched by the central government and state government for low income group. All of these factors gradually increase the demand of cement. The requirement of fine and course aggregate can be fulfill by C&D waste and other broken solid waste but the there is not any other alternative of cement. In this paper we have tries to reduce the cost of cement from the addition of Fly ash, lime, Aluminium Silicate, and Surkhi i.e. FLAS. It is reduce the much cost of the cement.

Keywords: Cement, Fly ash, Lime, Aluminium Silicate, Masonry, Brick

I. INTRODUCTION

The formation of Masonry cement is lime or hydraulic lime or pure lime with cement. It is effectively used in brick work and plastering. India is a fastest growing country proportionally grows the construction industries because the every growing country demands the basic raw material for construction like cement, sand, aggregate, etc. all these material are the natural resource and it is limited, some of the raw material comes after the long process and too much pollution done. One of the most important raw materials is cement. The production of cement requires much more raw materials like lime, silica, alumina, iron oxides, gypsum, magnesia, alkalies etc and after the collection of these material require burning at suitable temperature at 1500 ^{0}C and grinding. There is major problem of production of cement is that the generation of CO_2, after the production of one ton of cement generate same amount of CO_2, which is more harmful for the environment. According to Global Cement Directory 2018 lists India is the second largest producer of cement after China. Cement is the necessary and costly ingredient for the mortar and concrete. The substitute of fine and coarse aggregate is available but there is no any substitute commercially available of cement, so that each and every construction needs cement.

II. SIGNIFICANCE OF STUDY

In this study we are trying to focus to minimize the CO2 generation rate from cement industries without compromising the strength of cement by using FLAS Compound in cement. We are utilizes the some waste material which are commercially much less in fashion like used brick, converted into surkhi. Fly ash from thermal power plant, lime and aluminium silicate which less use in construction.

III. LITERATURE REVIEW

J. Lanas, J.I. Alvarez have been studied on Masonry repair lime-based mortars: Factors affecting the mechanical behavior. They have studied the various technological parameters like x ray diffraction, chemical analysis, compressive strength, flexural strength, thermal analysis, mechanical analysis etc on lime based mortar after3, 7, 28, 91, 128, and 365 days . They have found that the strength of mortar specimen increases on 356 day as compare to 28 day. In which the large amount of mixture increases the porosity of specimen and also increases the good interlocking ingredient in mortar mixture.

Rukshana Shresth, Sristi Koju and Rameswor Shrestha have been studied on Performance of Lime Mortar in Reconstruction of Monuments of Bhaktapur. They have prepared a slaked lime mortar 10 cm size cube test and prism test with different mix proportions. They have prepared five cubes and compressive test performed after 58 and 65 days and also prepare the six prisms, 3 were of 1:1:1 mix proportion and rest of 3 of 1:1:2 with same water content.

Jan wakeel Ahmad Wani, Ravi Kumar have been studied on influence of surkhi on various properties of concrete bricks. They have prepared a seven specimen with different materials and different mix proportion like cement, stone dust, surkhi, and gravel. They have performed various test on specimen like, hardness, efflorescence, soundness, shape and size, structural test, compressive strength test and found that bricks with higher value of compressive strength test, better hardness, soundness, structure and water absorption values, less efflorescence, were produced.

M.J. Mosquera,T, B. Silva, B. Prieto, E. Ruiz-Herrera have been studied on addition of cement to lime-based mortars: effect on pore structure and vapor transport. They have done the experimental works on mortar, pore structure, and vapor transport by using x ray diffraction pattern on aggregate, cement, hydraulic lime, quartz, calcite, ettringite, tombermorite, etc mercury intrusion porosimetry for pore structure and moisture absorbing measuring apparatus for vapor transport. They have concluded that the lime based mortar reduced the volume of mix cement content and presence of cracks is modified.

Prof. Jayeshkumar Pitroda, Dr. L.B.Zala, Dr.F.S.Umrigar have been studied on experimental investigations on partial replacement of cement with fly ash in design mix concrete. They have partially replace the

flyash with the cement with different mix proportion ranges from 0%, 10%, 20%, 30% and 40% by weight of cement for M25 and M40 mix concrete. They have found that reduction in compressive strength of flyash mixed cement. The mixture reduces the cost but also reduces strength of mixture. They have also suggested that the use of flyash mixed cement in construction material but judicious decisions are to be taken by engineers.

Aman Jatale, Kartikey Tiwari, Sahil Khandelwal have been studied on effects on compressive strength when cement is partially replaced by fly-ash. They have partially replace the flyash with the cement with different mix proportion ranges from 20%, 40% and 60% and also studied the effect of fly ash on workability, air content, setting time, compressive strength, density, modulus of elasticity for concrete mix of grades M 15, M 20,and M 25. They have concluded that the use of fly ash improve the workability, no any effect of air content and density of concrete mix also increase in strength and so many factors which are discussed in deeply with proper graph, table and figures.

Satish H. Sathawane,Vikrant S. Vairagade and Kavita S Kene have been studied on combine effect of rice husk ash and fly ash on concrete by 30% cement replacement. They have partially replaced the cement by fly ash and rice husk ash with different varying mix proportion of concrete. They have prepared a different size of cube for different technical parameters like compressive test for 7,14,28,56 and 90 days, Flexural strength for 28 days and split tensile strength for 28 days. They have concluded that the mix proportion of 22.5%Fly ash and 7.5% Rice Husk Ash increases the compressive strength. The increase the proportion of Rice Husk Ash also decreases in workability and so many factors which are discussed in deeply with proper graph, table and figures.

IV. MATERIAL USED IN FLAS COMPOUND

A. Fly Ash:

It is the end product or waste material comes from the thermal power plant. It is pozzolanic material and in Free State fly ash not shows cementing property but its mixture forms represent cementing properties. The major constituents of fly ash are silica, aluminium oxides and ferrous oxides.

Fig. 1: Fly ash

B. Lime:

Lime is the binding material which is used in ancient time by Egyptians and Romans for various constructional applications like roads, buildings, bridges etc. In India various applications of lime based engineering structures. There is some problem in lime i.e. slaking, hydraulicity, slow setting time etc. The basic constituents of lime are clay, soluble silica, magnesium carbonate, sulphates, iron, pyrites, alkalies and metallic oxides. Lime is classified into three major categories.

1) Fat lime: After the calcination of the pure carbonate of lime form the fat lime which is contain about 95% of calcium oxide. Its volume is increased due to vigorous slaking to about 2 to 2.5 times of quick lime. It is also called high calcium lime, pure lime, rich lime, white lime. Fat lime setting is very slow, good plasticity, soluble in water and color is perfect white.
2) Hydraulic lime: it contains the ferrous oxides and clay, it set under water and it also called the water lime. The color of hydraulic lime is off white, not easily dissolved in water and slaking is very difficult due to presence of clay. It is uses in plastering and set under water.
3) Poor lime: it is muddy white in color and very poor binding properties. It is not dissolve in water and set very slowly because more than 30% of clay content in poor lime. It is also called lean lime or impure lime. It is classify into class A to class F according their physical and chemical properties is given by BIS 712-1984.

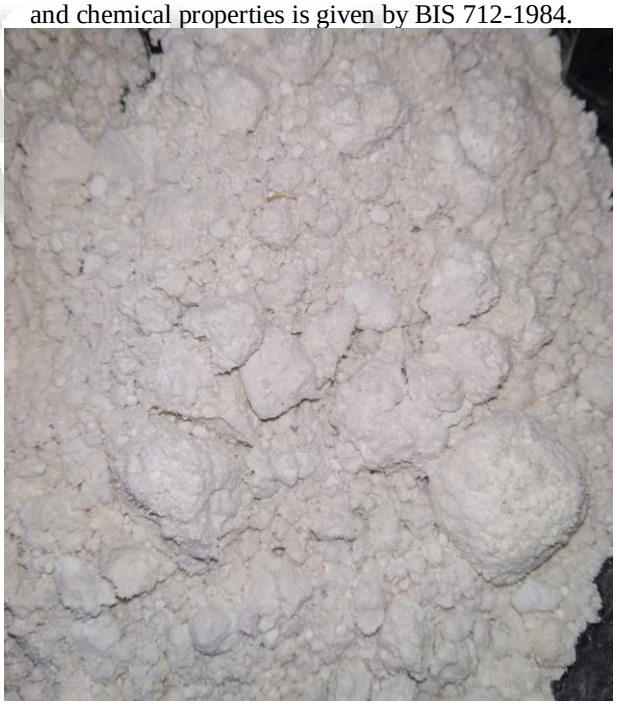

Fig. 2: Lime

C. Aluminium Silicate:

It is naturally occurring in minerals or synthetics which hydrated or anhydrous in nature. It is derived from silicon dioxide, Al_2O_3, aluminium oxides. The general form of aluminium silicate is the Kaolin which occurs naturally in clay. It is mostly found in the manufacture of cement, brick, plastering materials etc.

Fig. 3: Aluminium Silicate

D. Surkhi:

It is a pozzolanic material which is originate from the burn brick or utilized brick/ waste brick converted into powder form. Generally sand replaced by surkhi and used as water prrofing material in concrete or mortar but the cement may be replaced by fine grinding of surkhi, will give some plasticity to the mortar. The use of surkhi reduce the strength of concrete but after long time it gives some strength.

Fig. 4: Surkhi

V. Conclusion

In this review paper we utilize the waste pozzolanic material in cement. The main purpose of FLAS Compound using in cement is reducing the quantity of waste pozzolanic material as well as minimizes the cost of cement. Cement with FLAS Compound can be used for plastering, brick work, low load bearing structure etc.

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