TO MODERATE THE USAGE OF ORDINARY PORTLAND CEMENT AND FOUNDRY SAND AS FINE AGGREGATE

[1]Siddharth Shankar, [2]Dr.Ajay Swarup

[1] *M.tech Schlor, Civil Department, SSSUTMS, M.P.India*
[2] *Associate Professor, CivilDepartment, SSSUTMS, M.P.India*

ABSTRACT

A review study in sieve analysis, consistency, and water absorption, setting time and slump tests of wood ash added to ordinary Portland cement will produce significant results to accentuate the detailed study process. Uncontrolled burning of saw dust to form wood ash is used as a partial replacement of cement, thereby changing its physical and chemical properties. These properties are found somewhat similar to fly ash. Fly ash is already used in manufacturing of the bricks blocks and so many applications in the construction and the wood ash is always similar than fly ash. Waste of the wood is the great option as a fuel in the power production. It is decompose in nature but the problem of ash handling in power plant is still a major problem. So to reduce the wood ash a very little bit efforts in this work.

OBJECTIVES

The study focuses on the description of wood ash and saw dust properties after this to be replacement of cement with wood ash percentage. The objectives are given below :

1. To study the compressive and tensile strength of concrete along with the wood ash mix partially in cement.
2. To study the carbonation and drying shrinkage.
3. To study the effect on bulk density.
4. To study wood ash in making self-compacting controlled low-strength materials

Material Properties

The chemical properties of the cement consists of the following chemical compounds

(a) Tricalcium silicate	*3CaO.SiO2*	*40%*
(b) Dicalcium silicate	*2CaO.SiO2*	*30%*
(c) Tricalcium aluminate	*3CaO.Al2O3*	*11%*
(d) Tetracalcium aluminate	*4CaO.Al2O3.Fe2O3*	

The physical properties should be checked before selecting a Portland cement for civil engineering works. IS 269-1967 Specifies the method of testing. The testing methods are listed below

(a) Fineness
(b) Soundness
(c) Crushing strength

The chemical properties of the wood ash consists of the following chemical compounds

(a) Silicon oxide	*SiO2*	*31.8%*
(b) Aluminium oxide	*Al2O3*	*28.%*
(c) Iron oxide	*Fe2O3*	*2.34%*
(d) Calcium oxide	*CaO*	*10.53%*
(e) Magnesium oxide	*MgO*	*9.32%*
(f) Potassium oxide	*K2O*	*10.38%*

(g) Sodium oxide	*NaO*	*6.5%*

Methodology

SELECTION OF INGREDIENTS

The ingredients of concrete, when selected and proportioned suitably.
1) Cement.
2) Fine aggregates.
3) Course aggregate.
4) Water.
5) Wood Ash

CHEMICAL COMPOSITION OF WOOD ASH

There are Some of the major apparatus of wood ash are lime, (Ca(OH)2), CaCO3 and calcium silicate. The projected some of the chemical features of wood ash with different types of wood. The % age loss on ignition was between 6.5% to 58.1% and moisture content of 0.5% to 3.3%. The chemical properties of five sources of wood ash is given below in the table. ***There*** *are five source of the chemical properties of the wood ash of the different percentage is all depends on the quality and types of the wood ash available*

Table 1: *Chemical composition of wood ash*

SELECTION OF MIX PERCENTAGE

The method of preparing the cement concrete mix with wood ash is described in a way first we have to calculate the compressive strength for M20 mix was calculated according to IS: 10262 2009 and the strength is 27.8 N/mm^2 for 28 days. The water-cement ratio, fine aggregate content and coarse aggregate content was accordingly then carried as per the mentioned IS code. Thus mix proportion obtained was:
Cement content = 409.9 kg/m^3
Fine Aggregate Content = 545 kg/m^3
Coarse Aggregate Content = 1163 kg/m^3

Preparation of mix: *Preparation of control mix (M20 Design mix Considered) was done first for which the trial mix having water-cement ratio of 0.47 was prepared. Mix was checked for workability (to obtain consistent mix) and Slump Cone Tests to validate the results. Control specimen was casted for 7 days, 28 days and 56 days having foundry sand were casted.*
Secondly the preparation of mix for same 0.47 water cement ratio was done along with wood ash in different proportions of 5%, 10%, 15%, 20% and 25% by weight of OPC. The specimens were casted for 7days, 28 days and 56 days.

RESULTS & DISSCUSSIONS

Flexural strength

*Beams were casted having dimensions of 300 mm × 10 mm × 10 mm to check flexural strength as per IS: 516 – 1959 [13]. Vibration of mix was done on vibrating machine according to IS recommendations. A system of 2 point loading was used with CTM to test the specimens. It was observed that there was an increase in the flexural strength specimens with wood ash but not greater than control specimens. Optimum results were obtained at 10% replacement (****Figure 7****). The results are given in* ***Table 5****.*

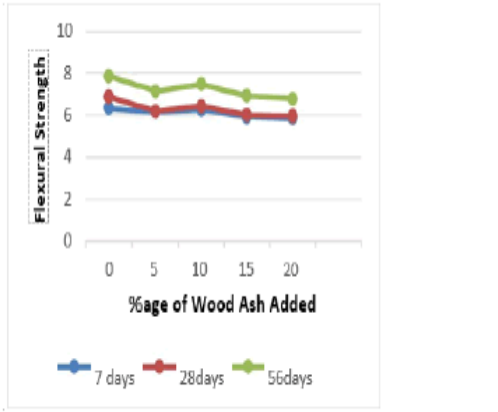

Figure 7: Comparison of flexural strength along wood ash percentage.

Figure 7: *Comparison of flexural strength along wood ash percentage.*

Water absorption

An increase in water absorption was observed maximum for 15% at 28 days which indicates that rate of pozzolonic reaction is much higher at 15% replacement. Beyond 15% replacement the water absorption significantly decreased.

Udoey et al. [7,10] According to this study the t-test carried showed certain results using wood ash as replacement of cement in the level of 5%, 10% and 25%, there was increase in water absorption for 28 days which was observed as significant. But the water absorption values uptill 10% were observed significant which produced positive results both with a without wood ash.

Soundness

The soundness of concrete mix was studied and observed to be increase while increasing the wood ash % age. Similar results were obtained from other studies when the replacements were done from 5% to 30%. At 30% concrete obtained produced much soundness. Thus in short soundness increases in direct proportions of increased wood ash incorporation [14,15].

Carbonation

The carbonation results along with the wood ash as partial replacement when water cement ratio of 0.50 was observed to decrease, providing optimum results at 5% of replacement. From other researches similar results were observed. The tests for carbonation showed that with 5% incorporation of wood ash in cement resulted in reduction in depth of carbonation. With the 10%, 15% and 25% the reduction in depth was insignificant [16].

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