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Experimental Study Of Palm Oil Fuel Ash As Cement Replacement Of Concrete

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ABSTARCT

Fast development of framework has prompted to the utilization of cement all over the place, and one of the principle items required in assembling cement will be bond, with the expansion in the measure of bond utilized, warmth of hydration expands which will prompt to the arrangement of splits in cement joined by shrinkage impact Keeping in mind the end goal to control this, palm oil fuel powder, an agro squander which contains some measure of silica go about as a pozzolanic material is being utilized as concrete substitution and its strength is compared with conventional concrete of grade M35. Palm oil fuel ash which is obtained by burning palm fruit and dry leaves of palm oil tree in palm oil mills is also used to control heat of hydration effect on concrete, in the wake of beating and making it into a fine powder. In this study bond is being supplanted with palm oil fuel fiery debris by 18%, 20%, 25% and the strength tests like compressive strength test, tensile strength test, flexural strength test are performed and are compared with the results of conventional concrete of grade M35 for 3,7 and 28 days.

Keywords: Experimental Study, Palm Oil Fuel Ash, Cement, Replacement, Concrete

1. INTRODUCTION

With the improvement of urban areas and their foundation and the headways of apparatuses the utilization of cement is picking up significance. Because of headways in material innovation shows up to 100Mpa are utilized, by and large these high quality cement requires high measure of bond which prompts to increment in the warmth of hydration prompting to development of breaks. This higher use of bond prompting to increment in warmth of hydration can be handled by lessening the measure of concrete with some other solidifying operators, and one such among is PALM OIL FUEL ASH. This palm oil fuel ash is the agro waste produced in manufacturing palm oil, this is produced by burning palm oil fruit and its leaves. This is being arranged in gigantic sum which is turning into a danger to environment. This palm oil fuel ash which we get after burning is of not uniform size and of different colour, but after pulverising it turns in to grey colour with uniform size, this pulverised palm oil fuel ash is said to have cementing properties with cement and hence is used as cement replacement. India remains in third position in creating this palm oil fuel fiery debris as its principle generation occurs in tropical nations. By utilizing this palm oil fuel fiery remains as swap for bond numerous things can be accomplished like decrease in cost of concrete as the usage of concrete is supplanted with palm oil fuel powder, natural harm can be minimized as the openly arranged palm oil fuel cinder is being utilized as a part of assembling cement likewise the solidness, appearance and quality of cement can be expanded by wiping out the development of breaks.

2. EXPERIMENTAL PROCEDURE

2.1.Materials

In making any type of concrete, selection and type of materials is very important as all the properties depends on them. The following materials are being used and are listed below.

- Cement
- Fine aggregate(sand)
- Coarse aggregate
- Water and

- Palm oil fuel ash

2.2 Materials Description And Their Properties

2.2.1 Cement

It is a powered adhesive and cohesive substance which when mixed with fine aggregate, coarse aggregate and water form a paste which on curing for certain period turns in to mass of hard stone.

Proper selection of cement is at most important as the strength of concrete mostly depends on it. Here the Portland cement conforming to IS: 4031-1988 is being used. The properties of cement are shown in Table. 1

Table 1: Properties of Cement

S. No	CHARACTERISTICS	VALUE
1	SEPECIFIC GRAVITY	3.15
2	NORMAL CONSISTENCY	32%
3	INITIAL SETTING TIME	83minutes
4	FINAL SETTING TIME	205minutes

2.2.2 Fine Aggregate

The selection of fine aggregate is also on important factor as it directly affects the strength of concrete with the varying utilisation of water. Fine aggregate with harsh surface requires high amount of water, so fine aggregate with smooth surface and rounded shape is being used as it requires low amount of water and hence produces high strength concrete. Properties of the fine aggregates given in Table. 2.

Table 2: Properties of fine aggregate

S. No	CHARACTERISTICS	VALUE
1	ZONE	II
2	SPECIFIC GRAVITY	2.57
3	DENSITY	14kN/m^3

2.2.3 Coarse Aggregate

It is well known fact that coarse aggregate occupies about 70% of concrete. Here coarse aggregate of 10mm size, crushed and angular shaped is used as they are found to have low stresses around them when loaded. Properties of the coarse aggregates given in Table.3.

Table 3: Properties of Coarse aggregate

S. No	CHARACTERISTICS	VALUE
1	NOMINAL MAXIMUM SIZE	10mm
2	SPECIFIC GRAVITY	2..78

3	DENSITY	1625.83kg/m^3

2.2.4 Palm Oil Fuel Ash

Palm kernel shells along with fiber wastes are burned together in chimneys to produce heat at a temperature of 450^o. After burning the ash generated tries to escape due to less weight, to avoid this water is sprinkled from top and then this is collected, pulverized and passed through IS 90mm sieve. Properties of palm oil fuel ash given in Table.4.

Table 4: Properties of palm oil fuel ash

S. No	PROPERTY	% CONTENT
1	SILICON DIOXIDE	63.2
2	ALLUMINIUM OXIDE	4.5
3	IRON OXIDE	3.9
4	LIME	7.2
5	MAGNESIUM OXIDE	0.48
6	POTTASIUM OXIDE	9
7	LOSS OF IGNITION	5.6

3.RESULTS AND DISCUSSIONS

3.1.Compressive Strength Test Result

It is one of the most important test conducted on hard concrete. The compressive strength tests are conducted on POFA concrete for different mixes. The test is conducted for 3,7and 28 days under compressive strength testing machine. The results obtained after conducting tests are shown in the below table it can be noted that at 12.5% of mix it shows higher strength. Compressive strength of concrete with various percentages of palm oil fuel ash given in Table.5

Table 5: Compressive strength of concrete with various percentages of palm oil fuel ash

S.No	% of Palm Fuel Ash	Compressive Strength at Age of 3days MPa	Compressive Strength at Age of 7days MPa	Compressive Strength at Age of 28days MPa
1	5	7.5	15.6	28.67
2	7.5	9.5	17.4	27.4
3	10	9	16.5	30.6
4	12.5	10.5	18	34.3
5	15	9.3	17.5	30.5
6	17.5	10	16.3	29.6

3.2.Split Tensile Strength Test Result

Tensile strength of concrete is one of the basic and important property of the concrete, it is determined by conducting tests on concrete cylinders. Split Tensile strength of concrete by the addition of various% of palm oil fuel ash given in Table.6.

Table 6: Split Tensile strength of concrete by the addition of various% of palm oil fuel ash

S.No	% of Palm Fuel Ash	Split tensile Strength at Age of 3days, MPa	Split tensile strength at age of 7days, MPa	Split tensile Strength at Age of 28days, MPa
1	5	1.3	2.1	3.6
2	7.5	1.5	2.4	3.5
3	10	1.2	1.9	2.98
4	12.5	2.1	2.6	3.4
5	15	1.8	2.0	3.2
6	17.5	1.7	2.4	3.3

4. CONCLUSSION

After careful experimentations done on concrete of grade M25 with varying percentage of palm oil fuel ash from 5-17.5%,by conducting tests like slump, workability, compressive strength and split tensile strength test, the following conclusion are obtain

1. In making this no advanced tools are required and it is easy to use this also it reduces the cost of concrete as there is replacement of cement with palm oil fuel ash.
2. With this there will be also reduction in the damage of environmental disturbances created by the spread of palm oil fuel ash.
3. From the above results it has been drawn that at 12.5% of palm oil fuel ash there is increase in the strength.
4. By using POFA tensile strength is slightly higher than opc at 12.5% of mix and tensile strength also increases accordingly.

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