EFFECT OF OIL PALM SHELL ON THE SURFACE STRENGTH OF FIBER REINFORCED CONCRETE.

KAYODE BAMIKOLE OLAWUNI

Site Engineer & Laboratory Analyst First Ashbell Limited
E-mail: kayode.olawuni@engineer.com, kayode.olawuni@yahoo.co.uk

Abstract- In this study, Oil Palm Shell (OPS) partly replaced with conventional aggregates. The effect of OPS and steel fibers were studied. Several concrete mixes were prepared with different OPS coarse aggregates amount of 25%, 50% and 75% that replaced by mass of 10 mm size conventional coarse aggregates. OPS fine aggregates amount of 10%, 7.5% and 5% replaced by mass of conventional fine aggregates. This procedure was imitated for target mean strength of 30MPa. Non destructive laboratory test - Schmidt hammer were tested on the surface of the concretes at the curing age of 28 days.

Key words- aggregates, fiber, rebound Schmidt hammer, testing.

I. INTRODUCTION

Palm tree, mostly found in the Asia and African countries, are the mother of Oil Palm Shell (OPS). Over four decades, counted as agricultural waste dumped near the local factory. For many years, OPS has no negative effect to weather condition and exposure.

About three decades ago, the importance of OPS was unleashed and unwrapped. Having discovered its' properties, researches has been carried out to test how useful it is.

Over the years, tests and experiments showed that OPS can successfully serve in the construction industries as a lightweight aggregate and also as a biomass for fuel.

The Palm Oil Plant (Elais Guinensis), considering its three different varieties Durà, Pesipherà and Tenerà, produces an edible fruit similar to an apricot that has inside a nut. During the crude palm oil processing, the fruit's flesh then melted through a steaming treatment. The residual nuts crashed to extract the seeds or Kernels. This is done by hand or mechanical. The crashed shells are Oil Palm Shells (OPS), a virgin biomass with a high calorific value (NCVAR typical about 3,800 Kcal/kg – ASTM D5865 – 02)

1.1 Oil Palm Shell

This palm kernel shell is the hard endocarp that surrounds the palm kernel seed. It is light and naturally sized. About twenty billion tons of palm kernel shells produced in the Africa and Asia countries per year. Many researchers have proved its importance in different ways ranges from construction industries and as biomass for fuel. Most recently, because of the vast growing of environmental concern, waste materials like OPS served as aggregates in construction industries as lightweight aggregates.

II. MATERIALS

2.1Natural Aggregates

Crushed limestones used for both fine and coarse aggregates are termed as natural aggregates.

OPS Aggregates

The OPS aggregates obtained from agricultural waste from Nigeria.



Figure 2.1 (a) OPS Coarse Aggregate



(b) OPS Fine Aggregate

2.2 Water

The water used in all mixes was potable water from the pipeline in the material laboratory of the University.

2.3 Cement

A well-preserved type 32.5 Portland cement was used.

2.4 Steel Fibre

Double hook-end hybrid steel fibres of length 60 mm, diameter 0.4 mm and an aspect ratio of 150 were used

in this study. The aspect ratio is high due to the hybrid nature of the steel fiber.

III. MIX PROPORTIONS

Table 3.1 – Concrete Mix Proportions [BS EN 206-1].

Mix ID	Cement(g)	Water(g)	S/Fiber(g)	Normal Aggregate (g)				OPS Aggregate (g)	
				Fine	10mm	14mm	20mm	Fine	10mm
CMix	390	225	-	900	260	390	216	-	-
C25M1	390	225	19.5	810	195	371	216	90	65
C50M2	390	225	39	833	130	351	216	68	130
C75M3	390	225	59	855	65	332	216	45	195

IV. RESULTS AND DISCUSSION

4.1 Rebound (Schmidt) Hammer Test.

This is one of the non-destructive tests performed on concrete cubic samples. It is classified as surface hardness test for evaluating concrete's sample compressive strength. During compressive strength test, the hammer was rebound 10 times at the surface of one side of the sample and the figures were recorded at each rebound test. This test was performed in accordance to (BS1881: Part 201, 2009). Figure 3.14 below shows the rebound hammer diagram.



Figure 4.1: Rebound Hammer Test.

The result of this test shows that specimen without OPS has less surface strength than those with OPS aggregates. Irrespective of the amount of OPS present in each sample, the specimen that has OPS almost has the same measurement of surface hardness. The specimen with highest OPS replacement has the highest surface hardness. However, specimen with 25% and 50% OPS replacement has almost the same surface hardness.

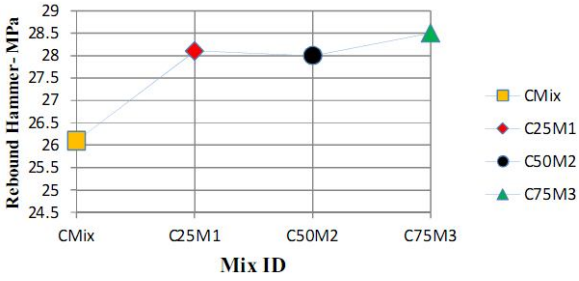


Figure 4.2: Rebound Hammer Test.

CONCLUSSION

The samples C25M1, C50M2 and C75M3 have more surface strength than CMix. This shows that concrete with OPS replacements has more surface strength than concrete that has no OPS aggregate. [Fig. 4.2].

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