A Study On Properties Of Concrete Incorporating Coconut Shell As A Partial Replacement Of Coarse Aggregates With Addition Of Fibers

M.Daniel babu[#1], K.Divya[*2], Dr.K.Chandramouli[#3]

[#1]*M.Techstudent,Departmentofcivilengineering,NRIInstituteoftechnology,Guntur,AndhraPradesh,Guntur.*
[#2]*Professor,Departmentofcivilengineering,NRIInstituteoftechnology,Guntur,AndhraPradesh,Guntur*
[#3]*Professorandheadofdepartmentofcivilengineering,NRIInstituteoftechnology,Guntur,AndhraPradesh,India*

Abstract

It is proposed to study the properties of concrete by partial replacing of coarse aggregate with coconut shell and addition of fibers to achieve target strength. The properties include compressive strength, splitting tensile strength and flexural strength.The use of construction is increasing day to day as the growth rate of population is increasing.

These tests are conducted on the cube specimens of dimensions 150mmX150mmX150mm at differet age's i.e. 7 and 28 days.The main objective of this investigation is to check the quality of concrete.

I. INTRODUCTION

The high cost of conventional building materials is a major factor affecting construction in India. In developing countries where abundant agricultural and industrial wastes are discharged, these wastes can be used for various purposes in construction industry. This will have double the advantages, reduction in the cost of construction material and also as a means of disposal of wastes.

Therefore an attempt has been made in this study to utilize the coconut shell as partial replacement of coarse aggregate. Coconut shells are new materials in the field of construction, so a study on various strength properties of these materials is required. Also suitable measures have to be adopted for attaining the target strength. The addition of fibers helps to increase the strength of concrete.

The studied said that Lightweight aggregate (LWA) plays important role in today's move towards sustainable concrete, Lightweight aggregates contributes to sustainable development by lowering transportation requirements, optimizing structural efficiency that results in a reduction in the amount of overall building material being used, conserving energy, Reducing labor demands and increasing the survive life of structural concrete

By replacing conventional coarse aggregate with coconut shell and concluded that- with 50% replacement of coarse aggregates by coconut shells, the strength attained reduces invariably from 10%-20% as compared to the conventional coarse aggregate concrete. With 50% replacement of coarse aggregates by coconut shells, the flexural strength attained reduces invariably from 10%-15% as compared to the coarse aggregate concrete.

By the use of coconut shells in cement concrete can help in waste reduction and pollution reduction. It is also expected to serve the purpose of encouraging housing developers in investing these materials in house construction. It is also concluded that the Coconut Shells are more suitable as low strength-giving lightweight aggregate when used to replace common coarse aggregate in concrete production.

The comparative cost analysis and strength characteristics of concrete produced using crushed coconut shell as substitutes for conventional coarse aggregate. The main objective was to encourage the use of coconut shell waste as construction materials in low-cost housing.

II. MATERIALS

A. Cement

A cement is a binder, a substance used for construction that sets,hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel together.cement mixed

with fine aggregates produces mortar fprmasonary or with sand and gravel produces concrete.
Cement used in construction are usually inorganic,oten lime and calciumsilicate based and can be as either hydraulic or non-hyrdraulic.

B. Sand

sand is a waste product obtained by the crushing stone, gravel and slag in crushes. The fineness modulus of Robo sand is 3.62 and is conforming to Zone III as per IS: 383-1970. Robo sand which is used for construction should be passed through the less than 4.75 mm sieves

C. Coarse aggregate

Coarse aggregate is obtained from quarry site. The aggregates of 20mm and 10 mm are used in this experiment conforming to Zone III as per 102622009. In this experiment, we are using 60% of 20mm and 40% of 10mm aggregates.

D. Steel fiber

Steel fiber addition into concrete improves the crack resistance capacity of concrete. Traditional rebars are generally used to improve the tensile strength of concrete in particular direction whereas steel fibers are useful for multi directional reinforcement. This is one the reason why steel fiber reinforced concrete successfully replaced weldmesh in lining tunnels

E. Polypropylene

Polypropylene is also known as polypropylene is a thermoplastic polymer used in a wide variety of applicatons.it is produced via chain growth polymerization from the monomerpropylene.
With density 0.855g/cm^3, amorphous
0.946g/cm^3, crystalline.

III. TEST PROCEDURE

A. Mixing and casting:

The concrete is similar to conventional concrete. Initially a dry mixture is prepared consists of coarse aggregate, Robo sand, fly ash and metakaiolin is mixed in types of different proportions. Coconut shell which is available in local mill of size 12mm-20mm. Proper mixing is done for 5-7 min to attain good bond between these constituents. Then the mix is filled into 150mm x150mm x 150mm moulds and casting is done by placing concrete in three layers. Each layer is tampered 25 times by using a tamping rod compaction is done at the rate of 25blows for 3 layers. As the setting time is very slow, the cubes are allowed to rest in the mould for 1 or 2 days. Then the cubes are removed from the moulds for curing.

B. Casting

Concrete blocks of size 150mm x 150mm x150mm are cased.
The concrete in the cube must be fully compacted with compacting bar or concrete vibrator. After 24 hours these moulds are removed and test specimens are kept for curing.
For curing, the specimen is coated with self curing agent and it is tested after 7 and 28 days.

Minimum 4 specimens of each mix proportion containing different percent of coconut shells (0%, 5%, 10% and 15% by weight of aggregates) and fibers are casted.

IV. CURING

The Curing process of concrete cubes is done in 2 stages. In the first stage, the cubes are kept in the oven for 24-48 hours at 600° c. In the second stage, the cubes are allowed to be cured in open atmosphere called" ambient curing.

A. Compressive strength

The compressive strength is defined as the resistance of failure under the action of compressive forces.
For cube test specimens of 150mmX150mmX150mm are used. These specimens are tested by compression testing machine after 7 days curing and 28 days curing.

P = load applied to the specimen in Newton.

d = diameter of the specimen (cylinder) in mm.

l = length of the specimen (cylinder) in mm

V. MIX PROPORTIONS:

Mix ratio : 1:1.4:2.7

cement	Fine aggregate	Coarse aggregate	Water cement ratio
425	595	1147.5	0.5

S.NO	Mix designations	Compressive strength(7 days)
1	Nominal mix	28.45
2	Mix 1	16.7
3	Mix 2	13.54
4	Mix 3	9.89
5	Mix 4	20.19

6	Mix 5	16.75
7	Mix 6	14.48
8	Mix 7	21.9
9	Mix 8	7.53
10	Mix 9	15.51

Nominal mix : 0% replacement of coconut shell.

Mix 1 : 5% replacement of coarse aggregate with coconut shell.

Mix 2 : 10% replacement of coarse aggregate with coconut shell.

Mix 3 : 15% replacement of coarse aggregate with coconut shell.

Mix 4 : 5% replacement of coarse aggregate with coconut shell + polypropylene fibers with 2% weight of cement.

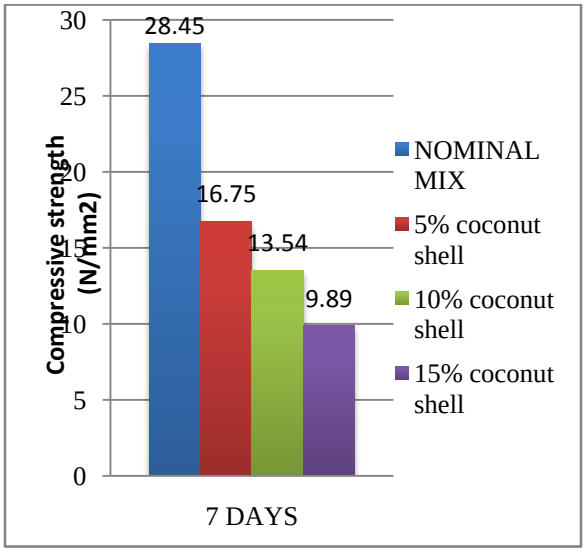
Mix 5 : 10% replacement of coarse aggregate with coconut shell + polypropylene fibers with 2% weight of cement.

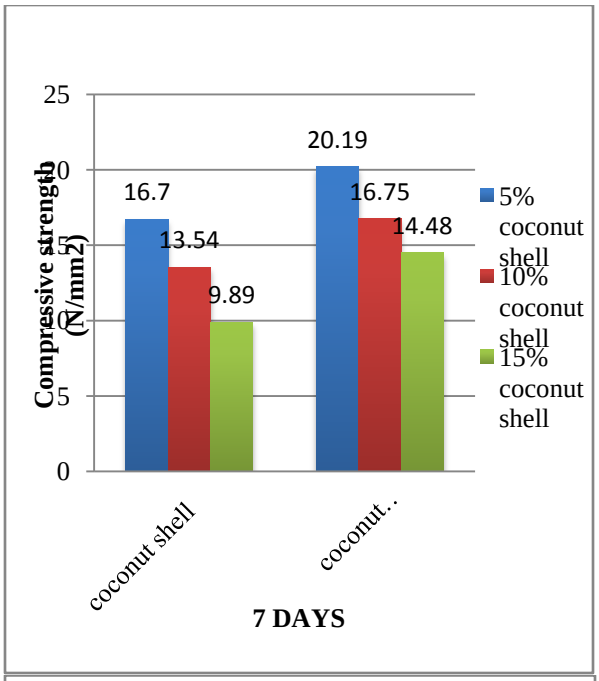
Mix 6 : 15% replacement of coarse aggregate with coconut shell + polypropylene fibers with 2% weight of cement.

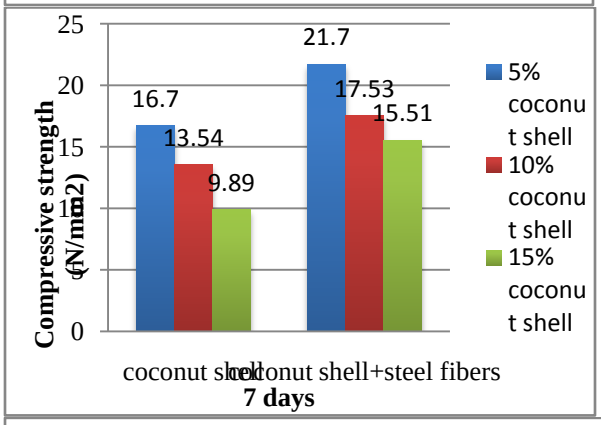
Mix 7 : 5% replacement of coarse aggregate with coconut shell + steel fibers with 2% weight of cement.

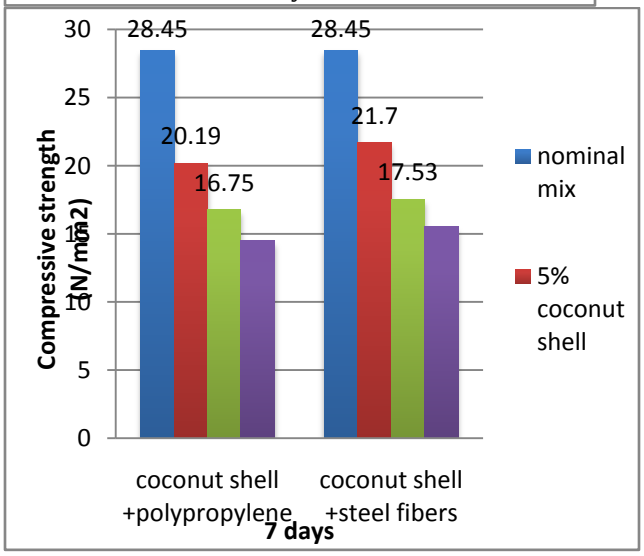
Mix 8 : 10% replacement of coarse aggregate with coconut shell + steel fibers with 2% weight of cement.

Mix 9 : 15% replacement of coarse aggregate with coconut shell + steel fibers with 2% weight of cement.









VI. CONCLUSION

From the above obtained results it is noticed that
The compressive strength of the nominal mix concrete specimens are of higher strength, than the coconut shell mixed concrete.
Compressive strength of the concrete with coconut shell replacemen value slightly increased by adding polypropylene and steel fibers in the concrete mix with coconut shell.
Strength of the concrete decreases with increase in % of coconut shell replacement as coarse aggregate.
By increasing the percentage of fibers in the concrete with coconut shell replacement the strength value increases.

REFERENCE

[1] A.Santhiya et al, A Review of Experimental Investigation on Coconut Shell as Replacement on Concrete as Course Aggregate in their Strength, Volume 4 Issue V, May 2016
[2] ApekshaKanojia et al,Performance of Coconut Shell as Coarse Aggregate in Concrete, Volume: 02 Issue: 04 | July- 2015
[3] Akshay S. Shelke, Coconut Shell as Partial Replacement for Coarse Aggregate Volume 5, Number 3 (2014), pp. 211-214