



Theoretical Assessment on Coconut Shell Powder as an Aggregate Material for Construction Bricks

KEYWORDS

Coconut Shell Powder, Bricks, Waste management.

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ABSTRACT

Today researches all over the world are focusing on ways of utilizing either industrial wastes or agricultural wastes as a source of raw materials for the commercial applications. Coconut Shell (CS) is the agricultural waste, available in large quantities throughout the tropical countries of the world. It is used for very few applications besides which it is generally thrown away or burnt as a means of solid waste disposal that contributes large CO₂ and methane emissions. More environmental and economic benefits, waste management can be achieved if it can be used for commercial application. The high cost of conventional construction materials is being a major factor affecting the cost of infrastructure. So some cheaper alternate material is required to be found. In this work the potential of CS Powder as an aggregate in construction bricks is studied. It will provide a platform for the further researches.

Introduction

Coconut is grown in more than 93 countries. South East Asia is regarded as origin of coconut. In India, Coconut is cultivated in 18 states and 3 union territories of the country. India is the third largest producer of coconut in the world. Annual production of coconut is 21.89 billion nuts (2012-13). Coconut contributes more than Rs.10000 crores annually to GDP [1].

Coconut shell (CS) is the agricultural waste having serious disposal problem for local environment is available in large quantities throughout the tropical countries of the world. It represents more than 60% of the domestic waste volume [2]. Currently coconut shells are being used for very few commercial applications like,

1. Being used as a fertilizer for other plantation,
2. In activated carbon producing industries,
3. As a source of fuel for limited applications like casting and forging operations.



Fig. 1 CS thrown away along the roadside

Besides all these uses, the coconut shells are generally thrown away or burnt as a means of solid waste disposal. Bamgboye and Jekayinfa [3] regretted that 90% of coconut (empty fruit bunches, fibers, fronds, trunks, shell) was discarded as waste and either burned in the open air or left

to settle in waste ponds. This way the coconut processing industries waste according to him contributed significantly to CO₂ and methane emissions. Hence there is need of finding a new usage of CS which will have double advantage of waste management as well as pollution control.



Fig. 2 CS burning in open air

The high cost of conventional construction materials is being a major factor affecting the cost of infrastructure. The cost of production of building projects has reached an all-time high due to the rise in prices of bricks from Rs. 3600 to Rs. 6200 per thousand bricks. Hence it is necessary to find an alternate material for bricks.

Literature Review

The literature search was started with selecting the keywords, Coconut Shell Powder, Bricks, Waste management. Journal papers and Conference papers were selected using Google search engine and Science Direct. For getting statistical data regarding coconut production, website of Coconut Development Board was used.

The result of this search was literature consisting of Journal papers, Conference papers, Project reports etc. from these,

only few papers were to be selected. The first criterion of selection was made on the basis of scope and objective of the work. Using this criterion, the papers were divided according to their objectives and only those having the objective of using coconut shell in construction and in mechanical engineering purposes and waste management were selected. Then from those papers, the next basis of classification was methodology used in the work. From this analysis of the literature following data was selected for the use in present work.

The properties of concrete using CS as coarse aggregate were experimentally investigated. The results show that CS concrete has better workability because of the smooth surface on one side of the shell. The experiments proved that CS fulfills the requirements for use as lightweight aggregate [4].

Combination of coconut shell and grained palm kernel has potential as lightweight aggregate in concrete. Also, using the combination of coconut shell and grained palm kernel shell as aggregate in concrete can reduce the material cost in construction because of the low cost and abundant availability of these agricultural wastes [5].

18.5% replacement of crushed granite with coconut shells can be used to produce structural concrete as per the requirements of British Standard Institution[6].

Experimental Analysis of the use of Coconut Shell as Coarse Aggregate have shown that in 25% replacement of the coarse aggregate showed properties similar to the nominal mix and 50% replacement showed properties similar to light weight concrete which can be used as filler materials in framed structures, flooring tiles, thermal insulating concrete etc. [7].

Coconut shell ash can also be used as a low cost reinforcement in Metal Matrix Composites (MMCs) [8].

Conclusion

From the above mentioned studies, it can be seen that the Coconut Shell being an agricultural waste has potential as an aggregate in concrete as well as for making composite materials. Referring this it can be concluded that the Coconut Shell in can also be considered for using as an aggregate material for making construction bricks.

Future Scope

In the future work, sample bricks using coconut powder as aggregate are going to be developed and also the feasibility of coconut shell powder as an aggregate in construction bricks will be experimentally investigated.

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