

A LITARATURE REVIEW ON USE OF CIGARATTE BUTTS (CBs) AND HUMAN HAIR AS A FIBRE IN FIRED CLAY BRICKS

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Abstract: In our environment, various wastes are transmit without any suitable treatment which causes nuisance and may pollute the entire environment i.e. Land or soil, water and air also; CBs are bone of them. CBs are basically filters which are made up with cellulose, acetate, rayon and paper. Near about 5.7 trillion cigarettes are produced across the world. 1.2 million tonnes of cigarette butts waste every year.

Cigarette butts are made up of some toxic chemicals such as cellulose, acetate and some toxic chemicals which are slow biodegradation under normal condition. In U.S.A., India, Australia, Mexico, Brazil. CBs poses serious environmental risk. To overcome the above environmental pollution, the bricks are prepared using CBs, which contains cellulose, acetate, nitrates and other toxic chemical substances which may accelerate the overall strength of the bricks, which will be studied in literature review. After that the composition of cigarette butts in bricks and their physical properties will be experimented.

In this study, we have used human hair as a fiber in fired clay bricks. Fiber fired clay bricks are made up of clay, sand and natural fiber i.e. human hair. These bricks uses all ingredients which are having a minimum negative environmental impact. Hence fiber fired clay bricks provides a batter way for achievement of real sustainable development and can be considered as brick for the next generation.

Key words: Cigarette butts, fired clay brick, recycling waste, light brick, human hair etc.

I. INTRODUCTION

Cigarette butts are most hazardous substance for entire environment in the world. There is a large demand for safe disposal and reused of cigarette butts or litters because they are non-biodegradable material. In our country, National Green Tribunal (NGT) and union ministry of environment and forest (MOEF) estimated that 100 millions of non-biodegradable cigarette butts (CBs) are disposed off into environment every year. According to MOEF by 2025, cigarette butts litter shall increase by 50%.

Cigarette butts filters are made of cellulose acetate which are less biodegradable and take some time to break down under normal litter conditions. Toxic chemicals i.e. cellulose acetate, nicotine and other substances are present in cigarette butts filters can be leached, and dangerous to environment. In cigarette smoke approximately 4000 chemical components are available of which 3000 are in gas phase and 1000 are in tar phase.

Following are the various methods of disposal of cigarette butts:

Land filling:-It is a disposal method but it contains high amount of toxic substances and organic matters, which may pollute the underground water and may leak pollutants into the soil and surrounding environment.

Incineration:-by the incineration it does not look a sustainable solution as burning waste because it content several hazardous or other toxic substances. These substances are dangerous to the environment.

Reuse:-another disposal of cigarette butts can be accomplished by using it as an engineering construction material. It is one of the practical solution to the pollution problem.

Land filling, recycling and incineration are difficult and uneconomical methods of disposal because there are crucial mechanism to ensure efficient and economical separation of the butts and appropriate treatment of the entrapped chemicals. An alternative could be to incorporate cigarette butts into fired clay bricks.

Brick is most important masonry units as a building material due to its property. Attempts have been made to incorporate CBs in the production of brick. Recycling of such wastes by incorporating them into building materials is a practical solution to pollution problem.

Human hairs are non-biodegradable material. In India this non- biodegradable waste are used as a fiber in construction materials such as in reinforced concrete, fired clay bricks, fly ash bricks etc.

Fibred fired clay bricks are more advantageous than normal fired clay bricks as per following aspects. Less water absorption, low weight, better finishing, high strength, less mortar consumption for joints filling, reduced wastage.

Why hair as a fiber?

- It has a high tensile strength which is equal to that of a copper wire with similar diameter.
- Hair, a non-biodegradable matter is creating an environmental problem so its use as a fiber reinforcing material can minimize the problem.
- It is available in abundance and also at a very low cost.
- Reinforces the mortar and prevent it from spalling.

II. LITERATURE REVIEW

The work by Abbas Mohajerani, Aeslina Abdul Kadir , Luke Larobina (2016) “A PRACTICAL PROPOSAL FOR SOLVING THE WORLD'S CIGARETTE BUTT PROBLEM: RECYCLING IN FIRED CLAY BRICKS.”They gives an idea about 7.5% CBs by weight with different mixing times increase the strength of clay brick incorporating CBs. Five samples were made of mixtures containing 0%, 2.5%, 5%, 7.5%, 10% CBs. Samples made of Cigarette butts containing 7.5 % by weight were tested with three mixing times of 5 min, 10min and 15 min to determine the compressive strength, flexural strength, water absorption, initial rate of absorption, and density. Varying heating time, Thermal conductivity, Leachate analyses Emission test also discussed.

The work on “CIGARETTES BUTTS AND THE CASE FOR AN ENVIRONMENTAL POLICY ON HAZARDOUS CIGARETTE WASTE.” by Thomas E. Novotny, Kristen Lum, Elizabeth Smith, Vivian Wang and Richard Barnes(2009). They gives an idea about History and function of Cigarette butts. Over the last 50 years, smokers switched almost entirely 99% to filtered cigarette and these made of cellulose acetate as well as Plastic product but they difficult to decompose. They discussed in these paper about the environmental problem of cigarette butts like cigarette butts become unsightly and difficult to remove waste in multiple location, including streets, storm drain, streams and beaches.

The paper by Aeslina Abdul Kadir, and Abbas Mohajerani, Felicity Roddick and John Buckeridge(2009), “DENSITY, STRENGTH, THERMAL CONDUCTIVITY AND LEACHATE CHARACTERISTICS OF LIGHT-WEIGHT FIRED CLAY BRICKS INCORPORATING CIGARETTE BUTTS.”Gives an idea about different types of mixes were used for making fired clay brick samples. CBs (2.5, 5 and 10 % by weight). The mixes were made using a Hobart mechanical mixer with a 10litre capacity for 5 minute. The sample were manually compacted in appropriate moulds of size (300x100x50). The sample were tested and determined compressive strength, density and water absorption. The density CBs brick decreases from 2118kg/m³ to 1482kg/m³ with 10% CB content. The compressive strength of bricks decreases from 25.65MPa to 12.57MPa,

5.22MPa and 3.00MPa for 2.5%, 5% and 10% CB content. Higher mixing speed and longer duration of mixing can lead to finer mixtures with higher compressive strength result. Water absorption increases in CB content.

The paper presented by Atishay Jain and Manish Dubey (2018) on “EXPERIMENTAL STUDY OF BRICKS BY BLENDING CLAY WITH CIGARETTE BUTTS.” Gives an idea about samples made of size 190mm×90mm×90mm by utilizing the cigarette butts with 5%, 10%, 15% and 20% by weight. Certain tests are performed and conclusion were made that the density of brick has been reduced by 17.50% to 28.98 % in comparison to standard brick , 32.3% to 41.70% in comparison to ordinary clay bricks and 35.2% to 44.2 % for fly ash bricks. Compressive strength of in comparison to standard brick first increases by 35.6% and then decreases by 36.42% while in comparison to fly ash brick it increases first by 51.63 % and then decreases by 28.9 %. In cost comparison it is cheaper than normal brick.

The paper on “POSSIBLE UTILISATION OF CIGARETTE BUTTS IN LIGHT-WEIGHT FIRED CLAY BRICKS.” By Aeslina Abdul Kadir, and Abbas Mohajerani(2010) studied the possible utilization of CB in light weight fired clay bricks and they gives an idea about samples were made with four different mixture using 0%, 2.5%,5%, and 10 % of cigarette butts by weight. The samples were made in three sizes cube (100x100x100 mm),Beam (225 x 110 x 75 mm) and Brick (300 x 100 x 50 mm) and experimental tests like compressive strength, Flexural strength, Density, water absorption, and initial rate of absorption were carried out on clay bricks containing cigarette butts.

The paper on “RECYCLING OF CIGARETTE BUTTS IN LIGHT-WEIGHT FIRED CLAY BRICKS” by Aeslina Abdul Kadir, and Abbas Mohajerani (2010), the experiment was divided into two stages of investigation, In first stage of investigation four mixes were used for making fired brick samples by incorporating 0%,2.5%,5%,10% by weight of cigarette butts content. In second stage of investigation Brick samples were made with 7.5% by weight with different mixing times of 5min,10min,15min.It was found that in first stage of investigation the density of the manufactured bricks decreases from 2118 kg/m³ to 1482 kg/m³ with 2.5% to 10% CBs. The compressive strength of bricks reduced from 25.65 MPa to 12.5 and 3 MPa for 2.5,5,10% CBs contents respectively.In second stage of investigation,it was seen that bricks samples with 7.5% CBs with mixing times 5min-15min density increased from 1591kg/m³ to 1789 kg/m³ and compressive strength increase from 2.97 MPa to 6.36 MPa.

The work on “UTILISATION OF CIGARETTE BUTTS IN CLAY BRICKS” by M. Gokulnath, P. Hari Krishnan, S. Jayashree, J. Julia Caroline, N. Arun Prakash (2019)They gives an idea about quantity of cigarette butts to be added 2.5% composition of clay brick during manufacturing process. Save energy during firing process of clay brick. The brick was manufactured of size (210 x 110 x 70mm). Various test to be performed on cigarette butts.

Paper on “HUMAN HAIR FIBER A DISCRETE FIBER TO IMPROVE SOIL SUB-GRADE STRENGTH” by Ujjwal Mishra in march 2017 from international journal of innovative research & advanced studies. According to various properties and studies use of human hair in various industries and in various area using different fiber content percentages at OMC &MDD values 0.3%, 0.4% & 0.5%. these percentage were being calculated by weight and fiber were mixed to soil which was air dried and kept in oven. From UCS test performed at OMC 0.35Kg/Sq.cm. Compressive strength was found for unreinforced soil and with mixing of 0.1% of HHF. It is then increase to 0.59 Kg/Sq.cm. indicating an increase in strength of 71.3%.

This paper on “HUMAN HAIR: A BIODEGRADABLE COMPOSITE FIBER – A REVIEW” By AkarshVerma, V. K. Singh, S. K. Verma&Anshul Sharma in 2016 from international journal of waste resource. After the various study of literature review, firstly it is clear that human hair is the well accepted choice as a

composite fiber in the field of advance engineering material and science. The experimental result discussed in the literature of various fabricating processes show that the effect of adjoining human hair in the matrix is not showing a fixed pattern in different operating conditions. In such cases, more scientific experimental studies are needed for different range of operating parameters. Secondly, considerable experimental studies have been carried out to examine the effect of human hair as a composite fiber in different matrixes. Researchers have well tested the feasibility and applicability of the human hair as a composite fiber in diverse conditions and have found many achievements in their relevant fields. So, finally it can be concluded from the above results that the human hair is applicable for various manufacturing processes and also, more research is needed in the field of weather forecasting of various composites taking the human hair as their chief fiber. Till now, none of the studies have inspected the human hair with various sizes or lengths in different ambient conditions to understand the basic physics of this god gifted composite fiber. So exploration of this area can be used to exploit the human hair as a more competent biological composite fiber in future.

Paper on “USE OF HUMAN HAIR AS NATURAL FIBER FOR FLY ASH BRICKS TO MINIMIZE NEGATIVE ENVIRONMENTAL IMPACTS OF THIS WASTE” by Hamidullah Naik, Nissar Ahmad Naikoo, Aisha Asgar, Ejaz Ahmad Mir, Danishwar Shaffi, Zakir Hussain Tak in International Journal of Advanced Research (2015), Volume 3, Issue 4, 1130-1133. According to this paper, it is observed that there is increment in the properties of fly ash brick by adding a certain percentages of human hair fiber by weight. By adding human hair, we conclude that there is improvement in the various properties when fly ash is reduced from 0.20 to 1.00% and human hair fiber is increased from 0.20 to 1.00% and other ingredients remain same. In this case the weight of the brick is increased, but percentage of water absorption is decreased and crushing strength is increased compared to normal fly ash brick.

Paper on “USE OF HUMAN HAIR AS NATURAL FIBER FOR FLY ASH BRICKS” by Darsh Belani, Prof. Jayesh Kumar Pitroda & Dr F S Umrigar in August 2013. According to the test performed it is observed that there is increment in properties of fly ash bricks according to the percentages of human hair fiber by weight. By using the Human Hair As Natural Fiber, we can conclude that improve the various properties of fly ash bricks. The present study was done for finding most achievable, economical as well as technically feasible mix for production of Human Hair Fly Ash Bricks in the central Gujarat region of India. When fly ash is reduced from 0.10% to 0.70%, and human hair fiber is increased from 0.10% to 0.70% and other ingredients like sludge lime, sand, and quarry dust are kept constant. It is well said that: “The taste of defeat has a richness of experience all its own.” During our research work we also faced the problem of uniform distribution of hair in the fly ash mix. So to overcome this problem we have adopted the manual method of distribution of hair in the fly ash mix.

The paper on “STABILIZATION OF CLAY WITH HUMAN HAIR FIBER” by K. Shankar Narayanan & S. Mary Rebekah Sharmila in International Journal of Civil Engineering and Technology (IJCIET) Volume 8, Issue 4, April 2017. Based on the tests results and investigation conducted on soil sample the following conclusions were given, it may be concluded that human hair can be used as a natural reinforcing agent for stabilization of soft clay soils. Human hair fiber has good strength properties, low cost and high toughness to biodegradability. It is also useful for the stability of slopes. It can be used as reinforcement in the flexible pavements then the sub-grade thickness decreases. The liquid Limit of soil sample is 58.4%. Soil sample is classified as Highly Compressible clay (CH). The optimum moisture content and maximum dry density of virgin soil sample is 15% and 1.67 g/cc. The unconfined compressive strength (UCS) of untreated soil sample is 12.58 N/mm². On adding Human hair fiber the UCS strength increases to 23.96 N/mm² and later on decreases when HHF percentage increases.

1. The California Bearing Ratio (CBR) of virgin soil sample is 5.41. With the addition of 1.2% of HHF the CBR value increased to 8.83. strength of the soil were increased to around 56.6% when compared to virgin soil sample

2. The strength characteristics UCS of virgin soil sample were 125 with addition of 1.2% of HHF the UCS value increased to 209.2kN/m². It decreases when adding above 1.2 percentage of HHF.
3. The maximum strength of the soil is achieved by the addition of 1.2% of HHF to soil sample
4. This soil stabilization technique can be used in pavement and foundation works.

The paper on “AMAZING TYPES, PROPERTIES, AND APPLICATIONS OF FIBRES IN CONSTRUCTION MATERIALS” by Abbas Mohajerani, Siu-Qun Hui, Mehdi Mirzababaei, Arul Arulrajah, Suksun Horpibulsuk, Aeslina Abdul Kadir, MdTareq Rahman and Farshid Maghool in 12 July 2019. Through previous research and investigations, the use of natural and synthetic fibers have shown promising results, as their presence has demonstrated significant benefits in terms of the overall physical and mechanical properties of the composite material. When comparing fiber reinforcement to traditional reinforcement, the ratio of fiber required is significantly less, making fiber reinforcement both energy and economically efficient. More recently, waste fibers have been studied for their potential as reinforcement in construction materials. The build-up of waste materials all around the world is a known issue, as landfill space is limited, and the incineration process requires considerable energy and produces unwanted emissions. The utilization of waste fibers in construction materials can alleviate these issues and promote environmentally friendly and sustainable solutions that work in the industry. This study reviews the types, properties, and applications of different fibers used in a wide range of materials in the construction industry, including concrete, asphalt concrete, soil, earth materials, blocks and bricks, composites, and other applications.

The paper on “Hair Fiber Reinforced Concrete” by Jain D. and Kothari A in 25th January 2012. Research Journal of Recent Sciences ISSN 2277 – 2502 Vol. 1 (ISC-2011), 128-133 (2012). According to the test performed it is observed that there is remarkable increment in properties of concrete according to the percentages of hairs by weight of in concrete. When M15 concrete with 1% hair is compared with the plain cement concrete, it is found that there is an increase of 10% in compressive strength and 3.2% in flexural strength. When M-15 concrete with 1.5% hair is compared with the plain cement concrete, it is found that there is an increase of 22% in compressive strength and 8.6% in flexural strength. When M-20 concrete with 1% hair is compared with the plain cement concrete, it is found that there is no increase in compressive strength and 2% in flexural strength. When M20 concrete with 1.5% hair is compared with the plain cement concrete, it is found that there is an increase of 8.8% in compressive strength and 5.5% in flexural strength. When M-25 concrete with 1% hair is compared with the plain cement concrete, it is found that there is an increase of 4.6% in compressive strength and 3% in flexural strength. When M-25 concrete with 1.5% hair is compared with the plain cement concrete, it is found that there is an increase of 11% in compressive strength and 4% in flexural strength.

The paper on “TECHNO-ECONOMICAL STUDY OF FAL -G BRICKS A CASE STUDY” in National conference on Fly ash/Futuristic Materials in Civil Engineering Construction For Sustainable Development 2010. The present study was done for finding most economical as well as technically feasible mix for production of FAL-G Bricks in the central region of Gujarat.

The study on “A COMPARATIVE REVIEW ON: EFFECT OF NATURAL FIBRES INCLUSION IN FLY ASH BRICKS.” According to Mr. Sanjay Salla & Jayeshkumar Pitroda in Volume : 1 | Issue : 12 | December 2012. Use of fly ash, natural fibre & agricultural waste help in environmental prevention and prevention of agriculture land utilised in brick production. Also the use of fly ash, natural fibre & agricultural waste improve the physical properties and compressive strength of fly ash bricks and clay bricks. The present study was done

for finding most achievable, economical as well as technically feasible mix for production of Fibre Fly Ash Bricks and Fibre Clay Bricks with its optimum content.

III. CONCLUSION

From the above literature review we can conclude that, when 2.5%, 5% and 10% CBs content and human hair by weight incorporated in fired clay bricks, we observed that compressive strength and density of CBs fired clay bricks decreases in and increases while adding human hair on fired clay bricks. Water absorption and porosity of fired clay bricks containing CBs and human hairs are increases. It observed that, with 7.5% of CBs content and human hair by weight with mixing time of 5 to 15 min. the compressive strength and density increases. Porosity and water absorption decreases. It also found that when 10%, 20%, 30% and 40% CBs and human hairs by weight in fired clay bricks in compressive strength increases and density decreases. Water absorption decreases by optimum percentage as compared to normal clay bricks.

It can be concluded that this recycling approach have two main benefits, firstly CBs and human hairs can be regarded as new construction materials in manufacturing of fired bricks. Secondly, utilization of CBs and fired clay bricks could contribute significantly to the solution of one of the environmental pollution problem in the world. In above study, possibility of incorporation of CBs bricks has been investigated. CBs which produce litter and affect the SWATCHH BHARAT ABHIYAN” Which is a initiative of India has been used in these CBs bricks and human hair. This type of CBs and human hair bricks does not required any skilled labour in manufacturing of these bricks size and shape of these bricks are similar to the required conventional brick and normal brick. These bricks can be used in partition wall, low cost housing and refractory linings.

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