

## UTILISATION OF CIGARETTE BUTTS IN CLAY BRICKS

M. Gokulnath<sup>1</sup>, P. Hari Krishnan<sup>2</sup>, S. Jayashree<sup>3</sup>, J. Julia Caroline<sup>4</sup>, N. Arun Prakash<sup>5</sup>

<sup>1,2,3,4</sup>UG Student, Department of Civil Engineering, Valliammai Engineering College, Tamil Nadu, India

<sup>5</sup>Assistant Professor (S.G), Department of Civil Engineering, Valliammai Engineering College, Tamil Nadu, India

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**Abstract** - Several trillion cigarettes are produced in the world resulting in tonnes of cigarette butts (CB). Cigarette butts contain lot of toxic substance. These cigarette butts are usually disposed by means of landfilling methods or incineration. Incorporation of cigarette butts in clay bricks is a sustainable method for the disposal of cigarette butts. This method saves energy during firing process of clay bricks. This method provides a sustainable method of disposal of CB's which causes environmental pollution. The brick was manufactured of size 210mm×110mm×70mm. All the bricks were kept for 5 days drying and then 10 days for firing. The various tests on bricks were done and results interpreted.

**Cigarette butts (CB), Environmental pollution., Fired clay bricks, Brick manufacturing process, Brick tests**

### I. INTRODUCTION

Worldwide, cigarette butts (CBs) are among the most common type of litter. Most cigarette filters are made of cellulose acetate which is slow to biodegrade and can take up to 18 months or more to break down under normal litter conditions. CB filters release a range of toxic chemicals as they deteriorate. Toxic chemicals trapped in the CB filters can be leached and cause serious damage to the environment. There are up to 4000 chemical components in cigarette smoke, of which 3000 are in the gas phase and 1000 in the tar phase. Landfilling and incineration of CB waste are neither universally sustainable nor economically feasible disposal methods. Recycling CBs is difficult because there are no easy mechanisms or procedures to assure efficient and economical separation of the butts and appropriate treatment of the entrapped chemicals. An alternative investigated herein is to incorporate CBs in a building material such as fired bricks.

### II. SCOPE

- ☒ To promote the sustainable method for the disposal of cigarette butts.
- ☒ To save energy during firing process of clay bricks.

- ☒ To encourage the waste product as eco-friendly material.
- ☒ To dispose the waste safely.

### III. LITERATURE REVIEW

Novotny and Zhao paper on Consumption and production waste. Another externality of tobacco use provides details on the waste produced due to cigarette butt production and the environmental effects due to the composition of cigarette butts. Cellulose acetate, nicotine and other toxic chemicals with low biodegradability were used in the cigarette butts.

Aselina Abdul Kadir and Abbas Mohejerani(2010) paper on possible utilization of cigarette butts in lightweight fire clay bricks gives an idea about the the quantity of cigarette butts to be added to the composition of clay brick during the manufacturing process. The experimental tests to be carried out on cigarette butt incorporated bricks.

### IV. OBJECTIVES

- ☒ To study the properties of clay bricks while incorporating cigarette butts.
- ☒ To study the Compressive strength of the brick by adding 2.5% of cigarette butts in each brick.
- ☒ To make the bricks which are energy efficient which is the only viable solution to the environmental concerns and natural resource conservation for future generations.

### V. MATERIALS TO BE USED

1. Clay.
2. Cigarette butts.
3. Water.

**1. CLAY:** The main raw material for bricks is clay other than clayey soils or soft slate or shale, which is usually obtained from open pits with the attendant disruption of drainage, vegetation and wildlife habitat. Clays for brick making vary broadly in composition and depend on the locality from which the soil originates. Different proportions of clays are composed mainly of silica (grains

of sand), alumina, lime, iron, manganese, sulphur and phosphates.

**2. CIGARETTE BUTTS:** The common name for the remains of a cigarette after smoking is a cigarette butt. The butt is typically about 30% of the cigarette's original length. It consists of a tissue tube which holds a filter and some remains of tobacco mixed with ash. Cigarette butts are the most common form of man-made litter in the world, as approximately 5.6 trillion cigarettes are smoked every year worldwide. The cellulose acetate fibres used as the predominant filter material in the cigarettes do not readily biodegrade. A normal life span of a discarded filter is thought to be up to 15 years.

**3. WATER:** Water is an important ingredient of brick as it actually used for manufacturing of brick. Since it helps to bind all the raw materials for giving proper mix.

**VI. MATERIALS COLLECTION**

The CBs of different brands and sizes are used. The butts has been collected in dry receptacles (cardboard boxes) and stored in sealed plastic bags. Necessary precautions and safety steps were adhered to during the storing, handling and disposal of wastes. The wearing of masks and gloves was done.

**VII. COMPACTION AND COMPOSITION OF CB's**

Compaction carried out to decrease the deformation potential and increase the strength of soil materials of the brick. Since the degree of compaction is affected by the amount of water present in the soil, compaction is carried out.

MIXTURE	CLAY (kg)	DRIED CB'S (kg)	TOTAL MASS OF RAW MATERIAL (kg)
210X110X70mm CB (2.5%)	2.92	0.08	3.00

Amount of cigarette butts added is 2.5% of the total weight of the clay brick.

Weight of brick is 3 kg (approximately)

Weight of cigarette butts to be added per brick

$$= 2920 \times (2.5/100)$$

$$= 73 \text{ g (or) } 0.073 \text{ kg}$$

**VIII. PROCEDURE**

1. Required proportions of raw materials are taken separately.
2. CB's, clay and water are mixed thoroughly.
3. The freshly prepared mix is pressed into the mould.
4. As most of the local manufactures are producing brick of dimensions 210mm×110mm×70mm. The same dimension is adopted here for production of bricks.
5. All the brick samples are kept for drying for 5 days followed by 10 days sun firing.
6. Compressive strength test and water absorption test are to be conducted to fund the effective proportion of the raw material.

**IX. BRICK MAKING PROCESS**



Fig-1 MIXING OF CB's AND CLAY



Fig 2-Hand moulding of bricks



Fig 3- Drying of bricks (stacks)



Fig 4-Firing of bricks

## X. TEST TO BE PERFORMED

**A. COMPRESSIVE STRENGTH TEST:** The brick specimens are immersed in water for 24 hours. The specimen is placed in compression testing machine with 6 mm plywood on top and bottom of it to get uniform load on the specimen. The load is applied axially at a rate of 14 N/mm<sup>2</sup>. The crushing load is noted. Then the crushing strength is the ratio of crushing load to the area of brick loaded. Average of five specimens is taken as the crushing strength.

**B. WATER ABSORPTION TEST:** Five brick are taken and it is weighted dry. It is then immersed in water for 24 hours. It is weighed again and the difference in weight indicates the amount of water absorbed by the brick. It should not be exceed 20 percent of weight of dry brick.

**C. SHAPE AND SIZE TEST:** In this test, a brick is closely inspected. It should be of standard size and its shape should be truly rectangular with sharp edges. For this purpose, 3 bricks are selected at random and they are stacked length wise, along the width and along the height.

**D. EFFLORESCENCE TEST:** This test is carried out to obtain the presence of alkaline substances in bricks. First, bricks are fully submerged in fresh water for 24 hours. After 24 hours they are collected from water and let them to dry. After completely dried, the bricks are closely observed to find the presence of alkali. If a white or grey layer is formed on the brick surface, it means alkali is present in the brick.

**E. IMPACT TEST:** In this test, few bricks are dropped from 1 m height. If bricks are broken it indicated low impact value and not acceptable for construction work. Good quality bricks do not break at all.

**F. SOUNDNESS TEST:** In this test, two randomly selected bricks are hardly punched with each other. If they produce a clear metallic sound and remain unbroken then they are good quality bricks.

**G. HARDNESS TEST:** In this test, scratches are made on the surface of the brick by a one-rupee coin. If it does not leave any impression the brick surface then it will be considered as good quality bricks.

## XII. CONCLUSION

The results found in this investigation are very promising. It is concluded that cigarette butts can be regarded as a potential addition to the raw materials of new types of light-weight fired bricks, for non-load-bearing as well as load-bearing applications, providing the mix is appropriately designed and prepared for the required properties. Considering the number of bricks produced around the world every year, recycling CBs into bricks could contribute significantly to a sustainable solution of one of the serious environmental pollution problems on our planet.

## XIII. REFERENCES

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