A Review on Recycling and Utilization of Cigarette Butt for Waste Water Treatment

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Abstract

This days, the cigarette butt pollution is at a peak.The increasing numbers of butts have become an inland water pollution problem and a consequent important environmentalissue. The cigarette butt waste contains harmful chemicals and itself it is a natural plastic, which is not biodegradable.The CBs accumulate due to the poor biodegradability of the cellulose acetate filter, and the toxicity constituent trapped within threatenshuman life, marine ecosystems as well as the environment if not disposed in an appropriate manner.With the increasing concern arising from insufficient landfill sites and the growing environmentalawareness about toxic incinerator emissions, there is a critical need for an alternative method for CB waste disposal which is environmentally acceptable. This paper presents a review of the environmental problems associated with CBs.

Keywords: Cigarette Butt, Leachate, Cellulose Acetate.

1.0Introduction

You smoke a cigarette, ensure that the butt is fully extinguished, and proceed to throw it in the dustbin (the responsible ones amongst us) or on the streets (everyone else). Ever thought about what happens after that? Does the butt decompose? Does anyone recycle it? Or does it end up polluting water bodies and clogging drains? Not many who smoke realize that a cigarette butt is made of cellulose acetate, a plastic filter that is not biodegradable and can be around harming the environment for years once discarded.resource to convert it as a manure for soil enrichments and economical sustenance. Disposed of cigarette butts are a type of non-biodegradable litter. Conveyed as overflow from lanes to channels, to waterways, and at last to the sea and its shorelines, cigarette channels are the absolute most gathered thing in universal shoreline cleanups every year. They are an ecological curse on boulevards, walkways, and other open ranges. Whatever their direct health impact on or benefit to smokers, cigarette filters pose a serious litter and toxic waste disposal problem. Cellulose acetate is photodegradable but not bio-degradable. Although ultraviolet rays from the sun will eventually break the filter into smaller pieces under ideal environmental conditions, the source material never disappears; it essentially becomes diluted in water or soil.

The cellulose-acetate filter was added to cigarettes in the 1950s in the wake of increasingly convincing scientific evidence that cigarettes caused lung cancer and other serious diseases. Filters were found to reduce the machine-measured yields of tar and nicotine in smoked cigarettes, and at first this seemed to be a healthy technological improvement in the cigarette product. In 1966, a review by the US Public Health Service concluded that, “The preponderance of scientific evidence strongly suggests that the lower the “tar” and nicotine content of cigarette smoke, the less harmful would be the effect.” Following this report, both Government and tobacco industry scientists conducted studies of cigarette manufacturing and tobacco cultivation that could lead to lower “tar” and nicotine yields. Cigarette manufacturers promoted such products, especially filtered cigarettes, through advertising that included an implied health claim for “safer” cigarettes.

2.0 Composition Of Cigarettes

A typical discarded cigarette butt consists of three parts: un-smoked tobacco, the filter of a cigarette, and a paper wrap. Ingredients of the discarded cigarette butts present their own environmental concern.

2.1 Tobacco

Nicotiana tabacum is a herbaceous plant in the Solanaceae (nightshade family) that originated in the tropical Americas and is now cultivated worldwide as the primary commercial source of tobacco. Cigarette production uses about 80% of all tobacco grown worldwide. China is the world's largest producer of tobacco, although India, Brazil, and the U.S. are also prominent (Food and Agriculture Organization, 2000). There is number of chemicals in unburned processed tobacco, about 23 chemicals can be identified as carcinogenic (International Agency for Research on Cancer, 1987, 1995). Some are naturally occurring in the tobacco plant; others are agricultural chemical residues from growing the tobacco, and the rest are additives and flavorings used in the cigarette manufacturing. In analyses, over 4,000 compounds have been found in a burning tobacco.

2.2Cigarette Butt Filter

The filter of a cigarette comprises of cellulose acetate fibres, a slowly degradable plastic in the environment, with an estimated degradation of 18 months or longer in ideal conditions (Ach, 1993). These fibers, each about 20 μ in diameter, are treated with titanium dioxide (a delustrant) and over 15,000 of them are packed tightly together, using triacetin as a binding agent, to create a single filter (Norman, 1999). Most cigarette filters are surrounded by two layers of paper and rayon wrapping, theporosity of which acts to control the airflow through the filter. Regular cigarettes have less spongy wraps to inhibit airflow, but light cigaretteshave more spongy wraps to allow for more airflow that reduces smoke yields about regular cigarettes. Cigarette paper also has many chemicals, including glues to hold the paper together and alkali metal salts of organic acids such as sodium acetate to keep the cigarette burning while smoking (Norman, 1999).

2.3 Cellulose acetate

Cellulose Acetate is a natural plastic, which is manufactured from purified natural cellulose. Natural cellulose of the appropriate properties is derived primarily from two sources, cotton linters and wood pulp. The presence of this great amount of cellulose in the cigarette butts makes them an ideal candidate for the recycling purpose. Waste cigarette butts has more than 4000 toxic chemicals and impurities ,So if we are able to reduce the toxicity level of the used butts and remove the bad sniff from them we can certainly use them for making of usable products which has been explored in much greater detail in the current research work. The one cigarette butt contains approximately 12000 cellulose fiber.

3.0 Consequences of Cigarette Litter

The following section describes some of the chemical consequences, specifically for animals and children who are exposed to the toxic effects of cigarettes. I have also discuss financial consequences in municipal waste management.

3.1 Toxic Exposure in Marine Life

Marine life is often at the receiving end of leached chemicals and toxins. Marine animals may be especially harmed by nicotine, ethylphenol, and other organic compounds in cigarettes. Ethylphenol, which is commonly used to flavor tobacco, can accumulate to such high levels in aquatic animals that they exceed the concentration in the surrounding environment. Researchers at San Diego State University examined the toxic effects of smoked cigarette butts (smoked filter and tobacco), smoked cigarette filters (no tobacco), and unsmoked cigarette filters (no tobacco) on topsmelt and fathead minnows (Slaughter et al. 2011). Surprisingly, all three materials were toxic despite the lack of tobacco in two of them. However the smoked cigarette butts with leftover tobacco did contribute to toxicity significantly more than the smoked and unsmoked filters without tobacco. Remnant tobacco, burned or not, almost always contributes to the cigarette butt's toxicity. The toxicity of unsmoked cigarette filters containing no tobacco indicates that chemicals used in manufacturing of filters are harmful even before the filters absorb chemicals when smoked. Thus, although smoking and the addition of tobacco increase the toxicity of cigarette filters, they are already toxic to begin with.[5]

3.2 Toxic Exposure in Children and Landfill Demands

Children and toddlers who ingest cigarettes can also be poisoned, but to a much lesser degree. Children can easily pick up cigarettes and ingest them in places like parks. Cases of cigarette ingestion usually involve children who are only a year old or younger. They are often found chewing the cigarettes. Fortunately, cases of significant toxic poisoning in children are rare.

Most children who ingest cigarettes do not show any symptoms, according to observations at poison control centers in both Japan and the U.S. Symptoms that do appear are usually vomiting or lethargy, both of which eventually cease. Children do have to be admitted to a hospital's emergency department but usually are not hospitalized. Gastric lavage, or stomach pumping, is unnecessary in most cases. Although the consequences of cigarette ingestion for children are not life-threatening, it is still an unnecessary danger and can be prevented by less cigarette litter in parks and other play areas. Like other forms of waste, smoked cigarette butts also contribute to greater landfill demands. In addition, when they are littered, they lead to increased costs of municipalities' waste disposal.Thus, a greater presence of cigarette litter means a higher likelihood for poisoning in children, more exposure to toxicity in marine life, and higher costs of waste management. These financial, social, and environmental consequences clearly emphasize the need to reduce cigarette litter.[5]

3.3 Uses of Cigarette butts

The use of cigarette butts in the fired clay bricks comprises ofrecycling CBs into fired clay bricks. Properties including compressive strength, flexural strength, density, water absorption and thermal conductivity of fired clay bricks are reported and discussed. Furthermore, leaching of heavy metals from the manufactured clay bricks was tested. The results show that the density of fired bricks was reduced by about 8 – 30 %, depending on the percentage of CBs incorporated into the raw materials. The compressive strength of bricks tested was 12.57, 5.22 and 3.00 MPa for 2.5, 5.0 and 10 % CB content respectively. Water absorption and initial rate of absorption values increased as density, and hence porosity, of bricks decreased with increasing CB volume. The leaching test results revealed trace amounts of heavy metals. [1]

The encapsulation of the cigarette butt is done before using it in the mix, encapsulation is necessary because it prevents mixing of the toxic materials or any other chemical present in the cigarette mix. The compressive strength of the modified mixes was decreased as compared to the control mix moulds. Also the problem of leaching is occure in the rainy season which result in the contamination of the water body. [6]

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 manufacturedof indian standard size210mm×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 interpret**.** [7]

4.0 Conclusion

From theprevious researches it has been observed that various methods are used to recycle the cigarette butt and the recycled product is reused by various means such as in fired clay bricks, in toys, in cushions etc. Which has outcome of economic, strong and durable products but there is no research on the use of cigarette butt in water or wastewater treatment.

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