

Carbon Footprint Reduction and Sustainable Reuse of Recycled Plastic

A.P.R. Srinivas

Department of Mechanical Engineering, Lingaya's University, Nachauli, Jasana Road, Old Faridabad, Haryana 121002 India
sprayyagari@gmail.com

Abstract -- With increased urbanization, solid waste is constantly increasing due to more resource utilization. More sustainable approaches are needed to tackle the environmental impact of solid waste. One-third of the domestic waste is plastic. The plastic is to be either recycled or reused in different ways. The paper proposes a new avenue to reuse the waste plastic in the form of mementos and also reduces the carbon foot print to a certain extent.

Keywords: Plastic, Solid Waste, Reuse, Carbon Footprint

I. INTRODUCTION

ACROSS, the Indian sub-continent, many conferences, workshops and seminars are conducted throughout the year. In these conferences, each and every speaker is presented with a memento made of wood. This wooden memento when observed on a nationwide scale adds to the carbon foot print of India. This wooden memento could be replaced by a sheet of recycled plastic pasted with a paper. This paper has all the requisite details as of the wooden memento. This way, plastic which is difficult to dispose off gets a new avenue of reuse and also tree chopping would be reduced.

II. LITERATURE SURVEY

Vanitha *et al.* dealt with the reuse of waste plastics to partially replace coarse aggregate in M20 concrete [1]. This is used in pavements and solid blocks. Each Indian generates a plastic waste of 700 grams a day per capita, on an average. This biodegradable plastic waste amounts to 40 percent of garbage. Plastics that cannot be further degraded are finely powdered and it mainly consists of high density polyethylene (HDPE). The specific gravity of such an aggregate is 1.04 [1]. There are two essential components of biodegradation process: that the material must be a food source for the bacteria in the disposal environment and the biodegradation must take place in a span of short time, typically six months. Biodegradation can also occur in the marine environment if the bacteria in the seawater consumes a major portion of the plastic in a short time-span. Agamuthu *et al.* discussed sustainability in waste management in Asian countries and pressed the need of technology transfer from developed countries, adapting to the local conditions. Municipal solid waste generation was projected to be 0.7 kg/day/capita by 2025 [3].

Methodology: The four pillars of sustainability are to reduce,

reuse, recover, recycle [6]. The article concentrates on sustainable reuse of recycled plastics. The study focuses on replacing the material of wooden mementos presented in the population sample with recyclable plastics. This opens up a new avenue to reuse plastics and thereby reduce the cost of recycling plastics. The population sample of the study is conferences, seminars and workshops in various institutes across India. The number of mementos is calculated as shown in Table 2. The tree basal area is the cross-sectional area of a tree stem measured at basal height of 1.4m [5]. The paper considers age of a tree to be 22 years and radius of a cylindrical tree at the basal area to be 70cm correspondingly [5]. The average organic carbon stock in a well-grown tree is 1.65 ton/tree [7].

Hypothesis 1: Reuse of plastics in mementos reduces the domestic plastic waste by 11.67 percent

Hypothesis 2: Replacing wooden mementos by reusable plastics reduces footprint by 0.76K ton annually

TABLE 1 -- TYPES OF RECYCLABLE PLASTICS [6]

Plastic type	Recycling Code
PET-poly-ethylene terephthalate	1
HDPE- High density polyethylene	2
PVC - Polyvinyl chloride	3
LDPE - Low density poly ethylene	4
PP-polypropylene	5
PS- polystyrene	6
Other resins	7

TABLE 2 -- CALCULATED VALUES OF DIFFERENT PARAMETERS

Parameter	Observed value
Annual number of conferences	500
Annual number of short term courses	$(30+30+30+120)*6*2=210*12= 2520$
Annual number of workshops/seminars	2520

Number of lead speakers in a conference	5
Number of speakers in a short term course	$4*5=20$
Number of speakers in a workshop/Seminar	$4*2=8$
Number of wooden mementos in a year	$500*5 + 2520*20 + 2520*8 = 73060$
Average dimensions of a memento including margins[4]	$25.6* 5.4*34.29 \text{ cm} = 0.00474\text{m}^3$
Wood consumed annually	$73060*0.00474 = 346.32 \text{ m}^3 = 350\text{m}^3(\text{approx})$
Merchantable tree height [4]	42 feet =105 m
Merchantable tree volume [5]	$V=0.42*\text{Basal area} * \text{height}$ $.42*(3.14*(70^2)/40000)*105 = 17\text{m}^3$
Trees chopped annually	$350/17 = 20.6 = 21(\text{approx})$
Trees rescued annually	21
Carbon footprint reduced	$21*22* 1.65 \text{ ton} = 762.3 \text{ ton}$
Carbon footprint of India[8]	1.04 ha/capita
World average footprint [6]	2.8ha/capita
Plastics in domestic waste[6]	30%
Domestic plastic waste reduction	$30:100 == 350:x \quad x=1166.7$
Percentage domestic plastic waste reduction	11.67

III. CONCLUSION

The paper opens up a new avenue to reuse plastics in the form of mementos presented to numerous intellectuals. This would also reduce tree chopping thus adding to the annual footprint reduction of 0.7 kilo ton of carbon. This carbon becomes an

organic stock in the tree trunk. However, mementos made out of glass and the respective footprint reduction is out of scope of the paper. The reuse of plastics reduces the domestic plastic waste by 350m³ annually. Thus, proves the aforesaid hypotheses. Further, the plastic could be reused with a replacable banner pasted to the plastic sheet. This reduces the plastic waste production by many folds.

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APR Srinivas is a post-graduate in Mechanical Engineering from National Institute of Foundry and Forge Technology, Hatia. He practices Mechanical Engineering at Lingaya's university in the capacity of Assistant professor.