

Solid waste management at ACE Engineering college

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Received 05 Aug 2021, Accepted 10 Aug 2021, Available online 15 Aug 2021, **Special Issue-9 (Aug 2021)**

Abstract

Solid waste management systems are one of the greatest challenges for sustainable development. For these systems to be successful, the first step is to carry out waste characterization studies. In this paper we have reported the results of a waste characterization study performed in ace engineering college. The aim of this study was to set the basis for implementation of a recovery, reduction and recycling waste management program at the campus. It was found that the institute produces 0.10 kg /person/day of solid waste. More than 65% of these wastes are recyclable or potentially recyclable. These results showed that a program for segregation and recycling is feasible in our college. The study also showed that the local market for recyclable waste, under present conditions – number of recycling companies and amounts of recyclables accepted – can absorb all of these wastes. Some alternatives for the potentially recyclables wastes are discussed. Finally, some strategies that could be used to reduce waste at the source are discussed as well.

Keywords: Solid waste management, reduction, recycling, segregation

1.Introduction

solid waste management (SWM) is the one of the basic services arranged and administrators by the municipal authorities in the country to enhance the locality. The main objective of solid waste management is to maintain clean and hygienic condition and reduction in the solid waste. A solid waste management programme on any college will benefit the college through reduced resource consumption. The solid waste management at the ACE College is still in progression. By using different techniques we can improve our college and make the college like a zero waste college. Solid waste management basically includes the collection and storage of solid waste, transfer and transport.

2.Project area

In our project, we selected an empty area for waste treatment which is located backside of academic blocks and beside of mechanical labs in our college. This is suitable place for solid waste treatment i.e., Incineration, Composting.



Fig no.1: location identified for the disposal

3.Methodology

The study was divided into four stages:

- Identification of waste generation sources
- Estimation and collection of the waste generate
- Estimation of the waste composition and
- Analyzing the data and providing a suitable method for waste management

4.Source of waste

To create effective waste management plans, colleges and universities first need to know the types of waste they are producing.

Some of the sources of waste produced from our college are,

*Food waste from canteens.

*Recyclable paper, card board, plastic, glass and cans from stationary and store rooms.

*Electronics waste from computer labs, copy machines, old printers etc.

*Furniture waste from classrooms, cafeterias, study spaces etc.

*Chemical waste from laboratories and some cleaning services, laundry rooms etc.

*Student cloths and housewares from college attached hostels.

*Maintenance waste etc.

5. Collection & transportation

5.1. Primary collection of waste

Primary collection is the collection of waste from the point where it is placed by the person or organization that has produced it. These collection points could be located outside each individual house hold and business, communal containers serving a number of households. Generally, wheel barrow, hand-cart, tractor, cycle-cart etc. used for primary collection of waste.



Fig no. 5.1 Primary collection of waste

The Green-colored dustbins are meant for wet and biodegradable wastes. For eg: kitchen wastes including vegetables and fruits skins. Blue dustbins are meant for disposal of plastic wrappers and non-biodegradable wastes. The yellow dustbin is used to segregate biomedical wastes such as syringes, expired tablets, human anatomical wastes, etc. Segregation is essential in day to day life which can prevent biodegradation and also enhance recycling. Yellow dustbins can be found in Hospitals, chemical labs, clinics, and factories. Non-plastic waste (used cotton, gauze, soiled bandages) should be placed in red bin with small bio-hazard symbol inside the small red bin.

Our college containing a number of blocks with ground floor plus minimum of three floors. We collect the paper waste, sweeping dust etc., from each class in each floor from all blocks. To store this waste temporarily, we provide some small dustbins in each floor in all blocks. This collected waste is stored in dustbins provided in our whole campus until we transported it to disposal site.

5.2 Transportation of waste

The transportation of waste is the movement of waste over a specific area by trains, tankers, trucks, barges or other vehicles. The type of waste that may be transported range from municipal garbage to radioactive or hazardous wastes. Transportation of waste from the point of collection to point of processing and waste must be transported under covered conditions to avoid littering. Exposure of the waste to the public should be minimized.

Generally, while transporting the waste we consider some factors i.e., climate, topography, layout-

container access, available transportation systems, traffic, roads and types of wastes collected.

For our project no need to consider transportation systems, traffic, roads etc., because disposal site is within the college. But consider some factors for our project i.e., climate, type of waste etc.

In our project we transfer the waste from primary collection to disposal area which is located at backside of academic blocks and beside of mechanical labs. In this process we use hand-cart vehicle and wheelbarrow vehicles.

6. Waste characterization

In order to identify the exact characteristics of solid wastes, it is necessary that we analyse them using physical and chemical parameters,

- 1) Physical characteristics
- 2) Chemical characteristics

The major physical characteristics measured in waste are:

Density, Size distribution of components, Moisture

Other characteristics which may use: Colour, voids, shape of component, Optical property, magnetic properties, electric properties

Knowledge of the classification of chemical compounds and their essential for the proper understanding of the behaviour waste, as it moves through the waste management system.

If solid wastes are to be used as fuel or used for any other purpose, following must be known:

Lipids, Carbohydrates, Proteins, Natural fibres, Synthetic organic material, Non-combustibles,

7. planning for integrated solid waste management

7.1 Per capita demand

Solid waste known as 'trash' or 'garbage' for most people. It is measured in the amount of kg/capita/day. A high Waste Generation Per Capita has a negative effect on the environment, especially when the waste is not recycled properly. It is estimated that solid waste generated in small, medium and large cities and towns is about 0.1 kg, 0.3-0.4 kg and 0.5 kg per capita per day respectively.

7.2 Waste generation:

Table no. 7.1 waste generation

s.no.	Source area	Amount of waste per day
1	Mess/canteen	120-150 kg/day
2	Academic	40-50 kg/day
3	Hostel blocks & staff block	50-60 kg/day
4	Gardens	60-80 kg/day

7.3 Waste storage

Solid waste storage” means the interim containment of solid waste, in an approved manner, after generating and prior to collection and disposal. “Storage container” means a garbage can, dumpster or other container used or designed for the deposit or storage of solid waste before transport to the landfill.

7.4 Waste segregation

“Waste segregation” means dividing waste into dry and wet. Dry waste includes wood and related products, metals and glass. Wet waste typically refers to organic waste usually generated by eating establishments and are heavy in weight due to dampness. Waste segregation is different from waste sorting. Waste segregation is the grouping of waste into different categories. Each waste goes into its category at the point of dumping or collection, but sorting happens after dumping or collection. Segregation of waste ensures pure, quality material. Sorting on the other hand will end up producing impure materials with less quality.

7.5 Waste transportation

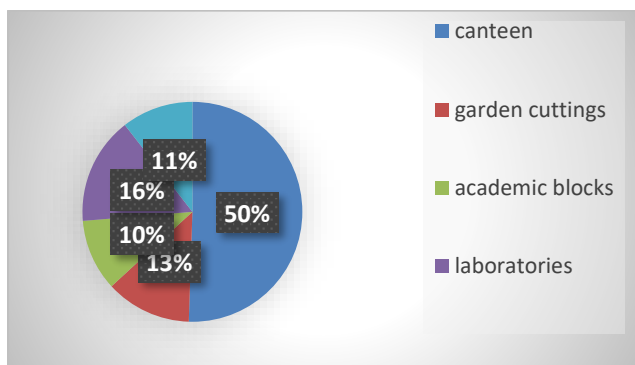
In our project we transferred the waste from primary collection to disposal area which is located at back side of academic blocks and beside of mechanical labs. In this process we used Hand-cart vehicle and wheelbarrow vehicles.

- Collection trolley collects the waste from dustbins daily.
- Waste is openly transported to the dumping site by a trolley.

7.6 Disposal of waste

Solid waste disposal is the ultimate disposition or placement of refuse that is not salvaged or recycled. Solid waste disposal methods are dumping into sea, sanitary landfills, incineration, composting etc. In our project we use incineration, composting, bio methane disposal methods.

8. Analysis



- Nearly 73% of the Waste produced at ACE is biodegradable and 27% of waste non-biodegradable. On an average 150 kg/day of biodegradable waste and 48 kg/day of dry waste is produced.
- Most of the waste produced at the college is biodegradable. It can be effectively disposed and managed to produce a better byproduct.
- The Wet and dry waste produced in the college can be used for composting.
- Most of the waste that was produced in the college has the recycling potential.

9. Proposing methods

9.1 Composting process for biodegradable waste

Composting is a method of treating solid waste, a biological process in which the organic portion of refuse is allowed to decompose under carefully controlled conditions.

- composting requires gathering a mix of 'Greens' and 'Browns'.
- Greens are materials rich in nitrogen such as leaves, grass, and food scraps.
- Browns are more woody materials rich in carbon-like stalks, paper, and wood chips.
- The materials are wetted to break them down into humus, a process that occurs over a period of months

9.2 Incineration for combustible waste

- Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials.
- Incineration and other high-temperature waste treatment systems are described as “thermal treatment”. Incineration of waste materials converts the waste into ash, fuel gas and heat.
- The incineration process requires 3 main elements to work efficiently, these are fuel, heat, and oxygen.
- Finally, there must be a sufficient amount of oxygen to start and keep the combustion process active.

9.3 Recycling process for plastic waste

The simplest process of plastic recycling involves in the steps of collecting, sorting, shredding, washing, de-watering, drying, extruding, moulding and finished new products

- The actual particular processes vary based on plastic resin or type of plastic product.
- Most plastic recycling facilities use the following two-step process

- **STEP ONE:** Sorting plastics automatically or with a manual sort to make sure all the contaminants are removed from the plastic waste stream.
- **STEP TWO:** Melting down plastics directly into a new shape or shredding into flakes then melting down before being finally processed into granulate

10.Future planning

The 5R'S: Refuse, Reduce, Reuse, Repurpose and Recycle

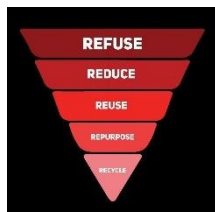


Fig no.7.2 5R's

Applying the 5 R's to our project waste management and recycling strategies can positively impact the outcome of our project by significantly reducing the amount of waste your business generates. In the 5 R's hierarchy, remember to treat recycling as a last resort after attempting to refuse, reduce, reuse, or repurpose.

Conclusion

- Finally, we concluded about our project is "Proper solid waste management in every college will help towards to zero-waste college".
- The aim for 'zero-waste college' should be achieved in steps by processing and disposing of all types of waste sequentially.
- The heat produced by an incinerator can be used to generate steam which may then be used to drive a turbine in order to produce electricity.
- Composting is also a good way to recycle leaves. Instead of paying a company to haul away leaves, we can compost the leaves and return the nutrients to garden. Instead of buying peat moss, save money and make own compost.
- Revenue coming from plastic recycling process can be used for our college necessities and sale the new packing materials as well as.

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