A Study on Characterization of Municipal Solid Waste in Vijayawada City

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Abstract- Solid waste management is one of the most important challenges in urban areas throughout the world and it is becoming a critical issue in developing countries where a rapid increase in population has been observed. Vijayawada is the biggest city in the district as well as the 3rd biggest city of this state of southern India It is the commercial capital of Andhra Pradesh. Vijayawada is politically active, sociologically dominant, agriculturally rich, and is an industrial transportation hub. The present study about the characteristics and the properties of solid waste in commercial and market area. It is necessary to know the intrinsic qualitative and quantitative characteristics of SW as its increase demand alternatives of handling and treatment. The studies of characterization may include analysis such as: physical and chemical composition, volume and generation that provide information for the planning and management of waste for its beneficial use and final disposal. Therefore, these studies constitute the first step to successfully implementing a comprehensive waste management system The results of the studies of characterization cannot be generalized towards different regions and seasons of the year because there are many variants such as: eating habits, consumption patterns, population composition, season of the year and income, that can cause dramatic changes in the composition and generation of waste.

Keywords –Quantification Characterization, Sustainable

I. INTRODUCTION

1.1. General:

As per the statistics available, the quantity of garbage generated in India, under average conditions is varying from 450 to 650 gms per capita per day, compared to the western countries with 1300 to 1800 gms per capita per capita per day. In the present use and throwaway society the quantity of refuse generated in activity indicates, the socio-economic status of the people living in that city. All over the world, today cities are vexed with the problems of disposal of solid wastes generated.

The city refuse generated in India contains a fairly high percentage of organic matter, as high as 60% to 70% by dry weight. This offers a tremendous potential for the utilisation of city refuse, for producing manure either by the natural or by mechanical processes and fuel cakes/pellets to produce thermal energy and there by producing electrical energy. At present in most of the towns and cities, the refuse is being utilised for filling up low lying areas, which is leading to environmental problems at a later stage.

The underground water is being polluted by the lea chats from the solid waste dumps. Air pollution is being caused due to the dusts and foul smells of anaerobic digestion of the decomposable wastes. Communicable diseases spread due to rodents, mosquitoes, flies, pigs and dogs which visit the dumping yard. Hence it becomes the responsibility of municipalities to pay immediate attention to these problems for improving environmental sanitation in the towns.

II. LITERATURE REVIEW

Decomposition of specific materials buried within sanitary landfills, in this observation, the results were the carbohydrates such as cellulose and starch were the quickest degrading portion of the waste, and the samples with high lignin Contents degraded more slowly than those samples with lower lignin contents observed by Baldwin (1998).

A spatial model or land fills sitting analysis. In this sitting analysis study two case studies are presented to demonstrate the applicability of the proposed model. One case study based on land cost and second case based on land slope and road network to demonstrate the flexibility of the model developed by Hung – Yuch Lin (1992).

Municipal solid waste recycling issues and their impact on, environment based on cost management studied by Lave (1999).

Simulation of construction and demolition waste leachate, the result was that the organic carbon concentrations in the leachates were generally lower than the tropical municipal waste leachates studied by Town shed (1999).

An empirical model and kinetic behaviour of hemophilic composting of vegetable waste. In this study laboratory scale temperature – controlled reactors were used to generate experimental data of themophilic compositing of vegetable waste studied by Huang (2000).

An investigation to develop a practical approach for in situ moisture content monitoring of municipal solid waste landfills conducted by Yuen (2000).

Geotechnical characterisation of municipal solid waste landfills of Allahabad, the results were that the maximum dry density of the land fill has been found to increase with depth the permeability of the land fill decrease with depth studied by Shahi (2000).

III METHODOLOGY

Sampling and Analysis:-

Sample collection and examine the waste will be identified in the respective three zones of the city by

a. Visual method
b. Sort and weigh method
c. Grid method



The sampling plan must be correctly defined and organized in order to get an accurate estimation of the characteristics of the waste. Both an appropriate sample size and proper sampling techniques are necessary. If the sampling process is carried out correctly, the sample will be representative and the estimates it generates will be useful for making decisions concerning proper management of the waste and for assessing risk.

Solid Quantifying a Waste Sector on Measurement at the Point of Generation

(b) Quantifying based on Waste Generation Factors
(c) Calculations for Composition
  -Calculating the Mean Estimate
  - Calculating the Error Range
(d) Volume to Weight Conversion Factors & Net Weight of Waste
(e) Calculating the Weighting Factors when Combining Waste Sector

a. *Quantifying a Waste Sector on Vehicle Surveys:*

For a given waste sector, *S*, the sector tonnage can be calculated from the tonnage, *q*, found on individual vehicles.

$$\text{Sector (tons)} = \frac{\Sigma Q\text{, S, survey period}}{\Sigma Q\text{ all, survey period}} \times \Sigma Q\text{ all, annual}$$

b. *Quantifying a Waste Sector on Measurement at the Point of Generation:*

$$\text{Volume container, annual} = \text{Volume container, measured} \times \frac{\text{Generation time annual}}{\text{Generation time measured}}$$

$$\text{Tons site, annual} = \text{Volume sample} \times \text{Density site}$$

.

$$\text{TPE annual, size group} = \frac{\Sigma \text{ visited sites Tons site, annual, size group}}{}$$

$$\text{Q site, annual} = \text{TPE annual, size group} \times \text{Industry - wide employment in size group}$$

Seventh, add the results for the size groups to calculate total tons disposed by the Industry

$$\text{Q industry} = \Sigma \text{Q size group}$$

IV. RESULT&DISCUSSION

Commercial area:

From the overall sample analysis of the individual components of the solid waste, it was observed that the moisture content of the components is as follows: vegetables-63.5%, food waste-60.7%, glass-7.8%, wood-6.9%, textile-6.0%, paper-4.8%, card board-4.6%, Miscellaneous-3.6%, plastic-3.2% and rubber-0.0%.from table-1.1.

Table-1.1Average value of the moisture content for commercial area:

Component	Moisture content (%)			
	Sample-I	Sample-II	Sample-III	Average
Vegetables	58.8	60.2	62.1	63.5
Food waste	60.2	61.2	60.8	60.7
Glass	9.3	8.0	6.2	7.8
Wood	11.1	3.6	7.14	6.9
Textiles	6.6	8.0	3.4	6.0
Paper	4.6	6.0	3.8	4.8
Cardboard	3.5	4.0	6.4	4.6
Miscellaneous	3.1	5.0	2.8	3.6
Plastic	3.1	2.6	4.0	3.2
Rubber	0.0	0.0	0.0	0.0

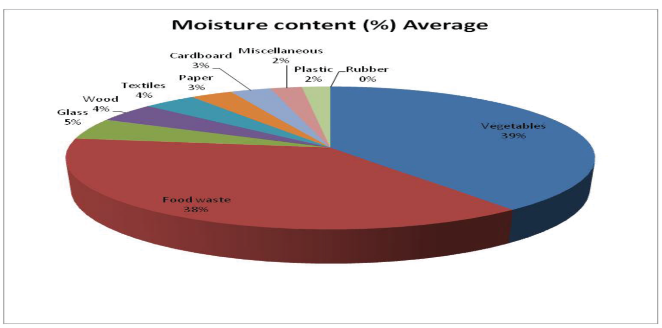

Fig: 1.1 Graph for the moisture content

The overall chemical compositions of the samples are as follows: carbon-16.1%, oxygen-12.4%, ash-4.3%, hydrogen-1.9%, nitrogen-0.1% and sulphur-0.0%.from the table

Table-1.2 Average value of the chemical composition for commercial area:

Composition (%)	Sample-I	Sample-II	Sample-III	Average
Carbon	15.3	16.3	16.7	16.1
Oxygen	11.9	12.2	13.1	12.4
Ash	5.5	3.2	4.2	4.3
Hydrogen	1.6	1.7	2.6	1.9
Nitrogen	0.1	0.1	0.1	0.1
Sulphur	0.0	0.0	0.0	0.0

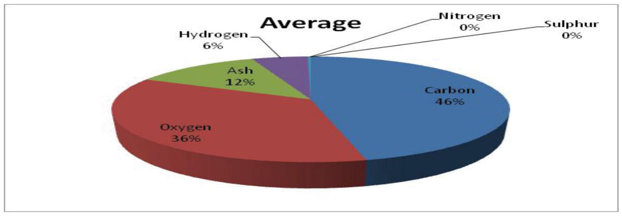

Fig: 1.2 Graph for the chemical composition

The overall Energy (calorific) values of the samples are as follows: rubber-41983kj/kg, plastic-36254kj/kg, wood-17215kj/kg, cardboard-16556kj/kg, paper-15228kj/kg, textiles-14375kj/kg, food waste-5826kj/kg. From the table-4.3

Table - 4.3 Average value of the calorific values for commercial area:

Component	Calorific value (Kj/kg)			
	Sample-I	Sample-II	Sample-III	Average
Rubber	41983	41983	41983	41983
Plastic	36308	36508	35948	36254
Wood	16993	16796	17858	17215
Cardboard	16782	16683	16205	16556
Paper	15266	15006	15414	15228
Textile	14268	14017	14840	14375
Food waste	5897	5810	5771	5826

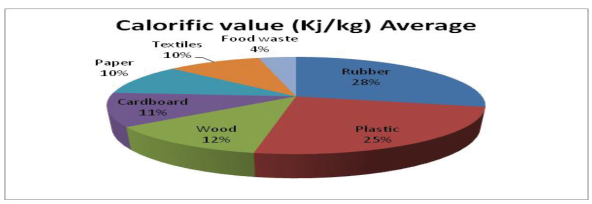

Fig: 1.3 Graph for the calorific values

Market area:

From the overall sample analysis of the individual components of the solid waste, it was observed that the moisture content of the components is as follows: vegetables-64.0%, food waste-61.4%, glass-4.7%, wood-6.9%, textile-7.2%, paper-4.8%, card board-4.8%, Miscellaneous-2.7%, plastic-3.3% and rubber-0.0%.from table-1.4.

Table-1.4 Average value of the moisture content for market area:

Component	Moisture content (%)			
	Sample-I	Sample-II	Sample-III	Average
Vegetables	64.1	64.5	63.4	64.0
Food waste	61.3	62.0	61.1	61.4
Glass	6.0	5.0	3.33	4.7
Wood	5.5	7.0	8.3	6.9
Textiles	9.0	8.0	4.6	7.2
Paper	6.3	5.5	2.8	4.8
Cardboard	3.1	4.2	7.1	4.8
Miscellaneous	2.5	3.0	2.8	2.7
Plastic	2.6	3.0	4.3	3.3
Rubber	0.0	0.0	0.0	0.0

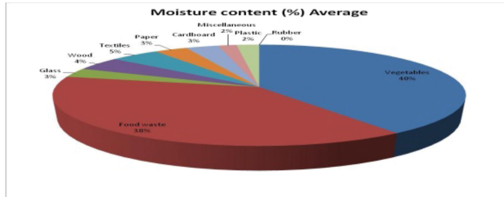

Fig: 1.4 Graph for the moisture content:

The overall chemical compositions of the samples are as follows: carbon-17.2%, oxygen-12.6%, ash-2.8%, hydrogen-2.03%, nitrogen-0.1% and sulphur-0.1%.from the table-4.5.

Table-1.5 Average value of the chemical composition for market area:

Composition (%)	Sample-I	Sample-II	Sample-III	Average
Carbon	17.5	17.1	17.0	17.2
Oxygen	13.2	12.7	12.0	12.6
Ash	2.3	3.0	3.2	2.8
Hydrogen	2.0	2.0	2.1	2.03
Nitrogen	0.1	0.0	0.2	0.1
Sulphur	0.0	0.0	0.3	0.1

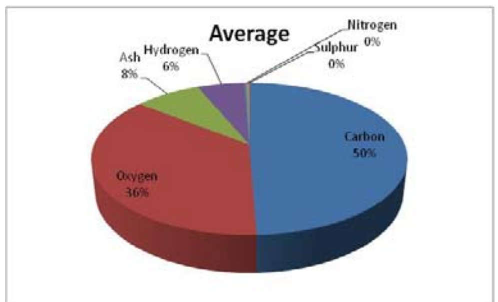

Fig: 1.5 Graph for the chemical composition

`The overall Energy (calorific) values of the samples are as follows: rubber-41983kj/kg, plastic-36228kj/kg, wood-17903kj/kg, cardboard-16520kj/kg, paper-15216kj/kg, textiles-14160kj/kg, food waste-5672kj/kg. From the table-1.6

Table-1.6 Average value of the calorific values for market area:

Component	Calorific value (Kj/kg)			
	Sample-I	Sample-II	Sample-III	Average
Rubber	41983	41983	41983	41983
Plastic	36508	36348	35828	36228
Wood	18217	17889	17605	17903
Cardboard	16862	16643	16057	16520
Paper	14950	15099	15600	15216
Textiles	13838	14018	14625	14160
Food waste	5789	5520	5708	5672

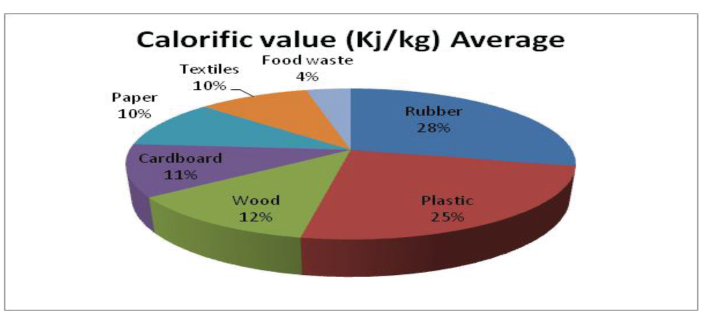

Fig: 1.6 Graph for the calorific values in market area

IV.CONCLUSION

Commercial waste

The moisture content of the overall samples is gradually increases in vegetables and lot of variations are observed in graphs. The food waste of the sample-1(60.2%) is increases to sample-2 after it is decreases (60.8%) as compared to sample-2(62.2%). This is due to the lot of changes in regular life.

Market area:

As per tables we observed that the values of moisture content in every sample consists lot of variations in every component that is in sample-1 as same as the commercial sample and the values are in lot of variations in each.

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