N. Munilakshmi, Prof.J.KarthiKeyan, E. Sanjeeva Rayudu / International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622
www.ijera.com Vol. 1, Issue 2, pp.360-362

ENERGY RECOVERY FROM TIRUPATI MUNICIPAL SOLID WASTE-GIS APPLICATION

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ABSTRACT

Status of Municipal Solid Waste (MSW) Management in Tirupati Municipal Corporation is presented in this paper. Quantity, physical components and chemical characteristics of MSW and collection, transfer and transport, processing and/or disposal practices are detailed. Further, Energy content of MSW is found out using Bomb Calorimeter. ArcGIS 9.3 is used to digitize the Geospatial Map of Tirupati Town.

Keywords: Solid Waste Management, Physical components, Chemical characteristics and Energy Recovery.

1.0. Introduction

Solid Waste Management involves various activities associated with generation, storage, collection, transfer and transport, processing and disposal of Solid Wastes in an environmentally compatible manner adopting principles of economy, aesthetics, energy and conservation. Solid Waste Management is one among the essential services and is an obligatory function of Urban Local Bodies (ULBs) in India. Being a populated country, problem of Solid Waste Management is becoming severe day by day.

1.1.Present Status of Solid Waste Management in Tirupati

Tirupati, the abode of Lord Sri Venkateswara is situated at latitude of 13^0 27^1 N longitude of 79^0 E and is spread over an area of approximately 18 sq.km. Tirupati has a residential population of 3,00,000 people and receives a floating population of around 50,000 per day . .

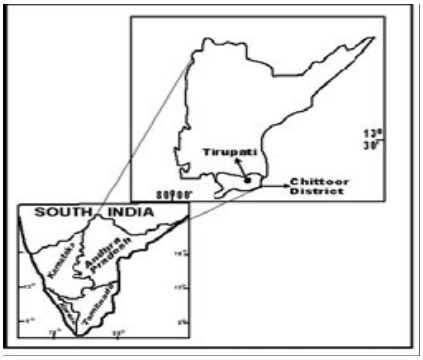

Figure 1: Location Map of the Tirupati Area

Wastes that are generated from different sources like residential and commercial premises, street sweepings, markets, hotels are stored in community storage bins (RCC pipe section open at both ends or Rectangular Hauling container made of iron), which are placed at certain places in the street.

Wastes are collected almost everyday. Tractors with Trailers are used to collect the refuse and are collected by the laborers manually. Each vehicle collects the waste from the bins and when full, the wastes are

transported to the site of disposal. After emptying, it comes back and again collects the Solid Waste from remaining areas. There are eleven tractors and each makes a minimum of two trips a day. It is observed that most of these vehicles are overfilled to its capacity and wastes are exposed to the open causing public nuisance.

All the wastes are transported to disposal site at Ramapuram, which is 18 Km away from the Tirupati Town and the wastes are disposed by open dumping without any supervision. The disposal yard presents an ugly look with heaps of solid waste left unsprayed and uncovered and emanates a foul smell and is a breeding ground for flies, rodents and pests.

1.2.Quantity and Waste Characteristics

Quantity and quality of municipal solid waste depends upon various factors such as lifestyle, food habits, standard of living, the extent of industrial and commercial activities in the area, cultural traditions of inhabitants, climate etc. Several studies, Karthikeyan (2008), Prasad (2008), Prasad, Karthikeyan and Srivastava (2009) have assessed quantity and Characteristics of Municipal Solid Waste generated in Tirupati. Rate of per capita generation of Municipal Solid Waste was determined as 0.337 kg/day. About 100 tones/day of Municipal Solid Waste is collected and transported to dumping place at Ramapuram.

Average physical components and chemical characteristics are as given in Table 1.

Table1: **Characteristics of Municipal Solid Wastes of Tirupati Town**

S. No.	Component/Parameter	Value,%
1.	Paper	11.61
2.	Plastics	12.25
3.	Rags	3.57
4.	Metals	0.25
5.	Rubber	0.09
6.	Glass	0.25
7.	Silt, fines and others	4.36
8.	Total Compostable matter	67.62
9.	Moisture Content	54.31
10.	Density, Kg/m^3	446.00
11.	Carbon	13.76
12.	Nitrogen	0.88
13.	Phosphorous asP_2O_5	0.575
14.	Potassium as K_2O	0.73
15.	pH	6.43
16.	Electrical Conductivity,mho/cm	5.76
17.	C/N ratio	15.64

(Source: Karthikeyan and Prasad, 2008)

1.3 Present Study:

In the present study, samples of Municipal Solid Waste are collected from different Residential, Commercial and Disposal site and analyzed for certain physical components and Energy content of the different components of Municipal Solid was determined using Bomb Calorimeter. Further ArcGIS 9.3 was used to digitize the information. Geospatial Map of the Tirupati Town is as given in the fig.2. Attribute data of sampling areas with respect to different components and energy recovery of Tirupati Municipal Solid Waste is as given in the Table 2.

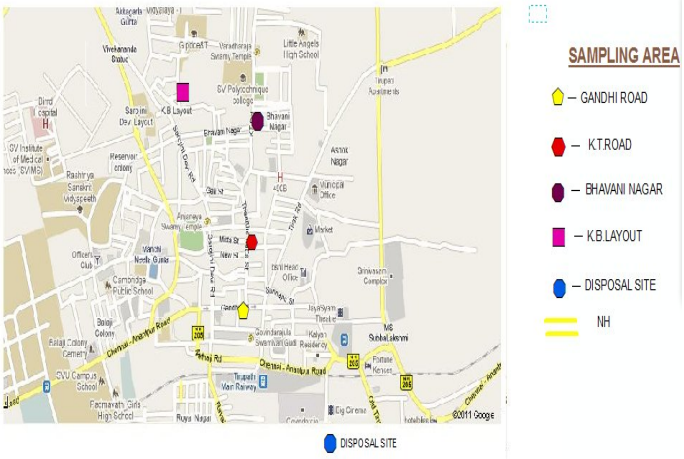

Fig.2: Geospatial Map of Tirupati Town showing sampling areas

Table: 2 Different components and calorific values of MSW of Tirupati

Attributes of MSW

FID	Shape *	Name	Paper	Plastic	Rags	O_M	Moiture	Glass	HCV_Paper	HCV_OM	HCV_MSW
0	Point	Gandhi Road(commercial)	19.6	15.66	14.141	34.88	38.5	0.127	3234.425	1658.88	2420.86
1	Point	T.K.Road(Commercial)	39.41	4.65	12.88	31.27	35.7	0	3823.382	1676.507	2294.68
2	Point	Bhavani Nagar(Residential)	11.42	6.38	0.0045	74.295	66.07	0.522	3267.25	1734.18	2053.24
3	Point	K.B.Layout(Residential)	19.5	11.38	0.8	55.11	69.46	0	3384.46	2048.4	2046.14
4	Point	Disposal Site	10.77	10	1.04	65.73	56.36	0.17	3294.771	1951.26	2056.17

(Note: - Components are in percentage and Calorific values are in Kcal/kg)

From Table2, The Organic content of Municipal Solid Waste is much higher. The value of organic matter is high in Residential areas and is less in Commercial areas. The value of paper is high in Commercial area and is less in Residential area. The Calorific value of Municipal Solid Waste is more in Commercial areas and is less in Residential areas. The Calorific value of organic matter is more in Residential area and is less in Commercial area. It follows from the Energy content analysis that the energy recovery from Solid Waste of Tirupati Municipality is high; above 2000 Kcal/kg and therefore has a high potential for Energy Recovery.

1.4. Conclusion and Suggestions

From the present investigation, following conclusions may be drawn:

1. Municipal Solid Waste Management in Tirupati is not satisfactory and deserves improvement. Quantity of Municipal Solid Waste is increasing day by day and this calls for a proper management of Municipal Solid Waste.

2. Location and placing of community bins are not convenient and this results in incomplete and improper collection with the wastes being thrown in open places and scattering around community bins.

3. Disposal of Municipal Solid Waste by open dumping is not correct and is associated with health hazards and environmental pollution.

4. A proper scientific approach should be adopted for collection, transfer and transport, processing and/or disposal of Municipal Solid Waste with material and energy recovery wherever feasible.

Some suggestions in this regards are:

1. Two bin systems to collect dry and wet waste separately.

2. Door to door collection is recommended.

3. Wet waste can be subjected to composting/vermi composting to get valuable manure.

4. Recycle materials or Recover energy from dry wastes.

1.5. Reference

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