Energy Estimation and Implementaion from Municipal Solid Waste

Ritu H. Nandanwar[1], Sagar M. Mohatkar[2], Vijay K. Moundekar[3], Pranav S. Sahu[4], Bhavesh R. Selotkar[5], Shanil M. Walondre[6], Sandip Chahande[7]

[1] UG Scholar, Electrical Engineering, PJLCE Nagpur, Maharashtra, India
[2] UG Scholar, Electrical Engineering, PJLCE Nagpur, Maharashtra, India
[3] UG Scholar, Electrical Engineering, PJLCE Nagpur, Maharashtra, India
[4] UG Scholar, Electrical Engineering, PJLCE Nagpur, Maharashtra, India
[5] UG Scholar, Electrical Engineering, PJLCE Nagpur, Maharashtra, India
[6] UG Scholar, Electrical Engineering, PJLCE Nagpur, Maharashtra, India
[7]Assistant Professor, Electrical Engineering, PJLCE Nagpur, Maharashtra, India

ABSTRACT

Energy can be recovered from waste by various technologies. It is important that recyclable material is removed first, and that energy recovered from what remains, i.e. from the residual waste. We can generate energy from most of the sources like solar, wind, hydro, coal as a fuel in plant etc. But in most there is cost problems for plant establishing, running, maintenance or availability of resources (fuels) which are going to be exhausted one day. So in the country like INDIA where the population is growing up drastically, the waste products are also making their places which may affect the people and the community in regretful manner. Therefore we will have to minimize and utilize it in useful work. So as for this purpose, a case study related to the municipal solid waste of local areas has been estimated and the certain calculations regarding the calorific value of waste as per the requirement of energy are done so that we can get better result in perceiving energy from waste. In this paper, the energy estimation from municipal waste is carried out for the city Nagpur which is located in central INDIA.

Keyword: - *solid waste, pellets, calorific value, waste to energy, generation*

1. INTRODUCTION

The electricity sector in India supplies the world's 6th largest energy consumer accounting for 3.4% of global energy consumption by more than 17% of global population. About 65.34% of electricity consumed in India is generated by thermal, 21.52% by hydroelectric power plants, 2.70% by nuclear power plants. Rapid economic growth has created a growing need for dependable and reliable supplies of electricity, gas and petroleum products. Due to the fast-paced growth of India's economy, the country's energy demand has grown an average of 3.6% per annum over past 30 years. In India, the typical rate of population increase is about 23% and in the urban areas is about 35%. Rate of increase of solid waste generated is 1.3% annually. This paper deals with the extraction of such information of the total waste generated and then segregation is carried out into two waste categories i.e. dry waste and wet waste. This paper deals with estimation of the amount of solid waste generated by the Nagpur city to generate electricity using spatial technique.

However, it is estimated that by the year 2025, 37% of the population of India i.e., 450 million will live in urban areas. Urban occupations generally fetch higher incomes -whether in factories or in the service sector or in petty businesses. Higher incomes enable higher levels of consumption. The impact on waste generation in the urban areas is a compounded effect of the proportionate increase in urban population, improved levels of income and change in the pattern of consumption. Urban solid and liquid waste has two principal components. One is the municipal solid waste (MSW) which includes commercial and residential waste generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous waste, e-waste and including treated bio-medical waste as defined in the MSW Rules, 2000. The other is the liquid waste that is sewerage. This paper is focused on MSW and hence the discussion that follows is exclusively on MSW.

1.1 Description of town

Nagpur also known as 'Orange City' is spread across an area of 217 sq.km with population of 2.5 million (Census2011). The city is located at the geographical centre of India. It is also the second capital of the Maharashtra state. The city is an educational hub and also emerging health hub in central India. With growing population coupled with urbanization and increasing floating population, the city is under pressure to meet the growing demands of its citizens. It is estimated that the city will grow to population of 4.3 million by 2041. Presently, the city generates 900-1000 TPD of waste, out of which only 150-200 TPD of waste is being processed. Evidently, the waste management system in Nagpur is presently inadequate. Irregular collection services along with limited processing and disposal facilities have led to open dumping of huge quantity of waste, which can have significant environmental and health impacts in future. The city is also poised to develop as a 'Smart City', with support from the Smart Cities Mission of the Government of India.

1.2 Collection of MSW

According to N.M.C waste management there are 10 zones in Nagpur city. Nandanvan area comes under zone no.5 and the total production of solid waste is 109.4 metric-ton as recorded on dated 1/12/17.

KRM Kanak Resources Management Limited
CIN : U74140DL2007PLC170750

INVOICE

BILL NO: KRML/2017-18/09 DATE : 31/12/2017

Name of Client : Nagpur Municipal Corporation,
Nature of Job : Transportation of Municipal Solid Waste of Nagpur City

Ref : Your Work Order No. HO/1622/MSC Dated 8.1.2008

Bill for the period from 01.12.17 To 31.12.17

NO.	Date	Quantum of Waste (in MT)	Rate Per MT	Amount Rs.
1	01.12.2017	1148.48	1306.87	1500914
2	02.12.2017	1122.52	1306.87	1466998
3	03.12.2017	1195.61	1306.87	1562507
4	04.12.2017	1159.38	1306.87	1515156
5	05.12.2017	1135.64	1306.87	1484134
6	06.12.2017	1167.66	1306.87	1525771
7	07.12.2017	1117.47	1306.87	1460323
8	08.12.2017	1145.28	1306.87	1496732
9	09.12.2017	1178.50	1306.87	1540747
10	10.12.2017	1130.21	1306.87	1477038
11	11.12.2017	1150.63	1306.87	1503802
12	12.12.2017	1009.24	1306.87	1318946
13	13.12.2017	1121.58	1306.87	1466151
14	14.12.2017	1109.68	1306.87	1450181
15	15.12.2017	1158.26	1306.87	1513695
16	16.12.2017	1205.47	1306.87	1575393
17	17.12.2017	1122.52	1306.87	1466998
18	18.12.2017	1193.14	1306.87	1559275
19	19.12.2017	1142.50	1306.87	1493095
20	20.12.2017	1084.66	1306.87	1417510
21	21.12.2017	1203.25	1306.87	1572491
22	22.12.2017	1187.15	1306.87	1551451
23	23.12.2017	1224.36	1306.87	1600379
24	24.12.2017	1201.17	1306.87	1569773
25	25.12.2017	1237.07	1306.87	1616690
26	26.12.2017	1137.49	1306.87	1486552
27	27.12.2017	1213.89	1306.87	1586398
28	28.12.2017	1176.48	1306.87	1536168
29	29.12.2017	1222.01	1306.87	1597068
30	30.12.2017	1209.42	1306.87	1580555
31	31.12.2017	1240.89	1306.87	1621682
	Total	36046.60	1306.87	47108220

(Rs. Four Crore Seventy One Lacs Eight Thousand Two Hundred & Twenty Only)

For Kanak Resources Management Ltd

Kamlesh Sharma
Head (Project)
KRML - NGP

2. PROCESS OF ENERGY FROM WASTE

We were collected data of solid waste from N.M.C and the next step is to analyze the whole data zone wise of Nagpur city. After this process we took sample of solid waste and visited the anacon lab, for testing the sample of solid waste and obtain the calorific value of it. On the basis of calorific value we calculated the approximate energy generation and compared energy from coal the flow of operation is as shown in figure below.

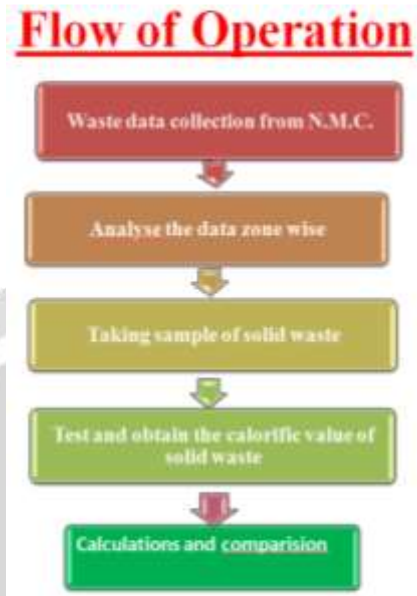

Fig - 1: Flow of Operation

2.1 Pelletization and Fluff as an RDF to Support Combustion Technology

Refuse Derived Fuel (RDF) is a segregated combustible fraction of MSW. The combustible fraction of the waste is transformed into fuel pellets by the compaction of waste or shredded and converted into fluff, enriched in its organic content by the removal of inorganic materials and moisture. Due to reduction in fuel particle size noncombustible material, RDF fuels are more homogeneous and easier to burn than the gross MSW feedstock. The RDF burning technology includes spreader stoker fired boiler, suspension fired boilers, fluidized bed units, and cyclone furnace units. In order to derive optimum advantage from RDF towards saving fossil fuel; secondary fuel like biomass, rice husk and other agro wastes can be used in small proportions for co burning to generate energy.

4. CONCLUSIONS

The scope of future waste generation is here analyzed by forecasting method, illustrates the estimates of waste quantum for period from 2011 to 2035 which shows that if the growth of population and the growth of percentage increase in per capita waste generation rate will be increase proportionally. The result shows that the expected municipal solid waste generation by Chandrapur metropolitan city in 2035 is 200 tons per year. With rapid development of economy and change of living standard, waste composition is expected to change. For a decoupling to take place between economic growth and waste generation, the waste generation by firms and households in relation to their economic activities must decrease in the future. A number of studies have found that the higher the household income and standard of living, the higher the amount of MSW generated. The per capita waste generation rate is changing decades to decades (0.2 kg/capita in 1981 and 0.47 kg/capita will be in 2035) due to change of economic growth. In Kolkata, municipal solid waste is still collected without segregation and treatment facilities are also very limited. The proper disposal of municipal solid waste is a necessary step, to minimize the environmental health impacts and degradation of land resources. The present study also indicated that much larger land areas need to be used for landfill shortage of natural resources such as land because the municipal solid waste generation will be increase. The biodegradable waste can be processed by aerobic composting, vermi-composting, anaerobic digestion or any other appropriate biological processing for stabilization of waste. Regarding municipal solid waste to energy, it should be either thermally treated or biologically treated. The other options are Pyrolysis and Plasma technology which are not cost effective. It is necessary for the success of such technology in Chandrapur to evolve and integrated waste management system, coupled with necessary legislative and control measures.

5. REFERENCES

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