Solid Waste Treatment Processes – A Case Study For Ahmedabad Municipal Corporation

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Abstract— Nowadays climate change especially global warming has raised humans' concern regarding environmental problem and a part of global warming results from inappropriate waste management. Waste is an important contributor to co_2 emission in world. There is a real need to alternate waste treatment to deal with above requirement.This research paper sets out a methodology for discovering best waste treatment that reduces the generation of green house gas. This research paper also directs to estimate waste arising in Ahmedabad Municipal Corporation.for 20 years from the year 2011-2031 and to calculate co_2 emission for a number of different waste management systems in the future.

Key words: Solid Waste Treatment Processes, Recycling, Composting, Energy from waste (EfW), Mechanical Biological Treatment (MBT), Pyrolysis, Higher Recycling, exponential growth, land fill, green house gas emission.

I. INTRODUCTION

Ahmedabad City and Ahmedabad Municipal Corporation are located on the western part of the India and has ranking as Mega City in National Sanitation Ranking 2009 as 19 with an area of 466.14 sq. km . Population of the Ahmedabad city is projected for the year 2021 as 75.73lakhs (Formula of Geometric Progression is used for projection) Ahmedabad Municipal Corporation as a waste disposal authority is composed of six zones viz. Central Zone, West Zone, North Zone, East Zone, South Zone and New West Zone. In this research paper, the carbon dioxide emission that is directly and indirectly caused by an actively or is accumulated over the life stages of products is considered.

II. NEED OF THE RESEARH PAPER

(A) Ahmedabad Municipal Corporation has at present very limited waste management processes. They dump all types of waste in open area known as Pirana Dump Site. It is therefore necessary to study the different methods of management for Ahmedabad Municipal Corporation and to recommend the treatment which gives minimum emission of carbon dioxide .

III. LITERATURE SURVEY

A. SUMMARY OF RESEARCH PAPERS:

(A Michael Smith (VESHENGRO) The Chartered Institution of Water and Environmental Management CIWEM) believes that recycling is too far through the life cycle of a product to deliver the kind of carbon savings that are required to meet UK's ambitious emissions reduction targets. The focus for waste management should be on resource efficiency, prevention and using waste as a resource.The Chartered Institution of Water and Environmental Management (CIWEM) believes that recycling is too far through the life cycle of a product to deliver the kind of carbon savings that are required to meet UK's ambitious emissions reduction targets. The UK generates some 342 million tonnes of waste per annum so the prevention represents the most effective way to reduce emissions as it reduces the consumption of raw materials and to expend further energy in managing the waste further down to line and then doing something else with the raw materials. This creates glass can be reused to infinitium by cleaning and sterilising it. Even wine bottles should be reused and refilled with the product they originally held but there is something about. All the talk is about time and again is recycling by collecting and breaking as in glass , the stuff up melting into glass. Plastic bottles are another kettle of fish and cannot be reused and then should be recycled into other things or turned into energy.

B. chartered institution of water and environmental management on energy recovery of waste (efw):

The policy position statement of (PPS) of CIWEM considers the issue surrounding the potential potential expansion of energy from waste as a waste management solution and sets out the position of CIWEM on how best to progress the sensitive issue. CIWEM energy recovery from waste has a legitimate role to play in the portfolio of sustainable waste management measure. CIWEM supports under use of combined heat and power (CHP) which represents the most efficient method of energy recovery from waste and encourages considerable of the role that it could play on reducing on reliance on conventional fossil fuels.CIWEM considers that government should assess the current and likely future for waste derived fuels that are still classified as waste especially in high energy use in industries where security and diversity of fuel supply could deliver on commercial advantage. CIWEM considers that energy from waste (EfW) has a significant role to play meeting the land fill directives targets adopted by municipal corporations for the diversion of biodegradable municipal waste from the land fill.CIWEM considers that the public perception of energy from waste is clouded by part performance and the strigent emission standard which must now be adhered to one such EfW should provide no greater air pollution than may common and widely accepted sources.Energy recovery from waste describes the process in which energy (in the form of heat) is recovered from the incineration of waste used to generate electricity which is then fed back into the national grid,or provide both electricity and heat (combined heat and power) to near by communities or other uses.Expansion of EfW has also been set against the need to deliver reduction in the amount of green house gases.Key Issues are (i) EfW is a sustainable waste management tool (ii) Public opposition and concern/perception pollution.(iii) The primary pollutants are dioxides, heavy metals, acid gases, nitrogen oxides and

particulates has resulted in fear and opposition because of their carcinogenic properties and persistence in food chain. Other pollutants can cause respiratory illness in susceptible individuals. Incineration are also efficient because energy is expended in rmoving moistures from the refuses and in scrubbing pollutants from gas.

C. PROFESSOR PAUL BARDOS, ENVIRONMENTAL TECHNOLOGY ON MECHANICAL BIOLOGICAL TREATMENT (MBT):

His opinion is that this is a well characterised technology potential to generate large volume of recycling, green house gas positive but not proved, no land fill, no incineration. Products are typically low, environment may not be much reduced compared with land fill incineration, versality, design to fit local circumstances.Biological pathogens, toxic substances.

D. PYROLYSIS TECHNOLOGY.AUTHOR RESEM COMPANY OF CHINA MUNICIPAL SOLID WASTE:

Cost effective and sound management (municipal is a pressing need in major population areas with high volume of waste and a few disposal sites. MSW treatment bottle necks are mainly associated with a mixed composition of waste stream that is difficult to process effectively safely using many applicable technologies. RESEM waste conversion can handle various materials various materials mixed together in everyday MSW stream including textiles, leather, rubber, and plastic goods, plastic bottles , varnish and oil paint waste, paper, card board, kitchen waste and convert them to a valuable by- products on a continuous basis with no harmful emission to the environment. Its combustion free methodology allows them to eliminate residual and fly ash emission into the environment. Pyrolysis is the only system to provide complete allowing molecular decomposition and destruction of dioxins and furans allowing for the most environmental friendly approved to waste treatment and commercial of the solid residue Advantages are (i) Conversion of upto 100 % waste (ii) No green house and other harmful gas emission in the atmosphere (iii) No toxic waste to dispose (iv) No dioxins in the off-gas and the solid residues. (v) Reduced Public Health Risk (vi) Simultaneous treatment of various types of waste materials (vii) Reliable energy source, high energy out put (viii) High conversion efficiency (ix) Carbon credits production (x) Low capital and operational costs (xi) Low energy consumption (as compared to alternate management scenarios).

E. THE BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE situated at NORTH CAROLINA (USA) ON GASIFICATION TECHNOLOGY.:

The burning of a waste in incinerator causes well known negative environmental and public health effects. Incinerators emit nitrogen oxides, sulphur dioxide, particulate matter, carbon monoxide, acid gases, lead, cadmium and mercury and organic components. Gasification facilities share the some environmental problems associated with mass burns incinerators include (i) Air Pollution (ii) Water Pollution (iii) Disposal of air and other by- products (iv) Large amount of water for cooling purposes (vi) Health Safety and odour impact (vii) Diversion of waste from recycling and composting. (viii) The gas produced from municipal waste contains hazardous organic components but the technology to these toxins does not exist on commercial scale.

F. COMPOSTING AND LAND FILL: AUTHOR WIKIPAEDIA: .

As concern about land fill space increases, worldwide interest in recycling by means of composting is growing since composting is a process for converting decomposable organic materials into useful stable products. Composting is one of the only ways to revitalize soil vitality due to phosphorous depletion in the soil.

IV. METHODOLOGY

A seminar on 14th July 2013 was held at Gandhinagar by AMC. The road map showing the target of zero waste to be achieved by the year 2031 was circulated amongst the participants. AMC under their web site has shown that waste collected was 750 MT. Daily in 1981 and 4000 MT. Daily in 2011. The web site also indicated that the growth is exponential. The number of households and population figures as on year 2011 are also given in the web site. These figures are projected for the year 2031 to calculate the co_2 emission. The co_2 gas emission is taken as indicator for arriving the best solid waste treatment to be recommended which gives the minimum off- set advantage of co_2 gas emission. The following solid waste treatment processes are proposed in this research paper:

(1) Recycling at 26 % and land fill with composting at 74 %.
(2) Recycling at 40 % and land fill with composting at 60 %.
(3) Recycling at 50% , energy from waste at 25% and and land fill and composting at 25%
(4) Recycling at 50%, Mechanical Biological Treatment at 40% and land fill with composting at 10%.
(5) Recycling at 50%, gasification at 40% and land filling with composting at 10%.

The quantities of components of the above solid waste treatment processes are calculated year wise taking the growth rate at 30%. The quantities are calculated from the quantities calculation from 2011 to 2031.

V. IV BASIS FOR QUANTIFICATION OF ABOVE SOLID WASTE TREATMENT PROCESSES, QUANTIFICATION OF GREEN HOUSE GASES, DOMESTIC CO_2 EMISSION, TRANSPORT EMISSION FACTORS .

Bases for calculating the co_2 emissions for the components of the above solid waste processes were searched for Indian Conditions but not found. However such basis were found as those framed by DEFRA (Department of Environmental Food and Rural Affairs) for United Kingdom. These bases are adopted for quantification of said components.

VI. CONCLUSION, AND RECOMMENDATIONS

A The quantification for green house gases are calculated based on above factors for all the five scenarios. The off- set advantage by comparing the above five scenario were calculated. It was found that scenario-3 i.e Recycling at 50 %, energy from waste at 25 % and Land Fill and composting

at 25% gives the maximum off- set advantage while comparing with scenarios 1,2,4 and 5. This scenario is recommended to AMC for adoption. This will encourage the private enterprise which is retained by AMC in getting more quantities for fuel.

ACKNOWLEDGEMENT

DO THE BEST AND LEAVE THE REST TO GOD: Proverb:

A On the occasion of successful completion of my work, I offer my salutation to the "ALMIGHTY"-" The Supreme Being" in making the dream a reality, whose grace has always enlightened my path and led me towards the journey of knowledge and wisdom.With a sense of gratitude and respect, I would liketo extend my heartfelt acknowledgement to all those souls who have awarded their help and guidance during the entire period of dissertation .First of all, I take the opportunity to express my intense feeling of gratitude towards my guide Prof. Dr. N. S Varandani, Head of the Department, Environmental Engineering, L. D. College Of Engineering, Ahmedabad for his extremely good suggestions, guidance and constant inspiration at every stage of this dissertation work. His trust on me helped me to complete my work successfully. His focussing ability and criticism helped me always during my work. His untiring guidance, constant encouragement and stimulating suggestions helped me to fulfil this task. His faith in my ability has led me a path of confidence and determination. This dissertation would never be completed without his support, helpful comments, insightful suggestions and criticism at various stages in addition to his generous time spent on reviewing my dissertation. I express my obligation and thanks to my faculty members of Environmental Department. Management.

REFERENCES

Dissertations:

[1] Waste Management What is the best alternative treatment to reduce municipal waste going to land fill in terms of carbon foot print BY TAKESHI SHIMOTAYA

MANUALS:

[1] Manual on water supply and Treatment , Third Edition Revised and updated by central public health and enironmental organisation , ministry of urban development, new delhi
[2] Manual on Municipal Solid Waste Management by central public health and environmental organisation, ministry of urban development, new delhi
[3] Manual on Sewerage and Sewerage Treatment second edition by central public health and environmental organisation, ministry of urban development, new delhi

WEB SITES:

[1] http://www.egovamc.com/ downloads/ downloads.aspx of Ammedabad Municipal Corporation
[2] The chartered Institution of water and Environmental Management (ciwem-2005"Composting "http// www.ciwem.org/policy/policies/composting.aspx viewed on 31st July 2008
[3] The chartered Institution of water and Environmental Management (ciwem) - 2005"Energy Recovery from waste" http:// www.ciwem.org/policy/policies/energy recovery from waste.aspx viewed on 31st July 2008
[4] The chartered Institution of water and Environmental Management (ciwem -2006" http : // www.ciwem.org/policy/policies/mechanical biological treatment of waste.aspx viewed on 31st July 2008
[5] The chartered Institution of water and Environmental Management (ciwem)- 2006 "Recycling http : // www.ciwem.org/policy/policies/recycling.aspx viewed on 31st July 2008
[6] DEFRA (3/05/2005) Land Fill AllowanceTrading Scheme Background http://www.defra.gov.uk/ environmental/ waste/ local auth/ lats/ intro.htm viewed on 3rd August 2008
[7] DEFRA (2005)" The Land Fill Allowance Trading System.The Penalty scheme. http://defra.gov.uk / Environmental waste/ local auth/ lats/ pdf/ lats faq-08.pdf viewed on 3rd August 2008
[8] Japan Aluminium can recycling association (2000) " Aluminium can recycling rate around the world http://alumi-can.or.jp/data/kunibetu- recycle pdf viewed on 28th July 2008
[9] Juniper (2005) "Mechanical Biological Treatment: A guide for decision making processes and policies and markets The Summary Report" http://.juniper.co.uk/publication/downloads..html viewed on 1st August 2008

APPENDIX – 1

NATIONAL AVERAGE PERSONAL CO_2 EMISSION USED IN THE ACT ON CO_2 CALCULATIONS

National Average	House Hold kg co_2	Individual	Percentage
House	4569	2004	44.7
Appliances	1556	683	15.20
Travel	4096	1796	44.10
Total	10,221	4483	100. 00

Table 1: National average

