Solid Waste Management in Mahaboobnagar Municipality

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ABSTRACT:

The 74th Amendment of the constitution of India in 199, made Municipal authorities in the country as a thi tier to government. The 12th schedule of the constitution envisaged functions to be performed by t municipal authorities, one among these functions is solid waste management. The Ministry of Environme and Forest has notified municipal solid waste rules 2000 under the Environment Protection Act 198 According to these rules all municipal authorities were expected to improve solid waste manageme practices in terms of a fore said rules by 2003, but the situation did not improve as expected for want adequate technical knowledge, there is no proper management facility for solid waste. Uncontrolled dumpi of municipal solid waste has been observed at the road side. There is no processing facility or dispos practices in any urban local bodies. The biomedical slaughter house waste is getting mixed with solid was and altering the characteristics of waste hence there is a need to develop a proper management systems. Th paper presents the waste management system of Mahabubnagar municipality in Andra Pradesh State of Ind to implement municipal solid waste rules 2000. Expeditiously in Mahabubnagar municipality by the proce of modernizing the system of solid waste management.

Key words: *solid waste management,emissions,land filling,biological process, green house gases.*

I. INTRODUCTION:

At 1992 Rio Earth summit, countries agreed to the UN(United Nations) framework convention on climate change (UNFCCC) in response to growing evidence that human activity was contributing to global warming. The UNFCCC contained a non binding commitment by industrialized countries that they would reduce their emission of green houses to 1990 levels by the year 2000. It soon became clear that this wasn't enough to avert the dangerous climate change and in1995, at the first conference of parties (COP1) after the convention came into force, parties began to negotiate a protocol that would set tighter and legally binding targets for reducing green house gas emissions. In 1997 at the third COP the convention at Kyoto in Japan, parties agreed on a protocol that set target for industrial used countries to reduce their emissions by an average of 5.2% below 1990 levels in the period 2008-2012 known as the first commitment period.

The Kyoto protocol of 1997 is crucial step in the implementation of the United Nations framework convention on climate change as it sets legally binding emission targets for a basket of six green house gases. A market mechanism called emission trading was established under the Kyoto protocol which allows governments or private entities in the industrialized countries to implement machine reduction projects and receives and credit in the form of certified emission reductions (CER) also called carbon credits. In the Kyoto protocol the developed countries committed themselves to reduce their GHG emissions by 5.2% by 2012. To reach Kyoto protocol allowed three flexibility mechanisms, they are Joint Implementation (JI), Clean Development Mechanism (CDM), and International Emission Training (IET). These are defined wide article 6, 12 & 17 of Kyoto protocol respectively. The clean development mechanism is a project based mechanism to assist developing countries in meeting the targets to reduce GHG in achieving their sustainable development objectives such CDM products would also lead to indirect benefits in the host countries like Income generation, Improvement more slightly to prove to be a primary funding source for climate change mitigation projects in developing countries as a part of multi-billion dollar Green House mitigation market.

Clean Development Mechanism Eligible Projects:

- Hydro power plants
- Tree Plantation, also using genetically modified tree
- Wind farms
- Solar Energy Projects
- Geothermal energy projects
- Biomass energy projects
- Waste incineration projects
- Projects Reducing emission of other Green House gases.

Methane and carbon dioxide are the emissions of solid waste dumping sites. Hence the option of composting of municipal solid waste is chosen to adhere to the clean development mechanism of Kyoto protocol.

II. METHODOLOGIES in MUNICIPAL SOLID WASTE PROCESSING TECHNICS:

One of the most important aim of municipal waste management is the safe disposal of waste generated daily this would involve separation of recyclable fraction and recycling the same, beneficial utilization of organic fraction of the waste and disposal of inert into the landfill.

There are several municipal solid waste processing technologies which are being followed in various parts of the world. Besides source reduction, reuse and recycling broad categories of available technologies for processing municipal solid waste.

Table: I

MUNUCIPAL SOLID WASTE PROCESSING TECHNIQUES	
Waste processing technology group	Waste processing technology
Thermal processing technologies	Incineration
	Pyrolysis
Biological processing techniques	
	Anaerobic digestion(bio-methanation)
Physical processing technologies	Pyrolysis\gasification
	Plasma arc gasification
	Aerobic digestion(composting)
	Size reduction

Final functional element in solid waste management system is treatment and disposal the present practice is to disposal of wastes by land filling or uncontrolled dumping at the disposal yard the proposed disposal system has been revised synchronizing with the storage and primary collection and taking into account municipal solid waste rules 2000. Land filling shall be restricted to non biodegradable, inert waste and other waste those are not suitable either for recycling or for biological processing land filling shall be carried out for residual of waste reducing policies as well as preprocessing rejects from waste processing facilities. Land fill site shall need the specification as given in schedule 3 of municipal solid waste rules 2000.

The decision to implement any particular technology needs to be based on its techno economic viability, sustainability, as well as environmental implications. The key factors are:

- The origin and the quality of municipal solid waste
- The quantity of waste generated
- Market for final products compost/power
- Commercial fertilizer prices prevailing
- Land price capital and labor cost
- Capabilities and experience of the technology provided.

It needs to be ensured that the proposed facility should fully comply with the environmental regulations laid down in the municipal solid waste rules 2000 issued by ministry of environment and forests, New Delhi.

When the above factors are applied for Mahabubnagar municipality it is recommended to have composting process as option. Composting process

- Technology is techno commercially available'
- Technology meets the regularity requirements and is socially acceptable with minimum impacts to the environment and citizens.
- Quantity of waste is less than 150 tons per day making composting operationally feasible.
- Sufficient land availability for establishing of facilities and all other related infrastructure.

III. CASE STUDY – SOILD WASTE MANAGEMENT in MAHABOBNAGAR MUNICIPALITY:

Mahabubnagar is situated towards the southwest at a distance of 100 km from Hyderabad city. Mahabubnagar is located at 16.73^{o}N, 77.98^{o}E and at an elevation of 493 mts, and spread over an area of 18472 sq.kms. Population of Mahabubnagar is above 139534 as per 2001 census, with 22763 numbers of households. The climate of Mahabubnagar is hot and humid, tropical, summer temperature is 32- 42 centigrade, winter temperature 10^{o} - 32^{o} and with annual rain fall of 355 mm. Mahabubnagar generates about 70 metric tons of waste every day from households, shops and workshops offices and institutions etc…, waste is directly transferred from the primary collection tool into the transportation vehicles the available infrastructure with the municipality 70 tricycles, 10 tractors, hand carts 100. The municipality transporting all collected solid waste to the 25 acre existing dumping yard. The quantity of waste generation is estimated and considered by using the secondary sources and primary survey results.

As per municipal records quantity of waste generation in Mahabubnagar is about 70 MTPD.The sources of the waste contributing to the total tonnage is given in the

Table: II

TOTAL QUANTITY OF WASTE GENERATED			
SNo	Source	Total waste TPD	% of Waste
1	Domestic house holds	36.47	52.1
2	Commercial establishment	9.32	13.32
3	Marriage and function halls	2.95	4.21
4	Hotels and lodges	2.84	4.06
5	Markets	2.21	3.16
6	Schools and institutions	1.45	2.07
7	Street sweeping and drain cleaning	13.44	19.2
8	Hospital waste	0.87	1.24
9	construction	0.45	0.64
	Total waste generated	70	100

From the above table it is seen that average per capita generation is about 0.36 kg per capita per day. Apart from the above waste generation was also assessed based on the capacity of each vehicle and the number of trips made in a day to the dumping site. The necessary details were collected and the waste quantity reaching the dumping yard is found to be 45-53 tons per day which translates to about 0.8-0.36 kg per capita per day. However the quantity of waste within the dumping site is about 70-90% of the generated quantity thus per capita generation is 0.36 kg per day.

But the national average per capita generation of waste semi-urban tons is around 0.30 to 0.35 kg per capita per day. Therefore per capita generation for all future projections for Mahabubnagar is taken as 0.36 kg per capita per day. Hence the waste generation for Mahabubnagar town can be taken as (146972*0.36) is 52.9 TPD say 53 TPD.

Composition of Waste :-

Waste compositions are addressed in the form physical as well as chemical parameters. The following sections give information on both
physical and chemical characteristics of waste. Men technique

Physical composition:-

The information on the quantity of waste generated and its composition are the basic needs for the planning of a solid waste management system. Quantity and characteristics of solid waste generated varies with income, socioeconomic conditions, social developments and cultural practices. The characteristic and quantity of waste generated based on the income pattern is presented in following table.

It is noticed that in high income countries the waste generated is more compared to that of low income countries whereas the density of waste is low from high income countries and high in low income countries indicating that more volumes are generated in high income as compared to low income.

Table: III

PHYSICAL COMPOSITION OF WASTE OF MAHABUBNAGAR	ITEM WISE GENERATION
ORGANIC WASTE: Comprising of leaves, Fruits, Vegetables, Food Waste, Coal, Fine organic matter, Hay and stray etc...	54.1
RECYCLABLES: Comprising of Rubber and Leather, Plastics, Rags, Paper, Wooden matter, Coconuts, Bones, Straw Fibers'.	12.2
INERT MATTER: Comprising of Ash, Earthen Ware (POTS), Stones and Bricks, Metals, Glass.	33.7
TOTAL	100.00

Chemical Characterisation Of Waste:-

Chemical characteristic considered for municipal waste are mainly moisture, nitrogen, phosphorus, potassium, C/N ratio etc…

Municipal Solid Waste sample was collected from the dump yard for Mahabubnagar town and analyzed for various chemical characteristics. The results are shown in the below table

Table: IV

Sl No	ITEM	UNIT	RESULT
1	pH(5% solution)	-	7.12
2	EC(5% solution)	103	415
3	Total Waste Soluble	Mg/gm	21.1
4	Moisture Content	%	40.23
5	Total organic Carbon	%	15.32
6	C/N Ratio	-	1:25
7	Calorific Value	Cal/gm	1241
8	Total Phosphorus	%	0.42
9	Total potassium As K	Mg/gm	3.64
10	Total nitrogen As N	%	0.62
11	Arsenic As As_2O_3	Mg/kg	<2
12	Cadmium As Cd	Mg/kg	<0.5
13	Chromium As Cr	Mg/kg	<5
14	Nickel As Ni	Mg/kg	22.3
15	Lead As Pb	Mg/kg	14.10
16	Zinc As Zn	Mg/kg	111.2
17	Copper As Cu	Mg/kg	<5
18	Iron As Fe	Mg/kg	4364

IV. EXISTING WASTE MANAGEMENT PRACTICES – MAHABOOB NAGAR:

The wastage is stored and transferred from primary collection tool into the transport vehicle. 80% of the population stores the waste at the source on the street open spaces and drains. 80% efficiency has been achieved for implementing the system of segregate of recyclable waste at the source. 80% of households, shops, establishments segregate the waste at the source. The ward wise storage depot details are given below:

Name of the ward- 38
No. of open storage sites- 250
No. of Masonry Bins – Nil
No. of round concrete pipe lines – 250
No. of covered metal containers - 12

Segregation of Recyclable Waste :-With 80% efficiency system of segregation of recyclable waste at the source is done. No special efforts are made by the municipality to educate the people to segregate recyclable waste. Traditional, segregation of recyclable waste is partially practiced by households / commercial establishment.

However the recyclable material is still disposed off by the residents along with domestic waste in a mixed form. This waste finds its way on the streets, in the drains, etc., Recyclable waste is, therefore, generally found mixed with garbage in the domestic bins, on the streets in the municipal bins and at the dumpsites.

Primary collection:-There are 23,000 household, 10,505 commercial and 100 industrial establishments and 75 institutional buildings in the town. System of primary collection of waste from the doorstep has been introduced in 80% households and establishments. The population covered for door to door collection is one lakh. The system of waste collection adopted in the city for collection of household waste, commercial waste, market waste, hotel waste, bio medical waste, construction waste is Two Bin System, Tricycle, Tractors.

Frequency of street sweeping:-The frequency and percentage of cleaning the roads and streets are represented in table:

Table: V

Status of Cleaning	% of cleaning the roads & streets
Daily	**90%**
Alternate Day	**5%**
Twice a week	**5%**
Once a week	**-**
Occasionally	**-**

The frequency of cleaning bins is done almost every day (90%) and sometimes alternate day (10%). The duty of street sweepers is 8 hrs / day. The work norms adopted by the street sweepers are area wise, ward wise and with assisted trained jawans. Street sweeping is done every day throughout the year including Sundays as well as public holidays. The minimum distance the sweepers had to walk with hand cart to unload the waste storage depot is 50m.The major tools given to safai karmacharis for street sweeping nala cleaning etc., are sped, baskets, axes, craw bar, drain cleaning sped, wheel borrows, shorthanded brooms.

Transportation of Waste :-The number of handcarts is 100 and tricycles are 70 with the solid Waste Management Department. 50% of the sweeper is provided with handcarts and 505 are provided with iron baskets. The quantity of waste transported is measured by visual estimate.
The details of transportation and employment are listed below table.

Table: I

Types of vehicles	Tractors
No. of vehicles	10 Nos.
No. of Drivers	10 Nos.
No. of shifts in which transportation activity	5 trips by each tractor
No. of trips made by each type of vehicle in one shift	

The average distance the vehicle has to travel to reach the processing/disposal site is 5 kms. The transportation of the waste is done every day including public holidays and Sunday also. The bio medical waste, hotel waste; construction waste is transported using tricycle. The quantity of waste transported is 35 tones in each shift.

Processing and disposal of waste :-No processing of the waste is being done by the Municipality, the area of land fill site is 5 acres and it will long up to 10 years. The dumping of the waste is done by the tractor and tricycles.

Existing Dump site Details :-In Mahabubnagar, the municipality has introduced door to door collection scheme of solid waste through tricycles. There are sufficient number of tricycles with a capacity of 0.5 Tone each were provided in 38 wards, where as the street and road heap collections were transported through wheel barrows of capacity 0.05 toned disposed primarily in the respective concrete collection and dumper bins. The concrete bins with a capacity of 2 tone and dumper placers with a capacity of 2 tonne were placed at the notified areas of Mahabubnagar Municipality.

The waste is being lifted by the municipal tractors with a capacity of 2 tone, dumper placers with a capacity of 2 tone, tipper with a capacity of 4 tone, and transported all collective solid waste at the selected dumping yard situated at survey No. 921, Koyalkonda x Road. Which are around 25 acres and 5 km away from the town.

Integrated Waste Management System: For designing any waste management facilities the points to be noted are the waste quantities generated, design period, waste quantity to be taken for the design period.
Waste qualification and characterization-:

Waste quantities depend on the population. The total waste generation from the municipality is measured or estimated based on the population of the town and the per capita waste generation. The future waste generation of the town is also been predicted.

Table: VII

Population Projections And Waste Quantities

Name Of The Town	Year	Population	Per Capita Kg/C/D	Waste Quantity TPD
Mahabubnagar	2009	146972	0.36	53
	2019	159470	0.4	64
	2029	171752	0.43	74

Design Period: - Processing facilities are designed for the period of 10 years as the life of the processing machinery is generally 10 years. Landfill facility is designed for 30 years period which would be constructed in phases. Landfill is designed for 30 year period.

Table: VIII

Waste Generation And Composition

Name Of The Town	Total Waste Generation	Organic Matter	Recyclables	Inert Materials
	TPD	TPD	TPD	TPD
Mahabubnagar	65	35	8	22

Design of Processing Plant –

Compost Plant:-Composting is the preferred option of processing for Mahabubnagar. Composting is a process of microbial degradation where organic matter is broken down by a succession of organisms in a warm, moist aerobic environment (controlled condition). Composting is form of recycling. Like other recycling effort, the composting of municipal solid waste that must help decrease the amount of solid waste that must be sent to a landfill thereby reducing disposal costs. Composting also yields a valuable product that can be used by the farmers, landscapers, horticulturists, government agencies and property owners as a soil amendment or mulch. The compost product improves the condition of soil, reduces erosion and helps suppress plant diseases.

Composting is an age old practice and the word compost is as old as agriculture itself. The solid wastes of plant and animal origin are utilized for conservation of carbon and mineralization.

It is the decomposition of organic matter by micro-organisms in warm, moist, aerobic and anaerobic environment. The compost made out of urban heterogeneous waste is found to be of higher nutrient value as compared to the compost made out of cow dung and agro-waste. Composting of municipal solid waste is, therefore the most single and cost effective technology for treating the organic fraction of the municipal solid waste. Main advantages of composting include improvement in soil texture and augmenting of micronutrient deficiencies. It also increases moisture holding capacity of the soil and helps in maintaining soil health with a concept of recycling nutrients to the soil. The composting does not require large capital investment, compared to other waste treatment options. At operation level, segregation of municipal solid waste is most important to avoid any toxic heavy metals present in the waste. The compost made from the local municipal solid waste can be marketed near the compost site itself to minimize transportation cost. There are many small and large composting projects in operation in India and

The designing capacities range from 100 to 700 TPD in different locations. Many of the composting facilities are being managed by the private sector through contract arrangements with the municipal authorities. In view of above advantages composting facility is proposed.

Windrow Platform*:*-The concrete yard is an essential infrastructure for preventing contamination of surface/underground water and nearby water bodies. In the instant case the concrete yard is designing in such a way that the fresh garbage received during the first 30 days is decomposed so that the volume and weight of the organic matter is considerably reduced. Inactivation is attained and the stability of organic matter is expected after 30 days.

Processing Equipments:- This is an area where the entire waste received is turned at regular intervals. Waste is shifted for feeding to the machinery. Rejects are pushed and the finished materials is also moved to bragging area. The front end pay loaders are essential for above activities.

As there will be a lot of dust and moisture during waste treatment process. These equipments require frequent and constant maintenance and therefore care is taken to provide adequate number of equipments includes 10 wheel tippers for crisscross movement of the waste / manure inside the treatment area and also to deliver finished materials to the required place within the primary marketing zone.

Designing of the concrete yard, processing machineries and equipments have been done in order to ensure treatment of the waste on a day to day basis. In a composting industry waste should not be made to accumulate as it gives out pollution and the cost of holding will also be heavy.

Following schedule will be adopted for turning of the windrows.: 1^{st} turning 5^{th} day of windrow formation, 2^{nd} turning 6^{th} day after 1^{st} turning 3^{rd} turning 6^{th} day after 2^{nd} turning and screening 6^{th} day after 3^{rd} turning.

Windrow turning mechanization and windrow formation:-Municipal solid waste received on each day will be formed into spate windrow everyday. Incoming vehicles will move only on the outer pathway. They will unload the material in the area designated for the purpose. Soon on unloading biological inoculums will be sprayed on the heap. Hydraulic excavators will lift the material and form the windrow. Outer row will accommodate 6 windrows.

- Daily in the flow of garbage X MT
- Bulk Density of garbage Y
- Volume of garbage received daily X/Y CUM

Cross sectional area of windrow:- (A+B)H/2 SQ.M

Where A = Base width; B = top width; H = Height, all meters,

.Length of windrow in meters, Total volume in cubic meters / cross sectional area in sq meters. An appropriate system is envisaged for continuous draining of leachate generated so that aerobic conditions are maintained inside the windrow for speedy composting.

Processing section*:* - Processing section is divided into three modules namely Preparation section, Secondary section, and Packing section.

Preparatory section*:* - In the preparatory section, the digested municipal solid waste will be passed through 75mm and 30mm trammel screens. The output will be stored in curing shed. The average retention period in the curing shed for 30 days. This will help in improving the quality of the end product. Further it will also increase recovery of composting and reduce rejects for land filling. The curing shed will have a capacity to accommodate 60 days of production.

Secondary section:- In the secondary screening section, the cured crude product will further passed through 16mm and 4mm screens. The output will be further passed through specific gravity separator to remove sand and other heavy impurities.

Packing section: -The compost so obtained will be stored in the area and it will be enriched with the nitrogen fixing and phosphorous stabilizing bacteria packed as per demand in the packing section. By splitting the screening operations into modules with adequate intermediate storage capacities, any breakdown of operations in one section will not affect operations in the other section or in other words each section can operate independently without creating bottlenecks. Capacities of each section is designed in such a way that backlogs created due to shut down or break down can be clearly subsequently overcome.

Table: IX
Compost Plant Area Requirements

Sl. No	DESCRIPTION	*UNIT*	*NOS*	*LENGTH (M)*	*BREADTH (M)*	*TOTAL AREA(Sqm)*
1	Open windrow platform	Sqm	1	70	30	2129.40
2	Preparatory Section	Sqm	1	10	10	300.00
3	Rejects Section	Sqm	1	4	4	120.00
4	Curing Shed	Sqm	1	20	20	919.29
5	Storage Godown	Sqm	1	10	10	204.29
	Total					3672.98

Proposed Systems for Disposal of inerts / Rejects Arising From Processing Operations:-The Municipal Solid Waste rules 2000 laid down the criteria for disposal of waste as under. Land filling shall also be restricted to non-biodegradable, inert wastes and wastes those are not suitable either for recycling or for biological processing. Land filling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from the waste processing facilities. Land fillings of mixed waste shall be avoided unless the same is found unsuitable for filling of mixed waste shall be avoided unless the same is found unsuitable for waste processing. Under unavoidable circumstances or till installation of alternate facilities, land filling shall be done following proper norms. Landfill sites shall meet the specifications as given in schedule III of the Municipal Solid Waste rules.

Land Sizing:-The volume of waste to be dumped in the landfill is worked out to 22 Metric Tons per day and the area required for 30 years is 3.00 Hectares.

Landfill design: - Main aspects covering the Landfill Design and Construction are: To minimize the possibility of contaminating surface and ground water, to have control over gaseous emissions and to minimize resource productivity

As suggested by MOEF guidelines a composite liner of two barriers made of different materials, placed in immediate contact with each other provides a beneficial combined effect of both the barriers. The liner system suggested by MOEF is a geo membrane layer over the clay or amended soil barrier. A drainage layer and leach ate collection system is placed over the composite liner system.

The effectiveness of the barrier layer basically depends on the hydraulic conductivity of the clay\amended soil layer and the density of the geo membrane against puncture. The clay\amended soil line r is effective only if it is compacted properly and geo membrane liner is effective only of it has the density or mass per unit area (minimum thickness is specified) is sufficient enough against puncture.

Starting from the bottom of the natural ground level, the following layer configuration are proposed for the bottom of the landfill.

Table: XI Bottom Liner System

LAYER NO	MATERIAL DESCRIPTION	THICKNESS
Layer 1	Barrier Soil Layer Comprising Of Clay or Amended Soil With Permeability Coefficient Less Than 1 x 10^{-7} cm\sec	900mm
Layer 2	High Density Polyethylene	1.5mm
Layer3	Soil Protection Layer	100mm
Layer 4	Drainage layer	300mm

Assessment of Leachate Quality: - Leachate refers to the liquid that has passed through or emerged from Solid Waste and contains dissolved materials removed from the solid waste. The Leachate generation is primarily a function of precipitation and is directly proportional to rainfall intensity and surface area. Leachate is basically generated from the active landfill area and after closure of land fill site.

Leachate quantity can be estimated for landfill and the leachate network is envisaged in such a way that leachate from the processing facility and landfill will be conveyed to centralized treatment plant to be treated to meet disposal standards.

Formula:-
I = P – PCR / O – AET +/- S
Where,
I = Rate of Infiltration
P = Precipitation
PCR / O = Coefficient of Runoff
AET = Actual Evapo - Transpiration
for Mahabubnagar is 72 KLD Soil moisture Content Retention
S = Capacity
Empirically,
For Capped portion of landfill: I = 0.01 P
For Uncapped portion of landfill: I = 0.07 P
Landfill with temporary cover: I = 0.3 P
Using the above formula leachate quantity assessed
Leachate Treatment – Process Description :
The treatment process (physical and biological processes) should be adopted in such a way that it should meet the disposal standards. The treatment process suggested is solar evaporation ponds / effluent treatment plant.

Table: XII Charecterisics of treated leachate

PARA METER	INLAND SURFACE WATER	PUBLIC SEWERS	LAND FOR IRRIGATION	MARINE COSTAL AREAS
pH	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
TSS(mg/l)	100	600	200	Floatable solids max 30mm. Settle able solids max 850microns
BOD (5 days @ 20^{o} C) mg/l	30	350	350	100
COD mg/l	250	-----	-----	250

Landfill gas collection and management system :
As only rejects after processing the municipal waste is proposed to be send landfill is categorized as inert and generated would be very minimal or negligible the quantity of gas generated from the landfill can be estimated with the help of method suggested in CPHEEO manual V = CWP/ 100 m^3/year.
Design of layers each with a specific function he surface cover system to enhance surface drainage, minimize infiltration support vegetation and control and release of landfill gases. The landfill cover to be adopted depends on the gas management system landfill cover and sequence of its laying: Final landfill cover is usually compose of several and as per the recommendations made by MoEF and CPHEEO.
Top cover layer of 450 mm thick with 300mm thick top soil and 150mm of vegetation supportive soil, drainage layer with 150mm thick clay liner with 600 mm thick and 200mm thick gas collection.

Details of Machinery: Different machinery proposed for the compost plant.
Primary screening:

- Conveyer -3nos
  - Trammel – 35mm screen
  - Trammel - 16mm screen
  - Hydraulic Power Pack – 2 nos
  - Hydraulic piping – 1 lot
  - Electrical Control Panel – 1lot

Secondary Screening :

- Conveyer – 3nos
- Trammel – 4mm screen
- Bucket Elevator – 1 no
- Gravity Separator – 1 no
- Dust collector – 1 Lot
- Packing System – 1 Lot
- Hydraulic Power Pack – 1 No
- Hydraulic Piping – 1 No

Mobile Equipment

- Excavators
- Front End Loaders
- Tippers

Methodology for remediation:

The waste remediations methods are like mining capping are closure etc. For the present conditions, capping of the existing dump site by relocating the dump to one part of the site is proposed and will be further closed according to Municipal Solid Waste Rules 2000. The land after remediation will be used and if it is not sufficient for new processing and disposal facility, new and adjacent to the existing dump site can be acquired for feasibility of operations and handling of new waste.

According to the area requirements of waste lying in the site at different locations to be estimated and assessed for deployment of vehicles for the relocation of the waste to the area earmarked for closure activity will be done depending on the feasibility at that location.

Drainage of surface water runoff Surface water runoff is a significant component in a landfill design and shall be clealy designed. The design includes a garland drainage system all around the landfill which shall be lined and shall be connected to a storm water outlet.

Surface water and Drainage Control Systems

Artificial and natural features at the landfill site control surface water ang ground water when integrated, the artificial and natural features must be effective in controlling runoff of surface waters as well as preventing groundwater from penetrating the landfill liner. When the landfill is closed, the drainage control system must be designed to function for the long term use of the site. Rainfall must be used removed from the final cover surface without soil or excessive water infiltration. The greatest risk to the site from pending of surface waters in areas of land subsidence. The features included in thr design of drainage control facilities

1) Collection and routing of surface waters off the landfill surface in the shortest possible distance

2) Selection of channel and drainage ways that will carry waters at adequate velocities to avoid deposition,

3) use of sufficient surface slopes to maximize the removal of surface runoff and at the same time minimize surface scour and

4) Material specifications for the drainage features that allow repair and replacement as the landfill settles. Access road of 5m width shall be provided around the site along with sufficient green belt.

Conclusion and Recommendations

To devise any sound waste management systems it is imperative to understand the current practices and scenario of waste management. The physical composition of municipal solid waste is normally presented as organic, recyclables and inert matter. Chemical characteristic considered for municipal waste are mainly ,moisture, nitrogen, phosphorous, C/N ration etc,MunicipalSolid Waste sample was collected from the dump yard of Mahaboobnager town and analyzed for various chemical characteristics. Since the calorific value of the Municipal Solid Waste is very low 1241Cal/gm, the best process for Municipal Solid Waste management is preferred as composting. The waste projection for 2029is worked out based on the current generation. Based on the quantities compost processing plant is designed. For the inert resulted after the processing landfill is also designed and leachate system is also proposed to comply Municipal Solid Waste Guidelines as per CPHEEO.

A. Conclusion:

- Environment Protection Act concludes aerobic composting does not contribute to CO2,CH4 or N2O emissions, the main contributors to greenhouse gas response and global warming.
- Any emissions from aerobic composting are considered part of the natural carbon cycle.
- Proper aerobic composting eliminates methane production
- Aerobic compost can be used as a landfill cover to reduce and eliminate methane emissions and odour as a result
- Aerobic composting appears to be the safest way of converting organic waste streams into a stable value added product
- Carbon is essential for soil stability and fertility
- Aerobic compost a sink helping reduce emissions in the atmosphere by sequestering the carbon in the soil.
- Converting organic waste into aerobic compost provides us with the potential to existing vegetation, allowing for more respiration in our atmosphere, which results in a reduction inCO2 levels.

B.Recommendation:

In the present study of composting plan for Mahabubnagar Municipality the Green House Gases focused are Methane and Carbon dioxide.

Composting is a financially viable option for municipalities with solid waste range of 150MT and below. It helps reducing Green House gas emissions thus complying to the projects under Clean Development Mechanism.

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BIOGRAPHY

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