



Government of Kerala

Abstract

Local Self Government Department – Guidelines on specifications, standards, unit costs, O&M protocols, subsidy norms etc. for solid waste treatment plants to be set up or promoted by Local Governments using vermi-composting, bio-methanation and windrow composting technologies – Approved – Orders issued:-

LOCAL SELF GOVERNMENT (DC) DEPARTMENT

G.O.(MS) No. 39/2008/LSGD

Dated, Thiruvananthapuram, 11th February 2008

Read: G.O.(Rt.) No. 3498/07/LSGD Dt. 24-12-2007

ORDER

As per the GO read above, Government constituted an Expert Committee to suggest the norms for specifications, standards, unit costs etc. for solid waste treatment plants using vermi-composting, bio-methanation and windrow composting technologies. The recommendations of the Committee were considered by the State Level Coordination Committee on Decentralisation at its meeting held on 23-01-2008. In the light of the comments of the Kerala State Pollution Control Board and based on the decisions of the Coordination Committee appropriate modifications were made by the Committee.

Government have accepted these recommendations and are pleased to approve the Guidelines appended to this order on specifications, standards, unit costs, O&M protocols, subsidy norms and contract conditions for solid waste treatment plants to be set up or promoted by Local Governments using vermi-composting, windrow composting and bio-methanation technologies.

By order of the Governor

S.M.Vijayanand

Principal Secretary

To

1. All Presidents/Secretaries of Village Panchayats
2. All Presidents/Secretaries of Block Panchayats
3. All Presidents/Secretaries of District Panchayats
4. All Mayors/Secretaries of Corporations
5. All Chairpersons/Secretaries of Municipalities
6. All Chairpersons of District Planning Committees
7. All District Collectors & Member Secretaries, District Planning Committees

8. The Member Secretary, State Planning Board
9. The Chairman, Kerala State Pollution Control Board
10. The Member Secretary, Kerala State Pollution Control Board
11. The Director of Panchayats
12. The Director of Urban Affairs
13. The Commissioner of Rural Development
14. The Director of Public Relations (For immediate press release)
15. The Director, Clean Kerala Mission
16. The Chief Town Planner
17. The Director, Kerala Institute of Local Administration, Thrissur
18. The Executive Director, Kudumbashree
19. The Executive Chairman & Director, Information Kerala Mission
20. All District Planning Officers
21. All Deputy Directors of Panchayats
22. All Assistant Development Commissioners (General)
23. The Director, Local Fund Audit, Thiruvananthapuram
24. State Performance Audit Officer
25. General Secretary, Kerala Grama Panchayat Association
26. Secretary, Kerala Block Panchayat Association
27. Secretary, Chamber of Municipal Chairpersons
28. Secretary Chamber of District Panchayat Presidents
29. The Principal Accountant General (Audit), Kerala, Thiruvananthapuram (With C/L)

Copt to:

1. The Private Secretary to the Minister for Local Self Government
2. The PA to Principal Secretary, Local Self Government Department
3. Local Self Government(DA/DB/DD/FM) Departments
4. Stock File/Office copy

GUIDELINES ON SPECIFICATIONS, STANDARDS, UNIT COSTS, O&M PROTOCOLS, SUBSIDY NORMS AND CONTRACT CONDITIONS FOR SOLID WASTE TREATMENT PLANTS TO BE SET UP OR PROMOTED BY LOCAL GOVERNMENTS USING VERMI COMPOSTING, WINDROW COMPOSTING AND BIO-METHANATION TECHNOLOGIES

1. INTRODUCTION

- 1.1 The Government of Kerala vide G.O (Rt) No.3498/07/LSGD dated December 24, 2007 has constituted an Expert Committee to prepare the Standards, Specifications, Unit Cost, O&M Protocols, Subsidy norms and Contract conditions for Solid Waste Treatment Plants using Vermi composting, Bio-methanation and Windrow composting technology. This was in the background of difficulty to take up the waste management projects by the Local Governments in the absence of cost norms, standards and specifications. Considering the specific requirements for sustainable performance of the plants with different technologies and handling capacities, the O&M protocols are suggested. In view of the present level of knowledge and practices in the Local Governments, broad understanding on the capabilities of service providers and current level of understanding on the agreements between different service providers and Local Governments and the operational constraints of contract conditions in solid waste management sector etc., model agreement is proposed for installing the plant and O&M of the plant separately for indicating the desirable terms of contract.
- 1.2 Over the recent years, there has been considerable increase in the scientific and technological inputs on solid waste management and there is possibility of further refinement in the technology and practice in this sector. Therefore, these guidelines will be subjected to revision, later.
- 1.3 The solid waste management plants have been classified as Household level, Institutional level and Community level with different capacities under each category.
- 1.4 Guidelines on Specifications, Standards, Unit Cost and O&M protocols respectively for Vermi-composting, Windrow composting and Biogas plants are given in succeeding paragraphs.

2. TECHNOLOGIES FOR TREATMENT OF ORGANIC FRACTION OF SOLID WASTE

2.1 VERMI COMPOSTING

2.1.1 Household level vermi composting units for 1.5 kg/day

Specifications

1. Two numbers of broad mouth plastic basin of 25 litre capacity each
2. Base layer with coconut fibre and gravel/sand with cow-dung (~5 kg) powder
3. Wire-mesh lid for the basins
4. 200 worms in each basin
5. Holes at the bottom of the basin to drain leachate/vermi wash to a vessel if kept at below

6. Arrangements for protecting the basin from mouse, red ants etc
7. Thick wet cloth or wet sack piece for covering the waste
8. Surgical hand gloves for handling waste and manure
9. Vermi wash collection system (optional)

Standards

1. *Eudrillus eugineae* worms
2. Moisture content of waste 40-55%
3. Temperature- 20 – 30°C

Unit cost

Rs. 800/- per unit

O&M Protocols

1. Chop the waste to size less than 5 cm before placing in the basin
2. Thickness of waste layer in the basin should not exceed 15cm
3. Use one basin for the first 15 days and then use the second basin after filling the first
4. Sprinkle cow-dung powder along with waste
5. Protect the basins from mouse, ants and other pests
6. Keep the basin covered with wet sack or cloth piece
7. Sprinkle water over the cover sack/cloth to maintain a moisture of 50-55%
8. Avoid over sprinkling of water and stagnation of liquid at the bottom of the basin
9. Basin should not be exposed to direct sun light or rainfall
10. Prevent introduction of excessive hot, sour and oily substances and also bones, meat & fibre materials
11. For removing the vermi compost, expose the basin with contents in shaded sunlight for 2-4 hours and remove the compost from the top and use the basin with earthworms for further composting of biowastes
12. Compost taken out should not be dried under sunlight
13. Renew the base layer annually
14. Collection of wash out from the basin in the final stages of composting for vermi-wash

Maintenance cost

Rs.0.4 per kg of waste for small household unit

2.1.2 Institutional level vermi composting plant for 10-100 kg/day

Specifications

1. Masonry tank of size 4m x 1m x 0.5m
2. Base layer with coconut husk of one or two layers with cow-dung powder (~10 kg)
3. Wire-mesh fitted on wooden frame to cover the tank
4. 1000 worms to be placed in each tank
5. Bottom of the tank to have appropriate slope for ensuring leachate drainage
6. Tank to be fitted with 50mm PVC pipe to drain out leachate
7. Plastic bucket/can for collection of leachate
8. Temporary shed of GI pipe structure and light roofing and cement concrete floor
9. Electrical installations for lighting

10. Washing area with water storage tank
11. Arrangements for protecting the tanks from mouse, red ants etc
12. Wet sack piece for covering the waste
13. Cow-dung storage tank/bucket
14. Surgical hand gloves for handling waste and manure
15. Basket, shovel, spade and chopper, gloves and boots
16. Manual 6 mm sieve with wiremesh fitted on wooden frame of size 1.2m x 1m
17. Spring balance
18. Vermi wash collection system (optional)

Standards

1. *Eudrillus eugineae* worms
2. Moisture content of waste 40-55%
3. Temperature- 20 – 30°C
4. Tank size of 1m x 1m x 0.5m for waste input of 10kg/day
5. Wiremesh cover of size 2.1m x 1.2; Two cover for each tank for easy handling
6. 50mm size PVC pipe of length 5m for each tank
7. Leachate collection tank of volume 25 litre for 10kg/day plant
8. Cowdung storage tank of 100 litre capacity for 10kg/day plant
9. Size of the shed to be decided based on number of tanks and passage requirement (For example, 20m² for a 10 kg/day plant; 90m² for a 50 kg/day plant and 150m² for a 100 kg/day plant)
10. Electrical installation for lighting 1 CFL lamp for each for 12 m² shed area
11. Two basket, One spade, one shovel and one set hand gloves and boots for 10kg/day plant and one wheel barrow, 4 baskets, 2 spades, 2 shovels and 2 set hand gloves and boots for 100kg/day plant
12. Manual chopper for waste shredding
13. Water storage of 40 litre for 10kg/day plant

Unit cost for plant, implements, utilities etc.

Rs. 0.65 lakh – 5.36 lakh for 10 to 100 kg/day plant; cost reduces with increasing plant capacity

O&M Protocols

1. Chop the waste to size less than 5 cm before placing in the basin
2. Thickness of waste layer in the tank should not exceed 15cm at a time
3. Introduce fresh waste at consecutive portion of the tank on successive days
4. Sprinkle cow-dung powder along with waste
5. Protect the tank from mouse, ants and other pests
6. Keep the tank covered with wet sack or cloth piece
7. Sprinkle water over the cover sack/cloth to maintain a moisture of 50-55%
8. Avoid over sprinkling of water and stagnation of liquid at the bottom of the tank
9. Tank should not be exposed to direct sun light or rainfall
10. Prevent introduction of excessive hot, sour and oily substances. Bones, flesh & fibre materials can be placed as inter-layer within the soft waste layer

11. Heap the compost with worms within the tank under light for two days and remove the compost from the top and use the worms at the bottom for further composting
12. Stop watering 3-4 days prior to removing the vermicompost from the tank
13. Allow the compost to dry in shade prior to sieving
14. Compost should not be dried under sunlight
15. Renew the base layer annually
16. Engage a part-time labour for plant maintenance
17. Collection of wash out from the basin in the final stages of composting for vermi-wash

Maintenance cost

Rs. 1.5 to 2.25 per kg of waste for 10 to 100 kg/day plant

2.1.3 Community level vermi composting plants for 250 -1000 kg/day

Specifications

1. Waste receipt & initial waste processing facility (partial windrow composting yard)
2. Masonry tank of size 4m x 1m x 0.5m for vermi-composting
3. Base layer with coconut husk of one or two layers with cow-dung powder (~30 kg)
4. 1000 worms to be placed in each tank
5. Bottom of the tank to have appropriate slope for ensuring leachate drainage
6. Tank to be fitted with 50mm/100mm PVC pipe to drain out leachate
7. Plastic bucket/can/masonry tank for collection of leachate
8. Temporary shed of GI pipe structure and light roofing & cement concrete floor
9. Wiremesh protection for the shed to prevent birds, mouse, dogs etc.
10. Electrical installations for lighting
11. Enclosed store room
12. Toilet and washing area of 4m²
13. Water storage and supply system
14. Arrangements for protecting the basin from mouse, red ants etc
15. Wet sack piece for covering the waste
16. Cow-dung storage tank/bucket
17. Surgical hand gloves and boots for labour handling waste & manure
18. Basket, Showel, Spade and Wheel barrow
19. Bag stitching machine
20. Mechanical shredder
21. Manual platform sieve of 6 mm size
22. Platform balance
23. Nursery tank of size 2m x 1m x 0.5 for worms
24. Vermi wash collection system is optional

Standards

1. One windrow for each days waste
2. Windrow size of 2m width & 1.5 m height
3. Semi-decomposed waste as vermi feed
4. *Eudrillus eugineae* worms
5. Moisture content of waste 40-55%

6. Temperature- 20 – 30°C
7. Tank size of 4m x 1m x 0.5m for waste input of 10kg/day of semi decomposed waste
8. Leachate drainage system using 50mm/100mm size PVC pipe
9. Leachate collection tank of volume 500 litre for 250 kg/day plant
10. Cowdung storage tank of 1m³ capacity for 250 kg/day plant
11. Size of the shed for 250 kg/day plant including waste receipt area, partial windrow composting yard, store room, toilet & wash area is 180 m²
12. Electrical installation for lighting 10 CFL lamp for 250 kg/day plant
13. Five baskets, two spade, three shovel and three set hand gloves for 250 kg/day plant
14. Water storage tank/bucket of 500 litre capacity for 250 kg/day plant
15. Nursery tank of size 2m x 1m x 0.5 for 250 kg/day plant
16. Store room size of 12 m² for 250 kg/day plant

Unit cost of plant, machineries, utilities etc

Rs. 7.6 lakh – 20.72 lakh for 250 kg/day to 1000 kg/day plant; cost reduces with increasing plant capacity (Building cost estimated for normal foundation)

O&M Protocols

1. Shred the over-sized waste to size less than 5 cm before composting
2. Windrow to be broken every seven days and partially decomposed waste to be shifted to the vermi composting tank
3. Thickness of waste layer in the tank should not exceed 30cm at a time
4. Introduce feed at consecutive portion of the tank on successive days
5. Sprinkle cow-dung powder along with waste
6. Protect the tank from mouse, ants and other pests
7. Keep the tank covered with wet sack or cloth piece
8. Sprinkle water over the cover sack/cloth to maintain a moisture of 50-55%
9. Avoid over sprinkling of water and stagnation of liquid at the bottom of the tank
10. Tank should not be exposed to direct sun light or rainfall
11. Heap the compost with worms within the tank under light for two days and remove the compost from the top and use the worms at the bottom for further composting
12. Stop watering 3-4 days prior to removing the vermicompost from the tank
13. Allow the compost to dry in shade prior to sieving
14. Compost taken out should not be dried under sunlight
15. Renew the base layer annually
16. Engage appropriate number of laborers for management of the plant (For example 3 full-time labourers are required for a 1000kg/day plant)
17. Collection of wash out from the basin in the final stages of composting for vermi-wash

Maintenance cost

Rs. 0.75 to 1.5 per kg of waste (Cost reduces with increasing plant capacity)

2.2 COMPOSTING

2.2.1 Household level anaerobic composting units (1.5 kg/day waste feed)

Specifications

1. Two numbers of concrete circular rings/ ferro cement tanks of 0.7 m diameter and 1 m high each for placing over the cover slab of Septic Tank / over concreted base (without fixing)
2. Circular cement concrete / ferro cement cover slab of 0.75 m diameter and 2.5 cm thick with central circular hole of 0.30 m diameter
3. Circular cement concrete / ferro cement cover of 0.40 m diameter and 2.5 cm thick as a sliding cover for the central hole of the cover slab
4. Base layer with cow-dung (~5 kg) powder
5. Surgical hand gloves for handling waste and manure

Standards

1. Moisture content of waste 40-55%
2. Temperature- 20 – 30°C

Unit cost

Rs. 1200/- per unit

O&M Protocols

1. Chop the waste to size less than 5 cm before placing in the basin
2. Remove the central cover if the ring by sliding movement and drop the waste inside the ring
3. Spread the waste evenly in within the ring
4. Use one ring for the first 90 days and then use the second basin after filling the first
5. After 175 days, compost from the first ring can be emptied and the ring can be used for further waste feeding
6. Renew the base layer annually

Maintenance cost

Rs.0.1 per kg of waste for small house-hold unit

2.2.2 Community level manual windrow composting plant of Capacity 1 – 5 tons/day

Specifications

1. Composting yard with permanent shed of GI pipe/angles structure with concrete pillars, light roofing & cement concrete floor having 1% slope
2. Area earmarked for waste receipt, shredder, windrow formation, maturity yard and sieve
3. Composting yard area of 85-370 m² for 1-5 tpd plant
4. Front-side height of 4.5m and rear-side height of 3m for the shed of composting yard
5. Slope of the cement concrete floor according to the space allotted for waste receipt, shredder, windrow formation, maturity yard and sieve
6. Electrical installation for CFL lamps of 15W, one for each 12m² area and three phase connection for shredder

7. Wire-mesh protection for the building with collapsible gate of full height at the waste receipt area and sliding gate of 3m height in other portion of the front side
8. Storage room with of 20-100 m² for 1-5 tpd plant for storage of compost for 3 months and other implements of the plant
9. Office room of size 6-12 m² for 1-5 tpd plant
10. Rest room of size 6-12 m² for 1-5 tpd plant
11. Store room with covered shed of GI pipe/angles structure with concrete pillars, light roofing, & polished cement concrete floor, plastered brick-masonry wall of 10cm thick and 3.5 m height, ventilators of size 1m x 0.5m in steel angle frame and wire mesh to cover 50% of wall length, electrical installation for two CFL lamps of 15W for each 6m² area
12. Office room and Rest room with covered shed of GI pipe/angles structure with concrete pillars, light roofing, & polished cement concrete floor, plastered brick-masonry wall of 10cm thick and 3 m height, 3 - 4 wooden windows of size 1m x 1.4m with wooden frame shutter with glass (3 windows for 6m² building and 4 windows for 12m² room), one wooden frame door of size 1m x 2m with wooden shutter and electrical installation for two CFL lamps of 15W for each 6m² area
13. One toilet and washing area of 4m² area with closet, wash basin, two tap connections, bathroom tiles on floors and walls (up to 1.5 m), ventilator of size 1m x 0.5m in steel angle frame with wire mesh
14. Cow-dung storage tank of plastered brick masonry with size 1.5 -7.5 m³ for plant of 1-5 tpd size located within the composting yard
15. Leachate collection tank of plastered brick masonry with size 0.6 -3 m³ for plant of 1-5 tpd size located within or adjacent to the composting yard
16. Slurry pump of 1 HP chemical process type with flexible delivery hose of 100m fitted with nozzle sprinkler for leachate recycling
17. Septic tank of size 1-3m³ for 1-5 tpd plant and soak pit for leachate treatment and disposal
18. Anaerobic composting tank of size 4m x 3m x1m with brick masonry, cement concrete floor and temporary polythene cover for 3 months storage of sorted-out biodegradable rejects/slowly composting waste (Such pre-processed waste to be put again in windrow)- 5 to 23 tanks for 1 to 5 tpd plant
19. Two reject collection polythene bags of 50 litre capacity
20. Water harvesting tanks in ferro-cement with storage capacity 10m³ each and roof-top rainwater collection system using PVC pipes and connectors to be provided at the rate 1 to 4 tanks for 1 to 5 tpd plant
21. Tank- 500 lit; tap- 4; & pipes, flexi pipes of 100m; electric motor 0.5 hp
22. Water supply installation with over-head tank of 500 lit., PVC pipe connections, four taps, flexi-pipes of 100m length and 0.5 HP electrical motor pump.
23. Mechanical shredder
24. Manually operated rotary sieve of 6mm size
25. Platform balance of size 530 x 530 mm
26. Stitching machine
27. Wheel barrow with pneumatic wheel
28. Surgical hand gloves, gum boots and masks
29. Basket, Showel, Spade, Sorting tool and Chopper

Standards

1. Use of special steel wherever applicable
2. Waste size of 25-75 mm and moisture content of 55% is optimum for windrow composting
3. Roofing material, electrical items and PVC items with ISI mark

Unit cost for plant, implements, utilities etc.

Rs. 7.39 lakh – 24.67 lakh for 1 to 5 tpd plant

O&M Protocols

1. Receive the waste at the designated waste receipt area and spread it
2. Spreading enables reduction of moisture in waste to optimal level
3. Subject the spread waste to preliminary sorting for picking and removing non-biodegradables to 50 lit capacity recyclable polythene bags and move the large size (>75mm) and slowly composting biodegradables to shredder
4. Move primarily sorted and shredded waste to designated windrow yard
5. Mix the waste with cow-dung slurry or dust, depending on the moisture content of the waste, and form windrows
6. Addition of cow-dung slurry is only optional for improving the C/N ratio and enhance the form of bacteria, actinomycetes and fungi for augmenting the microbial activity
7. Regulate size of windrow to maximum width of 2m, height of 1.5m and length of 3m
8. Form one windrow exclusively for each days waste
9. Turn the windrow every 4-5 days and make 5 turnings in 25 days
10. Maintain the temperature within a windrow between 55-60°C for three days to destroy the pathogens and between 50-55 °C for rest of the period for maximum microbial activity
11. Monitoring the temperature within the windrow and maintain the temperature by adjusting the turning interval
12. Sprinkle leachate over each windrow for maintaining the moisture of 55%
13. Break the windrow and spread it for secondary sorting and moisture reduction
14. Sent sorted non-biodegradables to 50 lit recyclable bag and slow putrefying waste to anaerobic composting tank
15. Sieve the compost and move the output to the designated maturity yard and keep it in a heap of 3m height for 30 days
16. Rejects of biodegradable nature from the sieve to be moved to the anaerobic composting tank and non-biodegradable nature to the 50 lit polythene bag for recyclables
17. Break the matured compost heap and keep it under shade for 2 days for moisture escape and shift it to the store room. Application of a 4mm sieve to the matured compost prior to storage is optional
18. Drying of compost under direct sunlight is undesirable
19. Recover the waste subjected to anaerobic composting tank, apply deodorant and add it to the windrows for aerobic composting
20. Make arrangements for disposing off recyclable waste collected in polythene bags
21. Avoid over sprinkling of leachate or water to the windrow and prevent stagnation of any liquid in the composting yard
22. Stop sprinkling of water 2-3 days prior to breaking the windrow

23. Prevent any obstruction to the drainage of leachate and collect it in the designated tank
24. Ensure that there is no leakage of leachate to surface or groundwater sources
25. Overflow of leachate tank to be directed to a septic tank and then to a soak pit
26. Cover the leachate tank securely to prevent mixing with rainwater
27. Maintain cow-dung storage for one month
28. Store an appropriate quantity of saw dust or dry leaves for application to high moist waste
29. Labour requirement for 1-5 tpd plant vary from 2-5. Engagement of a Supervisor is optional for improving quality control
30. Biological odour management by maintaining optimum moisture, temperature and aeration is critical
31. Maintaining temperature of 55-60°C for 2-3 days is critical for removal of pathogens and parasites
32. Ensure the compliance of worker protection safeguards through the use of gloves, gum boots, masks etc and maintenance of personal hygiene
33. Subject the compost to physico-chemical test periodically for nutrient content, organic content, pH, texture, particle size distribution, moisture content, moisture holding capacity, slat concentration, degree of stabilization, presence of pathogenic organisms, concentration of heavy metals to ensure quality and take precaution from health hazards

Maintenance cost

Rs. 0.65 to 0.50 per kg of waste for 1 to 5 tpd plant

2.3 BIOGAS PLANTS

2.3.1 Household level

2.3.1 a. Household level (Prefabricated -Low Cost Type) biogas plant

Specifications

1. Treatment capacity - 2.5 kg of solid waste per day
2. Volume of digester including gas holder - 0.50 m³
3. Plastic tank with circular shape as digester and gas holder
4. Inlet device with PVC pipe of diameter 110 mm
5. Inlet chamber with a plastic mug having circular shape and with a lid.
6. Outlet devise with PVC pipe of 63mm diameter.
7. A plastic can of 10 liter capacity to be used for collecting slurry/effluent for safe disposal. If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement.
8. Rubber hose of 25 mm (¾ inch) diameter for conveyance of biogas for use with a
9. maximum length of 10 m
10. Stove with single burner
11. Control valve for regulating gas

*Plant to be established in a place fully exposed to sunlight and away from drinking water source.

Standards

1. Minimum waste retention time of 40 days
2. All PVC pipe of class 4 kg/cm²
3. Rubber hose, stove and control valve with ISI mark
4. Particle size of waste not to exceed 20 mm

Unit cost

Rs.3,000/- for 2.5 kg/day plant

O&M Protocols

1. Start up by adding 25 kg of cow dung with equal quantity of water
2. Waste feeding after chopping and mixed with water in the ratio 1:1
3. Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water Clean the inlet chamber after each feed and keep it closed
5. Limit the maximum quantity of daily feeding of waste to 2.5 kg / day.
6. Daily removal of slurry in plastic cans and disposal as manure / disposal in to septic tank and soak pit arrangement.
7. Prohibited to feed the wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana leaves, coconut shells, coconut coir , pseudo stem etc .Feeding of toxic substances like fungicides, insecticides, pesticides, detergents and disinfectants like phenyl, dettol etc. are also prohibited.
8. Mix the substrate or rotate the drum at least weekly for preventing scum formation

Maintenance cost

Rs. 200/- annum per unit

2.3.1.b Household level floating dome type biogas plant for 7.5 kg/day (1m³ capacity)

Specifications

1. Treatment capacity - 7.5 kg of solid waste per day
2. Volume of digester - 1 m³
3. Digester with cement concrete/ Ferro cement
4. Gas holder dome with Fiber Reinforced Plastic (FRP).
5. Central support of GI pipe of 40 mm (medium class), fixed to base concrete / fixed to central beam
6. Inlet device with PVC pipe of diameter 110 mm
7. Inlet chamber with cement concrete/ferro cement, having circular shape of 50 cm diameter and with a lid.
8. Outlet devise with PVC pipe of 63mm diameter.
9. A plastic can of 10 liter capacity to be used for collecting slurry/effluent for safe disposal. If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement.
10. Rubber hose of 25 mm (¾ inch) diameter for conveyance of biogas for use with a maximum length of 10 m
11. Stove with single burner
12. Control valve for regulating gas

*Plant to be established in a place fully exposed to sunlight and away from drinking water source.

Standards

1. Minimum waste retention time of 40 days
2. All PVC pipe of class 4 kg/cm²
3. Medium class GI Pipe for central support
4. Rubber hose, stove and control valve with ISI mark
5. Particle size of waste not to exceed 20 mm

Unit cost

Rs.10,000/- for 7.5 kg/day plant (without septic tank and soak pit)

O&M Protocols

1. Start up by adding 50 kg of cow dung with equal quantity of water
2. Waste feeding after chopping and mixed with water in the ratio of 1:1
3. Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water
4. Limit the maximum quantity of daily feeding of waste to 7.5 kg / day.
A plastic can to be used for collecting slurry/effluent for safe disposal. If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement.
5. Clean the inlet chamber after each feed and keep it closed
6. Prohibited to feed wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana leaves, coconut shells, coconut coir , pseudo stem etc .Feeding of toxic substances like fungicides, insecticides, pesticides, detergents, and disinfectant like phenyl, dettol etc. are also prohibited.
7. Mix the substrate or rotate the drum at least weekly for preventing scum formation

Maintenance cost

Rs. 500/- annum per unit

2.3.2 Institutional level biogas plant

2.3.2.a Institutional level (Floating Dome Type) biogas plant

Specifications

1. Treatment Capacity - 50 to 200 kg of solid waste per day

2. Volume of digester;

Daily waste feed rate	50 kg	75 kg	100 kg	125 kg	150 kg	200 kg
Volume of digester	6 m ³	9 m ³	12 m ³	15 m ³	17 m ³	23 m ³

3. Volume of the gas holding dome;

Daily waste feed rate	50 kg	75 kg	100 kg	125 kg	150 kg	200 kg
Volume of gas holder	1.5m ³	2.25 m ³	3 m ³	3.75 m ³	4.5 m ³	6 m ³

4. Digester with cement concrete/ Ferro cement for up to 100 kg plants
5. Gas holder dome with Fiber Reinforced Plastic (FRP) or GI sheet with epoxy coating
6. Central support of GI pipe of 50 to 65 mm (medium class), fixed to base concrete / fixed to central beam
7. Inlet device with PVC pipe of diameter 160 mm up to 100 kg capacity plant and 200 mm for above 100 kg plant
8. Inlet chamber with a lid of cement concrete/ferro cement, having circular shape of 75 cm diameter up to 100 kg/day plant and of 90 cm diameter for above 100 kg plants .
9. Outlet device with PVC pipe of 140 mm diameter.
10. Septic Tank - Soak Pit system for treatment and disposal of effluent from biogas plants. Septic tank of at least 2 compartments with maximum of 1.7 m depth and L: B: H ratio of 7.5: 2.25: 1. The soak pit have to be concreted at bottom, honey-comb or perforated ring inside wall and 45 – 100 cm thick 2 mm sand envelop around. Vent pipe is not necessary.

*Plant to be established in a place fully exposed to sunlight and away from drinking water source

. Standards

1. Minimum waste retention time of 45 days
2. All PVC pipe of class 4 kg/cm²
3. Rubber hose, stove and control valve with ISI mark
4. Particle size of waste not to exceed 20 mm
5. Rubber hose of ¾ to 1 inch diameter with a maximum length of 40 m for conveyance of biogas
6. Minimum thickness of GI Sheet for gas holder of 2 mm
7. The capacity of the bio gas plant to be mentioned in terms of the loading rate (ie, maximum quantity of waste to be fed in kg per day)

Unit cost

Rs 1.20 lakh for 50 kg/day plant and 4.25 lakh for 200 kg/day plant

O&M Protocols

1. Start up by adding cow dung and equal quantity of water
2. Waste feeding after chopping and mixed with water in the ratio 1:1
3. Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water.
4. Limit the quantity of daily waste feed below the designed capacity.
5. Maximum waste particle size not to exceed 20 mm .
6. Daily removal of slurry in to Septic Tank - Soak Pit system.
7. Clean the inlet chamber after each feed and keep it closed
8. Prohibited to feed wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana leaves, coconut shells, coconut coir , pseudo stem etc .Feeding of toxic substances like fungicides, insecticides, pesticides, detergents and disinfectants like phenyl, dettol etc. are also prohibited.
9. Mix the substrate or rotate the drum at least weekly for preventing scum formation

Maintenance cost

1. Rs.20,000/- per unit as consultancy charge for technical support and capacity building for the initial period of six months
- 2 Rs.20, 000 to Rs.60, 000/ annum per unit as O&M cost

2.3.2. b Institutional level (Fixed Dome Type) biogas plant

Specifications

- 1 Treatment Capacity - 50 to 200 kg of solid waste per day
2. Volume of digester including gas holde;

Daily waste feed rate	50 kg	75 kg	100 kg	125 kg	150 kg	200 kg
Volume of digester	7.5 m ³	10 m ³	15 m ³	18 m ³	22 m ³	30 m ³

4. Digesters with ferro cement for capacity up to 125 kg and cement concrete or brick masonry with concrete/ferro cement lining for plant up to 200 kg.
5. Inlet device with PVC pipe of diameter 160 mm for plant up to 100 kg capacity and 200 mm for above 100 kg capacity plants .
6. Inlet chamber with a lid of cement concrete/ferro cement, having circular shape of 75 cm diameter up to 100 kg/day plant and of 90 cm diameter for above 100 kg plants
7. Balancing tank :

Balancing tank with Cement Concrete / Ferro cement	Waste feed rate (kg/day)	50	75	100	125	150	200
	Volume of digester(m³)	7.5	10	15	18	22	30
	Total volume	1	1	1.2	1.2	1.5	1.5
	Liquid volume (m³)	> 0.7	>0.7	>0.8	>0.8	>1	>1

8. Outlet opening of 150 mm x 150mm size.
 9. Outlet pocket and outlet tank with cement concrete/ brick masonry and the total liquid volume of 20 % of the digester volume.
 10. . Septic Tank - Soak Pit system for treatment and disposal of effluent from biogas plants. Septic tank of at least 2 compartments with maximum of 1.7 m depth and L: B: H ratio of 7.5: 2.25: 1. The soak pit have to be concreted at bottom, honey-comb or perforated ring inside wall and 45 – 100 cm thick 2 mm sand envelop around. Vent pipe is not necessary.
- *Plant to be established in a place fully exposed to sunlight and away from drinking water source.

Standards

1. Minimum 45 days waste retention time
2. Particle size of waste not to exceed 20 mm
3. Rubber hose of ¾ to 1 inch diameter with maximum length of 40 m for conveyance of biogas
4. . All PVC pipe of class 4 kg/cm²
5. Rubber hose, stove and control valve with ISI mark
6. The capacity of the bio gas plant to be mentioned in terms of the loading rate (ie, maximum quantity of waste to be fed in kg per day)

Unit cost

Rs 1.00 lakh - for 50 kg/day plant to Rs 4.00 lakh - for 200 kg/day plant

O&M Protocols

1. Start up by adding cow dung and equal quantity of water.
2. Waste feeding after chopping and mixed with water in the ratio 1:1.
3. Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water.
4. Limit the quantity of daily waste feed below the designed capacity.
5. Maximum waste particle size of 20 mm.
6. Daily removal of slurry in to Septic Tank - Soak Pit system
7. Clean the inlet chamber after each feed and keep it closed.
8. Prohibited to feed wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana leaves, coconut shells, coconut coir , pseudo stem etc .Feeding of toxic substances like fungicides, insecticides, pesticides, detergents, disinfectants like phenyl, dettol etc. are also prohibited.
9. Mix the substrate or rotate the drum at least weekly for preventing scum formation

Maintenance cost

1. Rs.20,000/- per unit as consultancy charge for technical support and capacity building for the initial period of six months and Rs.20,000 to Rs.60,000/ per unit as annul O&M cost

2.3.3 Community level biogas plant

2.3.3. a Community level (Floating Dome Type) biogas plant

Specifications

- 1 Treatment Capacity - 300 to 2000 kg of solid waste per day
2. Volume of digester:

Waste feed rate (kg/day)	300	400	500	600	800	1000	1500	2000
Volume of digester (m³)	35	45	57	68	90	115	170	225

- 3.. The volume of the gas holding dome :

Waste feed rate (kg/day)	300	400	500	600	800	1000	1500	2000
Volume of gas holder (m³)	7.5	10	12	15	19	24	36	48

4. Digester with reinforced cement concrete and having the following;
 - Pressure release valve.
 - Scum breaker mechanism / mixing having agitator or mixer of propeller type or anchor type.
 - Bottom slope of digester shall be 1 in 8 for easy withdrawal of sludge.

- Pumps of Screw Type or Submersible Type or External Chemical Process Type Pumps for pumping water, slurry and sludge.
5. Gas holder dome with Fiber Reinforced Plastic (FRP) or GI sheet with epoxy coating
 6. The following accessories for increasing the efficiency of digestion/plant.
 - Pre-digester tank / primary digester for increasing the efficiency of main digester
 - Homogenizer / Mixer / Pulper / Shredder for size reduction and to make the solid waste into uniform composition before putting it into pre-digester tank. Waste converted into slurry form by mixing it with equal volume of water to feed in to the digestion for easy and clog free digestion.
 - Solar water heater for making hot water, for mixing the waste with hot water, to maintain the temperature in the range of 55-60°C in the digester for the growth of thermophilic microbes..
 - Biogas holder / balloon storage facility for storage of at least one day bio gas generated.
 - Control Panel for monitoring / operation of plant
 7. Central support of GI pipe (medium class) 65 to 100mm, fixed to base concrete/ fixed to central beam.
 8. Inlet device with PVC pipe of diameter 250 mm up to 500 kg capacity plant and 300 mm concrete pipe for above 500 kg capacity plant
 9. Inlet chamber with a lid of cement concrete/ferro cement, having circular shape with brick masonry/cement concrete of 120 cm diameter up to 500 kg plant, 150 cm diameter for 600 kg to 1000 kg plant and 200 cm diameter for 1500 & 2000 kg capacity plant.
 10. Outlet device with PVC pipe of 140 to 200 mm diameter.
 11. Septic Tank - Soak Pit system for treatment and disposal of effluent from biogas plants
Septic tank of at least 2 compartments with maximum of 1.7 m depth and L: B: H ratio of 7.5: 2.25: 1. The soak pit has to be concreted at bottom, honey-comb or perforated ring inside wall and 45 – 100 cm thick 2 mm sand envelop around. Vent pipe is not necessary. Septic tank with size ranges from 1.5 m³ for 300 kg/day plant and 6 m³ for 2000 kg/ day
 12. Bio gas engines of single mode fuel (using methane gas only) option in the case of waste to energy plants. Additional facilities to be provided are the following;
 - Facility for utilizing the electricity generated for operating the equipments in the plant / lighting the plant area.
 - Facility for flaring of excess gas with automatic or semi automatic flame ignition.
 - Facility for Biogas cleaning for removal of water vapour and H₂ S concentration to 100 ppm or less.
 13. Skilled Manpower for Operation of the Plant.
 14. AMC with the consultant / supplier for a period of 2 years after installation
- *Plant to be established in a place fully exposed to sunlight and away from drinking water source.

Standards

1. Minimum 45 days waste retention time
2. Particle size of waste not to exceed 20 mm
3. Rubber hose of ¾ to 1 ½ inch diameter with maximum length of 40 m for conveyance of biogas

4. All PVC pipe of class 4 kg/cm²
5. Rubber hose, stove and control valve with ISI mark
6. The capacity of the bio gas plant to be mentioned in terms of the loading rate (ie, maximum quantity of waste to be fed in kg per day)

Land requirement

Land area of 15m x 10m for 300 kg plant , 18m x 10m for 500 kg plant, 25m x 12m for 1000 kg plant and 30m x 15m for 2000 kg plant

Unit cost

Rs 5.00 lakh for 300 kg/d plant, Rs 5.50 lakh - for 400 kg/d plant, Rs 6.25 lakh - for 500 kg/d plant, Rs 7.00 lakh - for 600 kg/d plant, Rs 8.50 lakh - for 800 kg/d plant, Rs 11.25 lakh - for 1000 kg/d plant, Rs 13.50 lakh - for 1500 kg/d plant and Rs 17.00 lakh - for 2000 kg/d plant.

O&M Protocols

1. Start up by adding cow dung and equal quantity of water
2. Waste feeding after chopping and mixed with water in the ratio 1:1
3. Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water
4. Limit the quantity of daily waste feed below the designed capacity
5. Particle size of waste not to exceed 20 mm
6. Daily removal of slurry in to Septic Tank - Soak Pit system.
7. Clean the inlet chamber after each feed and keep it closed
8. Prohibited to feed wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana leaves, coconut shells, coconut coir , pseudo stem etc .Feeding of toxic substances like fungicides, insecticides, pesticides, detergents, disinfectants like phenyl, dettol etc. are also prohibited.
9. Agitator or mixer of propeller type or anchor type to mix the substrate for preventing scum formation

Maintenance cost

1. Rs.30, 000/- per unit up to 500 kg plant, Rs 40,000/- up to 900 kg plant and Rs 50,000/- for 1000 kg/ day and above as consultancy charge for technical support and capacity building for the initial period of six months .
2. Rs.60,000 to Rs.300,000/- per annum per unit

2.3.3.b Community level (Fixed Dome Type) biogas plant

Specifications

1. Treatment Capacity - 300 to 2000 kg of solid waste per day
2. Volume of digester including gas holder;

Waste feed rate (kg/day)	300	400	500	600	800	1000	1500	2000
Volume of digester (m³)	41	55	68	82	109	137	205	275

3. Digester with reinforced cement concrete or brick masonry with RCC lining and having the following;
 - Pressure release valve.
 - Scum breaker mechanism / mixing having agitator or mixer of propeller type or anchor type.
 - Bottom slope of digester shall be 1 in 8 for easy withdrawal of sludge.
 - Pumps of Screw Type or Submersible Type or External Chemical Process Type Pumps for pumping water, slurry and sludge.
4. The following units for increasing the efficiency of digestion/plant.
 - Pre-digester tank for increasing the efficiency of main digester
 - Homogenizer / Mixer / Pulper / Shredder for size reduction and to make the solid waste in to uniform composition before putting it into pre-digester tank. Waste to be converted into slurry form by mixing it with equal volume of water to feed in to the digestion for easy and clog free digestion.
 - Solar water heater for making hot water, for mixing the waste with hot water, to maintain the temperature in the range of 55-60°C in the digester for the growth of thermophilic microbes..
 - Biogas holder / balloon storage facility for storage of at least one day bio gas generated.
 - Control Panel for monitoring / operation of plant
5. Inlet device with PVC pipe of diameter 250 mm up to 500 kg capacity plant and 300 mm concrete pipe for above 500 kg capacity plant
6. Inlet chamber with a lid of cement concrete/ferro cement, having circular shape circular shape with brick masonry/cement concrete of 120 cm diameter up to 500 kg plant, 150 cm diameter for 600 kg to 1000 kg plant and 200 cm diameter for 1500 & 2000 kg capacity plant
7. Outlet (balancing) tank with cement concrete/brick masonry having a free board of 30 cm and liquid volume of ;
 - 4.5 m³ for 300 kg plant
 - 6 m³ for 400 kg capacity plants.
 - 8.5 m³ for 500 kg capacity plants.
 - 12 m³ for 600 kg capacity plants.
 - 19 m³ for 800 kg capacity plants.
 - 23 m³ for 1000 kg plant
 - 30 m³ for 1500 kg capacity plant.
 - 40 m³ for 2000 kg capacity plant
8. Outlet opening with 200 to 300 mm diameter
9. Septic Tank - Soak Pit system for treatment and disposal of effluent from biogas plants. Septic tank of at least 2 compartments with maximum of 1.7 m depth and L: B: H ratio of 7.5: 2.25: 1. The soak pit have to be concreted at bottom, honey-comb or perforated ring inside wall and 45 – 100 cm thick 2 mm sand envelop around. Vent pipe is not necessary. Septic tank with size ranges from 1.5 m³ for 300 kg/day plant and 6 m³ for 2000 kg/ day.

- 10 Bio gas engines of single mode fuel (using methane gas only) option in the case of waste to energy plants. Additional facilities include;
- Facility for utilizing the electricity generated for operating equipments in the plant / lighting the plant area.
 - Facility for flaring of excess gas with automatic or semi automatic flame ignition.
 - Facility for Biogas cleaning for removal of water vapour and H₂S concentration to 100 ppm or less.
11. All metal parts to be coated with epoxy primer and epoxy enamel for avoiding corrosion.
 12. All masonry tanks to be coated with epoxy or other corrosion resistant coating.
 13. Skilled Manpower for Operation of the Plant.
 14. AMC with the consultant / supplier for a period of 2 years after installation
 *Plant to be established in a place fully exposed to sunlight and away from drinking water source.

Standards

1. Minimum 45 days waste retention time
2. Particle size of waste not to exceed 20 mm
3. Rubber hose of ¾ to 1 1/2 inch diameter with maximum length of 40 m for conveyance of biogas
4. All PVC pipe of class 4 kg/cm²
5. Rubber hose, stove and control valve with ISI mark
6. The capacity of the bio gas plant to be mentioned in terms of the loading rate (ie, maximum quantity of waste to be fed in kg per day)

Land requirement

5 to 10% more land area than the floating drum type plant

Unit cost

Rs 5.00 lakh - for 300 kg/d plant, Rs 5.5 lakh - for 400 kg/d plant, Rs 6.25 lakh - for 500 kg/d plant, Rs 7.00 lakh - for 600 kg/d plant, Rs 8.50 lakh - for 800 kg/d plant, Rs 11.25 lakh - for 1000 kg/d plant, Rs 13.50 lakh - for 1500 kg/d plant and Rs 17.00 lakh - for 2000 kg/d capacity plant.

O&M Protocols

1. Start up by adding cow dung and equal quantity of water
2. Waste feeding after chopping and mixed with water in the ratio 1:1
3. Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water
4. Limit the quantity of daily waste feed below the designed capacity
5. Maximum particle size of waste shall be 20 mm
6. Daily removal of slurry in to Septic Tank - Soak Pit system
7. Clean the inlet chamber after each feeding and keep it closed
8. Prohibited to feed wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana leaves, coconut shells, coconut coir , pseudo stem etc .Feeding of toxic substances like fungicides, insecticides, pesticides, detergents, and disinfectants like phenyl, dettol etc. are prohibited.
9. Mix the substrate or rotate the drum at least weekly for preventing scum formation

Maintenance cost

1. Rs.30,000/- per unit up to 500 kg plant, Rs 40,000/- up to 900 Kg plant and Rs 50,000/- for 1000 kg/ day and above as consultancy charge for technical support and capacity building for the initial period of six months .
2. Rs.60,000 to Rs.300,000/- per annum per unit as O&M cost

3. SUBSIDY NORMS

3.1 Promotion of household level and institutional level facilities as decentralized solid waste treatment option is essential for reducing load in the centralized treatment facility. As a beginning subsidy shall be given as follows for household level vermi-compost facility/ compost facility/biogas plant.

- i) Household level vermi-compost facility: 50 % of the capital cost for procuring vermi-compost kit subject to a maximum of Rs. 400 per unit. The subsidy is to be sanctioned to the kudumbashree unit/agency which supplies the vermi-compost kit.
- ii) Household level anaerobic compost facility: 50 % of the capital cost for installation of anaerobic compost units with concrete rings and cover slab, subject to a maximum of Rs. 600 per unit.
- iii) Household level portable low cost biogas plants / pucca biogas plants: 50 % of the capital cost for installation of biogas plants subject to a maximum of Rs. 1500 per unit.

3.2 The cost for setting up vermi compost/composting/biogas plants at the institutional and community levels can be met by the Local Governments.

4. GENERAL CONDITIONS

1. Efficiency of electrical energy generation from biogas plants from solid waste is yet to be proven, hence it is better to utilize the biogas generated as such for cooking or heating purposes. Therefore, at this stage, projects on Waste to Energy Plants using biogas from Organic Fraction of solid waste shall not be promoted.
2. Facility for flaring of excess biogas gas should be provided with automatic or semi automatic flame ignition in the community level biogas plants.
3. Skilled Manpower should be made available for operation of community level vermi-compost plants , windrow compost plants and. biogas plants.
4. The indicative unit cost given is the cost inclusive of installation of the facility and for performing trial run for a period of six months from the date of starting of trial run. This will include technical support and capacity building activities for the sustainable operation of all categories of plants.
5. Annual Maintenance Contract (AMC) agreement shall be entered with the consultant / supplier of the treatment facility for a period of 3 years in the case of institutional and community level plants.
6. For procurement of vermi compost kit and the worms required for household, institutional and community level plants priority should be given to kudumbashree units.

5. FORMATS FOR MEMORANDUM OF UNDERSTANDING / O& M AGREEMENT FOR TREATMENT OF SOLID WASTE

5.1. Format for memorandum of agreement for establishment of a solid waste treatment plant

This memorandum of Agreement is made and executed at on this day of

BETWEEN M/s (Hereafter called the Agency) AND the Secretary (Hereafter called the Local Government)

- I. The expressions, Agency and the Local Government, wherever occur hereunder shall mean and include and always deem their successors, their representatives, assignees, executors, administrators and successors in Office etc.,
- II. Whereas, Agency has offered the services to undertake the work of Construction of plant for management of solid waste at after having thoroughly understood the obligations, terms and conditions involved in the job and after realizing all its implications, came forward and offered the services and placed the same at the disposal of the Local Government.
- III. The Agency has deposited a sum of Rs..... as security deposit with the Local Government, which will be refunded to the agency after commissioning and successful operation of the plant.
- IV. Terms & Conditions of the Memorandum of Agreement:
 - A. For establishment of the plant**
 - i. The agency shall build a plant as per specification attached
 - ii. The agency shall bear all cost incurred for water, electricity, loading and unloading charges and any other cost likely to occur during the construction
 - iii. The local government will pay the agency the rates approved as per tender no dated
 - iv. The site shall be handed over to the agency within 7 days of signing the agreement. The title, ownership and rights with regard to the land will vest with the Local Government.

- v. The Agency should complete the construction work and install all machineries (where ever applicable) within 4 months from the date on which the site is physically handed over to the agency
- vi. The Agency should carry out the construction as per the calendar attached
- vii. The local body should get the consent of the Kerala State Pollution Control Board and other agencies as required under law.
- viii. The Agency should submit monthly progress report to the local government or any other person authorized by the local government
- ix. The plant should be commissioned on
- x. The plant shall have a trial run for a period of 2 months during the period the waste will be managed by the agency. The funds for the trial run shall be included in the tender
- xi. The agency shall ensure that the plant attains its full capacity during the trial period
- xii. The agency shall ensure that construction of the plant and erection of machineries (where ever required) is completed within a period of four months from the date of handing over physical possession of the site. The work shall have to be completed to the satisfaction of the Local Government.
- xiii. Suitable extension can be granted by the Local Government provided it is satisfied that the delay was unavoidable. In case failure on the part of the agency to complete the work within the stipulated period is adjudged by the Local Government to be attributable to causes within the control of the agency, then the agency shall pay to the Local Government compensation at the rate of 0.005% per week of the total estimated cost of the tender (as assessed by Local Government) subject to a maximum of 2.0 % of the total estimated cost of the concerned public convenience. The Local Government may levy and collect compensation at a rate lower than 0.005% depending upon its assessment of the circumstances of delay. The decision of the Local Government in this regard shall be final and binding upon the agency. Action under this clause of this agreement shall be without prejudice to any other right or remedy available under law to the Local Government.
- xiv. The agency or supplier shall give warranty for all equipment supplied for a period of 2 years. The warranty shall cover all service and replacement cost.
- xv. The local Government shall provide segregated biodegradable waste between andKilograms daily during the trial period. The biodegradable component of the waste supplied shall be 90% + 10%

- xvi. After completion of each facility, the agency shall provide 3 sets of completion plans including plans of various services provided therein including electrical drawing, water supply, sewerage, drainage drawings etc., along with inventory of various fitting & fixtures. Details of all equipments and diagrams (where ever necessary) shall be provided by the agency to the Local Government
- xvii. On the completion of the contract period, the agency shall hand over the land, building, equipments along with fixtures and fittings and inventory.
- xviii. That any of the conditions mentioned in this agreement can be altered, modified, changed or removed by the appropriate authority as per the necessity without assigning any reason.

In witness there of Agency and the Secretary, Local Government, here into set their hands on this day of at

Signature of the agency

(Affix rubber stamp)

Witness:

- 1.
- 2.

**Signature of the Secretary,
Local Government.**

Witness:

- 1.
- 2.

PS. This is a supplementary agreement to be signed along with the agreement as per PWD Manual. In case of any contradiction with the PWD agreement the conditions of agreement as per PWD manual will prevail.

5.2.Format for memorandum of agreement for operation & maintenance of solid waste treatment plant

This memorandum of Agreement is made and executed at on this day of
.....

BETWEEN M/s
.....(Hereafter called the Agency) AND the Secretary
..... (Hereafter called the Local Government)

- I. The expressions, Agency and the Local Government, wherever occur hereunder shall mean and include and always deem their successors, their representatives, assignees, executors, administrators and successors in Office etc.,
- II. Whereas, Agency has offered the services to undertake the operation and maintenance of plant for management of solid waste at after having thoroughly understood the obligations, terms and conditions involved in the job and after realizing all its implications, came forward and offered the services and placed the same at the disposal of the Local Government.
- III. The Agency has deposited a sum of Rs..... as security deposit with the Local Government, which will be refunded to the agency at the end of the contract period.
- IV. Terms & Conditions of the Memorandum of Agreement:

A. Operation & Maintenance

- i. The agency shall operate and maintain the plant for a period of years starting from till
- ii. The agency will keep the plant and its surroundings clean, hygienic, odourless and dust free to the complete satisfaction of Local Government.
- iii. The charges towards electricity, water, sewage and other such amenities shall be paid by the agency.
- iv. The Local Government shall not charge any license fee for the land and equipments provided to the agency.
- v. The agency shall ensure that the premises are not used for any un-lawful activities.

- vi. The entire structure as constructed along with fittings and fixtures provided in the plant will be handed over to the Local Government, on the conclusion of the agreement without causing any damage.
- vii. In case of loss due to theft or damage to the assets created in the plant, the agency shall be responsible for making good the same immediately at its own cost and shall continue to keep the plant operational.
- viii. In case of stoppage of works at any stage due to circumstances beyond the control of the agency, each instance will be reviewed and decision will be taken on a case by case basis.
- ix. Both the parties shall be at liberty to cancel this agreement at any stage after giving three months notice from either side if they find the arrangement not workable according to their aims and objectives.
- x. In the event of the Local Government considering it unavoidably and absolutely necessary in the interest of public necessity / requirement to take over the site and plant it shall do so after giving a minimum of three months advance notice.
- xi. In such circumstances as in clause (ix) and (x) The agency will continue to operate the plant till it is taken over by the Local government.
- xii. Disputes if any arising during the period of this agreement between Local Government and the agency shall be referred to the sole arbitration of the Commissioner, Local Government or a person nominated by him (the fact that the person so nominated is also and employee of Local Government shall not be a bar on his acting as an Arbitrator, nor shall any of the parties have any objection to his nomination for the said reason). The decision of the Sole Arbitrator so appointed shall be final and binding on both the parties. The venue of Arbitration shall be at the head quarters of the local government. The courts in head quarters of the local government shall have exclusive jurisdiction, to the exclusion of all other suits.
- xiii. The Local Government shall have the right to cancel / remove / terminate the agreement at any stage in case of breach of any of the stipulated terms and condition by the agency or in case their performance is not found satisfactory.
- xiv. The Local Government shall be entitled to terminate the agreement in case of any neglect or lapse on the part of the agency in respect of the regular maintenance of the facility in clean and hygienic conditions.
- xv. The agency shall keep the plant and all equipments in a state of good working condition at its own cost.

- xvi. The site and the work assigned to the agency by the Local Government shall not be transferred by the agency to any person, trust, society or institution in any manner whatsoever at any time whether during or after the termination of this agreement.
- xvii. The premises of plant shall not be used by the agency for purpose other than that for which it is allowed under the agreement for operation and maintenance.
- xviii. The agency or its employees or agents shall behave and deal with courtesy.
- xix. The agency will not use or allow any person to use plant or its premises for residential purpose and not keep any animal / motor vehicle in or around the complex other than those permitted by mutual consent.
- xx. The agency shall be allowed to plant flowering and other shrubs around the plant subject to the approval by the Local Government.
- xxi. The agency shall ensure enforcement of existing labour laws. Minimum Wages Act and at no point of time, the Local Government shall be drawn into litigations on these counts.
- xxii. The agency shall ensure that services of water supply, sewerage, drainage, electricity, telephone etc., in this vicinity encountered during the period of running / maintenance are not damaged. In case these are required to be shifted, the same shall be done by the department.
- xxiii. On the completion of the contract period, the agency shall hand over the possession of the site and plant along with fixtures and fittings, inventory, structures in good working condition to the Local Government within 24 hours and will not put any resistance failing which the premises shall be evicted and the Local Government shall assume the occupation without any notice whereupon the agency will have no claim.
- xxiv. The running cost of the plant will have to be met by the Agency and the Local Government will pay the agency an amount of Rs per tonne of waste received and processed in the plant
- xxv. The agency shall have the right to sell the fertilizer produced in the factory and the sales proceeds will be the right of the agency.
- xxvi. In case gas is produced by the plant the agency shall have the right to sell the gas so produced and the sales proceeds will be the right of the agency.
- xxvii. The agency shall carry out Annual preventive maintenance on the building and equipments so as to ensure their full utility over a period of time.

- xxviii. The local government or its representative will have the power for inspecting with plant as and when required and the agency shall in no way prevent the local government inspection
 - xxix. Standard operating procedures should be prepared and followed for the working of the plant
 - xxx. The local Government shall provide segregated biodegradable waste between andKilograms daily. The biodegradable component of the waste supplied shall be 90% + 10%
- V. That Agency is willing to abide by all the above stipulated terms and conditions as laid down in the agreement.
- VI. That any of the conditions mentioned in this agreement can be altered, modified, changed or removed by the appropriate authority as per the necessity without assigning any reason and the new conditions shall be binding on the part of the first part.

In witness there of Agency and the Secretary, Local Government, here into set their hands on this day of, at

Signature of the agency

Witness

- 1.
- 2.

(Affix rubber stamp)

Signature of the Secretary, Local Government.

Witness:

- 1.
- 2.
