GMR Institute of Technology
An Autonomous Institute Affiliated to JNTUK, Kakinada

GMRIT Training Tomorrow's Engineers Today

Standard Operating Procedure for Solid Waste Management for Clean Campus

With increasing incidence of waste generation in all Institutions across the country, an endemic problem of waste disposal / management and absence of an appropriate scientific system in these Institutions has called for a systematic approach to Solid Waste Management (SWM), the process of reducing, reusing/recycling the solid waste to convert it into a valuable resource. Solid Waste and Management is a major problem even in the rural areas wherein a proper process and approach is the need of the hour to convert the waste generated into useful forms, thus moving towards 'Waste to Wealth'.

As a way forward towards sustainable development, GMRIT started new initiatives to bring a change in the attitude of internal stakeholders as well as the residents of GMRIT campus. The first initiative was to bring awareness among the students and staff for maintaining a "**Zero Waste Campus"**. Further, proper care was taken from segregation of waste to the disposal.

Purpose

The purpose of the Standard Operating Procedure (SOP) for Solid Waste Management (SWM) in Educational/Training Institutions/Organization, is to provide a practically implementable procedure and direction for scientific management of waste generated, to maintain a clean campus and transform 'waste' into 'wealth'. In addition, this procedure outlines how to prevent discharges from dumpsters kept at the Facilities Management Yard and other locations on grounds, which could cause pollutants to enter storm sewers and also helps to create an ideal ecosystem for better learning outcomes and become a model for all to adopt and implement in their respective Institutions/Organisations

Scope

This procedure applies to all waste disposal activities by Facilities Management staff or contractors working for Facilities and is for all departments and members of the campus (living, visiting and working, etc.). All employees, contractors, visitors, residents and others must comply with applicable procedures at all times, when present in the campus. This procedure covers solid waste, which encompasses material typically disposed of in a landfill, and recyclable, recoverable, or reusable materials, which are materials that can be diverted from landfills. The intent of the SOP is to enable create cleanest, hygienic and environment-friendly working and living conditions for everyone on the campus.

Responsibility

Personnel Involved in Waste Management in a Campus: A sanitation team is responsible for working with staff to keep this policy up to date and revised as needed. This team is headed with a team leader who in turn have a set of co-workers along with supervisors to maintain the campus in accordance with the SOP guidelines and take notice of any changes, if they are made in the guidelines. Managers are to train their employees in the proper disposal of waste materials to prevent spills of potential pollutants into the storm sewer system. Managers and supervisors are responsible for ensuring training is conducted with the most recent version of the SOP.

Personnel Performing the Job

Personnel must follow the correct procedures in accordance with this SOP. Personnel are responsible for determining the type of waste they need to dispose of and following the procedure to ensure it is disposed of properly. Personnel are also responsible for reporting if instances of leakage, missing covers, or misuse of material receptacles.

Summary of the Procedure:

This operating procedure will involve step-by-step guidelines to be followed, starting with the survey of the waste generated to determine the plan to be adopted, sensitisation of all stakeholders for active participation, segregate the waste as per the norms and treatment by ultimately following the principle of 'Refuse, Reuse, Recycle, Recover and Regenerate' to achieve the goal of Clean Campus.

The institute through their facility management service provider would be responsible for ensuring compliance to the SOP for the institute under their management. The committee overseeing sanitation and cleanliness in the school premises monitors and supervises the works being carried out by the responsible party (Management/Contracted Agency) and ensure compliance to the SOP.

Survey of waste generation

Assess the Sources:

Initially the actual site of solid waste generation, type of waste and quantum of waste produced is needed to be identified so that proper collection process can be implemented in those areas. The quantum and type of waste collected is recorded in regular interval.

Assessment Forms for Waste Survey

Recording Type and Quantum of Waste Generated from each source

Wet Waste – Kitchen Waste/Dry Waste / Hazardous Waste / E- Waste

Date (WET)	Type of Waste In kgs	Quantity (daily) (Weekly) In kgs	Quantity (Monthly) In kgs	Quantity

Collection of the waste:

Wet and Dry dustbins are placed in various locations throughout the campus to collect the waste separately before it is sent to further treatment.

The different types of solid waste generated are a) Bio-degradable waste {green waste, food waste, paper waste, biodegradable plastics

b) e- waste,

c) Bulk garden and horticulture waste including recyclable tree trimmings,

e) All other non-biodegradable (dry) waste {recyclable and non-recyclable}

Some pictures of collection of waste are shown below

Pictures of collection of solid waste from

a. Academic Blocks (Point Source Collection & Segregation)

b. Horticulture (Dry Leaves Collection)

c. Staff Quarters (Point Source Segregation)

a. Girl's hostel and in campus (Point Source Segregation)

Segregating and Measuring of Waste:

Depending on the sources of waste generation, different teams constituted for the purpose shall assess the type and quantity of the waste being generated from each source by actually segregating and measuring each type of the waste. The assigned teams shall segregate and measure the waste from each source every two days. Based on the type and quantity of the waste assessed during the two days, the respective team shall arrive at the total quantity of each type of waste being generated from all the sources in the campus. The quantity of each type of the waste generated from each source will decide the type of treatment / disposal of the waste. The plastic and other recyclable waste is sent to Municipality every two days.

Picture of Segregation of Solid Waste (Organic/ Non-organic Waste) before Disposal

Disposal and Treatment of waste:

1. **Cattle feed:**

The wet organic food waste from the canteen, boys and girls hostels are collected and sent as cattle feed. The average generation of this waste is shown in the Table below. Utilizing food loss and waste in animal diets addresses waste management, food security, resource and environmental challenges. Some of the pictures of food waste distribution as cattle feed is shown below.

WET & DRY GARBAGE REPORT FROM JULY - 2020 - FEB - 2021								
	WET GARBAGE WASTAGE - Lit				DRY WASTAGE - Kg			
MONTH	BOYS HOSTEL	GIRLS HOSTEL	DAY CANTEEN	TOTAL KGS	BOYS HOSTEL	GIRLS HOSTEL	DAY CANTEEN	TOTAL
Jul-20	30	0	0	30	0	0	0	0
Aug-20	220	0	0	220	30	0	0	30
Sep-20	260	0	0	260	0	0	0	0
Oct-20	230	0	0	230	0	0	0	0
Nov-20	180	0	0	180	0	0	0	0
Dec-20	420	0	0	420	0	0	0	0
Jan-21	960	0	0	960	0	0	0	0
Feb-21	1250	680	220	2150	120	80	20	220
Mar-21	1450	720	380	2550	180	80	60	320
Apr-21	650	450	280	1380	180	60	40	280
May-21	0	0	0	0	0	0	0	0
Jun-21	0	0	0	0	0	0	0	0
Jul-21	780	650	0	1430	80	70	0	150
Aug-21	820	720	120	1660	120	90	40	250
TOTAL 08 MONTHS	7250	1850	880	8380	510	220	120	850
AVG.PER MONTH	1149	651	456	1047.5	419	121	15	106.25
AVG PER DAY	38.3	21.7	15.2	18	13.96666667	4.033333333	0.5	3.54167

2. A "**Biogas Plant**" was put to use the food and kitchen waste from hostels to produce gas, which in turn is used for cooking in the hostel. The produced gas acts as a renewable source of energy. It helps in utilization of waste and reduces soil and water pollution. The capacity of the plant is 2 units of 2000lt behind kitchen area. The model of the plant is Portable Floating Model and the material of Construction is FRP. Total cost of the unit is 131210.

   Technical Specification:

   Floating type Biogas Plant

MOC: FRP wall thickness of 5mm to 7mm

Capacity: 2000lt Digester

Waste Inlet – Funnel will be connected to Crusher with 4” PVC line

Slurry outlet – 3” outlet pipe will be diverted to a sump 10m away from Biogas Plant.

Application: Cooking (Canteen) / Hot water heating ¬ Single burner Bio Gas Stoves – 2units

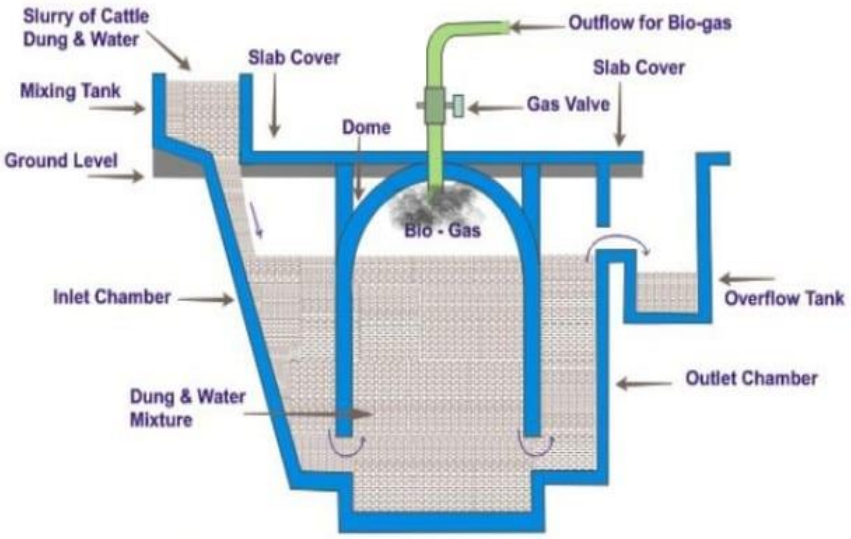
Operation Prameters:

Daily Waste Input – 40 kg – 50kg Waste Water Input –

120- 150l Daily Gas Output – 5 to 6kg Bio gas

Cooking Food for 2hrs of each burner

Organic Slurry (Manure) Output – 100 – 120kg per day



Fixed Dome type Bio-gas Plant

3. Composting

The dry leaves and the uncooked vegetable waste collected are deposited in compost pits made in various location inside the campus. The compost thus generated is effectively utilized for gardening. Composting areas are identified for the disposal of the organic food waste in the campus as shown below. Holes or trenches are dug to bury the waste, where organic materials gradually break down over long period. This method is effective for institutions with big lawns/playgrounds. The trench is also a good place to bury weeds and dead/semi dead plants. If buried deep enough, the weed seeds will not regerminate and keep the playground away from unwanted growth of plants.

a. Composting Yard (Dry Waste - Hostels)

b. Composting Yard (Dry Waste)

c. Composting Yard (Horticulture Dry Waste)

5. Treatment of e- Waste

The discarded e-waste in the campus is initially sent to the 'Material Recovery Facility' (MRF) and stored and then sent to specialist e-waste recyclers M/s Ramky – E-Waste Recycling Facility (Ramky Environmental Engineers Ltd., Sy No. 25 Hardware Park, Maheshwaram (M), Rangareddy

a. Waste CPU

b. Waste UPS

c. Waste wires

d. Waste monitors

Awareness Generation

Enabling a Clean and Healthy Campus would require effective participation of all the stakeholders. The possible stakeholders are all residents, households, all offi cials working, all visitors, all students, all maintenance staff and other personnel working for various services in the campus.

- Orientation of students, teaching faculty and staff on the importance of maintaining cleanliness and good water, sanitation and hygiene practices.
- Training of all maintenance staff in the use of the waste system and any equipment
- Display adequate sign boards at appropriate places across the Institution to prompt action and there by lead to continuous involvement of all the stakeholders for the plan to be successful.

Monitoring and Correctives

Weekly Review: The in-charge sanitation officer along with his/her team must carry out a weekly review to ensure compliance to the SWM plan of the Institution

Physical Verification: Weekly visits to the office spaces, households, segregation sheds and all other parts of the Institution are carried out for physical verification for any lapses in adherence and for taking up rectification steps

Display Contact Numbers of Sanitation Team: The mobile number of the sanitation incharge officer is clearly mentioned in all key visible areas of the campus and suggestion boxes are placed at accessible locations for regular feedback from all stakeholders

Monthly Meeting: A monthly meeting are held with participation of all stakeholders till the SWM plan gets streamlined

Plastic should be Refused: As per the 'Refuse' principle of the Waste Management, all plastic poly bags, bottles should be barred from entering/using on campus. The security personnel at the entrance are trained to perform regular checks on every individual/ vehicle entering the institution for any plastic bags/bottles and detain these plastic bags/bottles for appropriate disposal. GMRIT holds a free single use plastic campus.

Maintain least possible Residual Reject: Measures are taken to reduce and maintain this residual reject to be less than 10% of the total waste by adopting appropriate methods of processing the waste.

Equipment and Logistical Support for SWM

- Waste collection carts or vehicles
- Uniforms and safety gears for the sanitation workers
- Waste Segregation shed

- Facility for treatment of wet waste and other equipment such as rakes, shovel, hand fork, garden fork, trowel, buckets, wheel barrow, watering can, etc.
- Facility for treatment of dry waste (and the residual reject)
- Facility for treatment of e-waste (such as an incinerator)
- Storage place for recyclables until they are passed on to recyclers
- Facility for hand-washing / body washing for the sanitation workers
- Paper bins to be placed under each table in the campus
- Waste bins for households (if any) with three different colour bins – Green, Blue and Red
- Door-to-door collection bin and collection vehicle of the sanitation workers
- At every 100 metres one ‘set of bins’ are placed
- Display signs/signage to be placed near every set of bins for easy segregation