

DPU

Dr. D. Y. PATIL VIDYAPEETH, PUNE

(Deemed to be University)

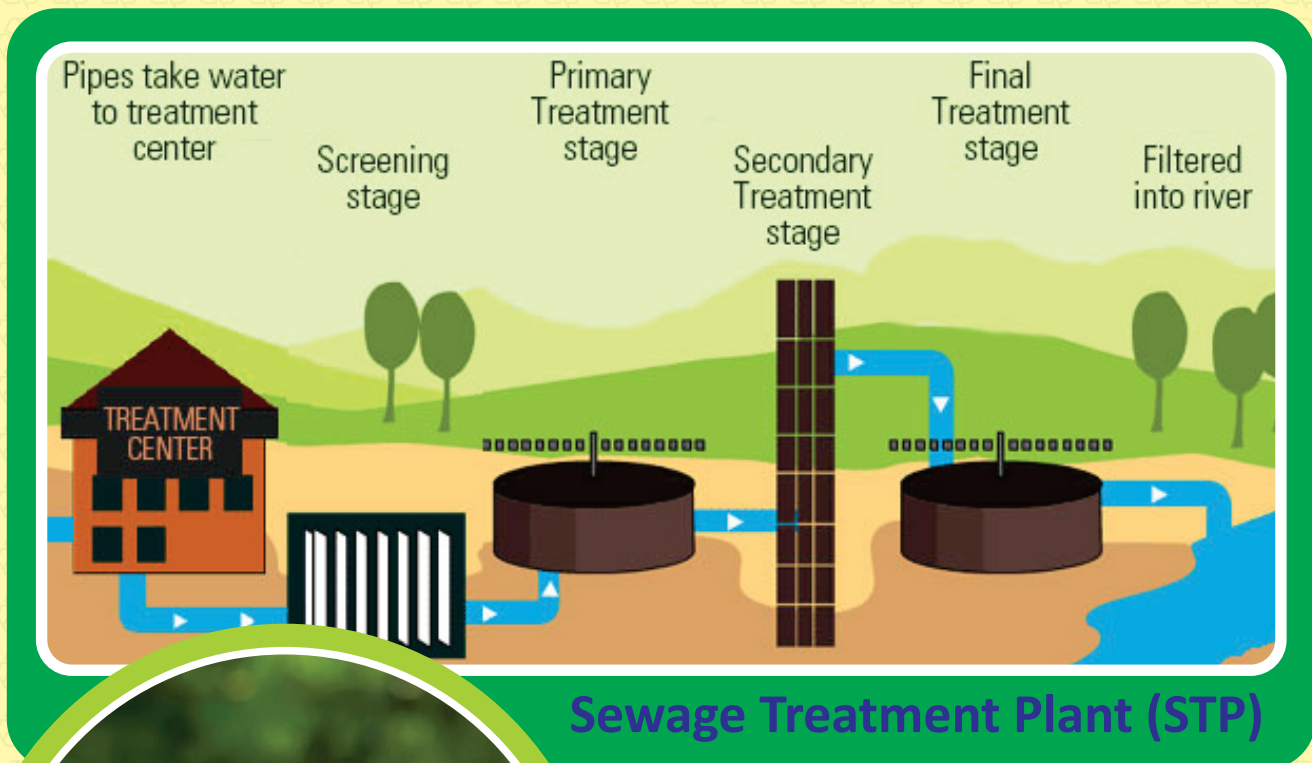
(Accredited (3rd Cycle) by NAAC with a CGPA of 3.64 on four point scale at 'A++' Grade)

NIRF-2022 : 41st (University), 3rd (Dental) and 17th (Medical) in India

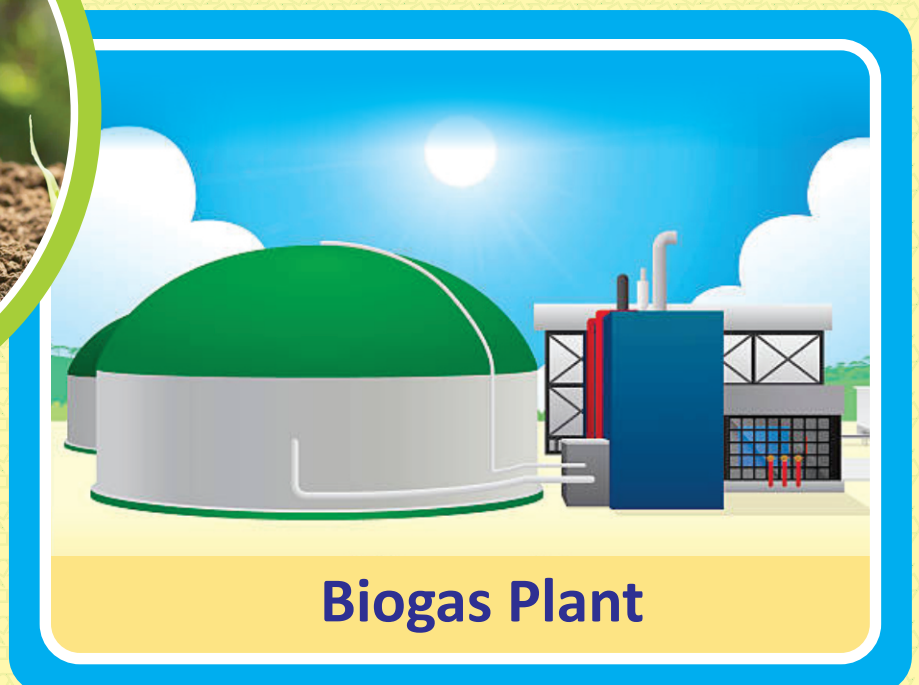
(Declared as **Category - I University** by UGC Under Graded Autonomy Regulations, 2018)

(An ISO 9001:2015, ISO 14001:2015 and Green Education Campus Certified University)

Standard Operating Procedures (SOPs) for **Recycling of Waste**



**Vermi
Compost
Plant**





Dr. D. Y. PATIL VIDYAPEETH, PUNE
(Deemed to be University)

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Dr. A. N. Suryakar
Registrar

Ref. No. : DPU/360-I/2022
Date : 20/08/2022

NOTIFICATION

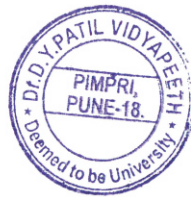
Whereas in pursuance of the resolutions passed by the **Board of Management** at its meeting held on **10th August, 2022** vide **Resolution No. BM-37(ii)-22**.

It is hereby notified for information of all concerned that Dr. D. Y. Patil Vidyapeeth, Pune has published the "**Standard Operating Procedures (SOPs) for Recycling of Waste of Dr. D. Y. Patil Vidyapeeth, Pune (Deemed to be University)**" for information to all the concerned.

The **SOPs for Recycling of Waste** will serve as detailed procedures for:

1. **Standard Operating Procedure (SOP) for Recycling of Waste (Sewage Treatment Plant [STP])**
2. **Standard Operating Procedure (SOP) for Recycling of Solid Waste (Vermicompost Production)**
3. **Standard Operating Procedure (SOP) for Biogas Plant**

The **SOPs for Recycling of Waste** will be useful to all the concerned. This will come into force with immediate effect.



(Dr. A. N. Suryakar)
Registrar

(Dr. A. N. Suryakar)
Registrar

Dr. D. Y. Patil Vidyapeeth
(Deemed to be University)
Pimpri, Pune- 18.

Copy to:

1. PS to Chancellor for kind information of Hon'ble Chancellor, Dr. D. Y. Patil Vidyapeeth, Pune.
2. PS to Vice Chancellor for kind information of Hon'ble Vice Chancellor, Dr. D. Y. Patil Vidyapeeth, Pune.
3. All Heads of the Colleges/ Institutes of Dr. D. Y. Patil Vidyapeeth, Pune.
4. The Controller of Examinations, Dr. D. Y. Patil Vidyapeeth, Pune.
5. The Finance Officer, Dr. D. Y. Patil Vidyapeeth, Pune.
6. The Director (IQAC), Dr. D. Y. Patil Vidyapeeth, Pune.
7. Web Master for uploading on Website.

STANDARD OPERATING PROCEDURES (SOPs) FOR RECYCLING OF WASTE OF Dr. D. Y. PATIL VIDYAPEETH, PUNE (DEEMED TO BE UNIVERSITY)

WHEREAS, the University Grants Commission, (Institution Deemed to be Universities) Regulation 2019, (hereinafter in this referred to as Regulations) has been published in the Gazette Notification of India by the Authority, University Grants Commission.

AND WHEREAS the provision of sub clause 10.07 sub-sub clauses 10.07.1 and 10.07.2 of the Regulations provides that the Board of Management shall be the principal organ of management and the apex executive body of the Institution Deemed to be University, with powers to make rules and shall be the final decision making body in respect of every matter including academic, administrative, personnel, financial, development matters of Institution Deemed to be Universities.

STANDARD OPERATING PROCEDURE (SOP) FOR RECYCLING OF WASTE SEWAGE TREATMENT PLANT (STP)

Objective: The objective of this SOP is to provide a systematic guideline for the operation and maintenance of a Sewage Treatment Plant (STP) to effectively treat and manage sewage, ensuring compliance with environmental standards and the production of treated water suitable for reuse or safe discharge.

1. Safety Precautions:

- Wear appropriate personal protective equipment (PPE) including gloves, goggles, and safety shoes.
- Follow safety protocols and guidelines to prevent accidents and ensure a safe working environment.
- Conduct regular safety inspections and maintain emergency response procedures and equipment.

2. Preliminary Treatment:

- Receive and screen incoming sewage to remove large debris, such as plastics, rags, and other solid materials.
- Utilize mechanical screens or bar screens to trap and remove solid waste.
- Periodically clean and maintain screens to prevent clogging and maintain efficient flow.

3. Primary Treatment:

- Direct screened sewage to primary sedimentation tanks for the settling of suspended solids and heavy particles.
- Allow sufficient retention time for sedimentation and separation of settleable solids.
- Periodically remove settled sludge from the bottom of the tanks and transfer it to sludge treatment facilities.

4. Biological Treatment:

- Transfer the partially treated sewage from the primary tanks to the biological treatment unit (e.g., activated sludge process, sequencing batch reactor, or other appropriate systems).
- Provide optimal conditions for the growth of aerobic microorganisms that break down organic matter through aeration and mixing.
- Monitor and maintain appropriate dissolved oxygen levels, temperature, and pH for effective biological treatment.

5. Secondary Treatment:

- Allow the sewage to undergo aeration and biological reactions to promote the conversion of organic pollutants into microbial biomass and stable compounds.
- Regularly monitor the efficiency of the secondary treatment process by measuring parameters such as biochemical oxygen demand (BOD) and chemical oxygen demand (COD).
- Optimize the aeration system, mixing, and other operational parameters based on the wastewater characteristics and treatment goals.

6. Tertiary Treatment:

- After secondary treatment, subject the sewage to additional treatment processes to remove remaining suspended solids, nutrients, and other contaminants.
- Utilize methods such as filtration, disinfection (e.g., chlorination, UV disinfection), and advanced oxidation processes to achieve desired effluent quality.
- Monitor the treated water quality regularly to ensure compliance with local regulatory standards and requirements.

7. Sludge Management:

- Collect and transfer excess sludge generated from primary and secondary treatment processes to sludge treatment units.
- Employ methods such as sludge thickening, dewatering, and stabilization to reduce the moisture content and volume of the sludge.
- Properly dispose of or utilize the treated sludge based on local regulations and guidelines.

8. Equipment Maintenance:

- Develop a preventive maintenance plan for all STP equipment, including pumps, blowers, mixers, and instrumentation.
- Regularly inspect and maintain mechanical and electrical components to ensure proper functioning and reliability.
- Conduct routine calibration of sensors, meters, and instruments for accurate monitoring and control.

9. Recordkeeping and Documentation:

- Maintain detailed records of operational parameters, process performance, maintenance activities, and compliance monitoring.
- Keep records of influent and effluent characteristics, treatment efficiency, and any deviations or incidents that occur during operations.
- Document any modifications, repairs, or upgrades made to the STP for future reference and auditing purposes.

10. Training and Emergency Response:

- Provide comprehensive training to STP operators on proper operation, maintenance procedures, and emergency response protocols.
- Conduct regular training sessions to update operators on new technologies, regulations, and best practices.
- Establish clear guidelines and procedures for responding to emergencies such as power outages, equipment failures, or process upsets.

By following this SOP, the STP can effectively treat sewage, mitigate environmental impact, and produce treated water that meets regulatory standards for reuse or safe discharge.

STANDARD OPERATING PROCEDURE (SOP) FOR RECYCLING OF SOLID WASTE (VERMICOMPOST PRODUCTION)

Objective: The objective of this SOP is to provide a step-by-step guideline for the efficient and effective production of vermicompost, utilizing earthworms to convert organic waste into nutrient-rich compost.

1. Selection and Preparation of Vermiculture Beds:

- Choose a suitable location for the vermicompost beds, considering factors such as shade, drainage, and accessibility.
- Prepare the beds with a suitable size and dimensions, typically 1-2 feet high and 3-4 feet wide, using materials like bricks, concrete blocks, or wooden frames.
- Ensure proper drainage in the beds by placing a layer of gravel or broken bricks at the bottom.

2. Source of Organic Waste:

- Collect organic waste from reliable sources, such as kitchen waste, plant residues, leaves, and other biodegradable materials.
- Segregate the waste to remove non-biodegradable materials like plastic, glass, and metals.
- Shred or cut the waste into smaller pieces to facilitate faster decomposition and easier consumption by earthworms.

3. Bed Layering and Moisture Management:

- Start by placing a layer of moistened bedding material like shredded cardboard, straw, or coconut coir at the bottom of the vermicompost bed.
- Add a layer of organic waste on top of the bedding material.
- Ensure the moisture content in the bed is maintained at an optimal level (approximately 70-80%) by periodically spraying water as needed.
- Avoid over-watering, as excessive moisture can lead to anaerobic conditions and odour issues.

4. Introducing Earthworms:

- Introduce the appropriate species of earthworms, such as *Eisenia fetida* or *Eisenia andrei*, into the vermicompost bed.
- Distribute the earthworms evenly throughout the bed surface.
- Avoid exposing the earthworms to direct sunlight or extreme temperatures during the introduction process.

5. Bed Maintenance:

- Regularly monitor the moisture levels in the vermicompost bed and adjust as necessary to maintain the optimal moisture range.
- Add additional organic waste as needed to maintain a consistent food source for the earthworms.
- Protect the vermicompost beds from heavy rain or excessive moisture by covering them with a tarp or using raised beds.
- Periodically turn the vermicompost bed using a garden fork or rake to facilitate aeration and distribute the composting materials.

6. Harvesting Vermicompost:

- Allow the vermicompost to mature for a designated period, typically 2-3 months, to ensure complete decomposition and conversion of organic waste.
- Once the vermicompost is mature, stop adding new waste and allow the worms to move to fresh bedding material.
- Separate the vermicompost from the worms by gently removing the top layer of the bed, which contains the vermicompost and partially decomposed organic matter.
- Collect the vermicompost and screen it through a fine mesh to remove any remaining undecomposed materials or worms.

7. Storage and Packaging:

- Store the harvested vermicompost in a dry and well-ventilated area to prevent moisture build-up.
- Package the vermicompost in suitable containers or bags, ensuring they are sealed properly to maintain quality.
- Label the packages with the production date, batch number, and any relevant information.

8. Quality Control and Testing:

- Conduct periodic quality control tests to assess the nutrient content, moisture level, and maturity of the vermicompost.
- Monitor the pH level of the vermicompost and adjust if necessary to maintain a neutral to slightly acidic range (pH 6-7).

9. Record-Keeping and Documentation:

- Maintain detailed records of the vermicompost production process, including waste quantities, worm population, moisture levels, and harvesting dates.
- Document any observations, issues, or modifications made to the production process.
- Keep track of vermicompost sales, customer feedback, and any quality assurance measures implemented.

10. Raw Material:

1	Collection Pit	Garden waste Leaves
		Cow Dunk
		Vermicompost/ Vermi
2	Decompose Pit	Collection Pit Compost
		30-35 KG Food Waste twice in Month
3	Ready Vermi Compost	

	30-40 Days			30-40 Days		Ready to use
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Collection Pit	Decompose Pit	Vermi Compost
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All Pits	Length	As per availability of Space
	Width	As per availability of Space
	Height	Min. 3 Ft

By following this SOP for vermicompost production, you can ensure consistent and high-quality vermicompost that is rich in nutrients and beneficial for soil health and plant growth.

STANDARD OPERATING PROCEDURE (SOP) FOR BIOGAS PLANT

Objective: The objective of this SOP is to provide a step-by-step guideline for the safe and efficient operation of a biogas plant, ensuring optimal biogas production and waste management.

1. Safety Precautions:

- Wear appropriate personal protective equipment (PPE), including gloves, goggles, and safety shoes.
- Ensure proper ventilation in the plant area to prevent the accumulation of flammable gases.
- Follow safety protocols and emergency procedures in case of any incidents or accidents.
- Regularly inspect and maintain safety equipment, such as fire extinguishers and first aid kits.

2. Incoming Waste Management:

- Collect organic waste from reliable sources, ensuring it is free from contaminants and non-biodegradable materials.
- Segregate the waste into appropriate categories, such as food waste, agricultural residues, and animal manure.
- Shred or cut the waste into smaller pieces to increase the surface area for improved digestion.
- Monitor waste quality and reject any waste that may contain hazardous or non-biodegradable substances.

3. Waste Feeding and Mixing:

- Add the pre-processed organic waste into the biogas digester in the recommended proportion.
- Ensure a proper mix of different types of waste to maintain a balanced carbon-to-nitrogen ratio.
- Use agitators or mixing equipment to ensure uniform distribution of waste and prevent the formation of scum or floating layers.

4. Temperature and pH Control:

- Monitor and maintain the optimum temperature range for anaerobic digestion (usually between 35-40°C or as specified).
- Regularly measure and adjust the pH level within the desired range (typically 6.5-7.5) using suitable buffering agents.
- Install and maintain temperature and pH sensors for accurate monitoring and control.

5. Gas Production and Collection:

- Continuously monitor biogas production using appropriate gas meters or flow meters.
- Collect the biogas generated from the digester using a gas collection system (such as a gas holder or gas pipeline).
- Ensure the biogas collection system is properly sealed and maintained to minimize gas leakage.

6. Digestate Management:

- Collect the digested waste, known as digestate or effluent, from the digester.
- Allow the digestate to settle in a separate tank to separate solids and liquids.
- Utilize the nutrient-rich digestate as organic fertilizer for agricultural purposes after proper treatment and testing.

7. Maintenance and Troubleshooting:

- Regularly inspect and maintain all equipment, including pumps, motors, valves, and gas storage systems.
- Conduct preventive maintenance tasks, such as lubrication, cleaning, and calibration of instruments.
- Promptly address any equipment malfunction, leaks, or abnormalities to minimize downtime and ensure smooth operation.
- Maintain a logbook to record maintenance activities, gas production, waste quantities, and any operational issues.

8. Training and Documentation:

- Provide appropriate training to plant operators on the safe operation and maintenance of the biogas plant.
- Document all operational procedures, including waste handling, digestion parameters, safety measures, and maintenance schedules.
- Keep records of gas production, waste quantities, feedstock sources, and any modifications or improvements made to the plant.

9. Compliance and Reporting:

- Ensure compliance with local environmental regulations, safety standards, and any permits or licenses required for operation.
- Maintain accurate records of waste disposal, biogas utilization, and any relevant environmental impact assessments.
- Submit regular reports to regulatory authorities as per the specified timelines.

10. Continuous Improvement:

- Monitor and analyse the performance of the biogas plant, including gas production, waste

11. Do's and Don'ts for Segregating Waste for Use in Biogas:

- Proper waste segregation is crucial for efficient biogas production and ensuring the quality of the end product. Here are some important do's and don'ts to consider when segregating waste for use in biogas production:

Do's:

1. **Separate Organic Waste:** Segregate organic waste materials such as food scraps, vegetable peels, fruit waste, crop residues, livestock manure, and other biodegradable materials. These organic waste materials are rich in energy content and serve as valuable feedstock for biogas production.
2. **Keep Waste Dry:** Moisture content affects the efficiency of the biogas process. Try to keep the organic waste as dry as possible by draining excess liquid or allowing it to dry before adding it to the biogas system. Excessive moisture can hinder the anaerobic digestion process and reduce gas production.
3. **Cut or Shred Waste:** Cutting or shredding organic waste into smaller pieces increases the surface area and promotes faster decomposition. This helps in the efficient breakdown of the waste material, enhancing biogas production.
4. **Store Waste Properly:** Proper storage of organic waste is essential to prevent odour, pest infestation, and the growth of harmful bacteria. Use covered containers or bins with lids to store the waste until it is ready to be added to the biogas digester.

5. **Monitor Waste Quality:** Regularly check the quality of the segregated waste. Ensure that non-biodegradable materials like plastics, metals, glass, and chemicals are not mixed with the organic waste stream. Contaminants can disrupt the biogas process and negatively impact the quality of the biogas and digestate.

Don'ts:

1. **Avoid Mixing Non-Biodegradable Waste:** Non-biodegradable materials, such as plastics, metals, glass, and synthetic materials, should not be included in the organic waste stream. These materials do not decompose and can cause blockages, damage equipment, and reduce the efficiency of the biogas system.
2. **Avoid Chemical Contamination:** Do not include waste materials that contain harmful chemicals, pesticides, or toxins in the organic waste stream. These substances can hinder the anaerobic digestion process and pose risks to the environment and human health.
3. **Do Not Include Hazardous Waste:** Hazardous waste, including batteries, electronics, medical waste, and other toxic substances, should never be mixed with organic waste for biogas production. These materials require specialized handling and disposal methods to ensure safety and prevent environmental contamination.
4. **Do Not Overload the System:** It is essential to add waste to the biogas system in proper quantities. Avoid overloading the digester with excessive amounts of waste, as it can disrupt the balance of the anaerobic digestion process. Follow the recommended waste-to-digester ratio to maintain optimal performance.
5. **Avoid Excessive Grease or Oil:** While some amount of fats and oils can be added to the biogas system, excessive amounts can create operational issues, such as clogging and reduced gas production. Minimize the inclusion of greasy or oily waste materials in the organic waste stream.

11. **Treatment Process:**

1. Raw material collection & transportation.
Food waste, solid waste should be mix as 1:1 ratio with water.
2. Bio methanation of kitchen waste
It takes place in 3 different ways:
 - a. Hydrolysis
 - b. Acidification
 - c. Methane Generation
3. Manure Generation

By adhering to these do's and don'ts for segregating waste, you can contribute to the efficient operation of the biogas system, maximize biogas production, and ensure the production of high-quality biogas and nutrient-rich digestate.

Sd/-
(Dr. A. N. Suryakar)
Registrar

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