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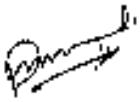
Editorial Note

CSIBER International Journal of Environment (CIJE) offers a venue where relevant interdisciplinary research, practice and case studies are recognized and evaluated. Increasingly, environmental sciences and management integrate many different scientific and professional disciplines. Thus the journal seeks to set a rigorous, credible standard for specifically interdisciplinary environmental research. CIJE is a multidisciplinary journal, publishing research on the pollution taking place in the world due to anthropogenic activities. CIJE welcomes submissions that explore environmental changes and their cause across the following disciplines like atmosphere and climate, biogeochemical dynamics, ecosystem restoration, environmental science, environmental economics & management, environmental informatics, remote sensing, environmental policy & governance, environmental systems engineering, freshwater science, interdisciplinary climate studies, land use dynamics, social-ecological urban systems, soil processes, toxicology, pollution and the environment, water and wastewater management, etc.

We invite authors to contribute original high-quality research on recent advancements and practices in Environment Management. We encourage theoretical, experimental (in the field or in the lab), and empirical contributions. The journal will continue to promote knowledge and publish outstanding quality of research so that everyone can benefit from it.

Er. D. S. Mali
Editor, CIJE



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Need of Pipe Composting in Rapid Urbanization for Clean, Green Environment

Prof. Amey Diwan[1], Prof. Subhash Yadav[2], Dr. Vinayak Diwan[3]
[1]Department of Civil Engineering, Dr. D. Y. Patil Pratishthan's College of Engineering, Salokhe Nagar Kolhapur, Maharashtra, India
[2] HOD Department of Civil Engineering, New Polytechnic, Kolhapur, Maharashtra, India
[3] Retd. Head of Dept. of Civil Engineering, New Polytechnic, Kolhapur.

Abstract
In the era of globalization, privatization & liberalization in most of the countries all over the world, are changing drastically towards the highest growth of urbanization. As a result, the population is shifting towards urban areas from villages. The density of population in urban areas is increasing consistently. The disposal of domestic urban waste is becoming very difficult for local authorities like Municipal Councils and Municipal Corporations. It is resulting in unhygienic conditions & spreading of epidemics. Such local authorities are trying to decentralize waste disposal/treatment plants as far as possible. One of the simplest ways of disposal of organic domestic waste effectively in minimum space in urban areas is "Pipe Composting.". It is easiest, compact, odourless way of composting domestic organic waste, especially from the kitchen. It can be used in very small areas even in a flat on any floor on a balcony, verandah, passage, etc. It is composting of waste by aerobic method in which waste is allowed to come in contact with oxygen in the air. It is a very low-cost way of disposing of kitchen waste or similar by the owner/occupier of the flat, bungalow, or even row house. The success of Pipe Composting has been experimented & proved by the authors. Pipe composting provides excellent quality organic fertilizer which may be used for gardening, or farms.
Keywords: Aerobic –Type of bacteria that convert the waste in the open atmosphere

Introduction:
One of the biggest issues the world is now facing is the disposal of solid waste. This issue must be on priority considering its size. About 2 billion tonnes of waste/year are produced worldwide. It must be disposed of securely and without endangering the environment. India is using poorly managed landfills, and waste is dumped in a disorganized manner in most places. Such a dumping of waste results in air, water & land pollution, infiltration, and spreading of illnesses. Domestic waste from the kitchen is mainly organic waste, which may be composted. Proper segregation of waste must be carried out for disposal. The separated organic waste may be turned into nutrient-rich fertilizers which may be used for gardens & farming. Pipe composting is one of the ways of low-cost models for home composting. Solid waste is generated by human activities and includes materials such as organic waste, plastics, metals, paper, glass, and electronic waste. Even in developed countries, solid waste management is a challenge, with concerns over landfill capacity and environmental impacts.

According to the US Environmental Protection Agency, food waste is 20 to 25 % of all municipal solid waste. Composting is an eco-friendly way of disposal of organic waste. Everyone can compost together and take care of the environment, which may be an ideal situation for sustainable development.

The amount of waste that needs to be moved and processed, as well as the costs and carbon emissions involved, etc. are reduced by composting. Due to the abundant nutrients in your biodegradable things, composting is a better choice than dumping your organic waste. Composting provides nutrients to the soil, reducing the need for fertilizers and pesticides. Compost improves the soil's capacity to hold moisture, which reduces surface runoff and controls soil erosion and the amount of floods. Plants grown with compost manure have better resistance to diseases and pests. The moist soil is easier to work for farmers and reduces fossil fuel emissions for plowing. Plants develop quickly in soil with compost added, which allows them to absorb more carbon dioxide from the atmosphere. Due to rapid urbanization, population growth, and economic development, India now produces 277.1 million tonnes of solid garbage annually. This amount is expected to increase to 387.8 million tonnes in 2030 and 543.3 million tonnes by 2050. Municipal solid waste is the waste that is exclusive from households, restaurants, institutes, road cleaning, and commercial activities. It does not include any waste from industries. Types of solid waste management are landfill, incineration, composting, recycling, and vermicomposting. Out of all these methods, we as individuals can easily perform composting of organic waste at home to reduce the load on solid waste management.

Due to India's rapid urbanization, industrialization, and population expansion, managing solid waste will be a big problem for state governments and local municipal bodies in the twenty-first century. For the health and welfare of the city, solid waste management is crucial. To solve these issues with waste management, the "Swachh Bharat Abhiyan" was created, and it taught the public how solid waste should be handled. The concept of managing waste has gained traction since the campaign's start.

Literature Review:

The conventional way of treating organic waste is by the land-fill approach. The waste is converted to safe status by the anaerobic bacteria action which is working without oxygen & away from exposed air & sunlight. They produce methane gas in their bio-degradation of the organic waste. The methane gas may be used as fuel as biogas for cooking or any other purpose if produced in a Biogas plant. The decomposed material after treatment should be taken out digging below the ground which needs labor & involves expenditure too. It may spread odor & unhygienic conditions near the plant. The second way of treating organic waste is the windrows method by Aerobic action. The organic wastes like municipal organic waste or

molasses from Sugar factories are spread up in a row open to the sky called a windrow. The leachate [i.e. the liquid coming out from Vermicomposting or aerobic composting containing a high amount of aerobic bacterial count] or spent wash is sprinkled on the windows of molasses as seeding. For better ventilation & effective action of aerobic bacteria, the waste is aerated by machines called aerators. It takes about 40 to 45 days to treat the waste to non-harmful material. It needs very large space for windrows and also produces foul gasses i.e odor. Such plants must be far away from residential areas. The third way is the Vermicomposting reactor which could generate better compost due to the high vermin process efficiency. It can effectively provide value-added advantages for residential areas throughout the co-composting process.

Pipe composting will become popular in urban areas due to the easy, economical, compact & effective way of disposal of organic household waste in a short duration. Pipe systems can also reduce leachate formation and unpleasant odors commonly found in traditional composting. Studies suggest that home composting with pipe systems can transform solid waste management and promote sustainable living.

One of the biggest issues facing urban environments today, in the majority of nations, is the collection and disposal of municipal solid waste (MSW). Solutions for MSW management must be technically practical, economically viable, socially and legally acceptable, and ecologically beneficial. The largest problem facing authorities in both small and large cities is solid waste management. Inadequate waste management affects ecosystems and contributes to air, water, and soil pollution, which poses a serious hazard to human health methodology
An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it. Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract.

Methodology

Composting using vertical pipes can be an effective method for processing organic waste into nutrient-rich compost. The method involves the use of vertical pipes that are filled with organic waste and then allowed to decompose over time. Here is a general methodology for composting using vertical pipes without a leachate recirculation system.

Equipment and Material

1. Vertical pipes - PVC pipes of diameter of 5 to 8 inches [120 to 200 mm dia.] and a length of 5 to 7 feet [1500 to 2100 mm] are recommended for this method. The number of pipes required depends on the amount of organic waste to be processed per day. It

is recommended to have a balance of carbon-rich and nitrogen-rich materials. Set up the vertical Pipes, with their base embedded in soil @ 1' [300 mm] for support.

2. Drilling hole - Drill small holes at the vertical faces of pipes @3 to 4 mm in diameter for better air circulation. Provide an end cap at the top of the pipe which helps as the lid on the pipe for feeding purposes. Place the pipes vertically in a designated area in the shaded area and have easy access for maintenance and monitoring.

3. Composting material: Organic waste such as food waste, skins of fruits, unused parts of vegetables, yard waste, and agricultural waste can be used for composting.

4. Fill the Pipes: Begin filling the vertical pipes with alternating layers of carbon and nitrogen-rich organic waste and biomass (like cow dung). Start with a layer of mud to begin the composting. Continue layering with finer materials like food scraps, leaves, and grass clippings. Keep the layers relatively thin (100-150 mm, @ 4 to 5 inches) to ensure proper aeration and avoid excess compaction. Tamp down the layers as you go to remove any air pockets and ensure good contact between the materials.

5. Observe the Composting Process: Keep watch on the temperature of the composting material. Ideally, the temperature should reach 30-45°C, which indicates that the composting process is actively breaking down the organic material. Check for moisture levels. The composting material should be moist but not saturated. If necessary, add water to maintain a consistent level of moisture. Observe the air circulation in the vertical pipes as aeration is necessary for the aerobic composting process to proceed to the optimum level.

6. Feed the organic waste in crushed form or small pieces in the pipe @ 100 to 150 mm in height, over the layer of soil by opening the lid at the top. Add soil or cow dung over the waste as if a sandwich. Continue the same till the pipe becomes full. Use the next vertical pipe till it fills in the same manner. It takes about 35 to 40 days to convert the organic waste to compost manure.

7. After 35 to 40 days, take out the first pipe of composting, take out the material for gardening or similar, clean the pipe & reuse it similarly.

Design of Aerobic Pipe composting

The diameter of the pipe may be larger even up to 12 inches [300 mm] & no. of vertical pipes required is also dependent on the volume of waste to be treated /day. In all the pipes, we must

maintain the proper moisture content as well as temperature. The system should be in shadow, not to be exposed to direct sunlight as it affects the temperature and moisture content. There must be good ventilation for proper aerobic composting.

Details of Experimental Setup of Pipe composting at new polytechnic

- Location Open to sky duct in front of HOD-Civil cabin, New Polytechnic, Unchagaon, Kolhapur-416005. Maharashtra, India.
- Date of installation - Tuesday 7th Feb. 2023.
- No. of Pipe installed - 4 Nos.
- The diameter of the pipe used -120 mm [@5”]
- Length of PVC Pipe - 1670 mm [@ 5”6’] with an end cap at the top as a lid.
- Base-Pottery for the garden of burnt clay @ 400 mm in height.
- Pipe embedded in soil - 300 mm [12”]
- Diameter of Holes- 3.00 mm [@1/8 “]
- No. of Holes in pipe- @ 6 at one level x 4 levels for aeration process.
- Temperature in Pipe- between 25 to 40^0C as measured twice a week.
- Moisture content- @ 50%
- Organic waste feed- Food waste from tiffin’s of Staff of Dept. of Civil Engineering
- Days for filling pipe @10 days considering Sunday weekly holiday.
- Removal of first pipe Monday, 20th March 2023 = 42 days

Fig.1 – Pipe Composting

Result and Discussion

a. The result from 1st pipe: 100% composting of food waste, fruit skins, etc. at 42 days. The same is continued for a further period till date.
b. Odor if any: Nil. It was in front of the HOD cabin where there was a rush all day.
c. Nobody has detected odour i.e. bad smell of any foul gases at all.

d. Present status of unit: Well-functioning unit, still in use for more than 8 months.
e. Effect of Manson: Bit slowly as compared to the summer season, but no odour at all.
f. Our way to the admission center was passing near the unit.

Conclusion:

The method of pipe composting is the easiest, economical, odourless, and eco-friendly which is suitable for sustainable growth in urban areas where waste disposal is a crucial problem. In most urban areas, collection & disposal of solid waste are highly expensive & not very efficient or reliable. It may result in air, water & land pollution & a source of the spreading of epidemics. The burden on local authorities of treatments on solid waste may be reduced by 15 to 20 & if most of the population adopts the technique of disposal of their kitchen waste by pipe composting. Besides this, the rate of pollutants added by landfilling or any method and pollution of water resources will be reduced on a large scale. It will also reduce carbon emissions by use of fossil fuels in the transportation of solid waste resulting in the greenhouse effect & global warming. It will help Rapid Urbanization for a Clean, Green Environment if it is implemented effectively.

Suggestions

1. Awareness should be created in the urban population to adopt Pipe-compostiong for themself.
2. Proper training should be given by free of charge Camps to the urban population.
3. A team of Volunteers should be created in urban areas for the effective implementation & operation of pipe composting
4. Local authorities may give a concession of a few % in Property tax for those who implement it.
5. To bring the "Swachh Bharat Abhiyan" into reality.

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