

SOPs of MSW Composting process by Lahore compost Private Limited

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Abstract

LCL is operating an aerobic composting plant at Lahore that has been purchased from and installed by the Menart Composting Company, Belgium. Since municipal solid waste (MSW) in Lahore is heterogeneous a screening drum (MTR 1850) installed to screen the waste before composting with additional possibility for hand-sorting of recyclables in a sorting belt. This Standard Operation Procedure (SOP) has been prepared for and adopted by the composting plant of the Lahore Compost Ltd (LCL). The SOP intends to ensure that LCL adopts the identified best practices in the plant, operates it through standard recommended procedures; and takes necessary corrective actions when required.

Keywords: Composting process, Standard Operation Procedure.

1. Introduction

Aerobic composting consists of a controlled biological process and mechanical screening thereafter. The biological process is the most critical component of aerobic composting process. Hence it is to be properly understood and regularly monitored to derive maximum benefits from the composting process [1]. The main objective of this SOP is to enable LCL to get optimum results. The whole plant's staff in general and the windrow management team in particular should study and follow this SOP religiously. The team leader should ensure that the team members entrusted with the responsibility of windrow management follows the recommended procedures. For windrow management, a team consisting of a windrow supervisor, two assistants, and the operators of turning equipment is suggested. The windrow supervisor should have scientific aptitude to understand the basics of microbiology and should have commitment and capacity to follow the SOP wholly. He is the most critical player in the whole process and his mistakes can lead to irreparable losses in the project outcomes.

The LWMC Lahore operates a weighbridge at the entrance of the MB (Mahmood Booti) dumping site and one

near the entrance of Lahore Compost Pvt. Ltd. where all the incoming vehicles are weighed and recorded. Trucks directed to LCL should be recorded separately in the format for recording the intake received daily. A new weigh bridge has been installed within the premises of the LCL in order to act as an audit check to the LWMC weigh bridge weight of the intake. Furthermore, the weigh bridge is to be used to measure the compost produced distributed as sample, sold in bulk and windrow discarded [2].

2. Windrow formation

Windrow means a long heap of regular shape and cross section. Formation of windrow is very important from following angles:

Available space is optimally utilized.

Natural air flow is not obstructed

Movement of incoming and outgoing vehicles is hassle free

Turning machines have easy access to each windrow.

Leachate overflow is controlled and

Overall appearance of the yard is aesthetically improved.

2.1 Moisture Level

If the moisture level is very low microbes may not survive and delay the composting process. Hence moisture

level may be monitored continuously for speedy decomposition and better output and quality of the end product. Ideal level of moisture will be around 50% [3].

2.2 Temperature Measurement

Due to the biological activity of aerobic bacteria, part of the organic carbon converted to carbon dioxide. This chemical activity is exothermic and hence lot of heat is generated. The temperature has to be maintained between 65-70°C. Temperature of every heap should be measured every day at 25 different locations. The temperature starts to rise from 2nd day of windrow formation and on 4th day it should reach around 60°C [4].

2.3 Oxygen Measurement

Oxygen is very necessary for biological activity of aerobic microbes present in the windrows. Oxygen meter with a probe long enough to reach deep into the windrow should be used. As the probe may not be strong enough to pierce and penetrate the heap to the desired depth, a hole may be made into the windrow where the temperature is to be measured with the help of a pointed pipe, and the probe be inserted. Oxygen percentage in the windrows should be above 10%. Oxygen of every windrow should be measured every day at 10 different locations.

2.4 Turning of windrows

Aerobic bacteria need oxygen regularly. Regular turning of the windrow is required to ensure availability of oxygen. Hence turning of windrows at fixed intervals should be strictly followed [5].

2.5 Treatment with inoculum

Incoming garbage may have native microbes which might have started decaying process. They could be of anaerobic and aerobic varieties. In order to have an end product of desired quality and also to accelerate the process of decomposition, inoculation with selected strains of effective microbes might be very essential [6]. Otherwise the decomposition process will be erratic creating problems for the operation. Purpose of biological treatment could be summarized as below:

- To accelerate biological process
- To ensure optimum decomposition.
- To make the end product of desirable quality.
- To suppress the activities of anaerobic microbes to minimize production of offensive odors.
- To ensure exothermic biological activity to destroy pathogenic organism.
- To reduce loss of nutrients
- To avoid propagation of insects and disease carrying vectors.

3. Maturity

The end product has to be fully matured and biologically stabilized to give better results in the field. Hence maturity should be checked by adopting Starch

Iodine test. Maturity of the decomposing garbage will have to be ensured before taking up for mechanical screening. The main indication of maturity is Carbon Nitrogen Ratio (CNR). If CNR is brought down to the range of 10- 15, it could be fairly assumed that the material is biologically stabilized and matured. If immature garbage is taken up for screening, recovery will be reduced and quality of end product will be poor [7]. Besides, end product after packing will keep on generating heat at yard or intermediate storage due to continuation of biological process and imperfect bio stabilization. By two methods maturity of the windrow can be tested [8].

3.1 Polythene bag test

Sample should be taken from windrow and place it in the polythene bag. Tie the polythene bag to make it air tight. This bag should be kept for almost one week. Then open the bag and immediately smell. If there is any foul smell then it is still immature but if there is no smell then windrow is mature.

3.2 Germination Test

Two pots should be taken and one should be filled with soil and other should be filled with compost. Same number of seeds should be sown in both pots and both pots should be placed for one week. Count the germination percentage after germination. If the germination percentage is higher in pot with compost then it is indication of compost maturity.

3.3 House Keeping

Since the composting aims at reducing environmental pollution, operation should be streamlined to avoid/reduce pollution effect on the surroundings. Hence, LCL should maintain good housekeeping practices. Attention to following areas will help in better house keeping

a) Control of bad odor

Bad odor is due to greenhouse gas emissions. It not only pollutes the atmosphere but also discredit the whole effort at the project site. Foul smelling gases emit when anaerobic pockets are created in the windrows. Proper treatment with adequate dosage of inoculums, regular turning of the windrows for proper aeration, maintenance of optimal moisture level; and control of leachate formation can avoid spread of unbearable and offensive odors. If the bad odor is beyond limits, the defective windrows should be broken and treated with supplementary dosage and after proper aeration, it should be reformed into a windrow.

b) Nuisance of flies and birds

Presence of flies and birds also present a bad look for the site. Improper windrow management especially with reference to the windrow formation invites flies. Slaughter house waste, rotten organic waste, presence of leachate and contaminated stagnant water will also promote presence of

flies. Once flies are observed abnormally, immediate action should be taken to improve the sanitary level of the site. The cause should be studied and corrective action taken to remove the cause. 'Herbocel' should be sprayed twice a day to drive away flies. While we can control how the LCL composting site is managed, we have no control over the open dumping site run by CDGL next door. Thus, there will always be some birds due to this, attributed to the CDGL MB open dumping site.

c) Overall Cleanliness

The LCL premises should be maintained clean and neat. Plastic packets getting sorted in the first and second screening should not be scattered all over the area. Even if it may not fetch remunerative prices, all plastic should be sorted out and kept aside in proper bundles.

d) Dusting

Dust is another disturbing element. Abnormal dust production indicates defective site operation. Dusting should be controlled wherever possible, by plugging leakages. The premises, especially the plant floor should be cleaned daily by sweeping.

4. Conclusion

For smooth functioning of composting from the receiving of MSW to the production of fine quality compost SOPs are very helpful. By following the SOPs, a company can save time, utilization of resources i.e. machinery, diesel, labour and electricity. Composting is a very delicate and sensitive procedure it needs proper attention though any one can produce a fine quality of recommended standards by following these SOPs.

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