

Technology Brief

WOODLAND PARK ZOO COMPOSTING PROCESS ASSESSMENT

This technology brief summarizes a Process Assessment conducted by E&A Environmental Consultants Inc. on behalf of Seattle's Woodland Park Zoo. The process assessment evaluates the zoo's current method of composting, and provides recommendations for improving general operational and process controls at the compost facility.

Background

The Woodland Park Zoo composting operation has been processing herbivorous animal manure, waste bedding materials, and limited quantities of animal feed since 1985. The facility currently generates between 550 and 600 cubic yards of finished compost each year.

There is strong demand for the unscreened finished product, marketed as "Zoo Doo - A Premium Organic Compost", and sold in bulk. A higher-value, niche-market product, in the form of a hand screened compost sold during the Holiday Season, is marketed as "Holi-Doo." Representing less than 2% of annual production, "Holi-Doo" generates over half the annual revenues for the compost operation. Improved process efficiency that results in a finer-sized product can have a positive impact on the composting facility's economics by allowing an increase in availability of material suitable to be marketed as higher-value "Holi-Doo", rather than the lower-value bulk "Zoo Doo".

Suitable Composting Technologies

Three composting technologies are suitable for the Woodland Park Zoo: turned windrow method; individual aerated static pile; and extended aerated static pile.

Turned Windrow. The facility currently utilizes the turned windrow method of composting, relying on a front-end loader for periodic turning. During the spring and

Key Words

Materials: Compost: herbivorous organic waste; exotic animal manure; barn stall bedding; animal feed.

Technologies: Individual and extended Aerated Static Piles; turned windrows.

Applications: Composting.

Market Goals: Greater production of higher-value, niche-market product.

Abstract: Recommendations for improving composting facility operations and process controls.

summer months, pile construction and turning occurs every 3 to 4 weeks, whereas during the fall and winter months, the frequency is increased to every 2 or 3 weeks. The front-end loader method of initial mixing generally does not produce a homogeneous blend of materials, resulting in somewhat adverse conditions for the composting process.

Monitoring of the composting process includes: 1) weekly temperature measurements, and 2) testing of the finished compost for parasites. The operating permit does not require any other testing. To facilitate passive aeration during the curing phase, 20 to 25 perforated PVC drain pipes are installed in the curing windrows.

Aerated Static Piles. The aerated static pile (ASP) method of composting is also suitable for the zoo. Two distinct ASP methods have been developed, the individual aerated static pile and the extended aerated static pile. Generally, they require less land area than windrow



composting, and reduce other problems associated with that process. The ASP methods provide for more flexible operation and more precise control of oxygen and temperature conditions in the pile than would be obtained in a windrow system. Since the time required for composting tends to be slightly shorter and anaerobic conditions can be more readily prevented, the risk of excessive odor generation is also reduced.

Other advantages of ASP systems include:

- Lower capital cost than other systems;
- Flexibility to handle variety and changes in feedstock materials and bulking agent quantity and quality;
- Easily expandable to handle an increase in seasonal waste production;
- Established technology commonly used in the U.S.

Disadvantages of ASP systems include:

- No agitation of pile contents during composting and so no mechanical breakdown of the larger particles.
- Decreased ability to adjust moisture in composting mass after pile construction.

Conclusions and Recommendations

After careful examination of the implications of the three methods on zoo composting operations, the process assessment makes several recommendations to guide improvement of the composting process.

Method of Composting. A switch from turned windrow composting to individual aerated static pile (ASP) composting was recommended for several reasons. ASP:

- Can be implemented within the same area currently being utilized (a 135-feet x 35-feet (1/4 acre) site).
- Requires a relatively small capital investment for blowers, controls and piping (under \$1200).
- Improves the zoo facility manager's ability to control the composting process.
- Reduces labor, equipment and maintenance requirements.
- Controls odors.

- Enhances finished product quality.

The assessment recommends that after establishing procedures and routines for individual ASP composting, the individual piles could then be combined into an extended ASP system. This would allow a reduction in the area requirements for active composting, and thereby increase the capacity of the site for composting, curing, and storing finished product. Further, extended ASP has the advantage of increasing the volume to surface area ratio, which improves thermal insulation (particularly during periods of cold weather) and reduces the amount of surface area exposed to wet weather.

Pilot Test Study. Prior to full implementation, the assessment recommends a pilot study of one windrow to demonstrate the individual ASP method. A monitoring program should be used to measure changes in temperatures, oxygen levels, total solids, and volatile solids. Ultimately, the pilot scale test will provide the basis for a Compost Operations Manual.

Materials Characterization. Material characterization tests on the initial feedstock materials are recommended to develop a basis for mixing and amending the initial compost mix. This information could be used to develop a suitable initial mixture of feedstock materials at an optimum moisture content.

Initial Mixing. The assessment also concludes that thoroughly mixing the feedstock materials will improve the performance of the composting system. Small manure spreaders or mixers are available for as little as \$5,000.

Process Monitoring. A process monitoring program was also recommended to facilitate process controls.

Conceptual Engineering Design. Finally, the process assessment provides a conceptual engineering design for an individual ASP system. Site layout, pile construction, aeration systems, and planning level costs are identified.

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For More Information

To order a copy of the full report, *Woodland Park Zoo Composting Process Assessment (CM-95-3)*, use the CWC Publication Order Form. If you want further information call the at CWC (206) 443-774, email at info@cw.org, or visit the CWC Internet Website at www.cw.org.

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