sea grant
COOPERATIVE EXTENSION • NEW YORK STATE • CORNELL UNIVERSITY

Composting Salmonid Fish Waste: A Waste Disposal Alternative

by David G. White, Joe M. Regenstein, Thomas Richard and Susan Goldhor[1]

Introduction

The New York State "Fish Carcass Disposal Law" was enacted in response to the increasing problems associated with fish entrails being deposited along and into major bodies of water in New York. The law states that:

"It is illegal to discard any fish carcass, or parts thereof, into the freshwaters of the state within 100 feet of shore or upon any public or private lands contiguous to and within 100 feet of such water, except:

- by owners of such lands
- live fish or fish required to be returned pursuant to other laws and regulations
- bait
- proper disposal into suitable garbage or refuse collection systems or by burial
- incidental cleaning of fish for consumption, but not within 100 feet of any public launching or docking site unless into suitable refuse collection system." (NYSDEC, 1989)

With this law has come the establishment of fish cleaning stations along New York's Great Lakes that are handling over 2 million pounds of fish waste generated by the salmonid fishery. Due to the presence of contaminants (PCB and mirex), disposal options for the waste are limited to land filling, land spreading and waste treatment. In an attempt to identify a usable alternative, Cornell University and the New York Sea Grant Extension Program carried out a compost demonstration project using the waste from Lake Ontario salmon combined with peat moss. The process of composting fish waste with peat moss, originally developed in Canada and refined in Maine, Wisconsin, and New York, was used as the basis for this project (Goldhor and Regenstein, 1989).

Project Description

At the start of the project, the owners of a marina and a sport store were identified as cooperators. The agreement reached with the cooperators was that all materials (excluding fish waste) and technical expertise would be provided by the research team. The marina and sport store staff would be responsible for subsequent pile construction and monitoring.

To reflect local conditions and user demands, two piles were constructed at each site using different confinement structures and compost mixtures. The size of the piles was arrived at after reviewing the projected needs of the facility, quantity of waste produced, and traditional composting processes. Confinement structures were all 4 feet high, 5 feet wide and 16 feet long. Two structures were built utilizing six wooden fence posts and twenty four 1 inch x 5 inch x 8 foot boards while the other two were built utilizing six metal fence posts and 32 feet of 1/2 inch wire fence.

---

[1]The authors are respectively, Sea Grant Program Coordinator, Professor of Food Science, Senior Research Support Specialist, and President of the Center for Applied Regional Studies.

Each confinement structure had a 6 inch layer of gravel, on top of which eight 4 inch drainage pipes with holes pointing up were laid widthwise, to provide bottom aeration during the composting process. A 6 inch layer of peat moss or wood chips was then put down as a base for the pile.

A layered approach was initially used, alternating 4-6 inch layers of peat moss and fish waste with a final layer of peat moss covering the pile at the end of each days waste. To initiate the composting process, a commercial compost starter was added to each layer of waste. Water was also added to maintain a 40 - 60 percent moisture level.

In constructing the piles, no labor was required beyond the daily pile construction as this is a static process where aeration through the pipes replaces turning. By maintaining a good cover of peat moss, odors and rodent infestation problems were controlled and leachate contained. By the end of pile construction the cooperators had placed between 3,000 and 5,000 pounds of fish waste into each pile.

The amount of peat moss utilized to construct one of the piles was significantly higher than expected due to the pile being constructed over several days with each days waste covered with a layer of peat. This resulted in an elevated cost of construction. In an effort to reduce the cost, another pile was constructed utilizing a base of gravel, covered with wood chips with the fish being mixed and layered with peat. This method resulted in the amount of peat on a percentage basis being cut in half, while still providing the conditions necessary for the composting process to occur.

Project Results

The composting process utilized in this project, though tested, had to be modified as composting commenced, to accommodate some of the piles being built on a daily basis over an extended period. The piles constructed in the wood structure worked very well retaining their integrity while the wire structure bulged at its sides. The decomposing waste reached a maximum temperature of 138 °F for approximately 3 days. As long as a complete cover of peat was maintained, odor, as well as problems with rodents and maggots, were minimal. All piles decomposed fully, odor was controlled, and labor was kept to a minimum. Our results indicate that composting is an effective on-site method to handling fish waste. Problems encountered include dealing with the rather messy initial waste product, and the time consumed in pile construction as part of a small business.

Regulation

As a result of contaminant analysis conducted as part of this project, the composted product meets the criteria to be classified by state law as Class II compost. In New York, composting is regulated by the New York State Department of Environmental Conservation under part 360 Solid Waste Management Facilities Regulations. The relevant sections for anyone considering composting using this process are:

SUBPART 360-5

COMPOSTING FACILITIES

Section 360-5.1 Applicability and exemptions.

(a) Applicability. The Subpart regulates the construction and operation of composting facilities for sewage sludge, septage, yard waste, and other solid waste.

(b) Exemptions. The following solid waste management facilities and operations are exempt from this Part:

(1) the composting of less than 3,000 cubic yards of yard waste per year, provided the process follows acceptable methods of composting; and

(2) a composting facility at which only food processing waste and/or animal manure are processed, if the following conditions are satisfied:

(i) the facility is developed, operated, and maintained in a safe, nuisance free manner;

(ii) the process follows acceptable methods of composting that minimize odors and produces a useful, stable end product;

(iii) prior to the commencement of operation, written notice is provided to the office of the department in the region in which the facility is located, stating the location of the composting facility, a description of the operation of the facility, and the intended end use for the compost;

(iv) the facility complies with the requirements of subdivision 360-4.4(d) of this Part; and

(v) the waste contains no domestic sewage, sewage sludge, or septage.

Section 360-5.3

(2) Class II compost:
- (i) must not have contaminant concentrations greater than the levels identified in subdivision 360-4.4(a) of this part;
- (ii) must not exceed 25 millimeters (0.98 inch) particle size. Particle size greater than 10 millimeters (0.39 inch) will be restricted to landfill cover and similar uses approved by the department on a case specific basis;
- (iii) must be produced from a composting process with a minimum detention time (including active composting and curing) of 50 days; and
- (iv) must be restricted to use on non-food chain crops.

Section 360-4.4 Sewage sludge and septage: operational requirements.

In addition to the operational requirements identified in section 360-1.14 of this Part, the following requirements apply:

(a) Sewage sludge and septage destined for land application must not exceed the following contaminant concentrations:

Parameter	Maximum Concentration ppm, dry weight basis
Mercury (Hg)	10
Cadmium (Cd)	25
Nickel (Ni)	200
Copper (Cu)	1000
Lead (Pb)	1000
Chromium (Cr)	1000
Zinc (Zn)	2500
Total PCBs	10

Since other contaminants may be present in the sewage sludge as indicated by discharge monitoring and other industrial pretreatment requirements, the department, on a case specific basis, may determine the maximum allowable concentrations of these contaminants in the sewage sludge to be used for landspreading.

Project Application

Based upon the results of this demonstration project, the following procedure is recommended:

- A confinement structure a minimum of 4 feet x 5 feet x 16 feet should be utilized. The structure should be constructed in such a way as to maintain its integrity. There should be a base of gravel (4-6 inch) and perforated pipe (holes up) placed widthwise every 2 feet for aeration.
- A base layer of peat moss or wood chips (6 inch) should be spread over the gravel.
- Construct the piles with alternating layers of fish waste and peat moss, with peat moss mixed directly in with the fish to speed decomposition.
- Each layer of fish may need a commercial compost starter added to begin the process.
- Water should be added as needed to maintain a 40 - 60 percent moisture level (this may require that the peat be wet before being added). Water should also be added if the pile temperature exceeds 160°F.
- The pile should be allowed to compost for up to 10 months (depending upon local conditions, and composition of waste placed in the pile).
- The pile should be mixed once prior to application to complete the composting process.

Prior to use of this process, it is recommended that a thorough review of the publications listed in the reference section be undertaken. These publications provide an indepth review of the process and can assist in avoiding problems that may arise when implementing this waste management process. (These publications are available for loan from the Sea Grant Extension office at the SUNY College at Oswego.)

Recreational or other facilities interested in utilizing this process are encouraged to contact the SUNY College at Oswego Sea Grant Office, the cooperators who actually participated in this project, and the DEC office in your region.

Acknowledgements

Special thanks are extended to Brad & Chris Frost, Frost Haven Resort, Fair Haven, New York and Rick Sorenson, Pineville Sport Store, Pulaski, New York for their assistance in developing this process.

References

Philip H. Averill. May 1988. Composting Seafood By-Products. Fisheries Technology Service, Maine Dept. of Marine Resources. West Boothbay Harbor, Maine. 8 pp.

William F. Brinton and Milton D. Seekins. 1988. Composting Fish By-Products: A Feasibility Study. Time & Tide RC&D, Mid-Coast Compost Consortium. Waldo-doro, Maine. 65 pp.

Thomas H. Eckert. October 1984. Draft Strategic Plan for Fisheries Management in Lake Ontario 1984 to 2000. New York State Dept. of Environmental Conservation, Albany, NY. 98 pp.

Lynn L. Frederick, Robin Harris, Lloyd Peterson and Stacy Kehrmeyer. 1989. The Compost Solution to Dockside Fish Wastes. University of Wisconsin Sea Grant Advisory Services, Madison, WI. 19 pp.

Susan H. Goldhor and Joe E. Regenstein. March 4, 1989. Improving Fish Waste Handling. New York State Sea Grant Institute. 77 pp.

Lee W. Jacobs. 1982. Annual Progress Report for Utilization of Homogenized Fish Wastes on Farm Land. Michigan State University, E. Lansing, MI. 7 pp.

Lee W. Jacobs. 1983. Annual Progress Report (No. 2) for Utilization of Homogenized Fish Wastes on Farm Land. Michigan State University, E. Lansing, MI. 23 pp.

Lee W. Jacobs. 1984. Annual Progress Report (No. 3) for Utilization of Homogenized Fish Wastes on Farm Land. Michigan State University, E. Lansing, MI. 26 pp.

Joe M. Regenstein. New Technologies for the Manufacture of By-Products from Fish Processing Plant Wastes in Urban and Suburban Locations. 1987. Cornell University, Ithaca, NY. 9 pp.

David A. Stuiber, Robert C. Lindsay and Richard Vilstrup. Rev. 1986. Handling Fishery Wastes and By-Products. Sea Grant College Program Reprint, Madison, WI. 42 pp.

Kenneth F. Wich, Norman H. Nosenchuck, and Daniel Barolo. April 1986. Local Disposal of Chemically Contaminated Fish, Memorandum. New York State Dept. of Environmental Conservation, Albany, NY. 5 pp.

Carl Woestendiek, Craig H. Benton, and Jeffrey P. Gage. March 6, 1986. Master Composter Resource Manual. Seattle Engineering Dept. Solid Waste Utility, Seattle, Washington.

Local Law No. 2 of 1983 Oswego County Solid Waste Local Law. 1983. Oswego County Legislature. 14 pp.

New York State Fishing Small Game Hunting Trapping Regulations Guide. October 1, 1988-September 30, 1989. New York State Dept. of Environmental Conservation, Albany, NY. 98 pp.

6 NYCRR Part 360 Solid Waste Management Facilities. December 31, 1988. New York State Dept. of Environmental Conservation, Albany, NY. 200 pp.

December 1989