

Using Composting To Recycle Meat Processing By-Products

Mid Atlantic Composting Association
Conference
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Problem

- Disposing of meat processing by-products
 - Rendering is less available, more expensive
- Current Michigan Bodies of Dead Animals Act (BODA) and the Natural Resources and Environmental Protection Act
 - Landfill and incineration are alternatives to rendering
 - Over half of landfills in Michigan have stopped taking animal tissues in past year

(BODA; No. 239, Public Acts 1982, amended and NREPA; 1994, PA 451, Part 115, Solid Waste Management)

Goal

- To demonstrate that a small meat processing business can use composting to effectively, safely and economically convert inedible by products into a compost product.



By-product production

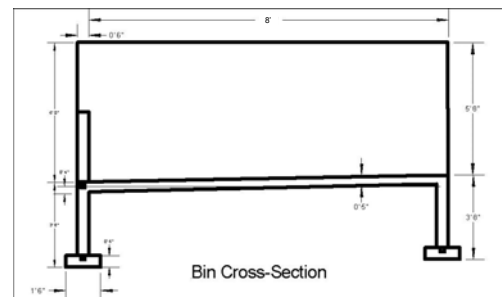
- Meat processing by-products
 - Meat scraps, fat trim, bones, internal organs, GI tract contents, and wash water solids.
- In 2002 through 2004, Jones Farm Meats accumulated 601,310 pounds of by-products annually, or 11,563 pounds/week
 - Rendering service
 - 2002 about \$13,700
 - 2003 about \$17,000

Facility



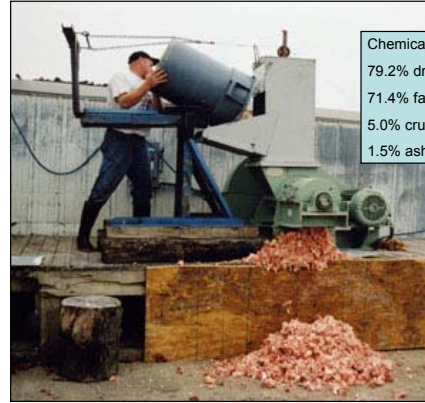
15 pounds of by-product per cubic foot of compost volume

Bin cross-section



Process

- Composting began in January 2004
- By products collected into 55 gallon barrels
 - About 10 barrels per week
 - Stored without refrigeration for a maximum of 3 days
 - Ground to reduce bone size
 - 20 hp Rietz Prebreaker without die or plate
 - Model No. PB-10-H3228 and Serial No. P-740353; Rietz Manufacturing, Santa Rosa, CA 95402
 - “Used” for \$4,200
 - Reducing volume by 250%
 - 1,535 lbs./yd³



Chemical analysis:
79.2% dry matter
71.4% fat
5.0% crude protein
1.5% ash

Process

- Carbon source
 - Dried hardwood sawdust
 - Sawdust bedding with dairy manure
 - Compost



Process

- Loading
 - Two to three bins each week
 - Bottom layer 1 foot bulking agent
 - Layers of animal tissue and bulking agent
 - Maximum depth of 5 feet



Process

- Aeration
 - Lifting, mixing, or movement to another bin
 - At least once per month minimum, may be 2 to 3 times per month
 - When temperatures remain low after each aeration (70 to 100 degrees F for at least 7 days)
 - Maintain “active” composting



Process

- Active composting for 3 to 4 months of time
- “Finished”
 - Compost was piled for further active composting
 - Application to fields as amendment
 - Not completely cured for use as rooting medium



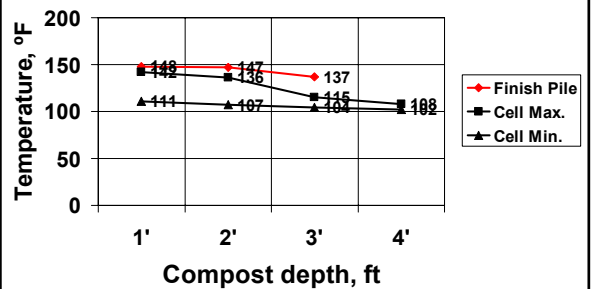
Observations



Particle size



Compost temperatures



Pile chemistry



Pile chemistry

Measurement	n	Avg	Range
Moisture, %	28	42	25- 54
pH	41	7.4	6.4 – 8.8
Ammonia, ppm	44	53	41 – 900
Hydrogen sulfide, ppm	38	ND	-
Hydrogen sulfide, ppm	6	17.3	4 – 30
Methane, %	43	0.26	0 – 3.8
Oxygen, %	27	2	0- 11
Carbon dioxide, %	42	2	0 – 14

“Finished” compost



Compost characteristics, %

	MC	Total N	NH ₄	P ₂ O ₅	K ₂ O	Ca
Compost	49	1.22	0.50	0.90	0.29	1.12
	0	2.39	0.98	1.77	0.57	2.21
Dairy manure	79	0.50	0.15	0.32	0.24	0.43
	0	2.42	0.70	1.56	1.14	2.09

Solvita 2.5 to 4.5

Things we noticed

- Odors occur during turning
- Sawdust cover reduces odor



Sawdust Cover



No Cover

Surface ammonia

Ammonia -ppm	
Sawdust Cover	No Cover
ND	20
Trace	20
ND	30
ND	ND
Trace	1.5
8	1
ND	1

Leachate

- Rain water, by-product fluids (water, lipids)



Control of leachate

- Placing raw product onto at least 1' to 2' of sawdust
- Manage layers
 - Single bucket 0.75 yd³
 - 2 to 3 inches thick over 7 x 13' area
 - One bucket of finished compost between tissue
- Turn frequently to mix saturated bottom material into dryer compost

Maintaining pile form and shape with melting fat



Things we recognized

- Individual bins make good, consistent (scheduled, specific) management possible
- A solid surface to drive on is essential
- The space between rows of bins should be adequate for equipment operations



Compost facility size

- Is facility size adequate for this meat processing capacity?
 - Yes, as intent is to comply with BODA and compost to produce compost that is non-nuisance
 - Useful soil amendment
 - No, if future intent is to produce compost that may be used as major rooting medium
 - Maybe 25 to 50% more time and space to cure thoroughly

Microbial monitoring

- Monthly monitoring of pathogens inside the meat processing plant
 - *E. coli* (Generic and O157:H7)
 - *Listeria* sp.
 - *Campylobacter* sp.
 - *Salmonella* sp.
- Finished compost
 - *E. coli* (Generic) < 10 / gram

Estimated cost \$12,421 annually (no compost value)

- Fixed cost of land and facility (30 year life)
 - Total of \$52,202
 - Straight amortization \$1,733 per year
- Variable costs of operation
 - Labor equals \$7,500 per year
 - 25 hours per month @ \$25 per hour
- Equipment: fuel, electricity, maintenance
 - Total of \$3,188 per year
 - Tractor
 - Grinder

New tractor \$62,500, then = \$16,000

Benefits

- Long term control of by product management
- Reduced costs associated with by product management
- Less pathogen risk- no rendering truck
- Environmental stewards, animal tissue nutrients are recycled
- Possible source of income from the sale of compost
 - Fertilizer equivalent of \$11.00 yd³ or about \$5.50 per ton

Appreciation

- Michigan Department of Environmental Quality,
Environmental Science and Services Division
 - **Retired Engineer Technical Assistance Program (RETAP) Technology Demonstration Program**
- Michigan Animal Industries Initiative
- Karl Jones, Jones Farm Meats
- Dr. Howard Person, Private Consultant
- MDA, Director Wyant and Kevin Kirk
- DEQ, Duane Roskoskey