Information Guide 2015
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Section A

Definition of Composting

Composting is the controlled biological decomposition and conversion of solid organic material into a humus-like substance called compost. This process is a natural transformation of organic materials into a material with environmentally beneficial applications. Composting is an aerobic process, meaning it requires oxygen. This process uses various microorganisms such as bacteria, fungi, etc. to break down the organic compounds into simpler substances.

Composting animal mortality is a viable process with a beneficial use. It reduces pathogens, diseases, and undesirable weed seeds. Properly managing air, moisture, and nutrients, the process can transform large quantities of organic material into compost in a relatively short period of time.

There are different types of composting which use different technologies, but the composting principles are all the same. The different types are: Aerated (turned) Windrow Composting, Aerated Static Pile Composting, In-Vessel Composting, and Vermicomposting.
Benefits to cured compost:

1) Increases the soil’s structure and ability to hold water and nutrients
2) Can reduce the need for pesticides by increasing the soil’s biological activity
3) Offsets use of natural resources (e.g., peat moss) for mulch
4) Diverts valuable organic materials from landfills
5) Adds organic matter and nutrients to soil, reducing the need for chemical fertilizers
6) Encourages slow release of nitrogen and lowers the carbon to nitrogen ratio, making nitrogen more available to plants
7) Kills pathogens and weed seeds
8) Prevents soil erosion
Composting Principles

In order to create a satisfactory compost, it is essential to have a favorable carbon to nitrogen ratio, as well as a sufficient moisture level and adequate oxygen. Carbon provides both an energy source and the basic building block making up about 50% of the microbial cells (wood chips, shavings, peanut hulls, etc.). Nitrogen is a crucial component of proteins, nucleic acids, amino acids, enzymes and coenzymes necessary for cell growth and function. The ideal ratio of C:N for active composting is 25:1 to 30:1. Ratios of 20:1 up to 40:1 will consistently give good results. A minimum of 5% oxygen concentration within the pore spaces of composting materials is recommended (air contains about 21%).

During composting, the microorganisms consume oxygen while feeding on the organic matter. In addition to providing oxygen, aeration removes heat, water vapor and other gases trapped within the composting materials. The most efficient temperatures for composting are between 130°F and 160°F. At these temperatures, your organic matter will break down quicker and there will be little to no pathogens, diseases, weed seeds, and insect larvae in the compost.

Water provides the medium for chemical reactions and for the transportation of nutrients. It also allows the microorganisms to move from place to place. Ideally, you are looking for a moisture level between 50-60%. Activity ceases when the moisture level drops below 15% and when moisture levels are above 60%; the water displaces much of the air in the pore spaces of the composting materials, which limits air movement and leads to anaerobic conditions.

Heat accumulation in a compost pile can rise above 160°F due to microbial activity and the insulating qualities of the composting materials. When the temperature reaches this level, many of the microbes die or become dormant. Temperatures should be monitored and heat loss should be accelerated by forced aeration.
In-Vessel Composting Definition

A process in which compostable material is enclosed in a drum, silo, bin, tunnel, reactor, or other container for the purpose of producing compost, maintained under uniform conditions of temperature and moisture where air-borne emissions are controlled.

In-Vessel composters use a forced aeration and/or mechanical agitation to control conditions and promote rapid composting.

In-Vessel Composting Advantages

1) Composting can be more closely controlled, leading to faster decomposition and more consistent product quality.

2) Effects of weather are diminished

3) Less manpower is required to operate the system and staff is less exposed to composting material

4) Can often be done onsite, saving collection costs

5) Less land area is required

6) Process air and leachate can be more easily collected and treated

7) Public acceptance of the facility are better

8) Can accommodate various types and amounts of organic waste (e.g., odorous bio solids & food)
Section B

Selecting and Sizing an In-Vessel Composter for a Broiler Chicken Operation:

Actual mortality log sheets are required in order to properly size an in-vessel composter.

Input data:

- 4 house farm with 80,000 birds
- Birds are grown up to 5lbs
- Suffer a 5% mortality loss
- They are kept for 42 days

The Math:

\[80,000 \times 5 \times 0.05 \times 0.5 / 42 = 238.1\text{lbs per day average}\]

The maximum daily capacity of the Ecodrum™ model 260 is 300lbs per day, therefore, it could handle this type of farm.
Selecting and Sizing an In-Vessel Composter for a Sow Site

Example:

Input data:
- 2500 sow farm
- Each sow produces on average 26 weanlings per year
- 13% mortality in the weanlings and 8% mortality in sows
- The weanlings average about 7lbs and the sows average about 550lbs
- There is about 100lbs of placenta per day

The Math:
\[ 2500 \text{ sows} \times 26 \text{ weanlings} = 65,000 \text{ weanlings per year} \]
\[ 65,000 \times 0.13 = 8450 \text{lbs of weanling mortality per year} \]
\[ 8450 \times \frac{7\text{lbs}}{365 \text{ days}} = 162 \text{lbs of weanling mortality per day} \]

\[ 2500 \text{ sows} \times 0.08 = 200 \]
\[ 200 \times 550\text{lbs} = 110,000 \text{lbs of sow mortality per year} \]
\[ 110,000 \div 365 \text{ days} = 301 \text{lbs of sow mortality per day} \]

\[ 162 \text{lbs} + 301 \text{lbs} + 100 \text{lbs} = 563 \text{lbs of mortality per day} \]

A model 460 could handle this type of farm.
Selecting and Sizing an In-Vessel Composter for a Finisher Pig Site

Example:

Input data:
- 2500 head in nursery barn and 2500 head in finisher barn
- Average loss of 3% in each barn therefore a 6% loss in total
- 250lbs finisher weight

The Math:

\[ 2500 \times 0.06 \times 250 \times 0.5 = 37,500 \]

\[ 37,500 \div 180 \text{ days} = 208 \text{lbs per day} \]

A model 260 could handle this type of farm.
Selecting and Sizing an In-Vessel Composter for a Turkey Thoms operation

Example:

Input data:

- 45lbs Thom average (0.70) = 31.5lbs
- 2 barns (9,000) per barn = 18,000
- 18 weeks being the grow out period (126 days)
- 12% mortality

The Math:

\[ 31.5 \times 18,000 = 567,000 \times 0.12 = 56,700 / 126 = 540 \text{lbs per day} \]

Although this would show using a Model 460, we understand that most of the weight will come at the end of the grow-out cycle. In order to process these birds, we recommend a Model 560, and add two storage bins. At the end of the grow-out when mortality numbers are high, any excess mortality that cannot be inserted into the Ecodrum™ can be stored in the storage bins. Once birds have gone to market the overflow can be inputted into the Ecodrum™ composter so that no birds remain on site when the producer receives the next flock.
**Bin Sizing for finished compost**

We suggest having a 10 x 10 bin for finishing compost.
Suggested placement

We suggest that the Ecodrum™ be sheltered in order to keep it out of the elements such as rain, snow, wind etc. A concrete pad is also heavily recommended, so as to have a more solid and level surface for the composter to rest on.
The Ecodrum™ In-Vessel composter requires a 220V outlet. The site which will feature an Ecodrum™ should already have a 220V receptacle installed in order to begin composting as soon as the composter is installed.
## Section C

### Cubic Foot Measurement on each Model

<table>
<thead>
<tr>
<th>Ecodrum™ Model</th>
<th>260</th>
<th>360</th>
<th>460</th>
<th>560</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement (ft³)</td>
<td>428</td>
<td>642</td>
<td>856</td>
<td>1070</td>
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</tbody>
</table>

### Pounds of mortality per model

<table>
<thead>
<tr>
<th>Ecodrum™ Model</th>
<th>260</th>
<th>360</th>
<th>460</th>
<th>560</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Daily Capacity*</td>
<td>300</td>
<td>475</td>
<td>625</td>
<td>750</td>
</tr>
</tbody>
</table>

*Capacities listed are maximum estimated pounds of mortality. Actual capacity of any Ecodrum™ model may vary depending on factors such as species, recipe and bulking material used.
Section D

Engineered Drawings of various sizes of In-Vessel composters

**ECODRAM™ MODEL 260**

VOLTAGE: 220V  
AMPERAGE: 20A  
WEIGHT: 5000LBS  
ALL DIMENSIONS FOR REFERENCE ONLY
ECODRUM® MODEL 360

VOLTAGE: 220V
AMPERAGE: 20A
WEIGHT: 7000LBS
ALL DIMENSIONS FOR REFERENCE ONLY

ECODRUM® MODEL 460

VOLTAGE: 220V
AMPERAGE: 20A
WEIGHT: 8500LBS
ALL DIMENSIONS FOR REFERENCE ONLY
ECODRUM™ MODEL 560

VOLTAGE: 220V
AMPERAGE: 20A
WEIGHT: 11000LBS
ALL DIMENSIONS FOR REFERENCE ONLY
Section E

Example Assessment Form for Sizing Broiler Chicken Farm

The form can be found on the next page.
FARM ASSESSMENT AND RECOMMENDATIONS

OVERVIEW

Ecodrum™ In-Vessel Composter is pleased to submit this Farm Needs Assessment and Model Recommendation. We have partnered with dozens of NRCS county offices and agents, lenders, and other government offices throughout North America. Our business is committed to improving the customer experience and success through high levels of accuracy, training and communication.

<table>
<thead>
<tr>
<th>NEEDS ASSESSMENT</th>
<th>ECODRUM™ RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>(information provided by client)</td>
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</tr>
<tr>
<td>Number of houses:</td>
<td>Ecodrum™ Model:</td>
</tr>
<tr>
<td>A. Total birds per flock:</td>
<td>Max daily loading rate:</td>
</tr>
<tr>
<td>B. Average finish weight:</td>
<td>Average daily loading rate:</td>
</tr>
<tr>
<td>C. Average % mortality:</td>
<td>Bulking material and ratio:</td>
</tr>
<tr>
<td>D. Average flock days:</td>
<td>Daily rotation schedule:</td>
</tr>
<tr>
<td>Avg daily mortality ((\text{calculate } A<em>B</em>C*.5/D)=)</td>
<td>Air exhaust schedule: with each rotation</td>
</tr>
</tbody>
</table>

ADDITIONAL COMMENTS

a) The Ecodrum™ compost system is monitored by temperature as shown on the temperature dial. Operating temp should be 131F or higher, and be recorded in the daily Log Sheet provided.

b) The Ecodrum™ takes about 14 days to process mortalities into compost. However, exiting compost should have an additional 30 days storage.

c) Dry storage is strongly recommended for bulking material.

d) Additional processing of mortalities is not required.

e) This proposal is based on information provided by the client, as signed below.

f) This proposal is non-transferable and expires 3 months from the above date.

g) Farm rep will submit three lab samples for testing, according to Ecodrum™’s instructions.

ADDITIONAL RESOURCES: http://www.ecodrumcomposter.com

CONCLUSION

We look forward to working with you to, and to meeting the challenges ahead with effective solutions. If you have any questions on this proposal, feel free to contact your Ecodrum™ representative, or Byron Irwin at byron@ecodrumcomposter.com or 701 446 6139.

Thank you for your consideration,
Section F

Compost Testing Procedures

Ecodrum™ composter offers every producer the opportunity to have their compost pile (finished product) tested for pathogens. The producer contacts Ecodrum™ for a Compost Sample Submittal Form which we fill out and send back. The producer must then take a sample and send it to whichever testing facility Ecodrum™ recommends.

The recommended sampling procedure is as follows:

1. Wearing latex gloves, remove approximately 1 quart of material from the middle of the discharge pile. Insert the material into a zip lock bag, remove air and lock. Place the bag into a second zip lock bag.
2. Fill out the date on the Lab Submittal Form.
3. Place the zip lock bagged sample and the dated Lab Submission Form into a USPS Priority Mail Small Flat Rate box for shipping.
4. Mail The US Post Priority box at the local post office

If there are ever any questions, it is recommended that the producer stays in touch with their local Ecodrum™ representative or the Ecodrum™ head office.
Compost Samples

Typical Lab Analysis Report: Broiler chickens

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Analysis Method</th>
<th>ANOVA Result</th>
<th>Date Analysis</th>
<th>Date Report</th>
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<tbody>
<tr>
<td>Moisture @ 70°C (%)</td>
<td>TMECC 03-09-A</td>
<td>43.30</td>
<td>11/21/2012</td>
<td>11/21/2012</td>
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<tr>
<td>Dry Matter (%)</td>
<td>TMECC 03-09-A</td>
<td>56.70</td>
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<tr>
<td>Total Nitrogen (N) (%)</td>
<td>TMECC 04-03-D</td>
<td>2.02</td>
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<tr>
<td>Phosphorus (P2O5) (%)</td>
<td>TMECC 04-03-A</td>
<td>0.70</td>
<td>1.37</td>
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<tr>
<td>Potassium (K) (%)</td>
<td>TMECC 04-04-A</td>
<td>1.70</td>
<td>3.15</td>
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<tr>
<td>Total Calcium &amp; P (dry) (%)</td>
<td>TMECC 04-04-A</td>
<td>1.74</td>
<td>3.06</td>
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</table>

## Typical Lab Analysis Report: Turkeys

### A & L GREAT LAKES LABORATORIES, INC.

#### COMPOST ANALYSIS REPORT

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>UNIT</th>
<th>ANALYSIS RESULT</th>
<th>DRY MATTER RESULT</th>
<th>ANALYSIS METHOD</th>
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<tbody>
<tr>
<td>Moisture @ 70°C</td>
<td>%</td>
<td>36.89</td>
<td></td>
<td>TMECC 01.09-A</td>
</tr>
<tr>
<td>Dry Matter</td>
<td>%</td>
<td>63.11</td>
<td></td>
<td>TMECC 01.09-A</td>
</tr>
<tr>
<td>Total Nitrogen (N)</td>
<td>%</td>
<td>1.22</td>
<td>1.56</td>
<td>TMECC 04.03-D</td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>%</td>
<td>3.30</td>
<td>0.32</td>
<td>TMECC 06.03-A</td>
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<tr>
<td>Phosphate (P²O₅)</td>
<td>%</td>
<td>0.75</td>
<td>1.19</td>
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<td>Potassium (K)</td>
<td>%</td>
<td>0.45</td>
<td>0.71</td>
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<tr>
<td>Potash (K₂O)</td>
<td>%</td>
<td>0.54</td>
<td>0.85</td>
<td>TMECC 04.04-A</td>
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<tr>
<td>pH</td>
<td></td>
<td>8.3</td>
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<td>TMECC 06.11-A</td>
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<tr>
<td>Fecal/Coliforms/MPN</td>
<td>MPN/g dry</td>
<td>0</td>
<td></td>
<td>TMECC 01.01-A</td>
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<tr>
<td>Pathogen Reduction - PASS/FAIL</td>
<td>pass/fail</td>
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<td>40 CFR 180-11 A</td>
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<tr>
<td>Compost Color</td>
<td></td>
<td>4</td>
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<td>Compost Odor</td>
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<tr>
<td>Maturity Index</td>
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<td>1</td>
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<td>TMECC 05.03-A</td>
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Report Approved by:

[Signature]

Approval Date: 11/02/2013
**Type Lab Analysis Report: Finisher pigs**

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<tr>
<th>PARAMETER</th>
<th>UNIT</th>
<th>ANALYSIS RESULT</th>
<th>DRY BASIS RESULT</th>
<th>ANALYSIS METHOD</th>
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<tbody>
<tr>
<td>Moisture @ 70 C</td>
<td>%</td>
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<td>TMECC 33.09-A</td>
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<tr>
<td>Dry Matter</td>
<td>%</td>
<td>67.77</td>
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<td>Total Nitrogen (N)</td>
<td>%</td>
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<td>3.41</td>
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<td>Phosphorus (P)</td>
<td>%</td>
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<td>3.07</td>
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<td>Potassium (K)</td>
<td>%</td>
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<td>1.90</td>
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<td>Potash (K2O)</td>
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<tr>
<td>pH</td>
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<td>Fecal Coliforms/MPN</td>
<td>MPN/100 dry</td>
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<td>Pathogen Reduction - PASS/FAIL</td>
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<td>Compost Color</td>
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<td>3</td>
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<td>TMECC 35.03-A</td>
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<td>Compost Odor</td>
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<td>4</td>
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<td>TMECC 35.03-A</td>
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<tr>
<td>Maturity Index</td>
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<td>1</td>
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<td>TMECC 35.03-A</td>
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</table>

Operational Guide Highlights:

Exhaust System

The Ecodrum™ features an exhaust system which draws air from the discharge end through the composting material and out the drive end. The fan, which draws air through the compost, runs for a set time every hour. This system helps to increase temperature within the drum and improves the quality of the finished compost.

Drive System

The Ecodrum™ features a heavy duty drive system with long lasting components, to rotate the in-vessel compost drum according to the control box programming. Each rotation takes approximately 15 minutes, and each model has a recommended range of rotations.

Control (Standard)

The Ecodrum™ features a timer based control box which automates the daily operation of the exhaust system and the drive system. For further instructions on the control box, see the Ecodrum™ Operation and Maintenance Guide.

For further information, review the Ecodrum™ O+M Guide.


Section H

Contacts

Sales Representative:  Byron Irwin  Atlanta, GA
Email: byron@ecodrumcomposter.com
Phone: 701-446-6139

Administration:  Tim Epp  Morris, MB, Canada
Email: tepp@triformpoly.com
Phone: 204-746-6401

Engineer:  Kevin Routledge  Morris, MB, Canada
Email: kevin@triformpoly.com
Phone: 204-746-6401

More information can be found on our website:  www.ecodrumcomposter.com