Improving MSW Compost Quality & Marketability

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Compost Matters in Alberta, Edmonton
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Background
Why concerned about contamination?

- City of Edmonton:
  - Edmonton Compost Facility (ECF) produces compost for sale.
  - Feedstock is co-mingled MSW collected from residents.
  - Central processing with pre and post treatment to remove contaminants.
  - Contamination negatively impacting sales.

(Rajabpour & McCartney 2015)
Edmonton Waste Management Centre (EWMC)

- 250,000T of commingled residential waste
- 90% waste diversion by 2018

**IPTF**: Integrated Processing and Transfer Facility
**ECF**: Edmonton Composting Facility
**HSAD**: High-Solids Anaerobic Digestion
**WTB**: Waste-To-Biofuels Facility

**TS**: Transfer Station
**PPF**: Pre-Processing Facility
**RDF**: Refuse-Derived Fuel

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**Background**

**ECF – Preprocessing Line**

1. MSW
2. 1st Hand Sorting
   - Recyclables, Rejects and bulky items
3. Trommel
   - 2 to 9 inch
   - 5 to 9 inch
4. Disc Screen
   - <2 inch
   - 2 to 5 inch
5. Pre-processing Line #1
   - C-600
   - To ECF
6. Pre-processing Line #2
   - C-700
   - To RDF
7. Common conveyors and belt-scales
   - C-401
   - To RDF

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Note: The flow of ferrous metals separated by overhead magnets from both undersize waste streams are not shown for simplicity.
Background
Contamination Mitigation Research Project
General Societal Benefits

- Add to research on improving final product quality.
- Insufficient information in literature.
- Identify processes and technologies to reduce contamination.
- Knowledge gained applicable to:
  - source separated organics (SSO) programs;
  - landfill bound waste streams.
- Aid decision makers regarding technology and SSO versus Central organics separation.

Objectives For Today

- Introduce issue of contamination.

- Provide some results of research literature review:
  - What are contaminants?
  - General approaches to separation of organics from MSW stream.
  - Risk levels for various uses.
  - Options for contaminant reduction.
Contamination

Before & After Screening Pre-treatment
Edmonton Compost Facility

% by wet weight

- Non-Combustible
- Glass
- Other Combustible
- Diap. & Nap.
- Food
- Yard
- Film Plastic
- Rigid Plastic
- Paper

March-14 | May-15 | June-15
---|---|---
Feed | <2" WS | Feed | <2" WS | Feed | <2" WS
33.4% | 63.7% | 3.0% | 10.8% | 7.2% | 10.8%
51.0% | 83.1% | 63.7% | 42.3% | 66.7% | 70.4%
10.7% | 8.0% | 7.2% | 11.1% | 8.8% | 10.0%

Edmonton Waste Management Centre of Excellence

Contamination levels?

< 2 in.
March
May
June
What are contaminants?

Foreign Matter (FM) Definitions
(CCME 2005)

- Any matter **over 2 mm** in dimension that results from human intervention and has organic or inorganic components such as metal, glass, synthetic polymers (e.g. plastic and rubber) that may be present in the compost but excluding mineral soil, woody material, and pieces of rock.

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**ECF compost consistently meets FM Category A**
What are contaminants?

Other Jurisdictions
(California January 1, 2018)

- Reg. Title 14, Natural Resources Division 7:
  - Physical contamination or contaminants means human-made inert products contained within feedstocks, including, but not limited to, glass, metal, and plastic.

- 17868.3.1 Physical Contamination Limits:
  - Compost shall not contain more than 0.5% by dry weight of PC > 4 mm. No more than 20% of this 0.5% (0.1%) shall be film plastic > 4 mm.

What are contaminants?

Specs Based on Use
Other Jurisdictions

<table>
<thead>
<tr>
<th>Use</th>
<th>Spec (dw basis)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscaping</td>
<td>Total FM ≤ 0.5% of &gt; 2 mm.</td>
<td>British PAS100 2009</td>
</tr>
<tr>
<td></td>
<td>Total plastic ≤ 0.25% of &gt; 2 mm.</td>
<td></td>
</tr>
<tr>
<td>Landscaping</td>
<td>Total FM ≤ 1%.</td>
<td>USCC 2005</td>
</tr>
<tr>
<td>Erosion &amp; sediment control</td>
<td>Total FM &lt; 1%.</td>
<td>AASHTO 2010</td>
</tr>
</tbody>
</table>
Examples of FM Specs Based on Use (cont’d)

<table>
<thead>
<tr>
<th>Use</th>
<th>Spec (dw basis)</th>
<th>Source</th>
</tr>
</thead>
</table>
| Catchment management (soil improvement)  | • Total glass, metal, rigid plastic ≤ 0.05% of > 2 mm.  
                                          • Light, flexible, & film plastic ≤ 0.005% of > 5 mm. | NSW 2007 Australia       |
| Land rehabilitation                      | • Total glass, metal, rigid plastic ≤ 0.25% of > 2 mm.  
                                          • Light, flexible, & film plastic ≤ 0.025% of > 5 mm. | NSW 2007 Australia       |
| End-of-waste compost (proposed)          | • Total glass, metal, & plastic ≤ 0.55% of > 2 mm.                            | Europe (Saveyn & Eder 2014)|

Three General Approaches

- **Source separated organics (SSO):**
  - Generator separated organics at source – typically residential.
  - Strathcona County.

- **Separate collection:**
  - Pure streams from ICI sector.
  - Safeway waste produce.

- **Central separation:**
  - Mechanical separation at central facility.
  - Edmonton Compost Facility.
Separation Methods

What is the best method?

(Donovan et al. 2010; Saveyn & Eder 2014; Levis et al. 2010; Lopez et al. 2015)

- FM never completely eliminated from MSW.
- SSO known to have lower levels of FM.
- More opportunities to reduce FM with separate collection (SSO), e.g. education of generators.

Organics and Waste Carts

Your carts and how to use them

- Black cart for waste
- Green cart for organics
- Compostable bag (optional)

strathcona.ca

Separation Methods

Advantages & Disadvantages

<table>
<thead>
<tr>
<th></th>
<th>SSO</th>
<th>Central</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantages</td>
<td>FM is lower.</td>
<td>Lower collection cost.</td>
</tr>
<tr>
<td></td>
<td>Heavy metals lower.</td>
<td>Simpler for users.</td>
</tr>
<tr>
<td></td>
<td>Opportunity for education.</td>
<td>GHG reduction potential compared to landfilling.</td>
</tr>
<tr>
<td></td>
<td>0 to 6% FM by wet weight.</td>
<td></td>
</tr>
<tr>
<td>Disadvantages</td>
<td>Lack of participation.</td>
<td>Marketability of product.</td>
</tr>
<tr>
<td></td>
<td>Higher cost of collection.</td>
<td>Heavy metal content.</td>
</tr>
<tr>
<td></td>
<td>FM still inevitable.</td>
<td>Screening only partially effective.</td>
</tr>
</tbody>
</table>

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### End Use Impacts

#### Risk Levels Due to FM

<table>
<thead>
<tr>
<th>Sector</th>
<th>Use</th>
<th>Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture</td>
<td>- Growing media.</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>- Soil improver.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mulch.</td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>- Salad, fruit, &amp; veggies.</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>- Non-food crops.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Grassland &amp; forage: harvested.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Grassland &amp; forage: grazed.</td>
<td></td>
</tr>
<tr>
<td>Forestry</td>
<td>- Nursery &amp; planting.</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>- Forestry.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Bioenergy.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sector</th>
<th>Use</th>
<th>Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land restoration</td>
<td>- General restoration.</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>- Landfill restoration.</td>
<td>Low</td>
</tr>
<tr>
<td>Waste Management</td>
<td>- Daily landfill cover.</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>- Landfill.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Incineration.</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>- Topsoil.</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>- Livestock bedding.</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>- Sports turf and amenity.</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>- Organic fertilizer.</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>- Biofilter.</td>
<td>Low</td>
</tr>
</tbody>
</table>
Contaminant Reduction
Technology Options for Contaminant Reduction

- Pre-acceptance load inspections/load rejection.
- Hand sorting of feedstock.
- Magnets for ferrous.
- Screening (remove larger particles).
- Extrusion.
- Density separation (air or wet).
- Centrifugation.
- Cyclones.
- Depacking.
- X-ray based sensors.

Research Program
Proposed Research Approach

- Technology assessments:
  - Assess pre- & post-processing technology.
- Detailed case studies:
  - Develop study protocols.
  - Select facilities to visit.
  - Material flow diagrams for each facility.
  - Contamination levels at various points in material flow, e.g. collection, preprocessing, post-processing.
  - Cost comparison per unit tonne, including education.
Summary & Conclusions

- Contamination a significant issue impacting MSW compost sales.
- Lack of quantitative information in literature to inform decision making.
- Interested in joining research project?

Questions?
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References


References (cont’d)


