

2nd Canadian Organic Residuals Recycling Conference



WHITBY ONTARIO CANADA

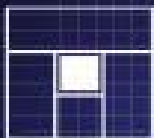


City of Sault Ste. Marie Co-composting Pilot Study



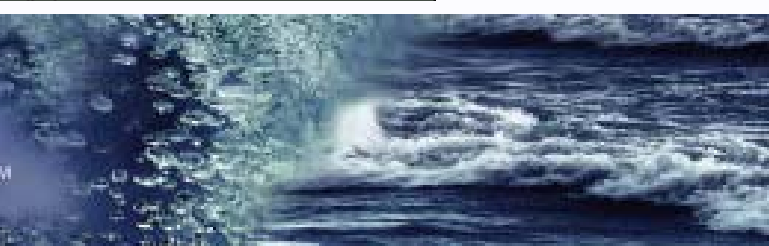
Michael Cant Manager, Solid Waste

April 25, 2003



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INTRODUCTION

- TSH retained to complete a long-term Waste Management Planning Study for the city
- 80,000 tonnes of waste handled by the city
- Approximately 32,000 tonnes or 40% is organic;



9,500 tonnes Leaf/Yard Waste



12,500 tonnes Organic Waste



10,000 tonnes Biosolids

INTRODUCTION

- In order to make full scale organics composting feasible from a solid waste perspective the city had to look at biosolids.
- City received a grant from the federal governments “*Green Municipal Enabling Fund*” (GMEF) to assess the feasibility of composting biosolids with other organic components of the municipal solid waste stream.

STUDY OBJECTIVES

- 1) Determine the residential response to a municipal composting program.
- 2) Determine if a useful soil amendment product can be produced.
- 3) Determine if composting is cost effective.

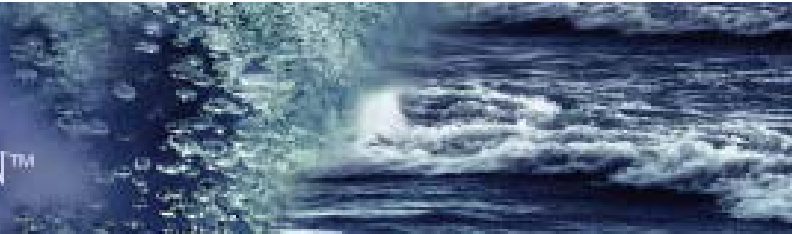
STUDY DESIGN

- Certificate of Approval Application
- Construction of Compost Pad
- Request for Proposals for Composting Technologies
- Identification of Residential Collection Area
- Container Research and Selection.



COMPOSTING TECHNOLOGIES

- Nine Proposals were received from technology providers:
 - 2 from aerobic digestion in rotating drums;
 - 1 proposal for windrow composting
 - 1 proposal for aerated static pile outdoors
 - 2 proposals for aerated static piles in an enclosure
 - 3 proposals for container systems



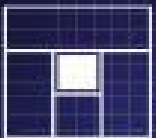
COMPOSTING TECHNOLOGIES SELECTED

Ag-Bag CT5 machine



COMPOSTING TECHNOLOGIES SELECTED

Omega Organics Rotating Drum



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IDENTIFICATION OF RESIDENTIAL COLLECTION AREA

- A pilot area was selected, 589 single family homes
- Collection undertaken by city staff
- **Container Selection**

Kitchen Containers



Pilot Study Kit



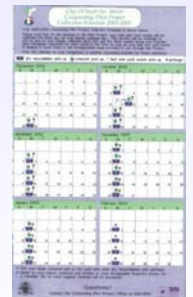
IMPLEMENTATION – RESIDENTIAL ORGANICS

- Public Consultation key to the success of the residential program
- A notice advising of the commencement of the study was delivered to the 589 households identified in the pilot area
 - Received 129 requests for exclusion from the pilot study, reasons including (12% Florida, 20% Elderly, 26% not interested, 11% already composting, 7% vacant homes, 20 % no reason given)

IMPLEMENTATION – RESIDENTIAL ORGANICS

460 residents were given the pilot study kits

- Included an explanation of how to use the containers and bags
- A poster outlining acceptable materials
- A calendar detailing how organics collection integrates with existing blue/yellow box and garbage collection



RESIDENTIAL PARTICIPATION

- On average 220 households participated between September 30, 2002 and January 27, 2003
- A total of 54 tonnes of materials was collected over the pilot period
- Averaged of 13.8 kg per participating households per week over the entire pilot period
 - Averaged approximately 21.0 kg per participating household between September and November (consisting of household organics and yard wastes)
 - Averaged approximately 5.8 kg per participating household between December and January (consisting of household organics)



OTHER INTERESTING FINDINGS

- At the end of the study 460 households received a questionnaire
- 230 responses to the questionnaires returned
- 96% of the participants interested in supporting a city wide program
- drop in the number of garbage bags from an average of 2.5 to 1.15 bags per week (54%)

COMPOSTING MIXES

6 different mixes were completed in October with the Ag-Bag Technology:

1. 1.3 kitchen/yard : 1.0 woodchips
2. 4.6 kitchen/yard : 12.4 woodchips : 1.0 Biosolids
3. 4.6 kitchen/yard : 3.4 woodchips : 1.5 Flakeboard Fries : 1.0 Biosolids
4. 4.6 kitchen/yard : 14.0 woodchips : 1.0 Biosolids
5. 2.0 woodchips : 1.0 Biosolids
6. 3.0 woodchips : 1.0 Biosolids

14 Additional mixes in December were processed with the Ag-Bag Technology

COMPOSTING MIXES

In November the Omega Drum Technology was started.
The following mixtures were tested in two drums;

- 1.5 kitchen/yard : 1.0 woodchips
- 2.0 leaf : 1.0 Vegetable/Fruit
- 2.0 woodchips :1.0 Biosolids

In total 8 different mixes were tested in the Omega Drum Technology

In addition 5 small windrows of woodchips and kitchen and yard waste were established

TECHNOLOGY PERFORMANCE - OMEGA

- Ontario's Interim Guidelines require that in-vessel composting systems reach temperatures of at least 55°C for a minimum 3 day period for pathogen inactivation
- Initially the rotary drum was outside and could not bring the mixes to 55°C
- Ambient temperatures between November 2002 and February 2003 ranged from 4°C to -26°C
- Built structures around the drums and gas heaters were installed inside the structures to heat them

TECHNOLOGY PERFORMANCE - OMEGA

- With the application of heat the material failed to achieve the required composting temperature
- Drum was moved inside after the submission of a Health and Safety Plan
- Drums restarted on January 28, 2003 but still unable to reach required temperatures to promote proper composting
- No product produced to test

TECHNOLOGY PERFORMANCE – Ag-Bag

Ontario's Interim Guidelines require that material throughout a pile must maintain a temperature of at least 55°C for a minimum of 15 day during the composting process to inactivate pathogens

October Mixes; with Days Exceeding 55°C (131°F) after 10 weeks

- 1) 1.3 kitchen/yard : 1.0 woodchips (0 days)
- 2) 4.6 kitchen/yard : 12.4 woodchips : 1.0 Biosolids (21 days)
- 3) 4.6 kitchen/yard : 3.4 woodchips : 1.5 Flakeboard Fines : 1.0 Biosolids (21 days)
- 4) 4.6 kitchen/yard : 14.0 woodchips : 1.0 Biosolids (10 days)
- 5) 2.0 woodchips : 1.0 Biosolids (26 days)
- 6) 3.0 woodchips : 1.0 Biosolids (9 days)

The ambient temperature range during this period was 9°C to –23°C

TECHNOLOGY PERFORMANCE – Ag-Bag

December Mixes

None of the mixes met the Ontario Interim Guidelines for time-temperature of 15 days exceeding 55 ° C (131 ° F)

- Mix 14 = 1.0 Biosolids : 20.0 Ground leaves 2.0 food (13 days)
- Mix 18 = 2.5 woodchips : 1.0 Biosolids (14 days)

COMPOST QUALITY - METALS

- Compost is required to meet the Provincial interim guidelines for metal content

	BIOSOLIDS		
	Ontario Guideline	West End Plant	East End Plant
<i>Arsenic</i>	10	0.9	2.8
<i>Cadmium</i>	3	1.8	0.9
<i>Cobalt</i>	25	7	22
<i>Chromium</i>	50	60	48
<i>Copper</i>	60	376	267
<i>Mercury</i>	0.15	0.36	1.19
<i>Molybdenum</i>	2	5	5
<i>Nickel</i>	60	21	12
<i>Lead</i>	150	295	14
<i>Selenium</i>	2	1.6	0.9
<i>Zinc</i>	500	412	951

All units mg/kg dry weight

- MOE Guidelines states “To prevent dilution of contaminated feed materials, no individual waste source, additive or inoculants may exceed the metal concentration limit”
- All existing composting operations in Ontario involving food and /or biosolids wastes do not met the Interim Guidelines



METALS STANDARDS

	ONTARIO "A"	CCME "A"	BRITISH COLUMBIA "A"	BC Biosolids Feed Stock
Arsenic (As)	10	13	13	75
Cadmium (Cd)	3	3	3	20
Cobalt (Co)	25	34	34	150
Chromium (Cr)	50	210	210	1060
Copper (Cu)	60	100	400	2200
Mercury (Hg)	0.15	0.8	2	15
Molybdenum (Mo)	2	5	5	20
Nickel (Ni)	60	62	62	180
Lead (Pb)	150	150	150	500
Selenium (Se)	2	2	2	14
Zinc (Zn)	500	500	500	1850

All units are mg/kg dry weight.



METALS RESULTS

MIXES 1 THROUGH 6

	ONTARIO	CCME "A"	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5	Mix 6
Arsenic (As)	10	13	1.1	2	0.9	1.4	3.7	2.1
Cadmium (Cd)	3	3	<0.5	<0.5	<0.5	0.6	0.7	0.5
Cobalt (Co)	25	34	6	4	4	4	4	6
Chromium (Cr)	50	210	201	201	183	169	99	294
Copper (Cu)	60	100	24	35	33	58	143	94
Mercury (Hg)	0.15	0.8	0.03	0.07	0.1	0.21	0.6	0.4
Molybdenum (Mo)	2	5	5	5	4	5	4	8
Nickel (Ni)	60	62	97	90	83	74	44	133
Lead (Pb)	150	150	8	8	15	12	25	18
Selenium (Se)	2	2	<0.2	<0.2	0.3	0.4	0.8	0.7
Zinc (Zn)	150	500	68	100	99	169	394	252

All units are mg/kg dry weight

Bold exceeds MOE, shaded exceeds CCME "A" and MOE

Mix 1 – 1 kitchen/yard: 1 woodchips

Mix 2 – 4.6 kitchen/yard: 12.4 woodchips: 1 biosolids

Mix 3 – 4.6 kitchen/yard: 3.4 woodchips: 1.5 fines: 1 biosolids

Mix 4 – 4.6 kitchen/yard: 14 woodchips: 1 biosolids

Mix 5 – 2 woodchips: 1 biosolids

Mix 6 – 3 woodchips: 1 biosolids

METALS RESULTS SELECTED MIXES

**TABLE 4.9
METALS ANALYSIS FEBRUARY 20, 2003**

	ONTARIO	CCME "A"	Mix 7	Mix 8	Mix 9	Mix 10	Mix 14	Mix 17	Mix 18	Mix 19	Static Pile
Arsenic (As)	10	13	56.4	4.9	2.5	0.6	1.0	2.5	3.3	1.7	1.1
Cadmium (Cd)	3	3	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	1.3	<0.5	<0.5
Cobalt (Co)	25	34	<2	4	<2	3	5	4	4	3	4
Chromium (Cr)	50	210	17	24	13	13	19	28	30	15	19
Copper (Cu)	60	100	65	40	30	20	31	118	142	38	35
Mercury (Hg)	0.15	0.8	0.27	0.19	0.09	0.05	0.05	0.23	0.38	0.08	0.05
Molybdenum (Mo)	2	5	<3	<3	<3	<3	<3	<3	<3	<3	<3
Nickel (Ni)	60	62	8	10	5	7	11	11	11	7	11
Lead (Pb)	150	150	19	34	17	<5	12	79	108	23	6
Selenium (Se)	2	2	0.4	0.3	0.2	<0.2	0.2	1.0	1.2	0.3	0.2
Zinc (Zn)	500	500	310	178	143	62	59	171	211	120	84

All units are ug/g dry weight.

* bold exceeds MOE, shaded exceeds
CCME "A" and MOE

Mix 7 - 2 woodchips: 1 biosolids

Mix 8 - 5 woodchips: 1 biosolids

Mix 9 - 8 woodchips: 1 biosolids

Mix 10 - 1 food: 1 ground leaves

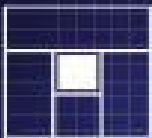
Mix 14 - 1 biosolids: 20 ground leaves: 2 food

Mix 17 - 3 woodchips: 1 biosolids

Mix 18 - 2.5 woodchips: 1 biosolids

Mix 19 - 3.5 woodchips: 1 biosolids

Static Pile - 4.6 kitchen/yard waste: 14 woodchips: 1 biosolids



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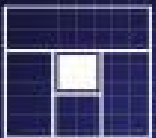


OTHER MUNICIPALITIES

BIOSOLIDS COMPOSTING RESULTS						
	ONTARIO	CCME "A"	Devon, Alberta Biosolids	Devon, Alberta Compost	Kelowna Biosolids	Kelowna Compost
Arsenic (As)	10	13	3.1	4.5	1.6	6.3
Cadmium (Cd)	3	3	1.77	0.336	1.42	1.3
Cobalt (Co)	25	34	2.43	4.05	15.2	19.3
Chromium (Cr)	50	210	12.8	76.6	2.43	2.75
Copper (Cu)	60	100	152	28.1	686	313.25
Mercury (Hg)	0.15	0.8	0.94	0.13	1.66	1.32
Molybdenum (Mo)	2	5	2.83	0.702	4.8	<4
Nickel (Ni)	60	62	12.7	12.4	16	13.25
Lead (Pb)	150	150	2.83	11.8	15.2	<50
Selenium (Se)	2	2	3.79	0.94	1.6	<2
Zinc (Zn)	500	500	362	84.4	226	226.5

All units are ug/g dry weight.

Bold exceeds MOE, shaded exceeds CCME "A" and MOE



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COMPOST QUALITY

- Harvesting the compost from Ag-Bag system April 24 and 25
- Additional testing will be undertaken at that time including C:N ratio, mineral content etc.

COMPOSTING PROCESS COSTS

- \$30 to \$60 tonne for window composts
- \$80 to \$100 tonne for processing indoor aerobic channel system or containerized system
- \$27.50 tonne to dispose waste in Sault Ste. Marie landfill
- propose to increase tipping fee to \$65 tonne by 2006
- currently only pay to have the biosolids hauled to the landfill site

SUMMARY

- Objective 1: Residential response to composting
 - High level of interest in full-scale residential composting

SUMMARY

- Objective 2: Can a useful product be produced
 - Based on Ontario's interim guidelines biosolids cannot be used as a feed stock for composting
 - May be able to produce a CCME Class A compost (additional testing and research required)
 - Could meet British Columbia Class A Standard

SUMMARY

- Objective 3: Will composting be more cost-effective?
 - Only charging \$27.50 tonne at the landfill
 - in P.E.I. charge \$80 tonne at compost plant and \$85 tonne at landfill
 - in Halifax charge is \$65 to \$75 tonne at compost plant and \$115 tonne at landfill

