Know What You Throw – Decoding Your Waste and Recyclables

Laura Drescher

October 1, 2019
What can be more romantic and thrilling than to be in engaged in a profession that saves human lives and adds to health, happiness, and prosperity of your own community.”

-Robert E. McDonnell, 1927
Agenda

Audit Types and Process
Audit Analysis
Recycling Market
Case Studies
AUDIT TYPES
Recycling Audit

► Used to determine % of recoverable commodities
  • Determines revenue share
► Several methodologies
  • Sampling one or more loads
  • Running a certain percent of material through the MRF
► Representative results:
  • Random samples
  • Sufficient quantity of samples
  • Statistical significance
Residual Audit

▶ Audit of the MRF residue
▶ Determine residue composition:
  • Contamination
  • Missed recyclables
  • Recyclable material not recoverable by equipment
▶ Recovery rate
▶ Amount and type of contamination
Commodity Audit

► Audit of a sorted commodity
► Provides information on:
  • Contamination
  • Mischaracterized recyclables
    ▪ Example: plastic bottle captured with the aluminum cans
    ▪ Example: HDPE bottle captured as mixed plastic
Audits Require Planning

► With private contractor, have parameters defined in contract when possible

► Procedures
  • Method of sampling
  • Sorting methodology / requirements
  • Material categories
  • Quantity of samples
  • Safety / Training

► Costs
  • Personnel
  • Sorting equipment (if applicable)
AUDIT ANALYSIS
Recycling Measurement

% Recycling Rate = \[ \left( \frac{\text{Total Recycled}}{\text{Total Recycled} + \text{Total Disposed}} \right) \times 100 \]

Measurement Alternatives:
- Capture rate
- Disposal rate
- Participation rate
- Life-cycle analysis
- Greenhouse gases
Single Family Pounds per Household per Year

- **Current**: 200 lb/hh/yr
- **Increase**: 40% due to Bins
  - 322 lb/hh/yr (NCTCOG 2018 Study)
- **Increase**: 10% due to Natl Avg Carts, accept glass
  - 357 lb/hh/yr (Natl Avg Curbside)
- **Increase**: 10% due to Natl Avg Carts, accept glass
  - 450 lb/hh/yr (Natl Avg Carts, accept glass)

Data from 2018-2019 NCTCOG Regional Recycling Education and Campaign and Recycling Partnership State of Curbside Report
Capture Rate Formula

Capture Rate provides an understanding of how effectively a curbside recycling program operates.
### Overall Capture Rate Results

#### What percent of available materials are captured?

<table>
<thead>
<tr>
<th>Material</th>
<th>Tons Recycled</th>
<th>% of Recyclable Captured</th>
<th>Tons Recyclables in Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>288,032</td>
<td>45%</td>
<td>350,660</td>
</tr>
<tr>
<td>Plastic</td>
<td>52,222</td>
<td>22%</td>
<td>183,614</td>
</tr>
<tr>
<td>Metal</td>
<td>16,477</td>
<td>18%</td>
<td>72,746</td>
</tr>
<tr>
<td>Glass</td>
<td>78,383</td>
<td>25%</td>
<td>238,848</td>
</tr>
</tbody>
</table>

Data from 2018-2019 NCTCOG Regional Recycling Education and Campaign
Individual Materials Capture Rate Results

Data from 2018-2019 NCTCOG Regional Recycling Education and Campaign
Disposal Rate

Tons/Person/Year

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2008</th>
<th>2012</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>0.54</td>
<td>0.51</td>
<td>0.48</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Johnson County Population

Total Tons Per Year

- Yard Waste
- Recyclables
- Refuse
- Population
The Economy of Recycling

► Recycling is the process of converting materials into new materials that otherwise would have been discarded as waste
► Manufacturing feedstock that competes with other raw materials
Commodities

► Recyclables are commodities
► Sold to combination of domestic and international markets
► Values constantly fluctuate
Factors That Impact Commodity Values

- Value of the US Dollar
- Value of Related Commodities (e.g. oil)
- Market Demand
- Export Restrictions
2008 – 2009 Market Crash

► Commodity values plummeted from all time highs to historic lows in a matter of weeks
► Crisis drove recycling processors to reconsider their financial approach to allocate more risk to local governments
► Financial benefits to local governments have decreased due to lower trending commodity values and higher processing fees
► As municipal recycling contracts expire, many cities are facing increased pricing for recycling
Unstable Materials Market

Single Stream Material Revenue

5-year Average $77 per ton
Costs & Revenues for Recycling Processing

Financial terms often include a processing fee and revenue share

► **Processing fees increasing**: compensate processors for cost to provide service, current typical range of $60–90 per ton; compared to $30–40 prior to 2008

► **Revenue share increasing**: Based on market prices for recyclable materials, typical range of 40–90 percent; but values typically less than in 2008
What is happening in China?

- **National Sword**
  - China banned 4 categories and 24 material types on December 31, 2017
  - 0.5% contamination threshold for processed material

- Issued compounded by tariffs in 2018

- Materials diverted to lower tier countries who are now restricting import
How the global river of plastic waste changed course in just 12 months
Exports of plastic waste, parings and scrap from G7 countries (’000 tonnes)

2017

- 2018

China and Hong Kong received nearly 60 per cent of plastic waste exports from G7 countries in the first half of 2017.

Following a Chinese crackdown on imports of plastic waste, which came into effect at the beginning of 2018, exports from the G7 fell by more than 20 per cent overall. The share of the remaining exports that went to China and Hong Kong fell below 10 per cent, with other Asian countries – particularly Malaysia – making up much of the shortfall.
Moving Forward

► Reset financial expectations
► Focus on reducing contamination
► Recycle materials with highest value
► Grow existing or potential domestic markets (17 new paper facilities coming on-line in the U.S.)
► Incentivize new manufacturing facilities in U.S. to use commodities and close loop
Recyclable Materials with Highest Value

- OCC
- Mixed Paper
- PET
- HDPE
- Aluminum
- Steel
Contamination is Expensive

- Paying $60 – $90 per ton to process trash
- Zero revenue is generated from contamination
- Costs to transport to landfill and dispose
Impact of Contamination on Average Revenue

- Revenue Per Ton

- Range of Processing Fees

- Percent Contamination

More Opportunity for Profit
Reducing Contamination

► Public education
  • Direct messaging
  • Regional cooperation

► Better understanding specific contaminants

► Inspections and enforcement

► Targeted ad campaigns

► Collaboration (e.g., The Recycling Partnership)
Multiple Reasons to Recycle

► Financial value
► Minimize disposal
► Environmental benefits
► Policy/diversion goals

Financial value of materials is only one of several reasons to recycle
CASE STUDIES

Emory University
Johnson County, KS
NCTCOG
Burns & McDonnell
Existing Goals:

► 95% diversion from landfill
► Plastic bottle ban
► Zero landfill waste at all university events
► Support culture change towards a “reduce, repair, restore, and reuse” mentality and “cradle-to-cradle” purchasing
About 67% of the landfill stream is compostable (food and other compostable material)

Over 20% of the landfill stream is recyclable or potentially recyclable

Less than 10% of the landfill stream actually belongs in the landfill
Emory Generator Takeaways

**LANDFILL**
Over 75% of Dining waste could be composted.
Less than 3% of the Research & Facilities landfill materials actually belongs in the landfill.

**RECYCLING**
Less than 1% of the Administrative and Research recycling materials were non-recyclable.
Over 40% of the Dining recycling stream is compostable.
Single-stream recycling in Residential areas is highly contaminated (>65%)

**COMPOST**
Administrative and Dining areas had less than 5% contamination in the compost.
Academic, Public Areas, and Research areas all had greater than 15% contamination in the compost.
Emory Projected Waste Diversion

2017
Exterior collection data and general improvements (start soon with new metrics; roll out tech in 1 to 2 years)

2017
Confirm optimal separation scheme

2017
Agree on campus standard(s) for collection containers and signage

2018
Release RFP to procure new containers

2018
Start development of education campaigns, and initiate trainings for staff handling materials

2018
Campus-wide roll out of new containers, signage, and outreach campaigns

2017
Binventory

2020
Investigate financial incentives for customers

After 2022
Landfill phase out, post-collection processing... get closer to 95% diversion

Financial investment is anticipated to be most significant in 2018/19, with purchase of new collection bins and development of education campaigns.
2010 Update to Solid Waste Management Code:
- Yard waste prohibited from disposal in the landfill
- Yard waste collection included in residential curbside collection
- Extend remaining life of landfill
- In 2007 audit, 17% JoCo residential waste was yard waste
Johnson County, KS Diversion Success

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Tons Per Year</th>
<th>Yard Waste</th>
<th>Recyclables</th>
<th>Refuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>270,000</td>
<td>6.4%</td>
<td>9.3%</td>
<td>83.9%</td>
</tr>
<tr>
<td>2008</td>
<td>290,000</td>
<td>5.9%</td>
<td>10.3%</td>
<td>83.3%</td>
</tr>
<tr>
<td>2012</td>
<td>340,000</td>
<td>13.7%</td>
<td>15.0%</td>
<td>70.8%</td>
</tr>
<tr>
<td>2017</td>
<td>440,000</td>
<td>20.6%</td>
<td>17.9%</td>
<td>61.4%</td>
</tr>
</tbody>
</table>

Johnson County Population

Total Diversion

- Yard Waste
- Recyclables
- Refuse
Johnson County
Ditch the Bag Campaign

- MRF audit conducted in Fall 2018 by Bridging the Gap
- Bagged recyclables the highest contaminants
Johnson County
Ditch the Bag Campaign

► Bin inspection of approximately 1,000 homes across the County
► Many residents bagging recyclables
► 7-week campaign funded through KDHE grant
► Recent bin inspection of same homes showed 50% decrease in bagged recyclables

## NCTCOG Project Overview

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>► Composition analysis of recycling and landfill material from 10 cities</td>
<td>► Capture rates</td>
</tr>
<tr>
<td>► Interviews with all MRFs in the region</td>
<td>► Prioritization of problematic and preferred materials</td>
</tr>
<tr>
<td>► Acceptable and problematic materials MRF mapping</td>
<td>► Economic value of material recycled and landfilled</td>
</tr>
<tr>
<td>► Multiple workshops and focus groups</td>
<td>► Strategies to develop a regional campaign</td>
</tr>
</tbody>
</table>
Capture rates more accurately inform action than recycling rate. Of what is available... what is captured

Data on *Participant* Capture Rates – How Recycling Participants are Doing
Recycling Partnership data using *un-bagged* material figures

**Data on *Whole City* Capture Rates – How the Whole City is Doing**
Recycling Partnership estimate using waste composition, recycling, and household data

*Data from 2018-2019 NCTCOG Regional Recycling Education and Campaign and Recycling Partnership State of Curbside Report*
NCTCOG Top Prohibited Items

- Plastic Bags
- Tanglers
- Explosives
- Sharps
- Food Contaminated
Want to make a positive 'ERY
Burns & McDonnell WHQ Audit

- Self-performed in April 2019
- Approx. 2700 lbs. of refuse, recycling, and compost sorted
- Representative sample of approximately 24-hours worth of generation
- Buildings sorted separately for reporting purposes
Capture Rates:

- 83% OCC/kraft paper
- 83% recyclable paper
- 66% aluminum cans

Higher for easy to identify items based on current education.
Burns & McDonnell
WHQ Audit Findings

- Largest materials generated:
  - Paper
  - Organic materials
- Much of paper not recycled is compostable (paper towels)
- Compost currently only consists of pre-consumer food scraps
QUESTIONS

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CREATE AMAZING.