State and Future of Northeast MRF’s - 2018

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Waste Management

88% Increase in amount of recyclables managed since 2007

~15M Tons of recyclables extracted from the waste stream

102 Recovery facilities owned/operated by Waste Management
Top Ten U.S. Exports

- Recyclables are the largest U.S. export item by volume
- The U.S. is impacted by trade interruptions with its investment in the recycling industry and other products
- We continue to export large volumes, but the end markets are changing

Source: JOC.com
Following the Path of Our Commodities

Destination of fiber recyclables 2017 vs 2018

WM is the 7th largest exporter of all goods (by volume from the U.S. (2018))

- 27% of our fiber went into China in 2017
- 5% in Q1 2018
- <3% in Q3 2018

Recyclers are continuing to build alternative markets to move material. India, SE Asia, Europe and domestic mills are all being used by WM’s marketing team.
Recycling Supply and Demand Imbalance

- Recycling programs have a fundamental economic supply/demand problem
- Even though demand has significantly declined, inelastic supply continues to flow in at high rates

Reduced overall demand, supply surplus, increased quality requirements = increased processing cost and low commodity values for paper
Impact of Excess Supply = Reduced Pricing

2018 YTD Mixed Paper Demand

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2017</th>
<th>% chg.</th>
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<tbody>
<tr>
<td>Mixed paper</td>
<td>2,198</td>
<td>2,172</td>
<td>1.2%</td>
</tr>
<tr>
<td>Domestic mill consumption</td>
<td>1,747</td>
<td>2,267</td>
<td>-22.9</td>
</tr>
<tr>
<td>Exports</td>
<td>759</td>
<td>265</td>
<td>186.7</td>
</tr>
<tr>
<td>India</td>
<td>234</td>
<td>68</td>
<td>244.9</td>
</tr>
<tr>
<td>Indonesia</td>
<td>153</td>
<td>72</td>
<td>110.5</td>
</tr>
<tr>
<td>China</td>
<td>73</td>
<td>1,382</td>
<td>-94.7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,945</td>
<td>4,439</td>
<td>-11.1%</td>
</tr>
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US Average Mixed Paper Prices

(FOB Generator’s Dock, Baled - $/ton)
Oversupply means increased quality requirements for all markets

1 in 4 items placed in a recycling cart is not recyclable!

0.5% contamination enforced by China

>24% Avg. contamination % in our MRFs

Every ton of material collected includes ~450 lbs of contaminants; markets expect <10 lbs
What contamination looks like in the MRF stream

- MRFs are adding equipment and labor, while slowing down their processing.
- The changing waste stream continues to stress MRFs.
- Consumers expect whatever they put into their carts to be recycled.
- There is little understanding of technical/economic limits of recycling.
- Recyclables do not create an economic or environmental benefit until they are sold as commodities and manufactured into products.
MRFs in the Crossfire

Inbound Pressure:
Recycle More!
Recycle Everything!
25% + Contamination
Keep costs Low!

Outbound Pressure:
• Improve quality
• Increasing cost
• Half the value
• Technology limits

MRFs:
The magic box in the middle that is supposed to solve it all....
It’s time to re-write the recycling playbook

• It is time to **rethink/reset** recycling programs.

• Which materials offer the best bang for the buck?

• As the cost of recycling increases, should we be looking more closely at the benefits of waste reduction?

• Environmental benefits are our goal

**WHY do we recycle and WHAT should we recycle?**
91% of CO2 benefits are from OCC and Mixed paper. Plastic is 4.5% & Glass is 3%.
Blended Material value ~(-48.2%) from 2017 to 2018 creating a challenging economic environment for recyclers and their customers.

- The 55% of the stream with the positive commodity value contributes to 97% of the emissions reductions.
- The 45% of recycling stream with a negative economic value contributes only 3% of the GHG emission reductions.
Increasing residue hurts everyone!

**Rule of Thumb:**
1% residue increase = 0.025 MTCO2e / input ton GHG Emissions Benefit decrease

- 10% residue = 2.01 MTCO2e per inbound ton
- 24% residue = 1.67 MTCO2e per inbound ton
- 10% residue = $56/ton Average Blended Value
- 24% residue = $39/ton Average Blended Value
State of MRFs: Summary

The bad news:

• Recycling is likely to get harder before it gets better. The cost of recycling is increasing and commodity values are expected to remain low, while quality requirements stay high.
• Packaging continues to become more complex. This makes recycling confusing and leads to increased contamination.
• Innovation for alternative solutions for varied plastics are increasing - but they will take time. We need to solve for the solutions first.

The good news:

• Markets for paper will improve. Recyclable paper is a feedstock for products that are in demand so new markets will develop. It will take 1-2 years to rebalance the markets.
• Increased education efforts can help reduce contamination: Collaborations to simplify messaging, increase funding, and expand public education and outreach are growing.
• We have more knowledge to prioritize our efforts around recycling the right things, correctly.

Thank you!