Separation at the Source
An Effective Approach to Increasing Recycling and Reducing Costs

Presented by TOMRA
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About TOMRA

TOMRA North America: Founded in 1972

Active in 9 States and 1 Province

Our Mission: To become the leading provider of advanced recycling technology for used packaging

World leader in compaction and baling solutions for solid waste materials at the source
  • Installed base of over 70,000 balers around the world

Serve major food retailers and beverage producers
Why Recycle?

The historical focus of recycling (in the 1990s) has been on keeping materials out of landfills.

Now, it's about more than that. In recent years, public solid waste policy has shifted to focus more on...

- Reducing need for virgin materials
- Avoiding GHGs and production of toxics
- Reducing energy use
Environmental Benefits

Next to conserving natural resources, the most immediate benefit from recycling are the **energy savings**.

When a product is made from recycled material, the use of virgin materials is not required. Therefore all the upstream energy and associated environmental impacts from the extraction, transport, and processing of those virgin materials are avoided.

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Energy Saved by Recycling (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>95%</td>
</tr>
<tr>
<td>Glass</td>
<td>30%</td>
</tr>
<tr>
<td>Plastic (all resin types)</td>
<td>70%</td>
</tr>
</tbody>
</table>
But not all recycling is equal...
Recycling Hierarchy

- Prevention
- Reuse
- Upcycling (closed-loop)
- Downcycling (open-loop)
- Disposal
The key to achieving the environmental benefits of recycling is to keep the material circulating for as long as possible.

The upstream environmental benefit of closed loop recycling is **10 to 20 greater** than open-loop recycling.

**Upcycling**, also called "closed-loop" recycling, converts end-of-life materials into new materials or products of higher quality and increased functionality. It is about reclaiming the materials from one product and using them to produce the same (or very similar) product in a closed-loop system.

**Downcycling**, or "open-loop" recycling, is where material is reclaimed for reuse in a product of lesser quality or in some way reduces the functionality of the material. When material is downcycled, it cannot be used to make the original product.
Upcycling, also called "closed-loop" recycling, converts end-of-life materials into new materials or products of higher quality and increased functionality. It is about reclaiming the materials from one product and using them to produce the same (or very similar) product in a closed-loop system.
Examples of closed-loop recycling:

- Recycled office paper being manufactured into a new paper product using secondary feedstock instead of virgin fiber
- Aluminum can being turned into a new aluminum can
- Recycled glass (cullet) used in the manufacture of new glass bottles (bottle-to-bottle)
- Recycled PET resin being manufactured into new plastic containers for foods, beverages, etc.
**Downcycling**, or "open-loop" recycling, is where material is reclaimed for reuse in a product of lesser quality or in some way reduces the functionality of the material. When material is downcycled, it cannot be used to make the original product.

**Examples of open-loop recycling**

- Tree bark or tree leaves being used to make wood chips or mulch
- Plastic bags, bottles, and packaging that cannot be recycled and instead end up in landfills
- Items made from aluminum cans that are crushed and used as filler in construction projects
- Used tires being shredded and used as aggregate in road construction
Examples of open-loop recycling:

- Recovered aluminum cans being manufactured into siding, automotive parts, and aluminum foil

- Recycled glass (cullet) being manufactured into fiberglass or being used as road aggregate or as substitute cover in landfills

- Recycled PET resin being manufactured into carpet and clothing fibers or other packaging materials
Single-Stream Recycling

- Allows businesses to commingle all their recyclables in one bin

- Began in California as municipalities were looking for a way to increase diversion while keeping recycling costs down

- Becoming increasingly popular in North America
Why is it so popular?

Increased recycling participation

More material collected

Reduced transportation costs

Reduced labor costs
Despite the advantages, single-stream recycling does not show the cost advantage that was originally anticipated...
Concerns with Single Stream Recycling Collection

Increased Contamination

- In general, single-stream MRFs produce materials of lower quality, and with more residuals and contaminants
- This increase in contamination results in the material being worth less, and can reduce the recycler's ability to produce quality end products
- e.g. On average, 40% of glass from single-stream collection ends up in landfills, while 20% in glass fines used for low-end applications (e.g., road aggregate). Only 40% is recycled into containers and fiberglass.

Increased Processing Costs

- With the growth of single-stream collections, recyclers/processors have seen their costs increase, related to:
  - Cleaning and screening poorly processed materials
  - Repairing damage to equipment
  - More frequent equipment cleaning
  - Equipment replacement
  - Buying new materials to replace those that were unusable
  - Increased disposal costs to dispose of residual materials that cannot be used
- It is estimated that paper mills spend $5 to $13 more per ton to process material from single-stream systems compared to material collected using cleaner methods.

Lower Yield Rates

- While single-stream MRFs use less energy and generate less material, less of that material is sent for recycling.
- According to a Bureau of Reclamation study in Minnesota, source-separated MRFs reported using nearly 100% of materials to recirculate or output, compared to 23-25% for single-stream systems.
- Recyclers report that on average, material from single-stream MRFs has a yield rate of about 60-70%, compared to 90% from dispersed or systems which typically have a yield rate of 80-90%.
- Paper mills that receive materials from single-stream MRFs have contamination rates as high as 15%.

In the end, with increased processing costs and lost revenues due to lower-quality material, the costs of single-stream are actually higher.
Increased Contamination

• In general, single-stream MRFs produce materials of lower quality, and with more residuals and outthrows.

• This increase in contamination results in the material being worth less, and can reduce the recycler's ability to produce quality end products.

• e.g. On average, 40% of glass from single-stream collection ends up in landfills, while 20% is glass fines used for low-end applications (e.g. road aggregate). Only 40% is recycled into containers and fiberglass.
Lower Yield Rates

• While single-stream MRFs take in higher quantities of material compared to multi-stream MRFs, less of that material is sent for recycling.

• According to a Eureka Recycling study in Minnesota, source-separated MRFs reported losing only 1.6% of materials to residuals or outthrows, compared to 27.2% for single-stream systems.

• Plastics recyclers report that on average, material from single-stream MRFs has a yield rate of about 68%-70%, compared to bales of PET from deposit return systems which typically have a yield rate of ~85%

• Paper mills that receive materials from single-stream MRFs have contamination rates as high as 18%
Increased Processing Costs

• With the growth of single stream collection, recyclers/processors have seen their costs increase, related to:
  • Cleaning and screening poorly processed materials
  • Repairing damage to equipment
  • More frequent equipment cleaning
  • Equipment replacement
  • Buying new raw material to replace those that were unusable
  • Increased disposal costs to dispose of residual materials that cannot be used

• It is estimated that paper mills spend $5 to $13 more per ton to process material from single-stream systems compared to material collected using cleaner methods
In the end, with increased processing costs and lost revenues due to lower-quality material, the costs of single-stream are actually higher!
Economic Impacts on US Recycling Industry

- Low quality recyclables are often shipped overseas where the materials can be separated for lower-costs (cheaper labor)

- Attractive low-cost overseas markets for secondary materials tightens the supply of domestically available secondary feedstock
  - Less material flowing to secondary processors and manufacturers

- Lost jobs

- Disincentive to use recycled content due to increased production costs
So, what is the best way to manage our waste?
"Waste" is simply resources mixed together.

To increase the chance that these resources are recycled, separation and compaction of waste materials at the source is critical.

Compaction can assist by offering space savings, which allow for less frequent pick-ups with fewer vehicles for pick up

• Saves $ by reducing labor and transportation costs
From Waste to Resources

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Compaction can assist by offering space savings, which allow for less frequent pick-ups with fewer vehicles for pick up
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Value Proposition

Source separate and bale materials on-site to attain the greatest economic value for collected materials and ship directly to market
Value to Small and Mid-Sized Generators

- Baling creates efficient compaction for transportation of the commodity and offers metrics for recycling volume reporting
- Baling allows businesses to pack more and spend less when managing waste or recyclable materials
Value to Small and Mid-Sized Generators

- Based upon the options currently available to mid- and small producers, the capture rate is generally low

- Baling source separated materials on site increases weight (density) and saves space
Questions

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