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Part 1

PLASTICS: HERO OR VILLAIN WHEN WE MANAGE THEIR AFTERLIFE?

Chaz Miller
AAEES
January 11, 2023
HERO?
OR VILLAIN?
WHAT I’LL BE COVERING
HOW MUCH PLASTIC
2018 EPA DATA
PLASTIC AS A PERCENTAGE OF MSW

2018 EPA DATA
EPA MSW PRODUCT CATEGORIES
2018 EPA DATA

Food & yard waste: 98.5 million tons = 33.75%
Containers & packaging: 82.2 million tons = 28.15%
Durables: 57.1 million tons = 19.5%
Non-durables: 50.4 million tons = 17.3%
Miscellaneous inorganic wastes: 4.1 million tons = 1.4%
PLASTICS BY MSW PRODUCT CATEGORIES
2018 EPA DATA

Containers & packaging: 14.5 million tons - 41%
Durables: 13.7 million tons - 38%
Nondurables: 7.5 million tons - 21%
PLASTICS IN MSW BY RESIN
2018 EPA DATA

LDPE/LLDPE: 8.6 million tons - 24%
PP: 8.2 million tons - 23%
HDPE: 6.3 million tons - 18%
PET: 5.3 million tons - 15%
PS: 2.3 million tons - 6%
PVC: 0.840 million tons - 2%
Other resins: 4.2 million tons - 12%
WHERE IS “AWAY” FOR PLASTICS?
WHERE IS “AWAY” FOR PLASTICS?

2018 EPA DATA

Recycle: 3,090 million tons - 8.7%
Energy Recovery: 5,650 million tons - 16.3%
Land disposal: 26,970 million tons - 75.6%
PLASTIC RECYCLING BY EPA PRODUCT CATEGORY

2018 EPA DATA

BY EPA PRODUCTS CATEGORY:

Durables: 0.93 million tons - 6.8%
Non-durables: 0.18 million tons - 2.4%
Containers & Packaging: 1.98 million tons - 13.6%
PLASTIC RECYCLING BY RESIN
2018 EPA DATA

BY RESIN TYPE:
PET: 0.98 million tons - 25.4%
HDPE: 0.56 million tons - 14.8%
LDPE/LLDPE: 0.37 million tons - 9.9%
PP: 0.05 million tons - 2.7%
MOST RECYCLED PLASTIC PRODUCTS
2018 EPA DATA

PET bottles: 0.91 million tons - 29.1%
Natural HDPE bottles: 0.22 million tons - 29.3%
Colored HDPE bottles: 0.29 million tons - 18.1%
LDPE/LLDPE bags, sacks & wraps: 0.37 million tons - 13.3%
RECYCLED PLASTIC RESIN
PLASTICS & WASTE REDUCTION

MSW Generation Per Person 1960-2018
PACKAGING LCAS

LIGHTWEIGHT RULES
Consume less energy
Less fossil fuel in transportation
Produce less CO2 emissions
Lower water use
Higher product to package ratio
Generate less MSW even if unrecyclable
WHAT DOES ALL THIS DATA MEAN?

Our use of plastic products has skyrocketed over the years
Plastics are a significant part of the waste stream
Plastics are found in every type of manufactured products
Plastics have slowed down waste generation
Plastic products are more diverse in composition, colors used, etc., than products made from other materials
RAW MATERIALS LOOKING FOR BUYERS
nHDPE NORTHEAST
JAN 2020 – DEC 2022

nHDPE NE cents per pound
PET NORTHEAST
JAN 2020 – DEC 2022

PET NE cents per pound
EXPORTS
RECYCLED PLASTIC EXPORTS

BILLIONS OF POUNDS

0 500,000,000 1,000,000,000 1,500,000,000 2,000,000,000 2,500,000,000 3,000,000,000 3,500,000,000 4,000,000,000

2017 2018 2019 2020 2021 2022
MYTH: the U.S. dumps its trash on other countries

• FACT: Virtually all US garbage stays in the states

• FACT: Paper and metal recyclables have been exported for decades without controversy

• FACT: US PET & HDPE exports declining since 2010 as domestic markets increased

• FACT: some unscrupulous recyclers do salt bales with non-recyclables but that is uncommon.
RECYCLING MARKET TRENDS

Recycled plastic demand is high based on “commitments” to use recycled content.

Recycled plastic supply is incapable of meeting those commitments. Those commitments can be constrained by overall raw material costs.

Economic trends important:
• Is the economy growing or contracting
• Do end markets need more or less raw materials
• Infrastructure Act should be good for some recycled plastics

Competition with virgin resin which is usually less expensive
Recycling resin prices are affected by Brent and Henry Hub
BARRIERS TO PLASTIC RECYCLING

- Lightweight
- Wide range of products
- Wide range of resins
- Wide range of colors
- Resin composition changes due to new chemistry & technology
- Harder to recycle than paper or metals
- Fluctuating markets
HOW DO WE FIX PLASTIC RECYCLING
POLICIES TO INCREASE RECYCLING: DEMAND SIDE

Recycled content either as part of EPR or standalone

• Few states with laws, fewer in effect

Government procurement requirements
POLICIES TO INCREASE RECYCLING: SUPPLY SIDE

Mandatory recycling

Bottle container deposits

• Ten states

• Highest aluminum, glass & PET recycling rates

EPR

• “Internalize” waste management costs

• Packaging laws common in Europe

• Four states passed laws, none implemented until 2025
MECHANICAL OR NON-MECHANICAL ("CHEMICAL", ETC.) PROCESSING

“Mechanical” processing at the more than 375 “MRFs” in the U.S.
• Uses a variety of technologies to separate out different plastics for end markets

“Chemical” or “advanced” or “molecular” processing has potential to process a wider array of plastic products and resins
• Less than ten facilities are operating in the U.S.

Non-mechanical recycling needs to make the transition from papers and press releases into commercially-sized operating facilities

Is creating fuel “recycling”?

Facility siting often contentious

Industry promoting legislation to classify as “manufacturing” and exempt from waste regs
• 21 states have adopted
MANAGING PLASTICS
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Part 2

PLASTICS: HERO OR VILLAIN WHEN WE MANAGE THEIR AFTERLIFE?

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January 11, 2023
The Many Faces of Plastic

- Polyethylene terephthalate (PET #1 and #2)
- High Density Polyethylene (HDPE)
- Polyethylene (PE)
- Polypropylene (PP)
- Polystyrene (PS)
- Polyvinyl chloride (PVC)
The Many Forms of Plastic

The Many Views of Plastic

• It can and should be recycled/reused.
• It is too expensive to be recycled.
• It is environmental irresponsible to chemically recycle plastic.
• Plastics should be banned/limited or extended producer responsibility required.
Plastic Bans, Fees, Taxes

Plastics Recycling Market – Highly Variable

ATLANTA (Southeast USA)
Plastics PET (Baled, $/lb, picked up)

Pricing History

![Graph showing pricing history for plastics PET in Atlanta, Southeast USA. The graph depicts the price trend over time, indicating variability in pricing across different regional levels.](image-url)
Plastics Recycling Market – Highly Variable

ATLANTA (Southeast USA)
Plastics Natural HDPE (Baled, ¢/lb, picked up)

Pricing History

- Regional Low
- Regional High
- Regional Average
- National Average
Plastics Recycling Market – Highly Variable

ATLANTA (Southeast USA)
Plastics Commingled (#1-7, Baled, ¢/lb, picked up)

Pricing History
The Holy Grail of Plastics Recycling

• End game: Quicker and more precise recovery of plastics by material composition, color, clarity, opacity, and form factor.

• Approaches
  • Mechanical separation
  • Optical sorting combined with artificial intelligence
Technologies

• Most the major equipment manufacturers employ various processes to segregate by size and material type:
  • Size segregation (trommels and screening)
  • Manual separation (both negative and positive sorting)
  • Shredding (various points in the process)
  • 2D-3D sorting
  • Optical sorting (plastics and fibers)
  • Robotics (positive and negative sorts, e.g., removal of PVC for pyrolysis)
  • Pneumatic separation (combined with optical)
General Process and Goals

• Engineered Fuels

• Typical MRF recovery sequence:
  
  Remove Bulky Items → Screen out inerts and organics → Size by trommels and screens → 2D and 3D material removal (OCC; #1 and #2 plastics) → Recover fiber/plastic for engineered fuel

• General goal: 94% to 96% efficiency for capture of targeted materials, with 92% purity of targeted capture material
Climate Controlled Sorting Stations

CP Group Front-End MRF
Bag Breaker - Trommel Screen

Disc Screen
Plastics Optical Sorter
Products

Plastics Bale

OCC Bale
Products

Engineered Fuel - Plastics

Cellulose/Pulp Engineered Fuel or Pulp Feedstock
What are processors doing?

• The challenge: Falling blended commodity values in 2022.
  • Q4 2021: $132/ton (WM)
  • Q3 2022: $94/ton (WM)
  • Expected Q4: $50/ton (WM)

• Move away from commodity price-driven returns and into fixed processing fee
  • Covers processing costs more reliably
  • Provides more consistent revenue streams to weather ups and downs of the market

• Employing more technology, artificial intelligence and robots
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