

MRF MATERIAL FLOW STUDY

MRC ANNUAL CONFERENCE 2016


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PREPARED BY




Providing solutions to meet sustainability, resource management and waste recovery goals of clients and their supply chains


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Introducing Our Services



Global Corporate Sustainability



Waste Recovery Solutions



Organics Management

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since 1986

Managing change in a resource-constrained world
for nearly 30 years

RRS 
RECYCLE.COM

managing change in a resource-constrained world.

Why?

- The material mix at the MRF is constantly changing
- Understanding how categories of materials flow will help the industry improve recovery

Goals



Flow

Where do packages end up?



Selection

Why do packages flow to commodities?



Processes

What changes to sort processes could improve recovery?

Methodology

1 Materials added to standard incoming recyclables



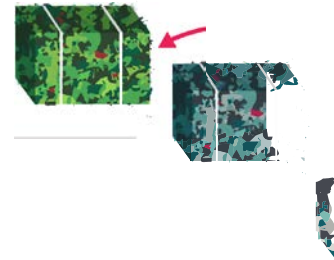
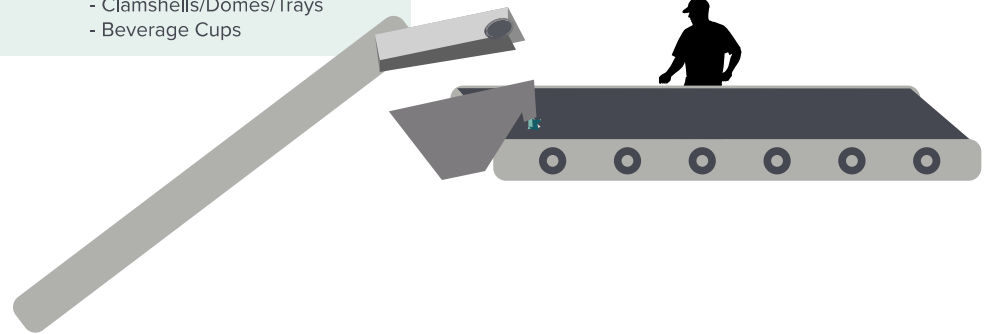
PAPER MATERIALS ADDED

- Gable-top and aseptic cartons
- Beverage cups (hot & cold)
- Ice cream containers
- Clamshells
- Trays

PLASTIC MATERIALS ADDED

- Bottles & Jars
- Small/Large plastic containers
- Small/Large plastic lids
- Clamshells/Domes/Trays
- Beverage Cups

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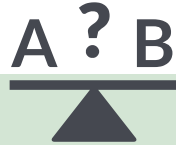


MRFs Tested



Locations

Midwest, Northeast
and Southeast



Type

One dual stream and
four single stream



Size

2 lg. (35 tph), 2 med. (25-30 tph)
and 1 sm. (10 tph)



Equipment manufacturers

4 different companies



Optical sorters

Ranged from 0 to 5

Paper Materials

Gable-top and aseptic cartons

Beverage cups (hot & cold)

Ice cream containers

Clamshells

Trays

Plastic Materials

Bottles & Jars

Small/Large plastic containers

Small/Large plastic lids

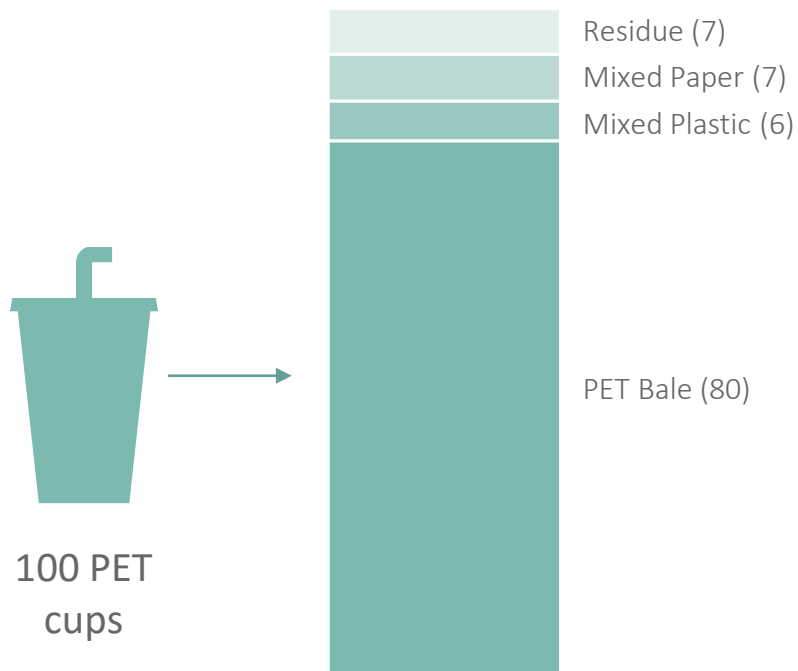
Clamshells/Domes/Trays

Beverage Cups

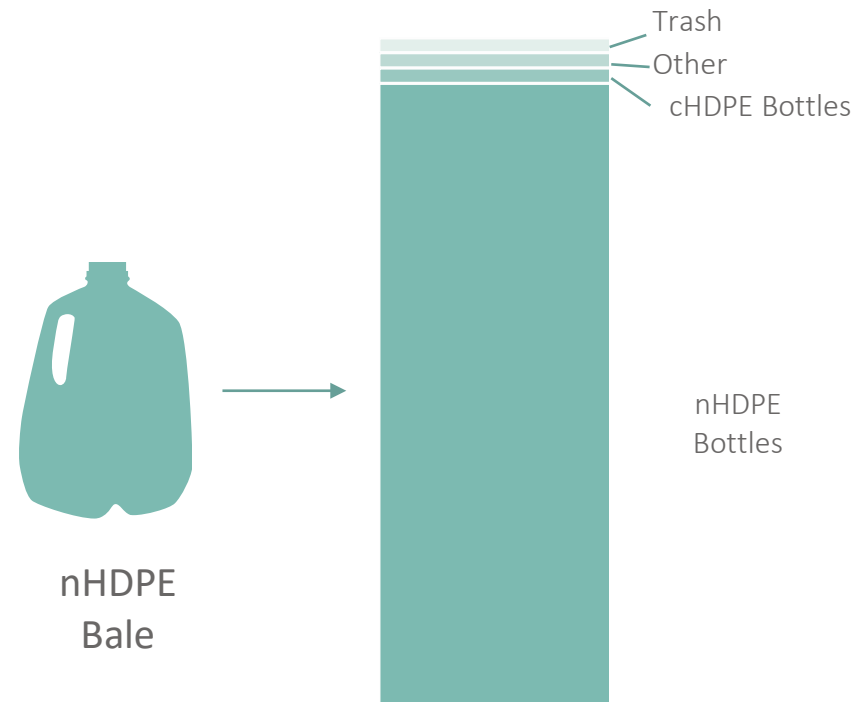


Two Types of Analysis

Where did study materials end up?



What was in each of the target bales?



Product Characterizations were Calculated for:



Mixed Paper



Mixed Paper
Newspaper ¹



cHDPE



Newspaper



PET



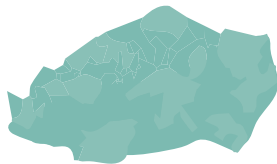
nHDPE



Cartons



Mixed Plastics ²



Residue

1. Some facilities only marketed one grade of paper
2. Also included a HDPE/PP Tubs and Lids grade

What did we learn?



2D/3D SEPARATION IS KEY TO HIGH RECOVERY

Overall loss rates of
containers to paper
commodities varied
from 3% to 12%



PACKAGE FORM INFLUENCES FLOW

Materials that held their
shape had a higher tendency
to flow to the container line
than those that flattened



OPTICAL SORTERS CAN HELP IDENTIFY PACKAGING

Increasing benefits as
stream evolves into
being more diverse
and lightweight



2D/3D SEPARATION IS KEY TO HIGH RECOVERY

Overall loss rates of plastic materials varied from 3% to 12%

Likely reasons for high loss:

- 8% loss at large facility had unusually compacted and wet material due to equipment failures and snowstorms
- 12% loss at both medium facilities likely had worn disc screen discs

Material preparation had a strong effect

- Minimize compaction of material by residents and collection trucks
- Keep material dry

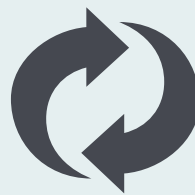
Avoid overloading screens past their design throughput

Screen maintenance is key to consistent performance

- Clean screens of material that are wrapped around the shafts
- Replace worn and damaged discs

More screens produced better separation

- Large facilities both had 1 extra screen than medium facilities and had lower loss rates of plastics to the paper stream



PACKAGE FORM INFLUENCES FLOW

Loss rate of packaging materials to the paper streams

FORM	Plastic Bottles	Plastic Cups	Plastic Containers	Plastic Clamshells	Aseptic and Gable-top Cartons
AVERAGE LOSS RATE TO PAPER STREAM	5%	10%	12%	29%	18%
LOSS RATE AT BEST PERFORMING SINGLE STREAM MRF	2%	3%	2%	12%	0%

No material is perfect

- Even plastic bottles had on average 5% loss to the paper stream

Materials that held their shape had a higher tendency to flow to the container line than those that flattened

- Lightweight water bottles had a loss rate of 15%

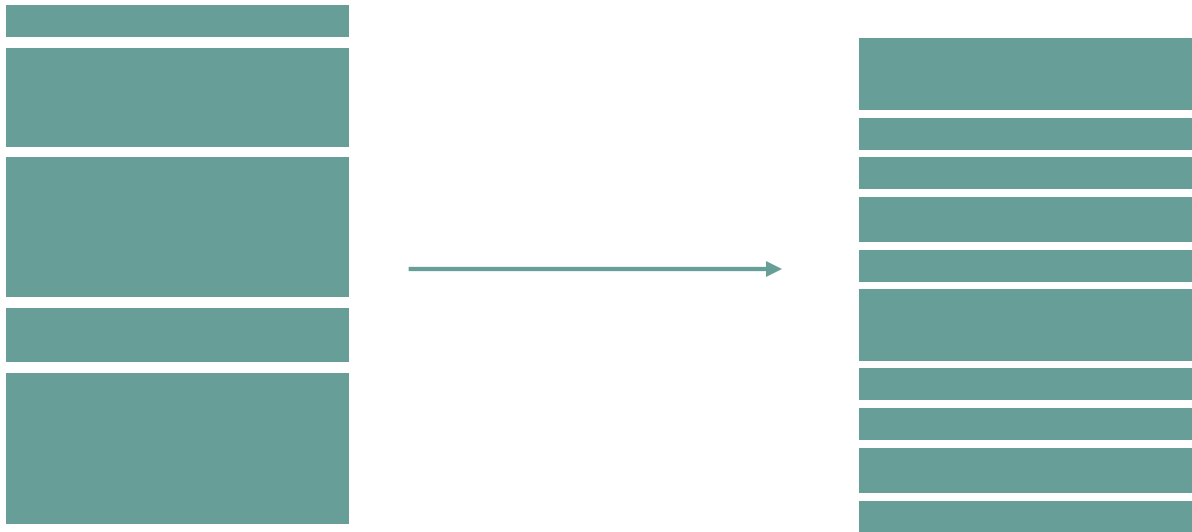
Loss rates above are to the paper stream only, each type also had losses to other commodities and to the residue



OPTICAL SORTERS CAN HELP IDENTIFY PACKAGING

Increasing benefits as stream evolves into being more diverse and lightweight

Manual sorters can be overwhelmed by number of individual pieces and confused by similar looking resins or packages (i.e. clear PET and clear PP)



Factors Improving a Package's Recovery

Size + Shape:

Dimensions make a difference - items tend to flow with similarly sized and shaped materials across materials

Stiffness:

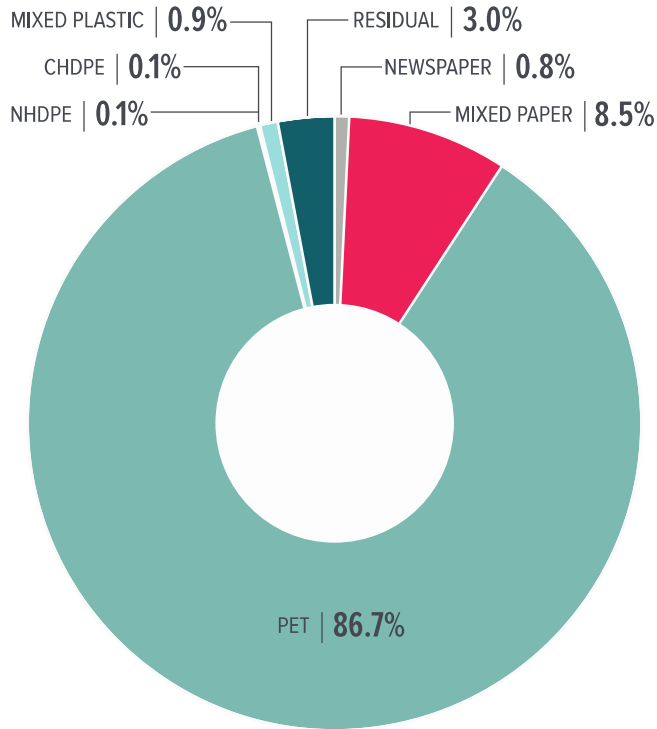
Holding the 3D shape improves likelihood of moving with containers

Common:

More prevalent form/resin combination will increase ability to target with dedicated optical or manual sorters

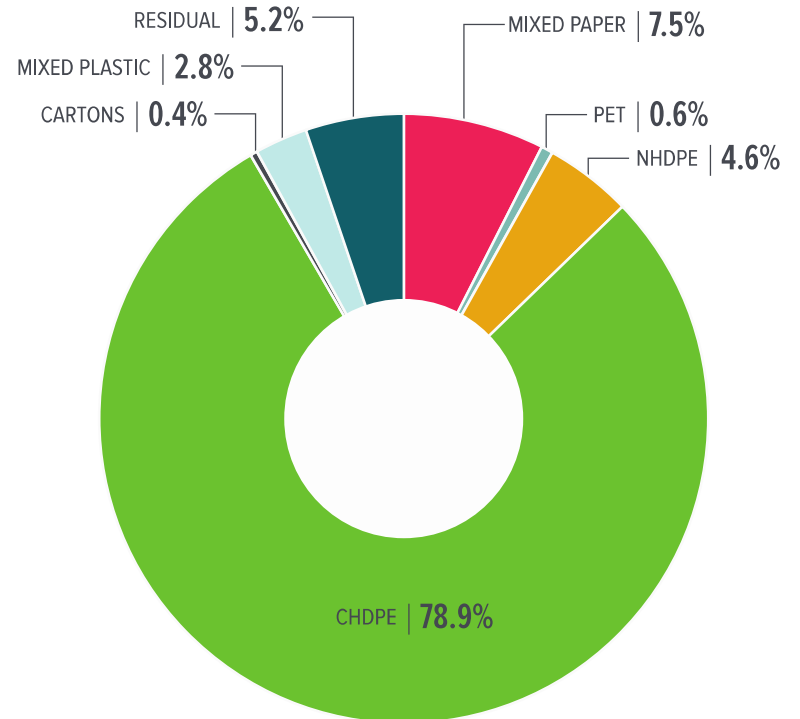
Where Did the Material End Up?

Small, regular weight PET beverage bottles



PET Bottles – Small (< 1L), regular weight
 Size – not too small
 Holds 3D shape relatively well
 Very common material in the MRF

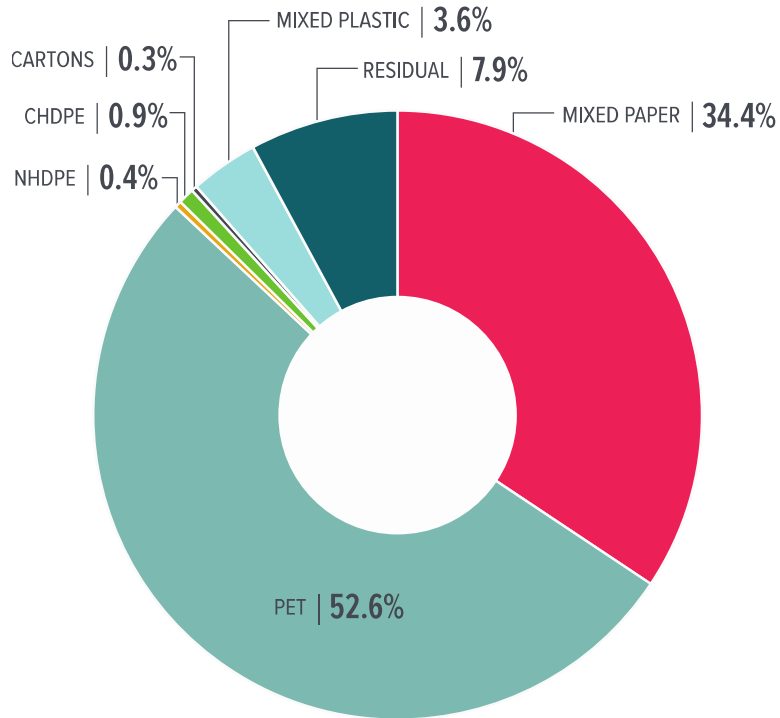
All CHDPE bottles



CHDPE Bottles - All
 Size – noted numerous small single serving type bottles
 Holds 3D shape relatively well
 Very common material in the MRF

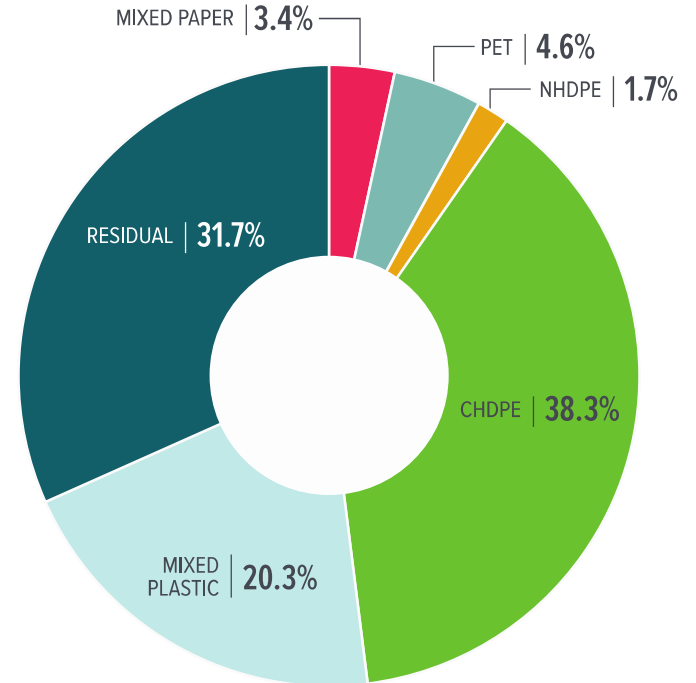
Where Did the Material End Up?

Small PET Containers



Size – many small containers
 More likely to flatten due to open top
 Very common material in the MRF

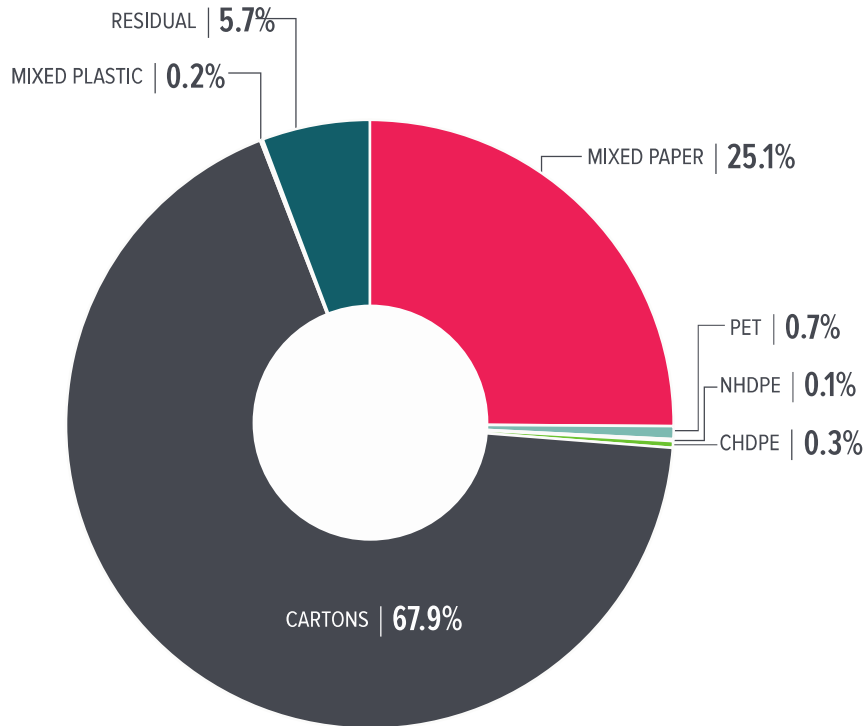
All CHDPE Containers



Size – noted numerous small single serving type containers
 More likely to flatten due to open top
 Very common material in the MRF, but easily confused with PP containers

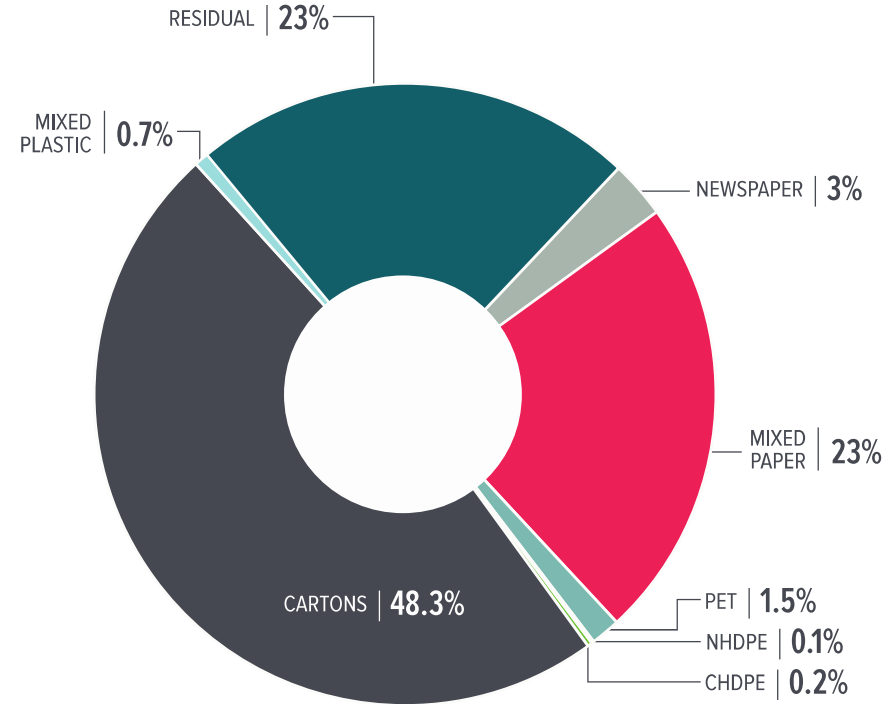
Where Did the Material End Up?

Cartons



Size – not many small school milk cartons observed
 Holds 3D shape relatively well
 Smaller percentage of overall stream

Paper beverage cups



Size – not too small
 More likely to flatten due to open top
 Not currently accepted by any of the test MRFs

Conclusions

Each player in the recycling value chain has a role to play to improve recovery and address contamination

PACKAGING DESIGNERS

Design with recovery in mind

MUNICIPALITIES

Work with MRFs to add new materials and educate residents on proper material preparation

MRF OPERATORS

Adequate separation equipment and continual maintenance improves separations

MRF EQUIPMENT DESIGNERS

Research designs to improve separation of new materials



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