

SIMS RECYCLING FACILITY

Date of visit: October 29, 2019

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Participants: Viviana Avalos, Ministry of Energy of Chile and about 20 persons interested in visiting the facility as part of a regular tour that SIMS offers.

Description

Material Recovery Facility - MRF

Currently, Sims Municipal Recycling (SIMS) is the processor of 100% of the metal, glass and plastic and 50% of the paper collected by the NYC Department of Sanitation throughout the five boroughs. This facility only separates materials, which are then sold them to re-processors in the US and Canada.

NYC operates the largest curbside recycling program in the United States.

They opened in 2013, and expanded NYC recycling program to all 5 boroughs.

SIMS is a private company, and has a public and private partnership with NYC, who pays a tipping fee by contract. When the recyclable market starts paying for the operation, there should no longer be a tipping fee.

They have a Recycling Education Center open to the public, prior arrangements for a visit.

Notes

They collect recyclables from households only. Comercial waste goes to another facility, and it is all private.

Curbside Collection:

- Paper
- MPG (metals, glass and plastic and cartons)
- Organics
- Refuse

SIMS is the largest MRF in the country by volume, it is state of the art technology, with a capacity of 1000 tons per day of recyclables.

The process consists on the following:

- Shredding: Recyclables arrive in clear plastic bags. They are shredded to open the bags by a shredder called "the Liberator".
- Separating: Glass is what is first separated, it is all crushed and sent to another SIMS facility in Staten Island. Paper is also bailed, and sent to the same facility.
- Magnetizing: metals and plastics go under a metal drum.
- Sorting
 - Ballistic sorting:

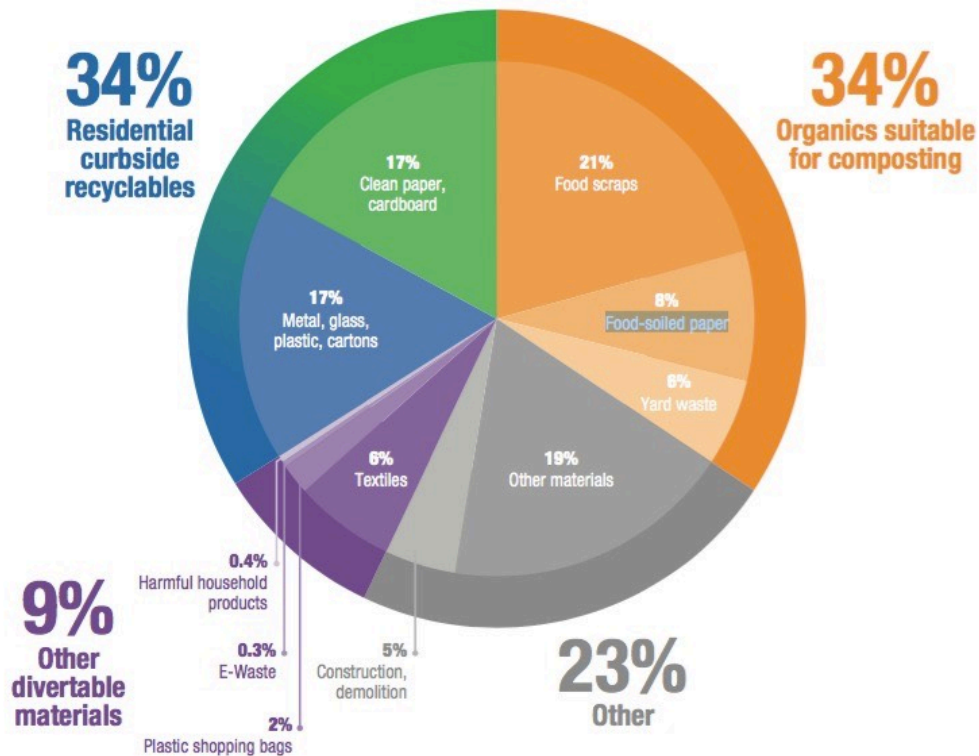
- Optical sorting: uses infrared light to scan through 10,000 objects a minute. It is used for plastics.
 - Human sorting: makes sure materials are separated correctly.
 - Bailing of materials
- Recyclables that are not washed by users and put “dirty” in the recycling containers, are not washed in the facility (my opinion is that it decreases the value of the recyclables).

12% is not recycled, and it is called the Refuse.

Change in plastic recycling. In late 2013, with the completion of SIMS in Brooklyn, curbside collection started including other types of plastics than bottles, this is yogurt containers, takeout containers, and bulky rigid plastics as recyclable.

NYC Residential Waste Profile in 2017

2017 Composition of Residential Curbside Aggregate Discards



- Waste composition is important to assessing how well the City is diverting materials from landfills and how much more it can potentially be achieved.
- What citizens consume and discard places a limit on what can be achieved even with perfect recycling. For New York City in 2017 residential curbside collections, this limit is 34% for Paper and MGP recycling with another 34% for Organics recycling. 23% of others will go to landfill or WTE. The recycling rate in NYC is 17%. 50% of recyclables

(green and blue bins) are collected.

3,5 millions houses have brown bin for food and yard waste

Most multilayered materials go to landfill. Tetrapacks get bailed and go to a special mill, and only the carton inside is used for making toilet paper. Plastic and metal is discarded.

Any plastic under 2 inches ends up in landfill. So keep the lids on plastic bottles.

If you are working in a large scale MRF, you cannot recycle everything because it's too expensive. What Terracycle does <https://www.terracycle.com/en-US>, is the opposite.

TerraCycle® is a social enterprise Eliminating the Idea of Waste®, in 20 countries. Leading companies work with them to take hard-to-recycle materials from our programs, such as ocean plastic, and turn them into new products.

HDPE is classified in two types, clear (milk jugs) and coloured.

Materials that causes problems in the facility plastic bag, hoes, sharp objects, weapons and food waste.

Some thoughts

- Paper market collapsed after the China Ban. For 20 years MRFs were selling their bails in China, since after the ban, paper has a negative value, this means that Sims now pays companies to take paper them away. There is a huge need of paper recycling facilities in the US, this is paper mills.
- MRF is single stream recycling, not sure about the quality of the recyclables and the price they receive per ton.
- About the recycling rates that are published in general, they do not represent the real amount of material recycled, as it only accounts for the material collected. From what is collected, there is an important amount (12% at SIMS, not accounting what is sent to the glass and paper facilities) is refuse and goes to landfill.
- There is an incentive for the municipality to collect the most amount of MSW to send to SIMS, for two reasons: it accounts as material recycled: and also because it's cheaper for them to recycle than to send to landfill. Gate fee at SIMS is about 60 US\$/ton, and about 100 US/ton in landfill.
- Waste Lobby in the US is massive, as it is a very big business. Gate fees are very high, and the cost of land is not so much in the middle of nowhere.
- Refuse is sent to landfill. When asked to the SIMS facilitators why wouldn't they send it to a WTE plant (specially considering that the refuse is mostly plastic with high calorific value), she replied that it was because WTE poses many environmental problems. But then I argued the points, and agreed to send her some reference documents to learn about modern WTE facilities.

Pictures of the Facility



Tipping floor



Tipping floor and the shredder to the left



View from the MRF



A few bails



The Education Center



The facilitator showing part of the process at the Education Center

▶ TRANSPORT IT

NEW YORK CITY has the largest, most ambitious recycling program in the nation. All 3 million households, plus public schools and other institutions, receive recycling collection by the Department of Sanitation.

IN-BOUND TRAFFIC



RECYCLABLES COLLECTED OUTSIDE ARE DELIVERED HERE TO THE NATIONAL RECOVERY POLICY (NRP) OR TO OTHER MANUFACTURING/RECYCLING FACILITIES (E.g., Glass or Metals Co.).

BARGES

Recyclables that are dropped off at either RRF facilities or loaded onto low-profile trucks (2 axles, 10,000 lbs) are sent to the RRF.

Set up to transport 100,000 pounds of recyclables in one trip, which can be as fast as 100 mph.

Approximately 60% of material is sent to the RRF.

TRUCKS

Collection from other areas (e.g., Dutchess County) is sent directly to the RRF for unloading.

Approximately 30% of recyclables are delivered to the RRF.

Approximately 10% of the total weight is the RRF.

OUT-BOUND TRAFFIC

After recyclables are sorted they are sent out by barge or semi-truck.

The world's largest and most advanced glass, metal and plastic recycling plants are located in the U.S. (including Florida, Indiana, Kentucky, North Carolina, Ohio and Pennsylvania). Florida's plants and Dutchess County's plant are among the world's most advanced.



BARGES

Glass and plastic are barge to our facility in other US.

Approximately 10% of the total weight is the RRF.

TRAINS

Other materials (e.g., metal, wood) are sent to other facilities for recycling.

Approximately 20% of the total weight is the RRF.

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SORT BY SIZE & SHAPE

SORT BY SIZE

Screens are used to separate items by size. Two types of screens are used in the MRF to sort material by size:

DISC SCREENS



The disc screens have 2" gaps between the discs. As the discs rotate and move the material forward, items that are smaller than 2.5 inches fall through the gaps. This includes broken glass, bottle caps, as well as metal keys, balls of aluminum foil and other small bits of paper and plastic.

TROMMEL SCREENS



At a later stage in the process, all of the ferrous metal separated with the drum magnets is put into a trommel screen, a large spinning drum with 9" holes in it. The large metal passes over the holes and comes out the end of the trommel. The smaller items fall through the holes. The trommel is used to separate tin cans from other bulky metal because tin cans are sold to different types of steel mills.



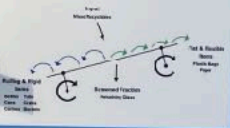
TROMMEL SCREEN

SORT BY SHAPE

BALLISTIC SEPARATOR



Ballistic separators are used to separate 2-dimensional objects from 3-dimensional objects using a series of paddles set at an angle. As the paddles move they "walk" the 2-dimensional material up, while the 3-dimensional materials bounce back down. This separates plastic bags from bottles and cans.

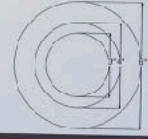


SIZE SEPARATION ACTIVITY

Test how the new sorting incline works.

YOU DO IT

- STEP 1** Take all balls from the table and place in collection bin on your left.
- STEP 2** Place balls, one at a time, on the incline. Mix up sizes as you go.
- STEP 3** Watch balls roll down the incline into bins sorted by size.





SORT BY MAGNETIC FIELDS

THERE ARE HUNDREDS OF DIFFERENT TYPES OF METALS.
HOWEVER, ALL METALS CAN BE BROKEN DOWN INTO 2 CATEGORIES:

1 METALS that are naturally MAGNETIC

FERROUS METALS

Ferrous metal is defined as any metal that contains iron. Ferrous metals contain enough iron to be attracted to or repelled by a magnetic field. Ferrous materials are the only objects that are naturally attracted to magnetic fields.

ICON: A crossed wrench and screwdriver.

ICON: A stack of metal cans.

ICON: A metal can with a circular arrow around it.

SORT BY MAGNETS

The most common magnetic material that New Yorkers put in the curbside recycling system are tin cans. Tin is not a magnetic metal, but "tin cans" are mostly made of magnetic steel with just a thin coating of tin.

DID YOU KNOW?

MAGNETIC FIELDS

A magnetic field is the area around a magnet up to which the attractive force of a magnet can be felt. A magnetic field consists of magnetic lines of force emanating from the north pole of the magnet and ending at the south pole in curved lines.

2 METALS that are NOT naturally MAGNETIC

NON-FERROUS METALS

Non-ferrous metals are any metals that do not contain iron in appreciable amounts. Generally, non-ferrous metals are used because of desirable properties such as low weight [ALUMINUM], high conductivity [COPPER] or resistance to corrosion [ZINC].

ICON: A metal can with a question mark inside.

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SORT BY EDDY CURRENTS

To separate non-ferrous metals we have to create a magnetic field or "Eddy Current" around the non-ferrous metal which causes the metal to be repelled by a magnet.

MAGNETIC SEPARATION ACTIVITY

Use these magnets to detect which metal conveyor belt these metals belong to.

YOU DO IT

- STEP 1** Fill collection bin with all metal recyclables.
- STEP 2** Place recyclables on conveyor and turn crank wheel.
- STEP 3** Watch the magnetic wheel separate the ferrous from non-ferrous materials.

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DO YOU

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The processing...
local material...
optical sorting...
magnets...
Curbide Recycling



SORT BY OPTICS

LIGHT WAVES

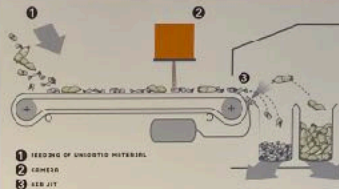
There are many different types of plastics that need to be sorted before they can be sold to manufacturers to make new products.

Optical sorters separate plastic by resin type using a camera with Near Infrared (NIR) light. When subjected to NIR light, each resin reveals its unique molecular signature. Optical sorters are also used to separate beverage cartons.



NEAR INFRARED LIGHT
Near infrared light is more in the human visible light spectrum, which means the machines are "seeing" characteristics of the plastic that we cannot.

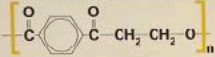
HOW AN OPTICAL SORTER WORKS



The optical sorter will look at every object that passes by on the conveyor belt. When it sees an object it is looking for, like a PET water bottle, it will signal an air jet to blow the item onto a different conveyor belt.

PET

POLYETHYLENE TEREPHTHALATE



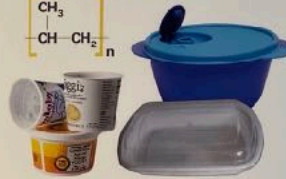
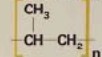
HDPE

HIGH DENSITY POLYETHYLENE



POLYPROPYLENE

POLYPROPYLENE



OPTICAL SORTING ACTIVITY

Get the dial to search for the plastic resin in your activity booklet.

YOU DO IT



STEP 1 Take objects from bins below and place in front of chute with matching cutout.

STEP 2 Rotate air knife toward one of the objects and press lever on nozzle.

STEP 3 Repeat steps 1 and 2 until all objects are blown into the sorting bins below.

PET
30" x 54" x 66"
1,280 lbs.
TODAY'S VALUE: \$
9¢/lb.

ALUMINUM
28" x 46" x 63"
1,440 lbs.
TODAY'S VALUE: \$
53¢/lb.

CARTONS
30" x 48" x 66"
1,720 lbs.
TODAY'S VALUE: \$
1¢/lb.

COLOR HDPE
30" x 54" x 66"
1,380 lbs.
TODAY'S VALUE: \$
2¢/lb.

POLYPROPYLENE
32" x 54" x 66"
1,200 lbs.
TODAY'S VALUE: \$
12¢/lb.

STEEL
18" x 24" x 24"
750 lbs.
TODAY'S VALUE: \$
6¢/lb.

NATURAL HDPE
30" x 54" x 66"
1,400 lbs.
TODAY'S VALUE: \$
40¢/lb.

REFUSE
29" x 51" x 66"
1,690 lbs.
TODAY'S VALUE: \$
-\$65/ton.

THE SIZE AND WEIGHT OF INDIVIDUAL BALES RANGE GREATLY.

Plastic and aluminum are generally baled to be about the same size, but the weight will vary depending on the type of material. Carton bales are made slightly longer, as is preferred by paper mills. Tin cans are sent to a powerful baler outside of the processing building, which produces small, compact bales.

Market prices for recyclables

- PET = \$ 9 c/lb = 198 US/ton
- Color HDPE = \$ 12 c/lb = 264 US/ton
- Polypropylene = \$ 12 c/lb = 264 US/ton
- Aluminium = \$ 53 c/lb = 1166 US/ton
- Steel = \$ 6 c/lb = 132 US/ton
- Cartons = \$ 1 c/lb = 2.2 c/kg = 22 US/ton
- Natural HDPE = \$ 40 c/lb = 88 c/kg = 880 US/ton
- Refuse = -\$ 65 US/ton (tipping fee in landfill)