

## THE ROLE OF THE DIRTY MRF

The typical dirty MRF employs various screening and sorting technologies to divide residual municipal waste into a recyclable material stream. With a small number of communities and waste management companies looking to these plants to process residential and commercial recyclables, where does the future stand for these MRFs in tomorrow's recycling industry?

BY RICHARD GERTMAN AND MARK BOWERS

**T**he primary role of a dirty materials recovery facility (MRF) is to recover resources that would otherwise be landfilled, so these materials can then be used in the manufacture of new products. After the recoverable recyclable materials have been removed, the remaining 'dirty organics' can be converted to compost, so they, too, are not being sent to a landfill.

The goal of these facilities is to process everything that is collected, in hopes that nothing collected is hauled directly to landfill; and, that only the residue from a processing or composting facility is landfilled. We know, from experience, that it is not likely that all residents and businesses will separate their discarded materials precisely the way we want them to, in the way that will maximize recovery. As long as we collect and dispose of garbage, we will be sending some recoverable resources to landfills; and, we will be sending some methane-generating organic materials to these disposal sites.

### Generator responsibility

Looking at a dirty MRF, several questions need to be posed at the outset, including how much sorting is required to make a municipi-

ality's current diversion program work? How many categories of materials does a program want residents and businesses to sort? How many containers, per household or business, are needed to store the number of categories of materials? How many trucks, with how many compartments, are needed to collect all of these categories of materials? And, how much time, per stop, is required for the driver to load the truck with more categories of materials?

### The collection system

The collection system cost is based on the number of trucks and drivers required to provide the required services; the total number of loads collected; the number of loads per truck, per day; the number of miles driven; the locations of the processing facilities and whether the various facilities are at the same or separate locations. The cost of collection can be reduced by designing a system that requires fewer trucks, with fewer drivers, plus burns less fuel and produces fewer greenhouse gas emissions.

### Collection strategies

In 2010, many municipal collection programs recover materials

## Marketing compost

- Clean organics make high-quality compost that can be used with food crops and in backyard gardens
- Dirty organics make a second-label quality compost that is best used for roadways, orchards and non-food crops. It is likely that, if all the organics in municipal solid waste were composted, the potential uses for the mixed waste compost will always exceed the supply.

from residents in three streams: Recyclables, plant trimmings and garbage (e.g., a mix of wet compostable materials and dry trash). The recyclables and plant trimmings are processed to recover valuable resources, and the garbage is sent to a landfill.

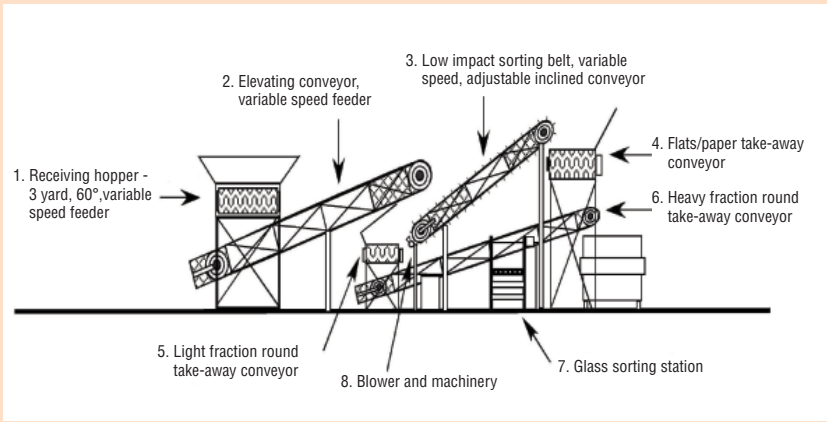
One alternative is to collect the same three streams, but, instead of sending the garbage directly to landfill, it would be sent to a dirty MRF to be processed, where additional recyclables and compostables would be recovered. It is easy to imagine that over half of the garbage could be recovered.

Another alternative is to collect three streams, but with a focus on collecting all organics (e.g., combined plant trimmings, food scraps, soiled paper and other compostables) as one stream, clean recyclables as a second stream, and trash (materials for which there is no feasible, cost-effective market) as a third stream.

A wet-dry collection system, where clean recyclables are the primary category and everything else (plant trimmings and garbage) is collected as mixed organics, has been implemented in three small communities in the San Francisco Bay Area. The clean recyclables are processed in a clean MRF and the mixed materials are hauled to a mixed-waste composting facility.

An alternative to the basic wet-dry system is to collect clean compostables as the primary sort (instead of clean recyclables) and everything else as the secondary sort. The clean compostables would be hauled to a composting facility, to be made into a high-quality compost, and the mixed dry materials would be hauled to a dirty MRF to be sorted to recover recyclable materials. Only a small amount of residuals from each facility would need to be landfilled.

## Figure 1 | High-tech facility installation



Source: City of Sunnyvale, Public Works, 2010

## Commercial collection

The commercial collection system can be designed to mirror the residential collection program alternative selected; in either two or three streams. The role of the processing facility is to resort what is collected commingled, as the materials have to be separated into marketable commodities, so that they can be used to manufacture new products. And, processing facilities can use either high-tech or low-tech sorting lines to achieve this.

High-tech facilities are equipped with high-volume sorting installations, generally rated at about 20 tons per hour (Figure 1). Low-tech facilities, designed to process materials at a lower rate, have less expensive equipment and typically require the use of more manual labor to process the material handled. A high-tech facility is not necessary to process a wide range of collected materials. Conversely, low-tech facilities provide smaller communities the opportunity to collect more materials, since the equipment is lower cost and requires less maintenance.

Low-tech facilities are also able to use the physical characteristics of the materials to be sorted, in order to assist in the process. As noted in “Softening the Blow,” found in the August 2008 issue of *Resource Recycling*, one concept for a low-impact sorter was described, which separates glass from other recyclables before much of the glass is broken during the handling process. This sorter uses rubber conveyor belts and gravity to separate flat items (e.g., newspaper, film plastics, flattened cans, etc.) from round materials (e.g., bottles, cans, wadded paper, flower pots, etc.) and an air classifier (blower fan) to separate heavy and lightweight materials. And, most of the glass bottles remain whole, so they can be color sorted.

Again, the purpose of processing is to

sort the recovered materials to the level of quality necessary to meet manufacturer specifications for making new products from them, not just to move what is collected through the processing facility and off to a market. This means that almost all paper loads are shipped sans plastics, glass or metal in the load, that almost all plastics loads are shipped devoid of paper, glass and metal, and so on and so on.

## Organics processing

All collected organics should be processed. There are two primary forms of processing in use: Aerobic composting, which produces compost and sequesters carbon, and anaerobic digestion. Anaerobic digestion can either be with liquid (wet) or with almost no free liquid (dry). The primary products of aerobic composting are compost, water and carbon dioxide (CO<sub>2</sub>).

The primary products of anaerobic composting are digestate, CO<sub>2</sub> and methane. If the anaerobic process happens in a landfill, a significant percentage of the methane generated is released into the atmosphere. If the anaerobic digestion occurs in a sealed vessel, the methane can be recovered. Clean organics can easily be composted in either of the processes described above. Mixed organics require extensive pre-processing and post-processing to make a marketable product (see Marketing compost sidebar).

## The SMaRT Station

The SMaRT Station is the materials recovery and refuse transfer facility in California shared by the cities of Mountain View (30-percent use), Palo Alto (20-percent



use) and Sunnyvale (50-percent use). The City of Sunnyvale owns and manages this venture for the partner cities. Since its inception in 1993, this cooperative venture has proven to be a smart decision.

The SMaRT Partnership provides:

- The sharing of resources to reduce operational costs of solid waste management
- Cost-efficient waste and recycling opportunities for residents and businesses
- A facility to assist in meeting state mandates for waste reduction

The facility was originally conceived to process only commercial waste, since the member communities already had mature residential recycling programs in place; but, the first facility operator wanted to try to recover additional materials from the residential wastes still being landfilled, so it became a dirty MRF.

## Materials Received

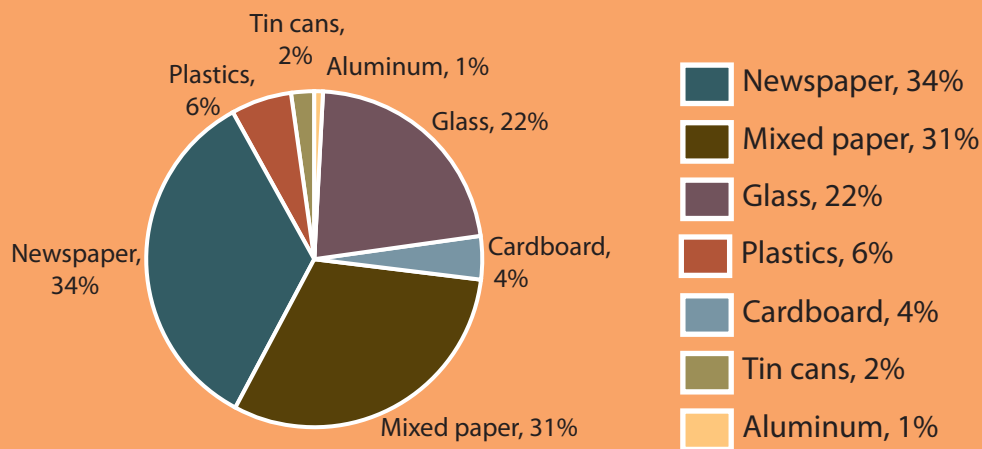
The cities collect residential and commercial source-separated recyclables, as well as clean plant trimmings, including:

- Yard trimmings from Mountain View and Sunnyvale (Palo Alto processes its source-separated recyclables and plant trimmings at other facilities)
- Single-family and multi-family recyclables from Mountain View and Sunnyvale
- Commercial recyclables, including Sunnyvale's cardboard routes and Mountain View's mixed commercial recyclables collections.

## Measuring program success

The measures of success of the future resource management system are resource recovery rates, the elimination of methane release to the atmosphere, and an overall reduction in greenhouse gas emissions from waste management activities. So, dirty MRFs will play an important role in processing materials that have not been properly sorted by generators.

## Chart 1 | Composition of source-separated recyclables processed



Source: City of Sunnyvale, Public Works, 2010

The curbside recyclables processing system was installed in 2001 and enables the SMaRT Station to accommodate processing of source-separated materials from the partner cities' curbside recycling programs (Chart 1). The system uses mechanical separation and an air classifier to sort glass and ferrous cans from mixed containers, while other containers are sorted by hand. The system also includes a horizontal baler that is capable of baling paper, plastics and cans.

Wood and yard waste recovered for recycling are further processed through a grinder at SMaRT. Ground wood is marketed to wood-fuel power plants and ground green waste is sent off-site for composting. Composted plant trimmings are made available to residents and city crews for use in landscaping projects.

With respect to refuse, the municipal solid waste received from the three cities is conveyed through a series of mechanical and manual sort processes to recover materials for recycling. The remainder is hauled in transfer trucks to the Kirby Canyon Landfill, located in south San Jose.

Further, the SMaRT Station serves as a convenient place for the public to recycle additional materials not commonly accepted in curbside recycling programs. In addition to being a California Certified Redemption Center, where the public may redeem beverage containers for cash, the station also serves as a universal public recycling center, providing an opportunity for residents of the partner cities to drop-off a myriad of products, including fluorescent bulbs and tubes; household,

rechargeable and automotive batteries; used motor oil and oil filters; and medical sharps and lancets.

## MRF challenges and benefits

Like with any facility or process, there are challenges and benefits to the use of a dirty MRF. Challenges typically encountered by such facilities include:

- Worker safety, compensation standards
- Contract concepts
  - Operator incentives for creative diversion
  - Maintenance versus repair versus replacement
  - Fixed annual payment or per-ton charge
- Three-city issues
  - Finding common denominators
  - Fair, transparent dealings (e.g., budget, annual audit)

One of the bigger issues, though, faced

## What's hauled to a dirty MRF?

- A typical dirty MRF will receive and process:
- Municipal solid waste from the residential and commercial sectors
- Construction and demolition debris, which many facilities will hand sort on the tipping floor
- Self-hauled refuse

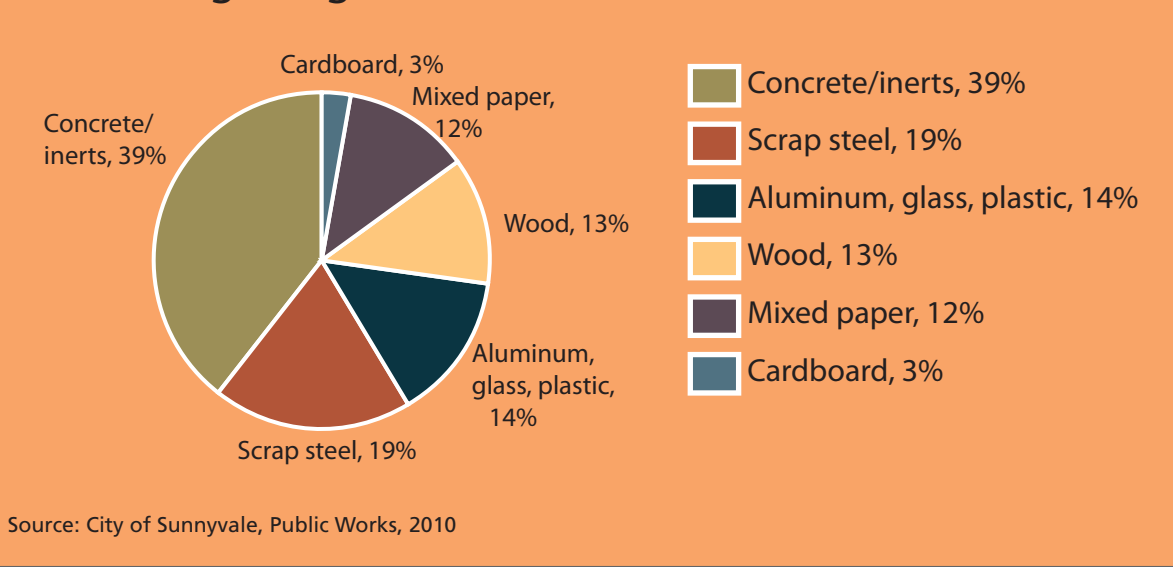
by officials overseeing these facilities includes communicating the “dirty MRF” concept to the public, while encouraging continued source separation.

Conversely, the benefits of utilizing a dirty MRF include increased total diversion and recycling revenue; the plant acts as a safety net for recyclables that slip past source-separation services; and, the use of a dirty MRF allows for removal of hazardous waste prior to residuals being shipped to a landfill.

Dirty MRFs are an important element in an overall resource management system. In fact, for some communities, the dirty MRF may be a key role player for those municipalities looking to achieve zero waste. **RR**

More information on the SMaRT Sta-

## Chart 2 | Composition of materials recovered from garbage



tion, including a link to a video of the operation of the City of Sunnyvale’s waste management system, can be found at [www.recycling.insunnyvale.com](http://www.recycling.insunnyvale.com).

Richard Gertman is principal of the Cascadia Consulting Group. He can be contacted at (408) 249-0691 or [richard@cascadiaconsulting.com](mailto:richard@cascadiaconsulting.com). Mark Bowers is

the solid waste program manager for the City of Sunnyvale, California. He can be contacted at [mbowers@ci.sunnyvale.ca.us](mailto:mbowers@ci.sunnyvale.ca.us).

*Reprinted with permission from Resource Recycling, P.O. Box 42270, Portland, OR 97242-0270; (503) 233-1305, (503) 233-1356 (fax); [www.resource-recycling.com](http://www.resource-recycling.com).*