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Redesigning recycling

The globalization of recycling markets is forcing local recycling programs to make dramatic changes. How can recycling coordinators design systems that will keep up with this global demand?

by Susan Kinsella and Richard Gertman

The North American residential recycling system is dramatically shifting. With single-stream programs becoming ever more popular, local community programs are changing how they collect and process recyclables. And, while wholesale changes take place at the local level, markets are becoming increasingly global. These two key factors are changing the nature of the materials available to domestic recycling manufacturers.

Product manufacturing is on the threshold of unprecedented challenges. New markets are opening in developing countries, which is causing a rapid build-up in their production capacities. The accelerating demand for energy and resources to meet the market build-up threatens to be environmentally unsustainable, as well as economically and socially destabilizing, unless manufacturing procedures shift to embrace new processes and feedstocks that minimize the production footprint. Recycling and recycled materials are the natural foundation for increasing the sustainability of production.

But to play this critical role, materials recovery must become the centerpiece of community collection programs, with garbage collection the secondary focus – only handling that which cannot be recycled. The recycling system must be upgraded to reliably provide more high-quality manufacturing feedstocks. Improvements in each part of the system must be coordinated to benefit and strengthen every other part of the recycling system as well.

Current improvements designed to increase the efficiency and economics of recycling collection systems, such as those produced by automated single-stream processes, have

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undermined the efficiency and economics of the manufacturing side of the system. Ultimately, this is a recipe for failure, since collectors have no markets if recycled product manufacturers go out of business or abandon the use of recovered materials.

Fortunately, improved design of municipal government recycling programs can provide the necessary coordination, driving recycling to reach its highest potential. To do so, though, local recycling managers must implement program-design best practices that are more comprehensive than those in use today.

Recycling program design

Recycling program design requires more than contracting for collection of the materials that are delivered to a material recovery facility (MRF). Single-stream collection, which many assume will simplify their programs, in fact, requires more detailed planning and investment than expected in order to sustain a fully functioning recycling system.

Recycling program designs currently set detailed requirements for collection, and often for promotion. But for local governments to ensure a healthy and thriving recycling system, detailed requirements must be added for processing, too. The following recommendations focus on contracted single-stream recycling programs; however, the recommendations can be applied to dual-stream and in-house programs as well.

Deciding the community's recycling goals

The details of recycling programs vary from region to region because of differences in weather, distance to markets, consumption patterns, economics, demographics, willingness of local collection companies and processors to provide desired services, program promotion and social expectations. The goals of each program may vary somewhat as well, but should include the materials that will be collected, to what quality levels materials will be processed and the requirements for determining accurate contamination rates. Goals may also include specific market requirements.

At a minimum, communities should collect only recyclable materials for which available markets exist, while processing recyclables to buyer specifications. This sounds elementary, but manufacturers have been put into a take-it-or-leave-it dynamic with many processors over the past few years. Manufacturers landfill significant percentages of the material they receive because they are unusable; therefore, program goals to meet the specifications of buyers for each material, and built-in feedback methods for ensuring they are met, are essential additions to today's program design contracts.

The community's recycling goals should be decided first and then put out for competitive bids, rather than simply accepting what a contractor is willing to provide.

The program also should be funded at the level required to do a good job. Local governments are charged with providing cost-effective services, but that does not mean they must provide services at the lowest possible cost. For example, governments do not buy the cheapest cars available for their police; they buy the cars that best meet the police force's needs. Costs can be lowered for recycling programs in a number of ways, including limiting the types of materials collected; however, cutting corners on processing undermines not only the local program, but the larger recycling system as well.

Collection considerations

Which materials should be recovered depends on several factors, including the community's recycling goals, the processing facility's capabilities, available markets, plus the public's expectations and level of participation. The higher the diversion rate the community is working toward, the more material types it must collect.

Increasing the number and diversity of material types, however, also will increase collection and processing costs. Plus, unless the processing system is carefully designed to handle the new materials, much of the additional materials likely will become residue. Always remember that materials collected in a single-stream system must be sorted at the processing center. The more complex the load, the more extensive, and expensive, the processing required.

If the materials are to be processed at a MRF that has not yet been constructed, then the facility can be designed to specifically handle the full range of materials the community wants to recycle. If the materials are to be processed at an existing facility, then the collected materials should either match the facility's capabilities, or the community and processor should upgrade the facility to handle the additional material types.

Which recyclable materials are collected also will affect collection costs. The most valuable and highest density curbside materials are aluminum, tin cans, glass and plastic bottles, newspapers and mixed paper. Sorted office paper and corrugated boxes also are highly valuable, but most of those materials are recovered from commercial sources. In order to recover a larger percentage of the waste stream, programs may need to add materials with less value and lower density. Unfortuately though, this can reduce the recovery program's cost-effectiveness.

Matching the programs of surrounding communities is worth considering, especially if sharing a processing facility with other recycling programs. This can also make public education and promotion easier to communicate to residents, who frequently find recycling differences confusing when they move from one locality to another.

The community should be very specific about materials handling requirements, such as driver responsibilities and ensuring clean recyclables, and the collection company should spell out how it will meet these requirements. The contract should include a sampling program to monitor the quality of collected loads when they reach the processor, in order to identify and address collection problems as early as possible. Some programs provide financial incentives to the collection company for clean loads and penalties for contaminated ones.

Program promotion

Most residents want to recycle more material than their recycling program collects. In many cases, when doubts arise about whether or not a material is collected – such as garden hoses, pizza boxes, light bulbs and plastic toys –residents put them into the recycling cart, expecting the processor to recycle them.

The ease of single-stream programs leads some program managers to believe that public education is not important. Paradoxically, single-stream programs usually require significant and continuous public education, because accurate sorting by residents becomes even more essential in helping collectors deliver clean and uncontaminated recyclables to the processor. And, the wider the range of materials collected, the greater the emphasis must be on promotion. A community with high-diversion goals should be prepared to

The Single Stream Recycling Best Practices Manual and Implementation Guide, developed by Conservatree (San Francisco) and Environmental Planning Consultants (San Jose, California), can be downloaded at www.conservatree.org. The manual highlights many ways to rethink recycling operations, focus on more targeted goals and adapt innovations in ways that benefit the whole system, not just discrete parts of it.

To develop these recommendations, Conservatree and EPC interviewed, visited and received feedback from hundreds of North American participants in all sectors of the recycling system, from collection and processing to manufacturing and recycled product purchasing. The manual focuses on single-stream programs, because that is where the greatest discrepancies currently appear. However, because single-stream programs are not suitable for every community, the recommendations also are intended to benefit the many other types of recycling programs that exist as well, including dual-stream and multi-stream programs.

Best practices for recycling collection and processing will be discussed in future articles.

support a major promotions program or simplify its list of collected materials.

Processing for clean materials

Recycling program contracts are very detailed about collection processes, but rarely, if ever, include requirements for how the materials should be processed or marketed. But, processing is so critical to creating quality feedstocks for recycled product manufacturing that local community programs must set requirements for this aspect of their programs.

The contract between the community and the materials processor should be very specific about both the processing requirements and the quality of the materials to be marketed. The community may choose to provide the processor with financial incentives for shipping clean materials or financial penalties for shipping loads that are contaminated. However, processors should not be penalized for landfilling material that was not recyclable.

How is the contamination or diversion rate to be determined? Frequently, processors promise and report residue and contamination rates that sound ideal, and are only slightly higher than source-separated contamination rates. Sometimes, recycling contracts include requirements that processors not exceed contamination rates, such as five percent. However, processors have a number of ways to show low contamination rates that do not, in reality, give an accurate picture of how well they are performing.

- Processors can achieve any residue rate desired by shipping contaminants out with the bales and loads of recovered materials. The community may not realize that their recyclables were actually landfilled by the manufacturing facility because they were unusable, or that they are so severely increasing production costs that the recycling manufacturer is unlikely to expand its operations or increase the recycled content in its products, and may even close. Already, the cost of handling contaminated materials at domestic newsprint mills has frequently pushed the price differential for using ONP beyond that of using virgin materials, and was a factor in closing mills in Texas and California.
- The processor may ship whole categories of recyclables, such as glass or plastics, for sorting at another facility. While this may be efficient, it can also hide the degree of contamination in the community's collection or processing program, because the residue rate from the shipped materials is not reported back and included in the community's statistics.
- Recovered materials may be landfilled locally, but considered recycled, because they are used for alternative daily cover (ADC) or landfill construction activities, such as fill around methane collection pipes.
- Materials, such as glass, may be sacrificed at the MRF and rendered usable only for low-value purposes, such as use in roadbeds. Improved processing systems, however, could make that glass usable for high-value products, such as bottles and fiberglass.

> Improvements designed to increase the efficiency and economics of recycling collection systems have undermined the efficiency and economics of the manufacturing side of the system.

Getting a complete picture of what happens to each material, instead of just the composite picture, is critical. In reality, almost no municipal recycling programs are gathering sufficient information to calculate accurate contamination rates. In order to evaluate how successfully a community's processor is meeting the program's goals, recycling managers must know the fate of each of the materials being shipped from that processor.

In particular, program managers must know how much of their materials were not usable when they arrived at a manufacturing facility. Manufacturers can provide millage-loss statements, although not always by specific programs. If necessary, the program can arrange to break open a sample bale, either as it is about to leave the processor or at the manufacturer, to determine contamination rates.

A processor may declare that their material quality is good enough for the mills to buy materials from them, but in recycling, good enough rarely is. The materials sold by the processors are feedstocks for manufacturing new products and MRFs should meet high-quality standards, not simply produce mixed materials that a buyer will take.

Managing markets

To ensure that materials are being used to support the best operation of the recycling system, communities should be specific about the marketing arrangements for the collected materials. Potential contractors should be asked to provide details on how the recovered materials will be marketed, including how the materials will be processed, the specifications that will be achieved for each material, the intended buyers for each commodity, and references from any current market relationships for each material being marketed.

Best practices dictate that, to the extent feasible, the collected recyclables should be directed to manufacturers who will make products that close the recycling loop, can be repeatedly recycled, or otherwise constitute high-value products. Using recyclables for low-value uses, such as ADC, roadbeds or burning for energy should be the last resort and avoided whenever possible.

A community's marketing goals may be very detailed, with requirements for how much of a particular material should meet certain specifications, or directing materials to support local recycled-product manufacturers. Delineating such requirements helps firms present realistic bids that will ensure the goals are met.

Dealing with data

Communities should specify the data they want contractors to track and report. Reports should outline how the collection and processing program is achieving the community's program goals, and incorporate feedback loops from the collectors, processors and manufacturers, so as to verify the information.

Best practices require that reports submitted by the collector and processor include information on collection, as well as the recovery rate for each commodity delivered to the processing facility, the process residue amount and composition and the marketing of the recyclables. In addition to reports on the tonnages recovered and marketed, the community should require the processor to report on contamination levels, both through sampling at the processing facility and in reports directed to both the program managers and the processor from the buyers of the materials.

Envision the system

Recycling is a system. Community recycling programs are directly responsible for managing certain parts of that system, namely collection and processing. However, they also are responsible for ensuring those parts of the system that support the optimal functioning of the rest of the system, especially manufacturing. Not only does this practice serve the best interests of their own program, but it also guarantees the continuing health and development of the full recycling system.

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