

Single-stream: A recycling method that cuts both ways

by Steven R. Stein

As single-stream recycling collection programs become more pervasive, players must analyze each side of the debate to ensure a sustainable system over the longer term.

“I’m sorry. We won’t be able to accept any more of your curbside-collected fiber at our mill.” Click. Dial tone.

The materials recovery facility (MRF) manager mumbled under his breath as he hung up the phone. The loads of materials collected in single-stream systems, where all recyclables are picked up mixed together, were too contaminated. The MRF contract commitment to the paper mill was for a maximum residue rate of 10 percent but the MRF shipments consistently exceeded a 20 percent residue rate.

The mill tried to work with the MRF, and the MRF had tried to work with the local city that supplied materials from single-stream routes, but the shipments remained too contaminated. Now the MRF manager had to call city officials to let them know the city would have to settle for a paper buyer paying per ton, resulting in lost revenues.

Fantasy? Not at all. This tale is part of a story about how one paper mill is recovering from a disaster created by changes in collection practices. In a confidential analysis of the issues paper mills face with single-stream recycling collection, Gershman, Brickner and Bratton, Inc. (Fairfax, Virginia) conducted an investigative research study in collaboration with a 100-percent-recycled, deinked newsprint mill (hereafter referred to as the “mill”), which, over the past two years, shared certain tonnage and financial data.

The dilemma

Two years ago, contamination problems from shipments received from single-stream MRFs hit a critical point. In 2002, the mill found

over 500 tons of broken glass embedded in the paper it received and was paying for material that they could not use. Worse yet, the contaminated material was damaging and wearing out equipment, causing downtime and running up maintenance costs.

The mill had invested millions of dollars in special equipment to help clean up the loads, removing over a hundred tons of metal, plastic bottles and cans – material that the mill had paid for but could not use. In the first stage of cleaning, the drum pulpers remove the plastic bottles and metal cans. Next, high-density cleaners capture larger glass pieces as well as staples and paper clips. Finally, the forward cleaner collects smaller pieces of glass that bypass the high-density cleaners.

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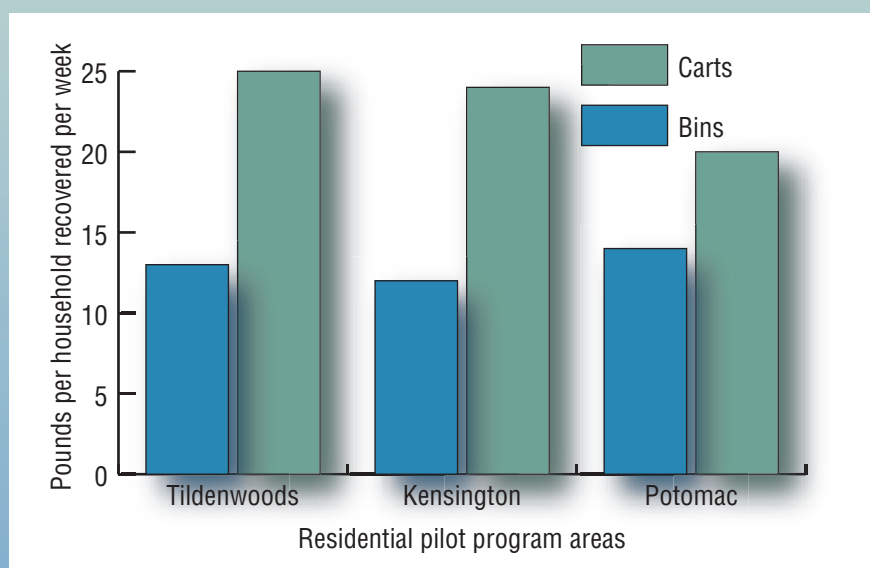


Table 1 Single-stream residue rates

Recycling system	Residue rate
Jaakko-Poyry/SERA	
Single-stream	14.4%
Dual-stream	6.8%
Residue increase	111.8%
Eureka/St. Paul	
Single-stream	14.2%
Dual-stream	6.4%
Residue increase	121.9%
GAA	
Single-stream	16.6%
Dual-stream	6.6%
Residue increase	151.5%

Sources: Skumatz Economic Research Associates, Inc., 2004; Eureka Recycling, 2002; Governmental Advisory Associates, Inc., 2002.

Figure 1 Impact of adding carts in Montgomery County



Source: Gershman, Brickner and Bratton, Inc., 2004.

The glass at this point in the process is broken down into small pieces that act like coarse sandpaper, scoring and wearing down the metal equipment.

And the situation worsened still. Despite having purchased specialized cleaning equipment, the mill had to pay to dispose of these once recyclable materials, plus incur the costs of glass shards embedded in the recyclable paper. These costs equate to more than a 20-percent premium over cleaner, source-separated, non-single-stream feedstocks.

The mill now had to use additional personnel to remove and landfill materials. The glass-related operations and maintenance (O&M) costs alone reached \$1.8 million in 2002, for glass that could have been recycled if the materials were collected and processed separately from paper. These costs included the purchase of glass in the paper, unnecessary chemicals use, equipment damage, and labor to repair the equipment, and handle and dispose of the glass.

Glass continues to break into smaller pieces as it makes its way through the mill's system, damaging equipment and causing over \$500,000 of damage in 2002 to the mill's valves alone. These valves, which normally lasted 12 to 18 months, now had to be replaced every six months.

Cutting off communities with high single-stream residue rates allowed the mill to realize lower costs as glass-related O&M costs were reduced to slightly more than \$600,000 in 2003 – still a significant sum, but an improvement over the previous year. Dropping several single-stream programs also helped the mill decrease the cost of glass-related damage to their valves to about \$159,000.

Residue rates

As shown in Table 1, three independent reports note that contamination from single-stream collection programs is significantly higher than dual-stream programs in which fibers are kept separated from mixed bottles and cans. The City of Phoenix reported that residue rates generated on their single-stream collection routes were running between 18 and 50-plus percent. Fort Worth, Texas, for example, has been reporting residue rates of 20 to 30 percent.

The recycling system now pays twice for material being landfilled, once when recovered for recycling and again when landfilled. Ironically communities count all of this material as part of their recycling and diversion rates despite the fact that, after incurring unnecessary and duplicative collection and processing costs, a substantial amount of commingled recyclables will end up being landfilled.

Recovery

While the mill was reticent to take actions that could threaten the source of raw materials, it began rejecting loads and cutting off processors that were unable to improve the materials' quality. Within one year, the mill's glass-related costs were cut by almost two-thirds. Although this was good news for the recycled paper producer, many communities incurred additional costs to their recycling programs for rejected loads, and some experienced lower revenue because they had to find other markets.

So what is the problem?

What should happen when collected recyclable materials arrive at a MRF is obvious.

Mixed recyclables go in one end and clean sorted products are supposed to come out the other side. In the case of paper mills, the desired end product from a MRF is fiber that can be used to make new paper. Despite the availability and use of sophisticated screening and sorting equipment at MRFs, at times this process becomes a little murky. Mixed recyclables still go in, but the end products generated are not always ready for end-users.

What should happen at paper mills is very clear. Incoming fiber is reprocessed and quality paper with post-consumer recycled content is produced. What does happen at some mills is also very clear, and the benefit of using post-consumer recyclable materials from the MRF is being lost. Millions of dollars are spent removing commingled materials that should never have been shipped as recyclable paper and then dealing with the damage that these materials cause to the mill's equipment and disposing of these materials as residue.

Magic carts

Proponents of single-stream often maintain that moving from a dual-stream to a single-stream system automatically increases the amount of materials setout for recycling. In truth, the use of carts, which virtually always accompanies single-stream collection, facilitates this increase.

For example, Montgomery County, Maryland, which operates a dual-stream system, recently conducted a pilot study in three areas to increase the amount of recyclables setout in their dual-stream system. In the pilot, 64-gallon carts were used for mixed paper and 18-gallon recycling bins were used for commingled containers. All containers were col-

lected weekly.

In two neighborhoods, the setout amounts doubled for all materials. In another neighborhood, setouts increased by about 50 percent. Figure 1 illustrates these increases. The County found that carts offered the residents capacity and convenience. Space abhors a vacuum, and the evidence shows that, given the capacity of large carts, residents are more than willing to fill it up with material – especially residential mixed paper. Montgomery County is now expanding this dual-stream carts system countywide to 130,000 households.

Where is glass going?

If glass is causing such significant problems in the paper recycling process, what is the future of glass container usage? If glass container use is waning, will it continue to decline until it is not a significant portion of curbside recycling?

While glass food container use continues to lose ground each year (mainly to plastic), the usage of glass beer bottles has been increasing annually since 2001 – with a record pace so far in 2004. And this turnaround is not limited to beer. Coca-Cola (Atlanta) doubled its use of glass containers in the bottling process this past year, while manufacturers of teas and new age beverages are carefully watching the levels of consumer acceptance of plastic over glass. However, such companies are generally hesitant to move much of their product into plastic. So, despite what some pundits may suggest, glass beverage containers are the preferred choice by many and are here to stay.

In fact, at its current pace, glass container shipments in 2004 could reach their highest level since 1999. This means that glass containers will continue to be an issue, particularly for single-stream collection systems. However, deposit-law states find much less glass in their dual- and single-stream systems, since beer bottles are normally covered under such legislation and constitute more than half of all glass container usage in the U.S.

The future of single-stream

At a time when municipalities across the country are wrestling with the expense of running a curbside recycling collection program, the idea of significantly reducing collection costs is understandably tempting. The savings from single-stream collection are clear. The use of carts and automated collection

vehicles significantly reduce the time required to collect material and automated collection requires fewer employees per vehicle, which results in considerably fewer worker compensation claims.

The viability of curbside recycling programs, however, is tied to the relationships among the community of players within the

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recycling system. MRFs and collectors are partnering with communities to achieve higher diversion goals, and end-users, such as paper mills, need to be a part of this process as well. Developing this kind of broader relationship can change the fundamental nature of curbside recycling collection in a way that will promote sustainability over the longer term.

As single-stream recycling continues to become more pervasive, higher residue rates will exert downward pressure on quality goals, but such attrition can lead to a crisis from which recovery is quite difficult. Becoming comfortable with that deteriorating quality will continue being the most serious threat that curbside recycling faces today.

What needs to be done

Elements that create successful curbside recycling collection programs (especially single-stream programs utilizing carts) include:

- ◆ Education – Consistent quality results when significant funds are allocated each year for continuous education
- ◆ Monitoring – It is equally important for carts to be monitored at least randomly, to ensure quality and to isolate problem areas
- ◆ Enforcement – As with other social issues such as speeding, the way to let residents know you are serious about quality is to ensure that local ordinances allow communities to enforce as necessary. Even

minimal enforcement helps residents understand that.

- ◆ Remove glass – The ability to remove glass from curbside collection will help ensure higher quality paper. Curbside recycling volumes consists of about 60- to 80-percent fiber.
- ◆ End users – When considering how to reinvent a curbside recycling collection program, municipal managers should bring end users into the process at the start.
- ◆ State-of-the-art facility – MRFs handling single-stream materials should be new or updated facilities with the ability to produce quality end-products. When choosing a processor, MRF vendors should be evaluated on their equipment and throughput as well as references. Some of the MRFs with higher residue rates are older facilities

without the benefit of updated equipment and designs. Other MRFs are investing in state-of-the-art sorting equipment to minimize the residue by sorting for glass both at the front-end and later in the process, in an effort to reduce the impact of glass in paper. To the extent that all MRFs move in this direction, the sustainability of curbside recycling service will be better maintained.

Other solutions

The metro Nashville, Tennessee government implemented their curbside recycling collection program as a modified single-stream system, collecting all clean and dry paper and metal containers curbside, specifically excluding glass and plastic containers. Their curbside recycling rate had already reached 26 percent with a residue rate of only three percent during its first year of operation.

Communities using 18-gallon bins for dual stream, curbside recycling collection programs may also consider a solution similar to that in Montgomery County, Maryland. Providing a large cart (64 or 96 gallons) can achieve similar collection savings without putting your curbside recycling program at risk. **RR**

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