

Single Stream Recycling

Single stream, or fully commingled recycling, is a system in which all paper fibers and containers are collected in the same bin instead of being sorted into separate commodities in separate bins (source separated) such as newspaper, cardboard, plastic, glass, etc. (WDNR, 2005). Single stream recycling typically collects a greater variety of materials than do source separated or dual-stream (paper in one bin; glass, plastic, and cans in another). Single stream processing facilities also range in setup and the amount of material they can handle. Some Material Recovery Facilities (MRFs) were built for dual-stream recycling and have been retrofitted for single stream as popularity increases, while others were specifically built to handle single stream collection.

Who is doing it?

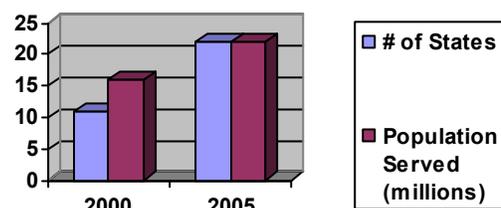
The idea of single stream recycling took hold in California in the late 1990s. Since then, single stream programs have been springing up all over the nation, steadily moving eastward. Today, an estimated 100 city and regional single stream programs are in operation in 22 states serving about 22 million people; this is compared with 11 states and 16 million people five years ago, according to Government Advisory Associates (CBS, 2005). As of March 2002, there were 88 materials recovery facilities handling single stream recycling: 41 in the West, 32 in the South, 13 in the Midwest, and two in the Northeast (Conservatree, 2003). In Wisconsin, several levels of local governmental units are participating in single stream recycling. These include cities (Madison and Whitewater), villages (Ashwaubenon and Mukwonago), towns (Genessee), and counties (Monroe).

What are the motivating factors to switch to single stream?

The major reasons for switching to single stream recycling are cutting costs for the local governmental service provision and increasing recycling rates. Motivating factors include:

- * Simplified recycling as all recyclable materials are collected in one container, making collection easy and convenient for participants. This typically increases the number of participants, tonnage collected, and material diverted from landfills
- * Reduced collection costs by using single-compartment trucks. These are cheaper to purchase and operate; can be used for garbage collection as well, and allow for larger loads and fewer trips to the recycling center than two-compartment trucks

Growth in Single Stream Recycling



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- * Increased cleanliness as there is a decrease of loose material blowing through streets and alleys. Hinged lids on carts that are often distributed keep recyclables dry.
- * Increased collection efficiency and reduced injuries since wheeled carts used in automated collection eliminates heavy lifting for residents and workers.
- * Switching to single stream offers the opportunity to update the collection and processing system, including adding more paper grades such as junk mail, telephone books and mixed residential paper; a good opportunity considering about 35% of all municipal solid waste is paper (EPA, 2005)

Does Single Stream Save Money?

Single stream recycling typically saves money on collection while increasing the cost of processing. The economics of single stream has demonstrated that:

- * Average savings for a collector using single stream was 5-25%
- * Total increase in costs to paper mills if single stream was universally employed is estimated to be about \$50 million per year
- * The net cost "total value chain" of single stream = collection savings per ton (~\$15); cost increase for processing per ton (~\$10); cost increase per ton for pulping/paper making (~\$8) = overall system net cost increase of ~\$3 per ton.

Case Studies

Chula Vista, California

The City of Chula Vista, California, began its recycling program in 1990 with a dual-stream program serving about 130,000 people, collecting newspaper in a bag and bottles and cans in an 18-gallon container; this had about 2.5–3% residuals. This program provided about \$300,000 of revenue for local public education. By 2002, the program collected from about 200,000 people, picking up four streams: newsprint, mixed paper, corrugated cardboard, and food and beverage containers; they also had weekly yard waste collection. In 2002, the City switched to single stream after determining that the potential benefits of single stream outweighed the downsides. In the new system, residents received a 96-gallon cart for recycling (blue), and had the choice of a 32, 64, or 96-gallon cart (black) for trash. Although residuals have increased to about 9%, recycling has more than doubled to about 1,500 tons per month, and trash pounds per household has decreased (this may be due in part to the pay-as-you-throw rule which charges for the amount of trash thrown out). The City takes recycling seriously, and attaches fines after three violations of finding trash in with recyclables; the city places a lien on the property of the resident until the fines are paid.

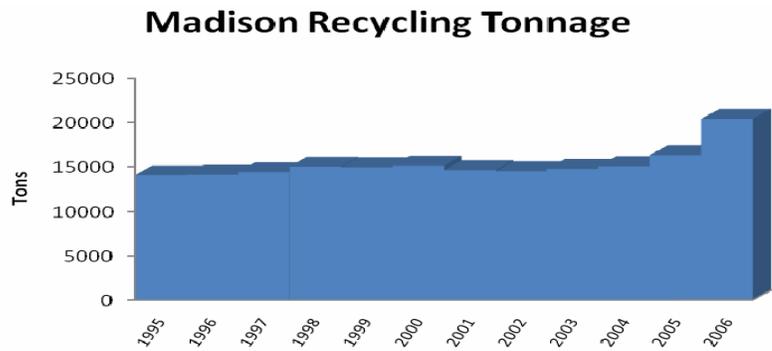
City of Madison, Wisconsin

The City of Madison began single stream recycling with automated collection in September, 2005, following two years of planning. The time was right for this changeover, since recycling trucks needed to be replaced; the transfer station needed redesign, and the recycling contract was up for renewal. Despite a significant capital cost, political support was strong to develop additional capacity due to population growth projections and a history of high recycling rates.

2006 was the first full year of implementation of single stream recycling and Madison experienced a significant increase in tonnages (see figure 2). As can be seen in the chart below, the City increased overall recycling by 25% from 2005 levels.

Additionally, the City achieved over \$103,000 in landfill tipping fees savings in 2006 as compared to 2005.

Finally, net cost per household was projected to only slightly more expensive than the previous system, as is illustrated in the chart below.



Recycling System Cost Annual Comparison

Category	Current System Manual Dual Stream	Proposed System Automated Single Stream
Wages and Benefits	\$600,744	\$529,344
Worker's Compensation	\$88,000	\$61,600
Time Lost	\$85,821	\$60,074
Equipment Debt Service	\$341,712	\$292,287
Equipment Maintenance	\$478,656	\$430,764
Cart Debt Service	\$0	\$305,784
Net MRF Revenue	(\$20,164)	\$0
Net MRF Cost	\$0	\$108,905
Tip Fee Savings	\$0	(\$62,048)
Total Annual Cost	\$1,574,769	\$1,726,710
Annual Cost Per Household	\$25.52	\$27.98
Recycling Bag Cost Per Household	\$3.40	\$0
Net Annual Cost Per Household	\$28.92	\$27.98

Note: Material recovery facility (MRF) revenue is subtracted from other items under the Manual System column. Tip fee savings are subtracted from the other items in the Automated System column. The tip fee savings includes only those savings associated with the estimated 10% increase in diversion associated with automated collection. Source Dreckmann (2004).

Source: Jamelske and Kipperberg, *A Contingent Valuation Study and Benefit-Cost Analysis of the Switch to Automated Collection of Solid Waste with Single Stream Recycling in Madison, Wisconsin*, Public Works Management & Policy, Vol. 11 No. 2, October 2006 89-103.

What are end users (manufacturers) looking for?

The following are industry specifications for single stream recyclables:

- * Paper industry - paper sorted by grade, with unwanted paper removed (Poly-coated, waxed, food soiled, brite-dyes) and no contamination (glass, plastics, metal, or food/organics).
- * Plastics industry - clean material sorted by composition, free of glass, paper, or garbage.
- * Aluminum industry - clean sorted material, with no glass, paper, plastics, or food in it.
- * Glass industry - clean material, with containers sorted by color when possible; no heat sensitive glass (such as Pyrex), rocks, ceramics, mirror glass, or plate glass. (Conservatree, 2006b).

Have there been problems for end users of the materials resulting in a decrease of recycling revenue?

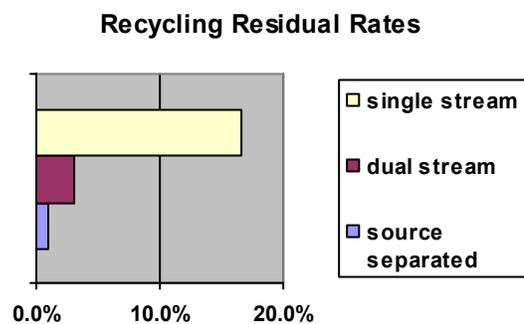
Single stream recycling tends to increase costs for processing and re-manufacturing. For example, the paper industry may experience cost increases due to:

- * Not being able to use all of the fiber, since up to 15% of the bale of fiber may be plastic, glass, and metal residue, meaning that only 85% of the bale is usable to the paper company.
- * Degradation of machinery due to other materials mixed in with fiber. Increased costs for parts and maintenance resulting in increased shut-downs and cleanings.
- * Potential loss of customer base due to possible decrease in paper product quality

Are there other disadvantages to single stream recycling?

Additional downsides to single stream include:

- * An increase in residuals, or recyclable materials that are contaminated. This includes paper or plastic contaminated by broken glass. These materials are landfilled and not recycled. The chart below illustrates residuals rates for various recycling collection systems.
- * A good dual-stream program can be around 2-3% residuals, while source separated can produce slightly more than 1% residuals (CBS, 2005). Single stream can be significantly higher; a study conducted by Government Advisory Associates (GAA) on 36 programs shows a residual rate of 16.6%, close to the number acquired by the St. Paul case study at 14.2% when not including mixed glass (27.2% when including mixed glass).
- * Initial capital costs of setting up a single stream system or switching from a dual-stream system: new carts, new collection vehicles, construction of or upgrading of processing facility, and education of residents (mail-outs, door-to-door education). Processing costs may increase, commodity prices may decrease due to contamination, and there is the potential of loss of public participation or lack of belief that the single stream method works due to the increase of landfilling of residual materials due to contamination or unmarketability (WDNR, 2005).



Summary

Single stream recycling is gaining popularity across the United States. Many residents prefer it because of convenience in terms of not having to sort materials and often having carts that can be wheeled instead of carrying materials to the curb in bins. Municipalities and collectors prefer the method due to increased ease and efficiency of collection with mechanized lifting of carts, associated cost savings, reduced injuries on the job, and increased overall participation and tonnage collected. Single stream, however, is not always cheaper than current systems. Cost increases can come in the form of new carts/bins, new trucks, education of residents, and the construction or renovation of a MRF or recycling center.

Single stream recycling could be aimed at areas where there currently are not strong recyclers or could be implemented in the attempt to dramatically increase tonnage collected. Areas that already have successful programs that achieve high participation and diversion rates may choose to continue with source separated or dual-stream recycling. Communities should analyze their individual situations in order to decide which type of program is best for them. Municipalities, collectors, processors, and manufacturers should work together to realize which method of recycling is best for their area, so that costs are equally shared and the highest amount and percentage of quality recyclables can be recovered.