Single Stream Recycling – a look at some of the pros and cons of this intriguing option; The jury is still out

By Guy Crittenden

Single stream recycling is one of the most talked about phenomena in the waste management industry today, mostly because of the potential savings it offers municipalities and private haulers on the collection side of their business. Collection is the most expensive component of any waste system, so cost reduction there is highly prized. Single stream has been adopted in more than a hundred communities in North America, though it remains controversial.

What is "single stream"? To paraphrase from Robin Mitchell of Kessler Consulting Inc. in Tampa, Florida, the term simply refers to the collection of commingled fibre and container recyclables at the street level in a non-compartmentalized vehicle. In a single stream system, fibre and containers are separated for recycling at the material recovery facility (MRF) by people and special equipment. An increased investment in these is still cheaper, proponents say, than the cost of special trucks collecting separate recycling streams.

"It's the way of the future," says Jack Allison, director of recycling with Waste Management of Canada, who says we'll see more and more municipalities and companies shift to single stream.

It's important not to confuse single stream processing with a mixed waste processing facility, commonly called a "dirty MRF." Those facilities attempt to sort quality recyclables from commingled garbage. Such facilities might be the best option for high-rises, but many have received poor reviews and have closed their doors. (*See article "Hot-Wiring Strathroy," Dec/Jan. 2000 edition and "Inside TCR," Oct./Nov. 1999 edition by searching at our website,* www.solidwastemag.com)

Proponents argue that, in addition to lower collection costs, higher diversion rates may be attained since it's easier for homeowners to participate. Also, there's just one tipping floor and one residue stream to manage.

"In addition to equipment," says Bob Marshall, president of equipment manufacturer Machinex Recycling Technologies in Pickering, Ontario, "municipalities must be willing to spend some time and money educating the homeowner in regards to quality issues. Education will be crucial to the success of the program."

Despite the apparent benefits, single stream is the subject of hot debate at conferences and industry gatherings.

According to consultant Maria Kelleher, principal of RIS International in Toronto, the jury is still out on single stream recycling.

"Collection savings are realized at the curb," she says, "but you have to spend money on carts to really get the benefits of single stream.

"With carts, householders don't run out of storage space for recyclables. Bags also address the lack of storage issue, but bags require debagging equipment."

Kelleher notes that moving to carts means using some type of automated collection system as the carts are too heavy for people to lift otherwise.

"MRF costs and residues are higher, but on balance you are probably further ahead with higher recycling rates due to the convenience for residents," Kelleher says, adding that the complexity of all this means single stream needs to be evaluated on a case-by-case basis.

Daniel Lantz of MacViro Consultants Inc. in Markham, Ontario, has studied single stream for years and argues that, as long as a municipality wants to offer weekly collection, it can achieve the same goals as single stream more cheaply simply by alternating fibre and container collection. This saves the cost of the front end of the MRF (equipment and labor) while avoiding contamination.

"You co-collect organics weekly as well the recyclables, and garbage is collected separately," says Lantz. "This gives you the option to eventually go to biweekly garbage collection, as Toronto is doing."

The contamination controversy

One contrarian viewpoint comes from Al Lynch who, in addition to operating the North Shore Recycling Program in British Columbia, is also this year's president of the Solid Waste Association of North America (SWANA). In his presentation on single stream at the spring Recycling Council of British Columbia conference in Whistler, B.C., Lynch detailed how his community's savings on collection would be wiped out by the lower value the paper mills would assign to fibre contaminated with glass.

"If we adopted a system similar to one I viewed in Seattle, the difference between attaining number 8 and number 6 newsprint would cost our program more than $200,000," Lynch says.

In his presentation, Lynch cited a recent study by the American Forest & Paper Association that found a savings of $10 to $20 per tonne for collection but that this was offset by an additional cost of $5 to $15 for processing and an increased cost of $5 to $13 per tonne of recovered fibre at the paper mill resulting, in

an average net increase of $3 per tonne system-wide. (The study didn't take into account the loss of revenue to municipalities from the downgrading of paper grades.)

The North Shore Recycling Program offers a good example of a smaller place where single stream may *not* be a good fit. It's a tri-municipal agency responsible for planning and administering all waste reduction and recycling activities in three municipalities near Vancouver. It serves 38,000 single-family homes as well as 29,500 multi-family dwellings in 900 buildings. The goal for the past nine years has been to reduce solid waste in the area by 50 per cent per capita based on 1990 levels -- a goal that was recently attained.

Garbage, recyclables and yard trimmings are collected weekly, and recyclables are sorted into old newspaper (ONP), mixed-waste paper (MWP) and old corrugated cardboard (OCC), and mixed containers (metal, glass, #1 and #2 plastic bottles). Collection containers include a blue box or bag, a yellow bag, and carts.

Recycling collection, processing and marketing is contracted to International Paper Industries (IPI).

According to Lynch, the current collection vehicles are "low-tech" three-compartment trucks with sliding aluminum panels. The trucks carry material to the North Vancouver MRF. ONP is unloaded into trucks and taken to a local de-inking plant, while MWP and OCC are sorted, baled and taken to market.

The system is not dissimilar to many other curbside programs in North America. But if North Shore tried single stream recycling, it might recieve $200,000 less for its fibre from the mills because of glass contamination, a higher cost than any collection savings, Lynch says.

Even so, Lynch is not opposed to single stream. Instead, he says that single stream is simply not for everyone. In some places it will be beneficial, and in other places not.

On the positive side, Lynch notes that in addition to the aforementioned lower collection costs, more material is collected per stop, it's convenient for residents and there are fewer containers in the home. Specialized collection vehicles are not required and single stream is compatible with automated collection. Participation and diversion rates may rise and the tip floor is easier to manage die to reduced truck traffic.

"The high capital cost of processing may not be a factor for communities with high volumes and long-term contracts," Lynch says.

But single stream was not a good fit for the North Shore program. The area already has the highest recovery rates in the region, with program participation above 95 per cent. Residents, Lynch says, are happy with the current system.

"The fact that the collector and processor are the same company results in less contamination," he says.

The low-tech trucks are inexpensive to purchase and operate, and processing is less costly due to the three-stream sort.

"We collect high quality product that generates high revenue," Lynch says. "No established single stream facility could take our volumes at an acceptable price."

Lynch also lists common complaints about single stream systems. The addition of material types may increase contamination. Food from partially rinsed containers can contaminate ONP and MWP. There's increased glass breakage and higher residue rates at the MRF.

While automated trucks make collection more efficient, they do cost more money both in terms of capital and operations/maintenance. Compaction trucks can't be fully utilized due to the integrity of containers. Additional sorters may be needed to clean fibre streams, and end markets just may not want recyclables from single stream systems.

The right stuff

It would be an oversimplification to say that single stream isn't a good fit in small communities and would work in every large community. Yet it seems logical that economies of scale do play a role, especially in justifying the capital expense of more machinery at the MRF. And almost everyone agrees that mill buyer reluctance must be overcome for the programs to reach their potential.

Single stream proponents emphasize that not all systems are created equal, and that choosing the right design and equipment can make all the difference.

MRF technology has improved dramatically in recent years. Advanced equipment and knowledge about layout have reduced labor costs while improving product quality and productivity.

Some single stream plants require much higher staffing levels than others to work the sorting lines. Older systems utilized ballistic separators that broke a lot of glass, making fibre difficult to market. According to Machinex's Bob Marshall, these separators were expensive to operate due to down time and maintenance. Newer separating systems such as his company's Mach One Separator (*See photo and caption*) use a much simpler technology that reduces glass breakage while improving flat/round separation, he says.

"These new primary separators will also separate #8 newsprint from the fibre to further reduce sorting costs."

The implementation of a finishing or polishing screen has been successful in creating a cleaner container stream by removing a greater percentage of fibre from the containers, while at the same time screening out the fines.

Don Holliday of Van Dyk Baler Corp. agrees that equipment makes all the difference in successful single stream. (*See photos and captions.*)

His company worked with Bollegraaf and with IPI's input to design a single stream system incorporating Lubo Starscreens in the single stream plant in Winnipeg. This design was based on Van Dyk's experience of over 35 single stream facilities operating in the USA (the first installation was in 1995). (*See article "45 Degrees of Separation" in the Feb./March 2004 edition.*)

"First you have to consider the cleanliness of the incoming stream. But after the initial pre-sort it's possible to make more of an apples-to-apples comparison between different types of equipment," says Holliday, "since the material is more homogenous."

"A crucial thing to look at is the volume per hour of the system, and how many sorters you need after the first separation screens [to separate fibre from containers]."

Holliday says there are so many variables on the container side that containers make a less useful comparison, but if you go (after the screens) to quality control in the paper, the worthwhile point of comparison begins.

Holliday says that in one Van Dyk installation that processes 20 tonnes per hour, only eight people are needed after the screens.

"That compares very favorably with upwards of 36 staff required in some 40 to 50 tonnes per hour operations with which I'm acquainted," he says.

After adjusting for the higher volume of the latter operations, that's roughly double the number of sorters needed. In this comparison, an extra 18 people each costing, say, just $20,000 per year works out to an additional $360,000 in annual labor costs. Factor in the lower value of paper containing more glass shards and, Holliday says, you have the difference between a successful and affordable single stream system, and one that is not.

Bob Marshall also emphasizes the importance of the screens in reducing residue and providing a cleaner stream to the sorters.

"Separator screens need to be designed with built-in flexibility to allow for changes in products and climatic conditions," he says.

Features such as variable-angle screen decks and easily adjustable screening surface with replaceable discs and variable speed drives play a role in the efficiency of the separator.

Overall systems design is vital to success, he says. It's important to understand what materials should be removed at the pre-sort and in what order other materials should be sorted.

"An equipment layout that uses self-dumping bunkers and live floor bunkers provide operational savings such as reduced vehicle movement on the process floor, which can help to reduce the size of the building and reduce front-end-loader maintenance," he says.

Evolution of the system

While it's true that one size does not fit all (as in the North Shore Recycling Program example) the move to single stream recycling is on in many communities and the potential benefits are attractive.

Waste Management's Jack Allison agrees that glass contamination in fibre is an ongoing problem for the paper mills.

"When I attend professional gatherings, and when someone raises concern about single stream, it's almost always someone from the mills," he says, adding that the mills can deal with the glass if they install special equipment.

"But I can understand their hesitation to spend upwards of a million dollars on equipment, when they can simply ask the municipality to generate cleaner material [i.e., through source separation or more effective MRF systems]."

Allison would likely agree with other single stream advocates that although it may not work for everyone, some combination of investment by the mills and the municipalities, along with technical advancements from equipment purveyors, will overcome these problems and lead to an acceleration of single stream in Canada in the next couple of years.