

Beyond recycling rates

by Ron Perkins

Using recovery rate analysis to benchmark recycling programs' performance and potential better equips program planners and managers to increase diversion and streamline operations.

the incremental cost of the additional labor and vehicle time to collect it. An increase in the quantity of recyclables in the

bin or rollout cart typically causes little or no increase in the time required to empty either type of container.

Most recycling program managers know the recycling rate being achieved by the program for which they are responsible; unfortunately, far fewer are aware of the percent of each targeted recyclable material generated that they are currently recovering, or of the rate at which they are capturing each recyclable material generated at individual households. Respectively, these are the recovery and capture rates, and need to be known in order to assess program performance and potential.

So why is an analysis of both recovery and capture rates an invaluable tool in benchmarking current program performance and identifying realistic program potential?

Answering that question requires looking at their practical application, including:

- ◆ Assessing the impact of expanding the range of materials collected.
- ◆ Assessing the impact of campaigns that target soft drink beverage containers.
- ◆ Assessing the impact on diversion of single-stream collection (vs. dual-stream).
- ◆ Comparing alternative single stream collection system approaches, such as split vs. dual carts.

The rationale for recovery rate analysis

The conventionally accepted method of measuring residential recycling program performance is by calculating the recycling rate. However, comparisons based on recycling rates can be misleading.

Use of the recycling rate as a performance measure inherently favors those communities that have a higher percentage of recyclables in the waste stream. Obviously a community with more recyclables in the residential waste stream to start with should be able to

As evidenced by stagnating national recycling rates, few residential curbside recycling programs are increasing their capture or recovery of targeted recyclables from the residential waste stream. Collection vehicle and processing facility capacities are increasingly underutilized, which results in unnecessarily high recycling costs per ton since the high fixed costs of collecting and processing recyclables are spread over too few tons. This puts the long-term sustainability of municipal recycling programs at risk as tax revenues decrease and other community service demands increase.

The economic sustainability of any residential recycling program can be improved by collecting more materials per household (or stop). This is especially true in today's market environment, as the market value of the additional materials recovered should exceed

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achieve a higher recycling rate than one with a lower percentage available to recycle. However, while the community may have a higher recycling rate than its neighbor, it may have a lower recovery rate (i.e., it may not be recovering as high a percentage of the total recyclables generated).

The recovery rate is a better measure of program performance since it measures the percentage of the total recyclables available that are actually being recovered. Such a measure does not stigmatize a community for having a lower percentage of recyclables in the waste stream in the first place (e.g., one that consumes fewer resources because its citizens make shopping decisions with source reduction in mind).

Table 1 illustrates the impact of using recycling and recovery rates in two sample communities with inherently different waste stream compositions. The city of Consumption Peaks has a higher recycling rate, so conventional wisdom suggests it has a more successful recycling program. However, upon closer examination, the village of Conservation Heights has a higher recovery rate, confirming that its citizens are actually placing a higher percentage of the available recyclables that they generate in their recycling bins.

Assessing the performance of expanding collection of materials

The American Plastics Council (Arlington, Virginia) advocates that communities include all plastic bottles in their recycling programs to increase recovery of high-value PET and HDPE. The APC wanted to know if all-plastic-bottle collection programs really do optimize the recovery of PET and HDPE plastic bottles. Merely comparing the pounds of PET and HDPE bottles collected before and after implementation of an all-plastic-bottle program would not provide an accurate assessment, as it does not account for associated changes in the quantities generated.

Performing a recovery rate analysis before program implementation reveals the benchmark recovery rate and the potential for increased diversion and material revenue. The recovery rate analysis is performed by selecting a random sample of households in representative community neighborhoods and then separately sorting and weighing the PET and HDPE in the recycling bins and refuse containers.

Following implementation of an all-plastic-bottle collection program, a follow-up recovery rate analysis provides an accurate measure of the improvement in recovery compared to the benchmark in a manner that takes into account changes in generation of PET and HDPE bottles. Such analyses in several selected communities across the nation have confirmed that programs that expanded collection from PET-and HDPE-only to collec-

Table 1 Comparison of recycling performance, in percentages

Targeted Recyclables	Consumption Peaks			Conservation Heights		
	Waste Stream	Recovery	Contribution to Recycling Rate	Waste Stream	Recovery	Contribution to Recycling Rate
Newsprint	12.0	60	7.2	9.0	70	6.3
Corrugated paper	6.0	50	3.0	3.0	60	1.8
Mixed paper	6.0	50	3.0	4.0	60	2.4
Glass	5.0	50	2.5	4.0	60	2.4
Steel cans	2.0	50	1.0	1.5	60	0.9
Aluminum cans	1.0	50	0.5	0.5	60	0.3
Plastic bottles	3.0	30	0.9	2.0	40	0.8
Yard trimmings	15.0	50	7.5	8.0	60	4.8
Total Percentage of Recyclables in MSW	50.0			34.0		
Overall Recovery Rate (%)		51.2			57.9	

Non-Recyclable	Consumption Peaks			Conservation Heights		
	Waste Stream	Recovery	Contribution to Recycling Rate	Waste Stream	Recovery	Contribution to Recycling Rate
Unrecoverable paper	13.0	NA	0	14.0	NA	0
Other plastic	5.0	NA	0	7.0	NA	0
Other glass	2.0	NA	0	3.0	NA	0
Other metal	3.0	NA	0	4.0	NA	0
Food scraps	13.0	NA	0	20.0	NA	0
Rubber, leather & textiles	7.0		0	8.0	NA	0
Wood	4.0		0	7.0	NA	0
Other	3.0		0	5.0	NA	0
Total	100			100		
Overall Recycling Rate			25.6			19.7

Source: SCS Engineers, 2004.

tion of all plastic bottles typically increase the recovery rate.

Measuring the performance of campaigns targeting specific materials

Targeted campaigns can have a positive impact on the recovery of specific materials. For example, the campaign being implemented by the National Soft Drink Association (Washington) is attempting to increase the recovery of PET and aluminum beverage containers.

To evaluate the potential impact of such campaigns, SCS Engineers (Long Beach, California) analyzed both the recovery and capture rates before and after campaign implementation in Pittsburgh and the Norfolk, Virginia metropolitan area. Comparison of the recovery rates obtained from samples taken in representative neighborhoods before and after the campaign revealed that recovery of PET and aluminum beverage containers

had increased more than 25 percent.

To obtain more insight into the recycling habits of households that did set out recyclables for collection, capture rate analyses were also performed. By sorting all the discards (both recyclables and refuse) set out at individual households, data on the distribution of indi-

When considered in conjunction with participation rate patterns, capture rate analyses provide valuable insight into whether campaigns should target existing recyclers, non-recyclers or both groups.

vidual household capture rates were obtained. Average capture rates for beverage containers typically were in the range of 60 to 75 percent, confirming that even recyclers do not always recycle all of their available recyclables.

Closer analysis of the distribution rates reveal that typically over 80 percent of the surveyed households recycled all or none, with only a distinct minority only recycling some. Data from other capture rate analyses suggest that this behavior is typical. When considered in conjunction with participation rate patterns, this information provides valuable insight into whether campaigns should target existing recyclers, non-recyclers or both groups.

Single-stream collection

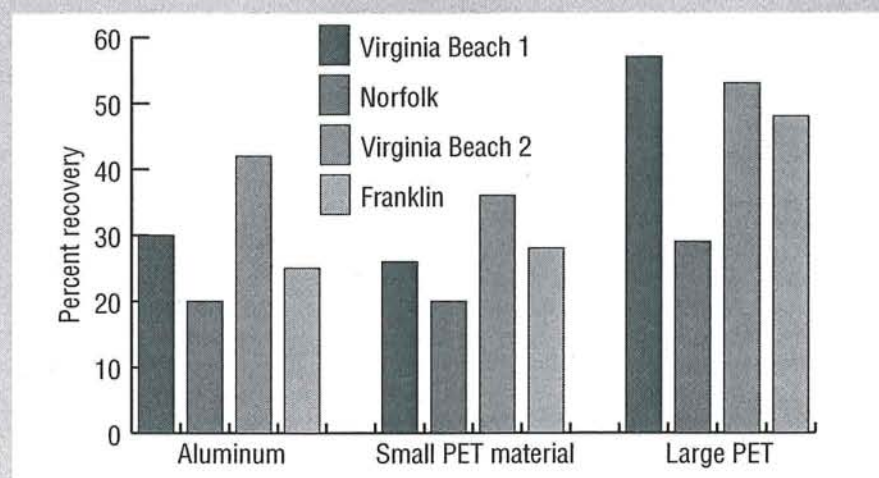
Experience to date suggests that, in general, collection of residential recyclables in a single-stream program increases recovery. But recycling program planners and managers considering single-stream collection need to know the level of diversion that they can expect in their particular community in order to make informed decisions as to the potential overall benefit of program modifications.

How much will recovery increase? As cited earlier, comparing changes in the recycling rate does not always tell an accurate story. Assessing recovery rates is advantageous to account for changes in recyclable material generation. By performing recovery rate analyses on samples from representative community neighborhoods, managers can establish benchmark recovery rates and assess the potential for increased diversion for each targeted material. Those desiring more reliable information before making a commitment can implement pilot programs and then conduct recovery rate analyses to enable comparison with the existing system.

An indication of the potential for increased recovery of recyclables is illustrated in Figure 1 by showing recovery rates achieved in neighborhoods with similar demographics. Figure 1 illustrates that higher recovery rates for three types of beverage container are achieved from single-stream collection in both low (VB1) and middle (VB2) income neighborhoods in Virginia Beach, Virginia, compared to results in the similar neighborhoods in nearby Norfolk and Franklin, which have dual-stream systems.

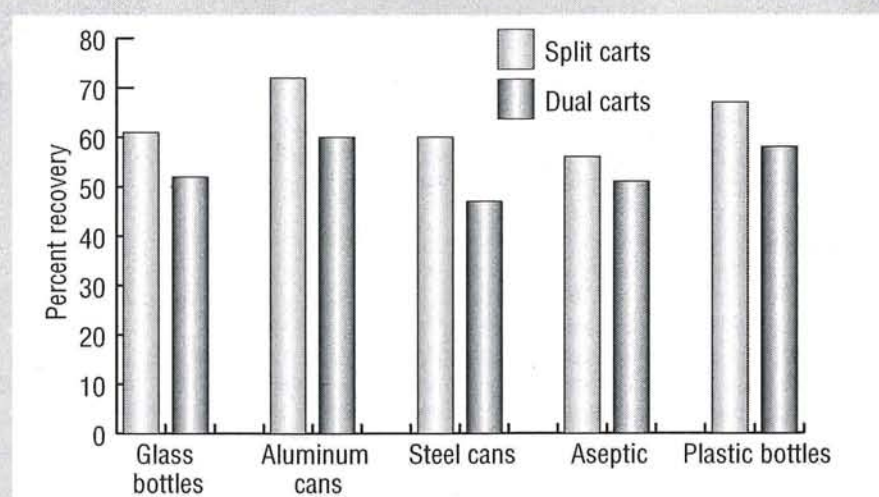
Another decision to be made in considering single-stream collection is whether to use one split cart or separate carts for recyclables and refuse. Is there any impact on recycling participation and diversion? Again, recovery rate analysis can be useful in answering this question. An example of using recovery rate analysis for this purpose is illustrated in Figure 2, which shows that in a selected pilot study neighborhood in a major Ohio city, recovery was approximately ten percent higher for each recyclable when split carts were used. The use of split carts limits how much can be discarded as waste and motivates more efficient utilization of the recyclables portion of the split container.

Figure 1 Comparison of recovery rates



Source: SCS Engineers, 2004.

Figure 2 Comparison of recovery rates: Split vs. dual carts



Source: SCS Engineers, 2004.

While conventional practice has resulted in the use of recycling rates to measure the performance of, as well as to compare, local and state recycling programs, citation of this ratio alone often leads to misleading or indefensible conclusions. Not all waste streams are created equal and, as a result, those with higher percentages of recyclables have a head start on achieving recycling goals or mandates.

On the other hand, use of recovery rates takes into account the real differences in the generation of recyclables between communities and over time, thus allowing more equitable and useful assessment of recycling program performance and potential. Analysis based on recovery and capture rates is a cost-effective planning tool that, when applied sci-

entifically, can provide justification for investments in education and equipment that meet fiscal guidelines for payback and return.

The applications cited here represent only a few of the potential applications of both recovery and capture rate analysis. Assessment of recovery and capture rates provide a defensible basis for program planners to accurately benchmark program progress, assess increased diversion potential and evaluate the impacts of program education, policy and operational practices. **RR**

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