Benefits and Challenges Associated with Pay-As-You-Throw and Automated Garbage Collection Programs

A Study Conducted for Abington Township through the PA DEP/SWANA Technical Assistance Program
December, 2007

Executive Summary

Abington Township expressed an interest in receiving technical assistance services to help explore the possibility of implementing a PAYT program, using an automated refuse collection system and recycling, with Recycle Bank as a partner. After R.W. Beck began this project, the Township decided against using a weight-based system or Recycle Bank because of compatibility concerns with automated collection. Rather, the Township conducted a pilot program where residents received two (2) thirty-five gallon recycling carts. One container was brown and would be used for the collection of commingled containers. The second container would be green and be used for the collection of newspapers and junk mail. The Township would collect the green and brown containers on alternating weeks.

To assist Abington Township with the pilot program, R. W. Beck therefore obtained and summarized the following information:

- Communities with "before and after" PAYT/automated collection information to gain an understanding of their current programs, and the benefits they realized due to implementing PAYT and/or automated collection. As was requested by the Township, this information was summarized into a PowerPoint presentation. (Attachment A);
- Communities with pricing differentials for different-sized containers or additional containers, and obtained and reported information regarding those pricing differentials; and
- The City of Cincinnati's experiences regarding their automated collection pilot program, and the follow-up resident survey that provided the City with feedback about the pilot program.

We also develop a rate structure for three solid waste collection scenarios, and traveled to Abington Township for a kick-off meeting and one-day of field observations.

Introduction

Abington Township is one of Montgomery County, Pennsylvania's oldest communities, having been incorporated in 1704. The Township primarily consists of residential areas, and has a shopping mall, many small businesses, and several large employers, such as Abington Memorial Hospital. The population of the Township was 56,103 in the 2000 Census, and spans 15.5 square miles. According to the U.S. Census, in 2000 there were 21,690 households in the Township.

PAYT/Automated Collection Research/Presentation Development

R. W. Beck conducted research in order to provide the Township with information about other communities' experiences with PAYT and automated collection. Details regarding this research and the findings are provided below.

Summary of PAYT/Automated Collection Programs

R. W. Beck interviewed communities that had implemented PAYT programs and automated collection programs to gain an understanding of:

- Their current trash/recycling collection programs;
- Benefits of the programs;
- Service metrics (e.g., households served per shift);
- Additional services provided (e.g., bulky waste collection); and
- Container sizes/setout limits.

The communities R. W. Beck obtained information from included:

- Greensboro, North Carolina;
- Garland, Texas;
- Longmont, Colorado;
- Thornton, Colorado;
- Bellevue, Washington; and
- Dayton, Ohio.

A summary of the programs of the communities researched and the benefits they realized from implementing PAYT programs is provided in Table 1.

Table 1
Summary of PAYT Programs and Benefits Realized

Community	Program Description	Benefits Realized
Greensboro, NC	▪ Weekly service, automated one-person crews ▪ 950 HH[1] Served per 7-hour day ▪ 90-gallon carts ▪ Weekly recycling also provided	▪ Decreased total crew from 58 to 50 ▪ Reduced trash collection from weekly to bi-weekly ▪ Injuries decreased from 4 – 5 per week to rarely ▪ Increased number of households served on each route by 15% ▪ Increased efficiency by 45%

Community	Program Description	Benefits Realized
Garland, TX	▪ Weekly service, automated side-loader with one-person crews ▪ 912 HH served per 10-hour day ▪ 90-gallon carts ▪ Bi-weekly recycling and weekly bulky waste collection also provided ▪ Weekly bulky waste collection also provided	▪ Decreased total crew from 32 to 16 ▪ Reduced trash collection from twice weekly to once weekly ▪ Dramatic decrease in worker's comp claims ▪ Decreased routes per day by 50% ▪ Noted an overall savings in program
Longmont, CO	▪ Weekly service, automated side-loader with one-person crews ▪ 96-gallon carts[2] ▪ Weekly automated recyclables collection, using split cart ▪ Quarterly bulky waste collection also provided	▪ Decreased crew size by 50% ▪ Decreased recycling collection from weekly to twice monthly ▪ Increased collection efficiency by 70% (from 500 to 800 HH per day) ▪ Reduced absenteeism by 83% ▪ Decreased total number of collection vehicles from 8 to 6 ▪ Noticed decrease in litter ▪ Have kept rates steady, previously had 7% rate increases each year ▪ Recycling participation increased from 50% to 80%
Thornton, CO	▪ Weekly refuse collection using 96-gallon carts ▪ 96-gallon carts for recyclables, collected once monthly ▪ Cost is $13.50 per month	▪ Replaced two refuse routes with two recycling routes ▪ Reduced workforce by eliminating 6 seasonal positions ▪ Reduced hours lost annually from 1,215 to 48.5 ▪ Total annual cost savings $145,000
Bellevue, WA	▪ Weekly refuse collection by private haulers using semi-automated vehicles and 32-, 60-, or 90-gallon carts ▪ Recyclables also collected weekly using semi-automated collection vehicles ▪ Monthly cost is $15.93 for 32-gallon, $23.18 for 60-gallon, or $29.61 for 90-gallon ▪ Bulky waste can be collected for extra charge, or residents can self-haul bulky waste	▪ Average per capita trash setout rate decreased from 6.85 lbs per week to 3.69 lbs per week. ▪ City achieved 60% diversion rate ▪ City is able to retain drivers longer ▪ Improved neighborhood aesthetics

Community	Program Description	Benefits Realized
Dayton, OH	▪ Weekly refuse collection using 96-gallon carts, fully automated collection with one-person crews ▪ Weekly recyclables collection using 14-gallon bins (manual collection) ▪ Quarterly bulky waste collection ▪ City charges $5 per HH per month	▪ Decreased the number of refuse routes from 36 to 22 ▪ Decreased staff from 200 to 144 ▪ Decreased equipment maintenance costs by $244,000 per year ▪ Decreased annual personnel costs by $1,400,240

[1] HH = households
[2] Optional second 96-gallon cart for $10.14 per month, and optional second 48-gallon cart for $6.60 per month

Cart Pricing Differentials

R. W. Beck identified communities that have a pricing differential for additional carts, or pricing differentials for different sized carts, and obtained information from representatives of these communities regarding price differentials and basic services provided in the program. These communities include:

- Huntsville, Alabama;
- Prince George County, Maryland; and
- York County, Virginia.

Table 2 provides a summary of the pricing information these communities were able to provide.

Table 2
Summary of Pricing for PAYT Cart Programs

Community	Service Fees	Services	Charges for Additional Containers
Huntsville, AL	▪ $174/year ($14.50/month) for 96-gallon cart	▪ Weekly curbside collection of refuse	▪ $2.00/month for each 60-gallon container ▪ $3.00/month for each 90-gallon container
Prince George County, MD	▪ $100/year for 35-gallon cart ▪ $118/year for 65-gallon cart ▪ $136/year for 95-gallon cart	▪ Weekly curbside collection of refuse and recycling	▪ Not applicable

Community	Service Fees	Services	Charges for Additional Containers
York County, VA	▪ $20 bi-monthly for 95-gallon cart	▪ Weekly curbside collection of refuse and recycling ▪ Every-other week yard waste collection November through January ▪ Quarterly bulky waste collection	▪ $6.50 bi-monthly for additional 95-gallon cart

Beyond researching rate structures in other communities, R. W. Beck used Abington Township's 2005 budget and preliminary pilot program data to develop a suggested rate structure specific to the Township. The first step R. W. Beck took to develop a rate structure was to determine baseline costs. In 2005, the Township budgeted $1,837,500 to dispose 24, 500 tons of waste at a rate of $77.00 per ton and $55,132 to process 2,506 tons commingled recyclables.[1] The Township also allocated $2,251,851 for solid waste and recyclable collection, $299,726 for program administration and $1,230,834 in capital cost. Table 3, distributes these costs amongst the 21,600 households on both an annual and monthly basis.

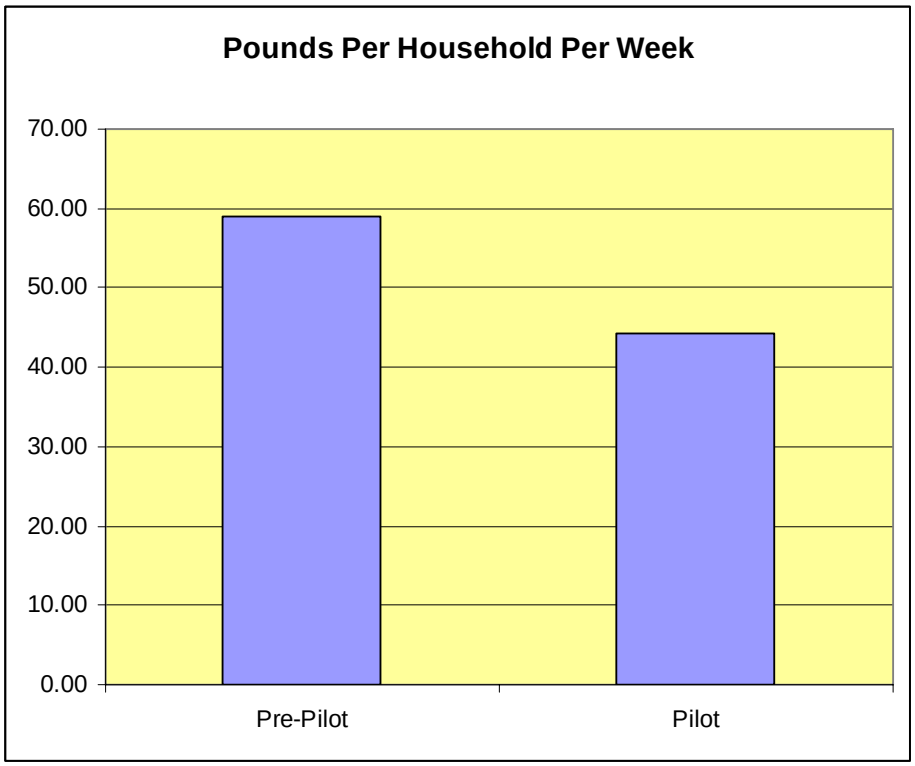
Table 3
Solid Waste Cost Distributions

Cost Center	Total Cost	Annual Cost Per Household	Cost Per Household Per Month
Disposal	$1,837,500	$85.07	$7.09
Recycling	$55,132	$2.55	$0.21
Collection	$2,251,851	$104.25	$8.69
Administrative	$299,726	$14.54	$1.21
Capital	$1,230,834	$56.98	$4.75
TOTAL GROSS COSTS	$5,675,043	$263.39	$21.95
Revenue	$829,709	$38.41	$3.20
NET COSTS	$4,845,334	$224.98	$18.75

However, as also shown in Table 3, the Township generated $829,709 in revenue from the sale of recyclable materials, providing recycling services to other communities, state performance grants and large item and commercial collection services. Thus, the net cost to the Township in 2005 was $4,845,334, which is equivalent to $224.98 per household per year or $18.75 per household per month. The Township assesses a residential refuse fee to fund the net cost.

[1] The Township is not charged to process fibers.

Figure 1
Pre-Pilot and Pilot Comparison



To determine a residential user fee rate that reflects decreases in disposal quantities, R. W. Beck used data provided by the Township to estimate annual disposal rates prior to the pilot program (2005) and during the pilot program (2006). As shown in Figure 1, the average pounds per stop of refuse set out for pilot program participants decreased from 58.89 to 44.35 during that time period, or by approximately 25 percent. R. W. Beck then applied this 25 percent reduction to the $85.07 average annual disposal cost per household, which yielded a reduction in the average household disposal cost of $21.19 per year. The impact of increased recyclables was not included in the analysis as the Township pays for the processing of commingled containers and receives revenue from fibers as well as the Pennsylvania recycling performance grant. Thus, the Township will incur a cost from recycling additional commingled containers, but could receive a net financial benefit from increasing the overall quantity of recyclables collected.

To calculate potential residential refuse fee, R. W. Beck used the following 3 scenarios:

- Scenario 1 – The Township does not institute PAYT or change the existing curbside recycling program. The cost per household per would be equivalent to the baseline, which is $224.98 per year or $18.75 per month
- Scenario 2 – The Township institutes a program similar to the pilot program where residents receive one (1), 96-gallon cart, with once a week refuse collection; and curbside recycling

with commingled containers and fibers being collected on alternating weeks. For Scenario 2, we reduced disposal costs by $21.19 per year. This decreased annual residential refuse fee to $203.79 per year or $16.68 per month.

- Scenario 3 - The Township institutes a program similar to the pilot program where residents receive one (1) 64-gallon cart, with once a week refuse collection; and curbside recycling with commingled containers and fibers being collected on alternating weeks. For Scenario 3, we reduced disposal costs by another $21.19 per year. This decreased annual residential refuse fee to $182.60 per year or $15.22 per month.

Benefits/Drawbacks of PAYT and/or Automated Collection

To assist the Township develop the most appropriate solid waste collection system, we researched the benefits to PAYT programs, particularly to PAYT programs using automated collection.

The benefits of PAYT/automated collection include:

- Increase in number of households served per route;
- Fewer collection vehicles needed, potentially;
- Potential to share vehicles (or backups) for refuse/recycling routes;
- Decrease in personnel needed (due to one driver per vehicle, and reduced routes);
- Potential to decrease collection frequency (particularly if large carts provided);
- Increased recycling and minimized disposed waste generated (particularly if price differential between cart sizes is significant, and if recycling carts provide additional space for storing recyclables);
- Improved worker conditions for automated vehicles, leading to:
  - Reduced worker injuries/sick days;
  - Enhanced worker longevity;
  - More broad potential employee pool;
  - Reduced tip fees on trash due to drier (hence lighter) setouts; and
- Improved neighborhood aesthetics (due to uniform, lidded carts, less debris).

Some potential drawbacks of PAYT/automated collection include:

- Some residents may be tempted to dispose of trash illegally, if charged by the container;
- Cost of carts and collection vehicles are high;
- Provisions may have to be made for waste generated beyond that which can fit in a cart, or extra education/outreach efforts may need to be undertaken to ensure waste is not set outside of cart;

- Automated collection vehicles may require more maintenance than manual-collection vehicles;
- There may be some situations that are not compatible with automated collection, such as narrow roads or alleys, or streets with low-hanging wires or trees;
- In order to realize the efficiencies of collection, residents must be educated to place carts at the curb properly; and
- If automated collection used strictly, separate collection routes needed for bulky waste.

Cincinnati Pilot Program Data

R. W. Beck was also able to provide the Township with information pertaining to the City of Cincinnati's pilot program to use as a benchmark for the performance of the Abington pilot program. The City of Cincinnati conducted a pilot program in which both fully-automated and semi-automated collection vehicles were used. Three locations across the City were carefully selected to help gather data on different types of households and collection situations. The pilot program routes were in the neighborhoods of:

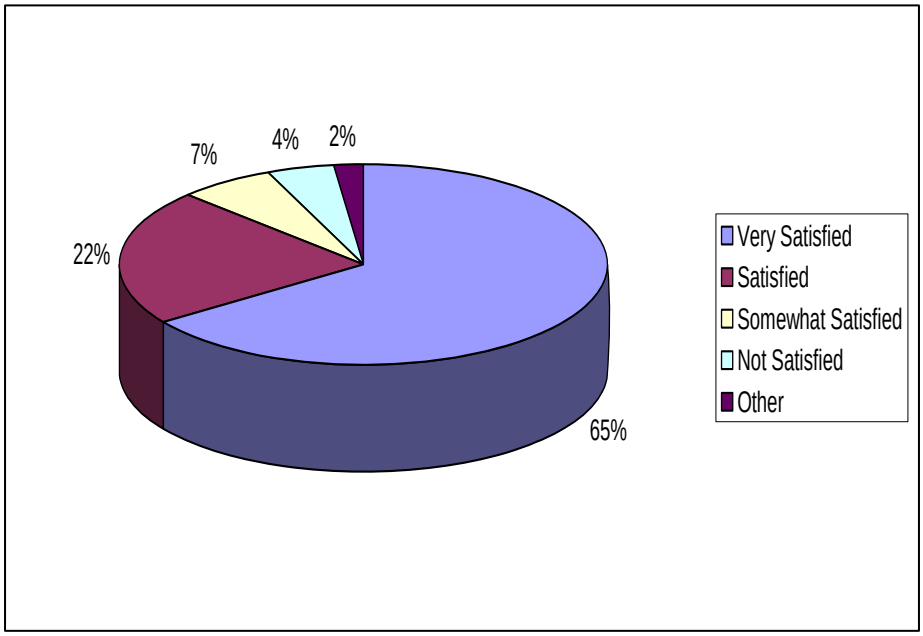
- Westwood (fully automated)
- East Walnut Hills/Evanston (semi-automated); and
- Mt. Washington (fully automated).

The pilot program was conducted from September, 2002 through March, 2003. During this time, three pilot and three control routes were selected to collectively represent the entire City. Fully-automated collection vehicles have an automated "arm" which collects the cart. The driver of the vehicle does not have to leave the cab of the truck, and uses a joystick to maneuver the "arm" to collect the cart. Semi-automated collection involves manually moving the cart to the rear of the vehicle and placing the cart on a hydraulic lift, which lifts and tilts the cart to empty its contents into the hopper of the vehicle. Automated collection routes were serviced by the LaBrie automated side loader and a one-person crew. The semi-automated collection route was also serviced by the LaBrie vehicle, however instead of using its automated "arm," the one-person crew used the semi-automated flippers to tip the carts.

Monitoring of the pilot program indicates that the average set-out weight for households on the pilot routes ranged from 2.08 to 8.63 less than the control routes. Extrapolating this citywide indicates that the City could potentially save $150,128 to $622,864 per year in tipping fees by containerizing garbage, thus reducing moisture content and weight.

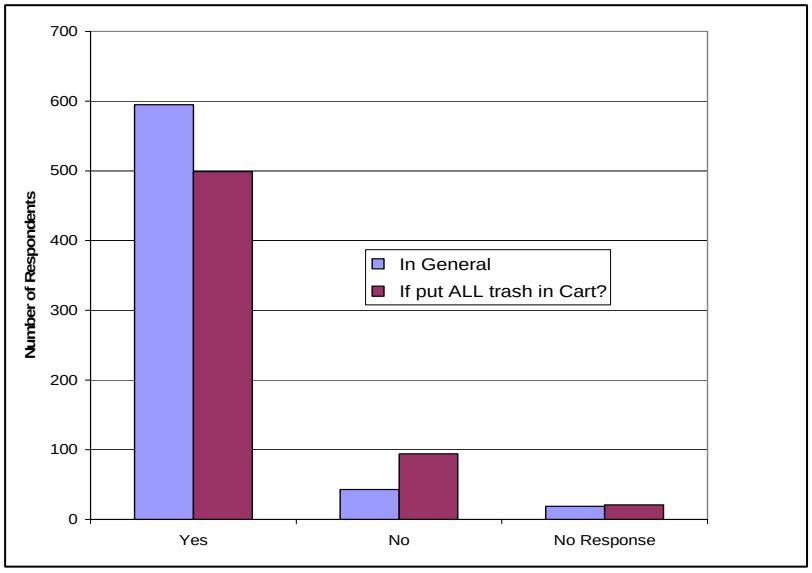
A survey conducted after the Pilot Program was complete indicated that 65 percent of the residents were "very satisfied" with the program, and an additional 22 percent were "satisfied" with the program. Seven percent were "somewhat satisfied," and only 4 percent were "not satisfied." The results of this survey are summarized in Figure 2.

Figure 2
Summary of Survey Satisfaction Question



Pilot program participants were also asked whether the program should continue in general, and whether the program should continue if ALL trash must be placed in the cart. Figure 3 illustrates those responses.

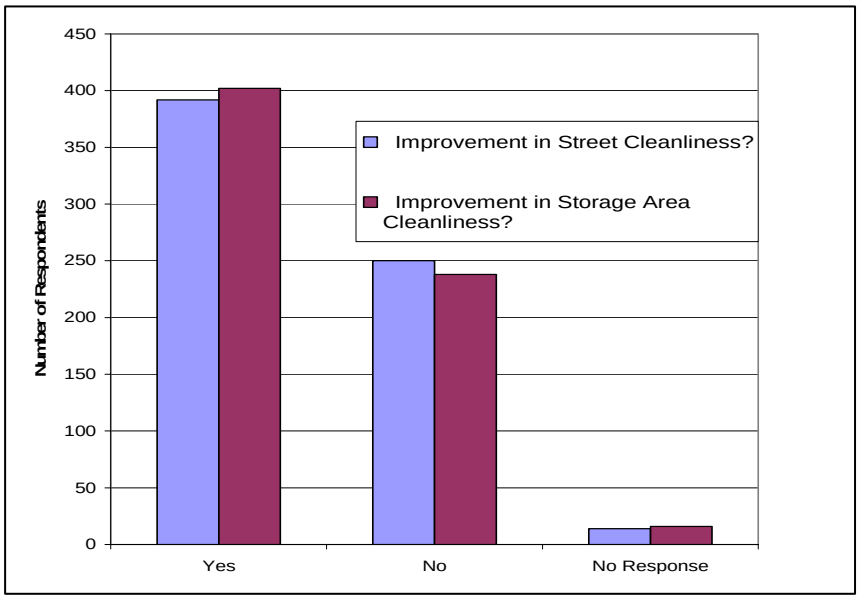
Figure 3
Summary of Program Continuation Responses



As Figure 3 illustrates, most respondents (nearly 600) wanted the program to continue in general, and 500 wanted the program to continue if ALL trash had to be placed in the cart. Nearly 50 respondents did not want the program to continue, and that number jumped to nearly 100 if all trash had to be placed in the cart.

Residents were also asked whether they saw a change in street cleanliness, as well as trash storage area cleanliness, under the pilot program. The results of these responses are summarized in Figure 4.

Figure 4
Summary of Street and Collection Area Cleanliness Responses



As Figure 4 shows, 400 residents saw an improvement in storage area cleanliness, and nearly as many saw improvements in street cleanliness. Two hundred fifty respondents indicated that they did not see an improvement in street cleanliness, and slightly fewer indicated that they did not see an improvement in street cleanliness. Figures 5 and 6 show photos of Cincinnati residential areas before automated collection, and after.

Figures 5 and 6
Cincinnati Scenes Before and After Cart Collection

A copy of the Presentation is provided in Appendix A.

Conclusions

There are potential benefits and drawbacks to PAYT and automated collection, as described on pages 8 and 9 of this report. Abington Township can increase its chances of implementing a successful PAYT program if:

- Residents are used to paying for the trash collection services, therefore do not see the "fee" as an imposition of a new tax, or as receiving a reduction in services;
- Additional services can be implemented at the same time as PAYT, such as curbside recycling;
- Extensive education and outreach is done so that residents understand the benefits of recycling, and the fact that paying for trash disposal based on the amount generated is actually a progressive means of charging for services; and
- Residents have a thorough understanding of the recycling program, and it is provided at no additional charge, and with a container that is adequate in size.

Other issues Abington Township needs to consider include the following:

- Because residents are offered a choice in cart size, the Township will need to develop a policy on how frequently customers can request a different cart.
- The Township should consider options in advance, and give thought to how choices can be made (e.g., in some cases residents receive a post card to select their size, in other cases they receive a default size, and can later "switch" carts).
- Carts may need to be serviced from time-to-time, and carts require repairs. The Township should consider cart distribution and repair services offered by private vendors, such as the hauler or the cart vendor. Similarly, the Township should make clear to residents whether the carts will have an identifying mark or tag that links the cart to a particular address, what will happen if carts need repair or replacement (e.g., will residents be charged) and whether the cart needs to stay with the address in the event a home is sold.
- After the program has been operating for a year, the Township may need to adjust the rate structure to reflect fluctuations in disposal quantities, and the expenditures and revenues associated with recycling.

Appendix A
PAYT and Automation Case Study Presentation

Presentation Developed for Abington Township

Case Studies for Automated Collection

Greensboro, NC

- System
  - Weekly curbside collection with fully automated collection vehicles and one-person crews
  - 950 households per route during a seven-hour workday
  - Residents have 90-gallon carts
  - Weekly curbside recycling

Greensboro, NC

- Since implementing automated collection
  - Decreased crew from 58 to 50
  - Decreased collection from twice to once a week
  - Decreased worker injuries from 4-5 a day to rarely
  - Increased number of households served by 15%

Garland, TX

- System
  - Weekly refuse collection
  - Automated side loader with one person crew
  - 90-gallon containers
  - serve 912 hh per day during 10 hour day
  - Biweekly curbside collection of recyclables
  - Weekly bulky waste collection

Garland, TX

- Since implementing automated collection
  - Decreased crew size by 50% (32 to 16)
  - Dramatic increase in worker's compensation claims
  - Decreased routes per day by 50 percent
  - Deceased collection frequency from twice weekly to once weekly
  - Noted an overall savings in their program

Longmont, CO

- System
  - Weekly refuse collection
  - Automated side loaders with one-person crew
  - 96-gallon carts
    - $10.14 per month for extra 96-gallon container
    - $6.60 per month for extra 48-gallon container
  - Weekly automated curbside recycling
  - Split carts for recycling
  - Quarterly bulky waste collection

Longmont, CO

- Since implementing automated collection
  - Increased collection efficiency by 70% (500 to 800 households per day)
  - Decrease recycling collection from once a week to twice a month
  - Decreased crew size by 50%
  - Reduced absenteeism by 83%
  - Decreased total number of residential collection vehicles from 8 to 6

Longmont, CO

- Since implementing automated collection
  - Implemented night shift for garage, decreasing vehicle down time
  - Noticed decrease in litter
  - Increase participation in recycling program from 50% to 80%
  - Have been able to keep customer rates steady, whereas previously rates increased 7% annually

Thornton, CO

- System
  - 4 refuse and 20 recycling routes
  - 7 full-time employees
  - Once a week refuse collection
  - Once a month recycling collection
  - 96 gallon carts for refuse and recyclables
  - $13.50 per month for garbage

Thornton, CO

- Since implementing automated collection
  - Replaced two refuse routes with two recycling routes
  - Decrease staff from 7 full-time and 6-seasonal to 7 full-time
  - Reduced number of hours annually lost from 1,215 to 48.5
  - Total annual savings - $143,000 per year

Bellevue, WA

- System
  - Private hauler provides weekly collection of refuse and recyclables
  - Semi-automated collection with one crew
  - Resident can choose from 32, 60 and 96-gallon carts
    - 32 gallons – $15.93 per month
    - 60 gallons – $23.18 per month
    - 90 gallons – $29.61 per Month
  - Residents can self-haul bulky waste to the transfer station or pay for a private contractor

Bellevue, WA

- Since Implementing Semi-Automated Collection
  - Average trash set out decreased from 6.85 lbs per week to 3.69 lbs per week
  - City achieved a 60 percent diversion rate
  - Refuse drivers have longer careers
  - Improved neighborhood aesthetics

Dayton, OH

- System
  - Once a week refuse and recyclables collection
  - Residents have 96-gallon carts for refuse and 14 gallon bins for recycling
  - Fully automated refuse collection with one person crew
  - Quarterly bulky waste collection
  - City charges $5 per month for solid waste collection services

Dayton, OH

- Since implementing fully automated collection
  - Decreased routes from 36 to 22
  - Decreased staff from 200 to 144
  - Decreased equipment costs by $240,000 per year
  - Decreased personnel costs by $1,400,240 per year

RATE COMPARISONS

Community	Fee	Services	Additional Containers
Huntsville, AL	▪$14.50 per month	▪1 – 96 gallon refuse container per week	▪$2.00 per month for each 60 gallon container ▪$3.00 per month for each 90 gallon container

RATE COMPARISONS

Community	Fee	Services	Additional Containers
Prince George's County, MD	▪$100 per year for a 35 gallon cart ▪$118 per year for a 65 gallon cart ▪$136 per year for a 95-gallon cart	▪Once a week refuse and curbside recycling	▪Not Applicable

RATE COMPARISONS

Community	Fee	Services	Additional Containers
York County, VA	▪$20 bi-monthly for 1 95-gallon container per week	▪Once a week refuse and curbside recycling ▪Every other week yard waste collection form November through January ▪Quarterly bulky waste collection	▪$26 bimonthly for 2 95-gallon containers per week

Roll With It!

City of Cincinnati Garbage Cart Pilot Project

Trying Out New Collection Technology

Fully-Automated Collection →

← Semi-Automated Collection

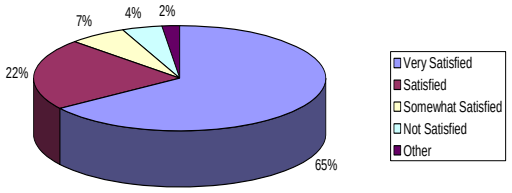
New Collection Equipment

New, easy-to-use 90+ gallon garbage carts for several selected trial routes

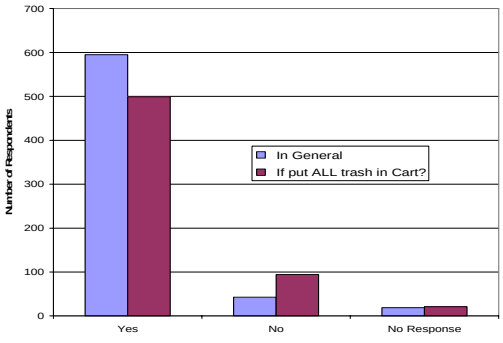
Selected Route Locations

- Three route locations across the city were carefully chosen to ensure data could be gathered on different types of households and collection situations.
- Routes were located in the neighborhoods of:
  - Westwood
  - East Walnut Hills/Evanston
  - Mt. Washington

Pilot Program Results- Overall Satisfaction



Should the Program Continue?



Impact on Set-Out Weights

- The average set-out weight for households on the pilot routes ranged from 2.08 to 8.63 pounds less than setouts on the control routes
- By containerizing garbage, the City's tipping fees could be reduced by $150,128 to $622,864 per year.

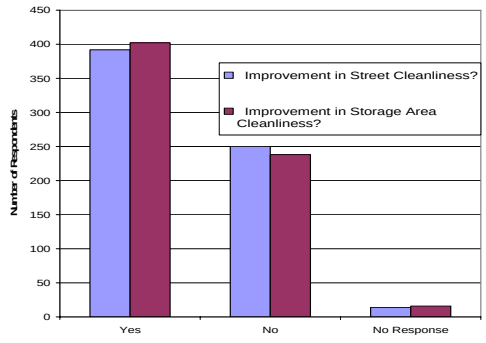
Impact on Efficiency

- Currently, the City uses a two-person crew to collect from 600 to 800 households per day.
- Converting to a fully-automated collection system could enable the City to collect from 500 to 700 households per day using a one-person crew on certain routes.

Impact on Efficiency

- This could save the City between 30 and 50 percent in crew costs.
- If fifty percent of the routes could be collected with a single-person crew, collection crew costs would decreased by 25 percent or $832,500 per year.

Impact on Street Cleanliness



Impact on Street Cleanliness