

MULTIFAMILY ORGANICS SEPARATION PILOTS IN TORONTO

WHEN the city-owned Keele Valley landfill site closes December 31, 2002, Toronto, Ontario's garbage will have to be sent to private landfill sites, increasing waste disposal costs from \$12/metric ton (\$7.60 US) to \$52/metric ton (\$33 US). In preparation for this event, the city of Toronto created the Waste Diversion Task Force 2010 in January 2001. The Task Force, chaired by Toronto's Mayor and the chair of the city's Works Committee, was asked to consult with the people of Toronto and develop a comprehensive waste diversion plan. Its specific goal was to come up with a made-in-Toronto solution for meeting the following targets: 30 percent diversion of household waste by 2003; 60 percent by 2006; and 100 percent by 2010.

One of the main components of the waste diversion plan is to implement a three-stream collection program for source separated organics, recyclables and residual waste. Organics collection – known as the Green Bin program – commenced in September for 70,000 single family dwellings in one of the city's four collection districts and will be phased in across the city. Blue box material (containers) and grey box (fibers) will be combined into single stream recycling collection. It is anticipated that the three-stream program will be fully operational in all four districts (490,000 households) by the end of 2005. A new Yellow Bag program incorporating organics collection has been introduced for the city's commercial customers. (See sidebars for more details on the Green Bin and Yellow Bag programs.)

One of the challenges Toronto faces with implementing a residential organics collection program is that approximately 40 percent of its residents live in high-rises. About 5,000 multiresidential complexes currently receive city collection service. Therefore another of the Task Force recommendations is to report back on a system for collecting source separated organics from multiresidential buildings. Towards this end, the city has undertaken several pilot projects at apartment buildings, to test different methods of collecting household organics. Allowable

The city is testing a three-stream waste sort and deep collection containers that are 40 percent above ground and 60 percent five feet underground at two multifamily housing units.

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materials in the organics fraction include fruit and vegetable scraps, meat and fish products, pasta, bread and cereal, dairy products, coffee grinds and filters, tea bags, soiled paper towel and tissues, soiled food packaging, diapers, sanitary products, household plants, and animal waste, bedding and litter. Organics from the first phase of the single family Green Bin program, the multifamily pilot and the commercial organics are being taken to the city's new Dufferin anaerobic digestion facility (see sidebar).

DEEP COLLECTION SYSTEMS

The Solid Waste Management Services division of Toronto is evaluating two types of deep collection systems that involve installing collection containers that are partially underground. The deep collection system is being used successfully in apartment buildings in Belgium, Finland, France, Germany, Portugal and Sweden, but the Toronto pilot is believed to be a first in North America. The deep collection containers are 40 percent above ground; 60 percent is installed five feet underground. This increases the capacity of the container, and the cool underground temperature effectively con-



Deep collection containers were installed at a 20-unit condominium for garbage (6.5 cy capacity), recyclables (1.7 cy) and organics (0.4 cy). The illustration (inset) shows how the containers are 40 percent above ground and 60 percent below.

SINGLE FAMILY ORGANICS COLLECTION

TORONTO'S new Green Bin program will be key to helping the city achieve its goal of 60 percent waste diversion by 2006. The first phase of the program has been rolled out to 70,000 households (one out of four collection districts in the city). As part of the implementation, the city delivered two new containers to residents in the Phase 1 area. One container is for use in the kitchen and one is for setting material at the curb. The organic materials collected in the new program include: fruit and vegetable scraps, meat and fish products, pasta, bread and cereal, dairy products, coffee grinds and filters, tea bags, soiled paper towel and tissues, soiled food packaging, diapers, sanitary products, household plants, and animal waste, bedding and litter. Organics

are collected every week along with alternate weekly collection of recyclables and residual garbage and taken to Toronto's new Dufferin Organics Processing Facility (see accompanying sidebar) where it is anaerobically digested.

The rollout schedule is as follows: Phase 1 was implemented in the Etobicoke community (70,000 homes) on September 17, 2002. Phase 2, which has been approved in principle by Toronto City Council but is still subject to budget approvals, will be implemented in Scarborough (110,000 homes) in June 2003, East York, York and Toronto (210,000 homes) in July 2004, and North York (110,000 homes) in June 2005. For further information on the City's new Green Bin organics program, please visit our web site at www.city.toronto.on.ca/greenbin.

trols odors from stored organic residuals.

Traditionally, multi-residential dwellings possess several characteristics that act as barriers to recycling. These include lack of convenience to residents; communication challenges due to many languages and high turnover of residents; physical constraints of buildings; lack of building management support; and lack of financial incentives. Thus, in order to take the next step and test organics separation, the project team felt it was important to pilot the deep collection system at buildings that already had a successful recycling program. Because the collection units get buried five feet into the ground, we had to ensure that the buildings selected had an area that was clear of underground utilities (e.g. natural gas, cable, sewer, electrical).

The project team also wanted to test the system at a building with and without a garbage chute. A small 20 unit condominium without a garbage chute, and a large 260 unit rental building with a garbage chute were selected for the pilot. Permission was sought from the board of directors at the one building and the property management and building superintendent of the other.

At the smaller building, it was possible for staff to attend a resident meeting prior to the installation to explain the project, and distribute instructional material and kitchen containers for organics. Residents were instructed that they could line their kitchen containers with plastic bags, i.e., grocery bags, if they wished, but could also empty the material from the kitchen containers directly into the deep collection container.

At the larger building, the property management distributed a letter to all house-



A truck fitted with a hydraulic lifting arm is used to service the deep collection units.

holds introducing the pilot project and notifying residents that city staff would be visiting the building soon to distribute free kitchen containers and information explaining the project. Staff set up a lobby display on the day of the installation and distributed the kitchen containers and newsletters with information on the pilot. Residents were instructed by the property management to double bag their organics using shopping bags, due to concerns about leaking bags in the event that residents take the bags out on their way to work without the kitchen container provided. The cost for the deep collection system, kitchen organics containers, installation, and collection are paid for by the city. The cost of the deep collection units ranges from \$2,000 to \$4,400 depending on the size and type of unit. Installation was done by city staff at approximately \$500/unit (about \$320 US).

The small building had the Molok deep collection system installed for its garbage, recycling (paper and containers commingled) and organics in April 2002. Its one 3 cubic yard bulk-lift garbage bin, and its four 90 gallon recycling carts, were replaced with one 6.5 cubic yard deep collection container for garbage, one 1.7 cubic yard deep collection container for recyclables, and one 0.4 cubic yard deep collection container for organics.

The larger building had the Alfa deep collection system installed only for organics. The recycling program performance at the 260 unit building was above average due to the active involvement of the building's superintendent and thus it was decided not to interfere with or change the recycling program. Two small units (300 gallon capacity) were installed close to the area of the existing bulk-lift recycling bins in August 2002.

PARTICIPATION AND PERFORMANCE

The 20 unit building went from a twice weekly garbage collection and once a week recycling collection to a once a month garbage and organics collection, and once every two weeks recycling collection. To determine the collection frequency, the units were monitored on a weekly basis until the generation pattern was established. The prepilot diversion rate from the building averaged 21 percent. Since April, it has had an average diversion rate of 60 percent with the new system. The 260 unit building has had only two collections of organics so far (collection frequency is every two weeks, again determined by monitoring of the unit). Diversion has increased from an average prepilot rate of 32 percent to 42 percent with the addition of organics.

The organic material from both buildings has been very clean so far with less than five percent contamination. There have been a few problems with fruit flies at the smaller building, but no problems with other pests or animals. In fact, the small building had raccoon problems before the installation of the deep collection system, and no problems were reported afterwards. Only one call was received in June about a slight odor coming

ANAEROBIC DIGESTION FACILITY STARTS UP

A NEW anaerobic digestion facility is part of the city of Toronto's organics diversion program. The Dufferin Organics Processing Facility is designed to process about 28,000 tons/year (25,000 metric tons) of source separated organics from residents, commercial businesses and public buildings. The city issued a design/build contract for the plant, which is now in the final stages of commissioning. The plant uses the BTA wet mesophilic anaerobic digestion technology; Canada Composting, Inc. of Newmarket, Ontario is the North American licensee of the system. The plant recently began its start-up phase, processing household organics from the Phase I rollout of the Green Bin program. Organics collected from the commercial sector as part of the Yellow Bag program are going to Dufferin as well. (See accompanying sidebars for information on those programs.)

The facility is designed as follows, explains Brian Van Opstal, an engineer with the city of Toronto's Solid Waste Management Services Division. Residents are provided with rigid kitchen and curbside containers for organics collection and are also able to package organics in plastic grocery type bags and to use plastic liners for their curbside bins. Materials are unloaded at the plant and are conveyed to a trommel screen, which opens bags and fractionates the waste stream into three sizes — 2 1/2 inches (65 mm), 10-inches (250 mm) and overs. The 10-inch and overs fractions are conveyed to a line that includes sorting stations, and magnetic and eddy current separators. "The amount of hand sorting required will depend on how clean the material is," notes Van Opstal.

Following the bag opening and sorting operations, the material is conveyed to the hydropulper, the first stage of the anaerobic digestion process. Bags that are not opened by the trommel screen are opened by the hydropulper. "The hydropulper will open bags and remove plastic, but I think as we get up to scale, relying on the hydropulper to open bags will slow down the process — primarily because the hydropulping operation will take longer. A better solution may be to install a bag breaking system in front of the trommel," says Van Opstal.

The hydropulper is a large tank with an agitator that is mounted from the top of the tank. The agitator resembles a screw auger or an agitator in a clothes washer, he explains. There are no cutting edges on it. The 2 1/2-inch minus

fraction from the trommel screen, and the larger fractions that have gone through the sorting line, are all loaded into the hydropulper. It is filled with recycled process water to bring the solids content of the material down to about eight percent. "The agitator spins very quickly," says Van Opstal. "The difference in velocity between the water close to the agitator and the water closer to the walls is so great that it creates a sheer force that will open bags and literally — I am told by the manufacturer — separate fibers and organic matter from

notes Van Opstal. "The surge tank allows the digester to be fed at a constant rate." Another contaminant removal system, known as a hydrocyclone, runs in parallel with the surge tank, he adds. It removes very small pieces of heavy fraction material, such as pieces of glass that are smaller than a grain of rice, collectively referred to as grit. Liquid from the surge tank runs continuously through the hydrocyclone and then back into the tank. The light and heavy fractions from the hydropulper and the grit from the hydrocyclone are the residuals from the process — estimated to be about ten percent or less by weight of the incoming organics stream.

The digester is a glass-lined steel tank that resembles a farm silo and has a working volume of 3,000 cubic meters (about 3,900 cubic yards). The average solids retention time in the liquid phase digester is 15 days. Material is continuously withdrawn and a screw press is used to separate liquids and solids. "We expect the cake solids to be about 30 percent," he says. "The operator of the Dufferin facility has a



Hydropulpers (above) are the first stage of the wet mesophilic anaerobic digestion technology, wetting, separating, then pulping the organic fraction. A rake-like unit (right) passes through the liquid to remove plastics and other floating light fraction material.

other materials. For example, if a disposable diaper is put in, the plastic liner will remain intact and come out as residue and the rest comes out as organic pulp."

Once the pulping operation is complete, a very large rake-like unit passes through the liquid to remove plastics and other floating light fraction materials. A trap in the bottom of the pulper removes heavy objects such as silverware, glass and ceramics. One complete cycle of the hydropulper, including pulping and screening, typically requires 70 minutes.

The pulp moves from the hydropulper into a large, fiberglass surge tank. "The purpose of the surge tank is to act as a buffer between the hydropulper, which is a batch operation, and the digester, which needs to be loaded continuously,"



contract with a composter in Niagara Falls, Ontario to process the solids." Because the plant just started processing material in September, only small quantities of cake solids have been transported to the composting facility as of mid-October.

The biogas is not being captured for energy recovery at this time. If the plant is expanded, it is expected that a cogeneration system will be installed to utilize the biogas energy. The entire plant is fully enclosed, with building air treated through a biofiltration system. Once the facility has been accepted by the city, it will be operated by Canada Composting, Inc. — N.G.

Collection frequency at the multifamily buildings was determined by monitoring the units weekly to establish a generation pattern.

YELLOW BAG PROGRAM FOR COMMERCIAL COLLECTION

THE CITY of Toronto is undertaking a number of initiatives to reduce garbage and increase diversion. The Yellow Bag program, which started September 3, 2002, encourages Toronto's commercial customers to decrease garbage while increasing diversion through recycling and a new organics collection service. Commercial customers receiving city service must now place their garbage in special yellow bags for pick up. The bags cost \$3.10 each, which

covers the collection and disposal of garbage. Toronto built in a diversion incentive that enables businesses to reduce their garbage and thus costs through recycling and organics collection, both of which are provided by the city at no charge. Recycling carts (95 gallon) and organic carts (32 or 64 gallon) must be purchased from the city. More information on Toronto's new Yellow Bag program can be found at www.city.toronto.on.ca/yellowbag.

from the organics unit. It was a very hot summer in Toronto with temperatures regularly in the mid 30°C or mid 90°F. The problem was rectified by ensuring that collection occurred before the level of organics reached the above ground portion of the deep collection unit. The larger building has only had the new system since August and thus there is less information available from this site. Both of the deep collection pilots will run for at least a year with continued monitoring.

A truck fitted with a hydraulic lifting arm is needed to service the deep collection units. City staff are currently using a Ford five metric ton truck fitted with a HiAb crane. Staff are investigating the possibility of alternate collection methods that are more compatible with the city's existing fleet and collection operations.

AUTOMATED CHUTE TRIAL

In addition to the deep collection project, Toronto is also testing a three-stream sorting automated chute system with an organics component. The chute pilot was initiated in January 2002. One of the Toronto Community Housing Corporation's buildings was chosen for the project. The building is a 48-unit medium rise with an existing garbage chute and recycling program. The existing chute was retrofitted with a new system that can direct materials into different bins. The chute rooms on each floor were outfitted with a special panel indicating the choices that the resident could make when disposing their materials. From the convenience of their hallway chute rooms, residents can choose to drop off garbage, paper and container recyclables (mixed together), and organics. City-owned housing was chosen due to the large investment of retrofitting the chute.

In the pilot, garbage is directed to a compactor, and recyclables and organics are directed to 60 gallon carts. A private contractor is collecting the organics carts and the recycling carts once a week, while the city's contractor continues to collect garbage twice weekly. Information sessions were held with

the tenants at the start of the program; kitchen containers and information materials were distributed at those meetings. Residents are requested to line their kitchen containers with bags, such as a grocery shopping bag.

Audits undertaken before the pilot was initiated showed that the average diversion of the existing recycling program was 24 percent. Monitoring indicates that the three-stream sorting chute has definitely had a positive impact on the recycling tonnage; overall diversion has increased to 37 percent. However, the contamination in the organics carts and the recycling carts has increased drastically — from around five percent to around 23 percent by weight. Part of the problem seems to be a decrease in staffing at the building from five days/week to two days/week. Solid waste management staff have discovered that the three-stream sorting chute system is often shut down on the weekends due to lack of housing staff available to check on the system and change carts. This has led to frustration on the part of the tenants who mistakenly think the system is broken, which results in a lack of enthusiasm for the program. Thus, the chute system for organics separation is not working well in this scenario.

In addition to the pilot projects, city staff are organizing forums in order to facilitate input from property developers, architects, builders and property managers on design requirements for source separated organics programs in multiresidential dwellings. The information gathered at the forums, along with data from the pilot projects, will assist staff towards making recommendations on appropriate collection systems for source separated organics from multiresidential dwellings. ■

Renee Dello is coordinator, Waste Diversion Planning, in the city of Toronto's Solid Waste Management Services, Works & Emergency Services division. Toronto staff would be very interested to make contact with other cities that are providing their multiresidential sector with organics collection. Please contact Renee Dello by email at rdello@city.toronto.on.ca.

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