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Orange County organics diversion pilot programs comparison

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During the summer of 2009, Orange County Waste and Recycling (OCWR), the agency in Orange County, California, that owns and operates three landfills and four household hazardous waste (HHW) dropoff centers, awarded grants to cities to implement landfill diversion programs. The source of the funding for the grants was a \$19-per-ton surcharge assessed on all inbound self-hauled materials to County landfills. This surcharge, which was effective beginning July 1, 2006, not only reduced the tonnage of self-haul being hauled to County landfills by 83% (self-haulers instead took the materials to materials recovery facilities or out of County landfills), but it also generated \$17 million in revenue for the County.

In order to increase the chances of winning grant funds, OCWR encouraged Orange County cities to work with their contract haulers and team up on projects that would have a regional impact. The County also encouraged the cities to implement a program that diverted significant tonnage away from the landfills. In order to comply with this request, many cities targeted organics for diversion since roughly 16% of the commercial waste stream consists of these materials.

In Orange County, two regional groups received grant funding to implement commercial organics diversion programs: cities serviced by CR&R Inc. (San Clemente, Dana Point, San Juan Capistrano, Laguna Niguel, Laguna Hills, Aliso Viejo, Rancho Santa Margarita, Capistrano Unified School District schools located in Unincorporated Orange County, and Tustin) and cities serviced by Waste Management (Mission Viejo, Laguna Beach, and Irvine). OCWR awarded \$400,000 to the cities serviced by Waste Management and \$450,000 to cities serviced by CR&R. As part of the grant process, OCWR offered an additional \$50,000 to applicants that included unincorporated areas of the County.

The two regional groups used two entirely different commercial organics diversion programs. The CR&R cities implemented a traditional organics diversion program, which employs a collection truck to collect 60-gallon wheeled carts at five restaurants in each city. The food waste is collected three days per week on a regular route and hauled to CR&R's transfer and sorting facility in Stanton, which is located in north-central Orange County.

These loads, which usually weigh 8-10 tons, are consolidated in a covered transfer trailer at CR&R's facility. When the transfer trailer is full (usually once to twice per week), CR&R hauls the trailer approximately 130 miles to a composting facility in Thermal (in the eastern end of California's Coachella Valley).

The cities serviced by Waste Management implemented an organics dehydrating machine to restaurants to process their materials onsite. The machine, which is called an eCorect and is manufactured by Somat, reduces the materials' weight and volume by 83-93%. The machine can process up to 220 pounds of organic materials per cycle. Each cycle generally takes 12-18 hours. The by-product is a soil amendment that can be used on landscaping if it is diluted with soil at a 6-to-1 ratio. The machines cost over \$20,000 each and a total of ten eCorects have been installed in the three participating cities.

Both programs are offered at no cost to the participating restaurant. All the materials needed for internal and external collection of organics, such as 23-gallon slim jims, educational posters, and 60-gallon totes, are provided through

Table 1: CR&R Organics Diversion Program Emissions Analysis

| CR&R collection fleet | MPG | Miles on route | Gallons used per route | Lbs CO ₂ per gallon of diesel combusted | Lbs CO ₂ emitted per route | Routes per month | Lbs of CO ₂ per month | MTCO ₂ E per month |
|-------------------------|-----|----------------|------------------------|--|---------------------------------------|------------------|----------------------------------|-------------------------------|
| Diesel food waste truck | 5 | 137 | 27.4 | 22.4 | 613 | 13 | 7,962 | 3.8 |
| Diesel transfer truck | 3 | 260 | 86.7 | 22.4 | 1,939 | 5 | 9,694 | 4.4 |
| Total | | | | | 2,552 | 18 | 17,656 | 8.2 |

the grant by the haulers. At the time of publishing, both organics diversion programs have been operational for several months and the advantages and disadvantages of both program types are becoming clear. In the preceding section, the two diversion programs will be compared according to the following criteria: economic incentives for participating restaurants, monthly organics diversion tonnage, and reductions in greenhouse gas emissions.

Economic incentives for participating restaurants

The key to building a sustainable and long-lasting organics diversion program is to ensure that the participating restaurants have an economic incentive to participate in the program. Fortunately, both organics diversion programs have such incentives. The CR&R organics diversion program allows restaurants to dispose of their organic materials in 60-gallon carts. The largest contributor to the organics diversion program, a luxury resort, routinely fills ten of these 60-gallon carts three days per week. Since most restaurants are charged by the volume of materials the trash company removes from the premises (in the form of cubic yards per week), there are significant cost savings associated with diverting high volumes of food waste through a free organics diversion program. For example, the ten 60-gallon carts serviced three days per week that the luxury resort produces equals 1,800 gallons, or about nine cubic yards of volume. This equates to a three-yard trash bin serviced three days, which usually costs over \$200 per month in Orange County. As a result of the organics diversion program, many restaurants have reduced their trash service levels, in some cases up to 50%, which has led to lower monthly charges.

The Waste Management organics diversion program has a very similar incentive structure when compared to the CR&R program. There are several participants that have reduced their trash service levels as a result of

their use of the food scrap dehydrator. Both programs also offer more lucrative incentives if the participating restaurant utilizes a compactor in which to dispose of its organics. The incentives lie in the rate structure for compactors; compactor customers are charged not only for the collection of their compactor but also by the ton of material inside the compactor. Cities charge between \$30-60 per ton for compactor loads. Due to the density of organics materials (a field study found a 60-gallon toter full of post-consumer organics weighed over 320 pounds), there are significant economic incentives to divert these materials away from the compactor and into the free organics diversion program. If the luxury resort mentioned above were to throw nine cubic yards of organics into the compactor per week (roughly five tons), that would add up to about \$300 of compactor fees per week and over \$1,200 per month. Reducing the volume of organics thrown into the compactor also reduces the frequency of collection, which may result in additional savings.

A major consideration for the CR&R organics program is "what will happen when the grant program is over and the restaurants will be charged for organics diversion service in March 2011?" To date, no rate has been set for this service, but it is evident that the rate needs to be lower than the cost of trash removal in order for the program to be sustainable. Furthermore, it is important that a minimum amount of restaurants continue to participate in the program in order to spread the program costs and to avoid a cost-prohibitive rate.

Monthly organics diversion tonnage comparison

Both organics diversion programs have successfully diverted significant amounts of organic materials from the participating restaurants. However, because of the autonomous nature of the eCorect, it is difficult to accurately track the tonnage of organics diverted

through the program. In recognition of this, beginning in the month of November, Waste Management implemented a tracking log. This tracking log will be used by the machine operator and will track the fullness of the machine at time of operation as well as its frequency of use. This log will greatly increase the accuracy of the reported diversion figures. However, since this data is not yet available, we will use estimates to calculate the monthly diversion tonnage. Using 220 pounds as the maximum capacity of the machines, an estimate of the tonnage of organics diverted can be calculated if a fullness percent is indicated on the tracking log. For example, an eCorect that is run five days per week at 50% capacity each would presumably divert 550 pounds of organics per week (110 pounds per cycle multiplied by five cycles per week).

Using a similar formula, we can derive an estimate of the total organics tonnage diverted since the machines were installed in July 2010. Assuming each of the 10 machines were 100% full and cycled seven days per week, these machines could potentially divert 33 tons of food scraps per month. A likely estimate would be to assume 50% fullness cycled five days per week. This scenario would divert approximately 12 tons per month for all 10 machines.

The nature of CR&R's organics diversion program allows the hauler to weigh the materials collected from restaurants since this program utilizes a collection vehicle to service the restaurants. The collection vehicle eventually is weighed as it enters the transfer station at the conclusion of its route. Since this program began operating on April 8, 2010 through the most recent report for September 2010, it has diverted 595 tons of food waste materials or approximately 100 tons per month. Furthermore, the collection vehicle driver closely tracks the fullness of the organics carts at the time of collection and the time it takes to service the containers. This information will



The eCorrect, an organics dehydrating machine that processes restaurant materials onsite

be used to determine specific rates to be charged to participating restaurants when the pilot status of the program concludes and it is no longer offered free of charge.

Greenhouse gas emissions comparison

Both organics diversion programs are estimated to result in a net reduction of greenhouse gas emissions. This reduction is due to the fact that if the organic materials were sent to a landfill, they would have decomposed anaerobically in the oxygen-free environment of the County's landfills. The by-product of the anaerobic decomposition of organic materials creates methane gas. One metric ton of methane gas has the

equivalent heat-trapping capacity as 72 metric tons of carbon dioxide when considered on a 20-year timeframe in the atmosphere. Each program has different factors contributing to its carbon footprint: the Waste Management program relies on electricity to dehydrate the organics while the CR&R program relies on fossil fuels to collect and transfer the food waste from the generator to the compost facility.

The eCorrect used by the Waste Management cities uses three kilowatt-hours per cycle. Assuming all 10 machines were cycled seven day per week, this would result in an electricity usage of 900-kilowatt hours per month. Using 724 pounds of CO₂ emitted per

megawatt hour, this equates to about 650 pounds of carbon dioxide emitted per month (0.3 metric tons), or roughly 20-54 pounds of carbon generated per ton of organics diverted, using the low estimate and the high estimate, respectively.

CR&R has two major sources of greenhouse gas emissions embedded in their organics diversion program: (1) the carbon dioxide emitted by the collection truck servicing the restaurants, and (2) the emissions from the transfer of the materials from Orange County to the composting facility in Coachella Valley. The emissions from the collection vehicle roughly equate to 3.8 metric tons of carbon dioxide per month (assuming a 137-mile average route in a diesel collection vehicle with five-miles-per-gallon fuel economy that emits 22.4 pounds of CO₂ emitted per gallon of diesel combusted). The emissions from the transfer operations are approximately 4.4 metric tons of carbon dioxide equivalent per month (assuming five transfers per month using a diesel tractor trailer that has an average fuel economy of three miles per gallon on the 260-mile round trip haul that emits 22.37 pounds of CO₂ per gallon of diesel combusted). In total, CR&R's collection operations associated with the commercial organics program emits 8.2 metric tons carbon dioxide equivalent (MTCO₂E). This equates to 177 pounds of CO₂ emitted for every one ton of food waste diverted. Table 1 on p. 42 displays these calculations.

Both of the above calculations for carbon emissions, however, do not take

Table 2: Comparison of Two Organics Diversion Programs

| | eCorrect | | Traditional Program |
|--|--------------|---------------|---------------------|
| | Low Estimate | High Estimate | |
| Number of Participating Restaurants | 10 | 10 | 40 |
| Average Tons per Month Diverted | 12 | 33 | 100 |
| Total MTCO ₂ E Reduction | 8.75 | 24.5 | 59.4 |
| Lbs CO ₂ Reduction per Ton Diverted | 1,600 lbs | 1,640 lbs | 1,300 lbs |
| Estimated Annualized Cost per Ton of Organics Diverted | \$2,777 | \$1,010 | \$375 |

into account the net reduction in greenhouse gases due to the avoidance of the anaerobic decomposition of organics at the landfill. According to the EPA warm model, each ton of food waste diverted sent to the landfill emits 0.75 MTCO₂E. Using this coefficient, the CR&R program reduces 75 MTCO₂E per month, a net reduction of 66.8 MTCO₂E per month when factoring in 8.2 MTCO₂E emitted during the collection and transferring processes. This equates to a net reduction of more than 1300 pounds of CO₂ equivalent reduced per ton of organics diverted by CR&R.

Waste Management's organics diversion program diverts an estimated 12-33 tons per month. Using the lower estimate of 12 tons per month, this program reduces carbon emissions by nine MTCO₂E per month, which results in a net reduction of 8.7 MTCO₂E when factoring in the 0.3 MTCO₂E emitted to generate the electricity to power the dehydrator. This equates to a net reduction of over 1600 pounds of CO₂ equivalent per ton of organics diverted by Waste Management's program.

The comparisons between the two programs are shown in Table 2 on p. 44.

Conclusion

Each organics diversion program has its benefits. The Waste Management program has a much smaller overall carbon footprint than the CR&R program, but is limited to the amount of organics it can cost-effectively divert. In addition, the Waste Management program has a high upfront cost, but has a minimal cost associated with upkeep and maintenance. This attribute may be advantageous considering the limitations of the Orange County grant, which will not likely be offered again in the near future.

On the other hand, the CR&R program diverts more tonnage of organics and is able to serve four times as many restaurants. Because of this attribute, the CR&R organics diversion program has the potential to divert thousands

of more tons of organics and reduce the emissions of more metric tons of greenhouse gases than the Waste Management program. However, due to the labor costs and the distance between the transfer point and the final facility, the CR&R program may actually cost the customer more than equivalent trash service. This cost disparity, if not addressed, may cause the program to

lose participants when the grant term is over and the full cost of the service is passed along to the customer.

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