Recycling and Waste-to-Energy: Working Well Together

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Recycling and WTE: Working Well Together

A survey of 66 communities shows that recycling and waste-to-energy are compatible—and that these waste management approaches often help each other.

By Jonathan V. L. Kiser

Materials recycling and waste-to-energy combustion appear to work better together than they do apart, according to a recent survey of communities across the U.S. Each community selected for the survey relies on, or is planning to build, a waste-to-energy plant as a component in its integrated waste management program.

The survey is part of an on-going investigation by the Integrated Waste Services Association (IWSA) to determine what methods communities are employing to effectively manage their municipal solid waste. Some of the specific findings, discussed in the sections that follow, are:

—A majority of the communities served by waste-to-energy plants (and those planning facilities) have recycling rates greater than the national average of 17 percent—some nearly three times the average.

—Recycling programs are expanding in all of the responding communities served by, and planning to implement, waste-to-energy facilities.

—On-site recycling is occurring or will occur at 92 percent of the waste-to-energy projects polled.

—All of the waste-to-energy projects polled are currently or will be linked to off-site recycling programs.

—All of the municipal officials, recycling coordinators, and other waste management professionals who responded indicated that recycling and waste-to-energy are compatible, and provided supporting evidence.

Survey Methodology

The recycling/waste-to-energy survey was conducted during May to July 1992, with a key criteria being that all of the communities are now or will be served by a modern waste-to-energy plant. IWSA contacted 66 communities; of these, 51 are now served by a waste-to-energy facility, two have a facility under construction, and 13 are planning to implement waste-to-energy. The 51 operating facilities represent more than one-third of all operating WTE plants and 65 percent of the waste-to-energy processing capacity in the U.S.

The survey respondents included municipal officials (25 contacted), recycling coordinators (19), waste management authority personnel (15), waste-to-energy plant managers and staff (12), a consultant (1), and a trade association employee (1). (See the box on page 18 for more information about the survey design.)

Table 1 provides community data relating to waste-to-energy and area population. As indicated, the 51 operating plants are now processing more than 20 million tons of MSW annually for more than 24 million people. In addition, the 15 plants under construction and being planned will serve 8 million people by processing an additional 7 million tons per year of MSW.

On-Site Recycling Programs

Of the operating waste-to-energy plants reporting, 90 percent have on-site ferrous metals recovery programs. Table 2 details ferrous metal recovery activities at the surveyed waste-to-energy plants. The 27 plants that provided tonnage data recover 780 tons of ferrous metals daily, or an average of 29 TPD each. This equates to approximately 242,000 tons per year. Most of these metals are recovered post-combustion at mass burn waste-to-energy operations. However, several refuse-derived fuel plants separate ferrous during the front-end processing of MSW that's required to produce the fuel.

Other recycling activities take place at many of the operating waste-to-

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energy facilities, with the recovery of non-ferrous metals being the most prevalent. Additional efforts include the recovery of plastics, glass, white goods, and combustion ash.

All of the reporting waste-to-energy projects now under construction or in the planning stage will recover ferrous metals for recycling. Several projects also expect to recover non-ferrous, plastics, glass, and corrugated cardboard.

Table 1: WTE and Population Profile of Surveyed Communities

	Operating WTE	*WTE Under Construction*	*Planned WTE*	*Total*
No. of Plants	51	2	13	66
Processing Capacity in TPD (thousands)	55.7	3.1	16.2	75.0
Processing Capacity in TPY (millions)	20.3	1.1	5.9	27.4
Estimated Population served (millions)	24.3	1.1	6.9	32.3

Off-Site Recycling Programs

All 66 communities surveyed engage in recycling away from the waste-to-energy facility site. Table 3 shows the types of recycling programs and associated participation rates in these communities, and also to what extent these programs are expanding. The most prevalent type of program is curbside collection—found in 73 percent of the responding communities. In addition to the types of programs shown in the table, 74 percent of the surveyed communities reported having recycling initiatives to collect other materials, such as batteries, corrugated cardboard, used oil, and telephone books. A combination of recycling programs often are found in the same community.

All of the responding communities are expanding their recycling efforts. Examples of expansions include:

—the start-up of curbside collection in Kent County, Michigan, where a 625-TPD waste-to-energy plant has operated since 1990; and

—implementation of a yard waste composting program and broader curbside collection participation in Charleston, South Carolina, where a 600-TPD waste-to-energy plant has operated since 1989.

High Recycling Rates

While the contention has sometimes been made that waste-to-energy facilities hinder the implementation of recycling, the previous tables make it clear that this is not the case in the surveyed communities. Table 4 summarizes the recycling rates currently being achieved in all of the responding communities IWSA surveyed. Many waste-to-energy communities operate outstanding recycling programs. Among the 53 communities from which recycling rate data were available, 32 have rates exceeding the national average of 17 percent. The average recycling rate among these 32 communities is 29 percent. The average recycling rate for all 53 communities is 21 percent.

Two of the local recycling programs—in Newark, New Jersey, and Newton, Massachusetts—have received awards recognizing their excellence. EPA recognized Newark's program for maintaining a recycling rate exceeding 50 percent. However, it should be noted that this rate includes several materials not usually considered part of the MSW stream, such as auto bodies, scrap metal, and construction & demolition debris. Besides the high rate, other criteria used to judge "excellence" were the types and range of materials recycled and the caliber of education outreach initiatives. Newton's 1992 award was co-sponsored by the U.S. Conference of Mayors and the H.J. Heinz Company Foundation. Newton was judged on how well the town integrated the recycling program with other management options, its design innovation, the level of support from its political leadership, and the amount of commercial recycling.

Recycling-WTE Compatibility

The final survey question sought the opinion of community MSW management professionals regarding the compatibility of waste-to-energy and recycling. All 73 of those contacted stated that the two options are compatible.

Survey respondents cited numerous reasons supporting why recycling and waste-to-energy work well together. The most common reasons given, along with pertinent qualifications made, are provided below.

Promotes Self-Sufficiency

The combination of recycling and waste-to-energy enables communities to become—or remain—self-sufficient by reducing their reliance on others to manage their MSW. Many communities would have to export their MSW to out-of-state destinations if it were not for their successful implementation of recycling and waste-to-energy programs. These communities have control over their MSW management programs and the associated costs. In Essex County, New Jersey, which had been exporting 100 percent of its MSW, out-of-state shipments ceased following the implementation of recycling and waste-to-energy.

Islip, New York, has had a similar experience. "If not for a successful combination of recycling and waste-to-energy technologies, the exportation

Table 2: Ferrous Metals Recycling at Waste-to-Energy Facilities[1]

	Operating WTE	*WTE Under Construction*	*Planned WTE*	*Total*
No. of Plants Recovering Ferrous	46[2]	2	12	60
Percent of Total	90	100	100	92
Ferrous recovered (tpd)[3]	780	n/a	n/a	780

n/a = data not available at the time of the survey

Notes:

(1) Total respondents in each category were: operating, 51; under construction, 2; planned 12.
(2) Includes three operating projects that are now implementing ferrous metals recovery for recycling.
(3) These data represent the quantities reported by 59 percent of the operating facilities (i.e., 27 plants). Tonnages from the remaining 41 percent were not available.

of garbage would be a reality for the town of Islip," said Peter Daily, recycling coordinator for the Islip Resouce Recovery Agency. "A visionary approach to managing garbage has enabled our town to remain totally self-sufficient in the light of state mandates."

Proper Plant Size

Properly sized waste-to-energy plants help ensure that a community's recycling objectives can be achieved. More specifically, accurate waste management planning will enable communities to establish meaningful recycling goals while also implementing sufficient disposal capacity. If recycling activities reduce the amount of MSW going to the waste-to-energy plant to the point where capacity becomes available, the service area can be broadened to help solve regional waste management problems. An example of this is the cooperative arrangement between the towns of Hempstead and Brookhaven, New York, where ash from Hempstead's waste-to-energy plant is disposed of in Brookhaven's landfill, in exchange for MSW disposal at the waste-to-energy plant.

Another example is provided by Bay County, Florida, where waste-to-energy has augmented local recycling efforts, according to Bill Hudson, acting director of the county's solid waste department. Due to the large seasonal tourist (and MSW generation) fluctuations, excess waste-to-energy capacity is marketed to outside counties. In the process, participating jurisdictions are able to extend the life of their local landfills.

WTE: A Form of Recycling

Many communities consider waste-to-energy to be a form of recycling, since the MSW is reused in a productive way and the energy value is recovered for beneficial use. In addition, on-site recycling programs at waste-to-energy plants, such as post-combustion ferrous recovery, collect recyclables that might not be efficiently captured in other recycling programs. John Maier, director of the Gloucester County, New Jersey, board of freeholders, notes, "By recycling the energy from 400,000 tons of waste since January 1990, we have generated the equivalent of more than 250,000 megawatt-hours of clean electricity. You'll find the citizens of Gloucester County agree: waste-to-energy has enhanced our recycling efforts, augmented our energy efficiencies, and improved the safety of our environment."

Table 3: Off-site Recycling Programs and Participation Rates(1)

	Operating WTE	*WTE Under Construction*	*Planned WTE*	*Total*
Communities with Off-site recycling(1)	51	2	13	66
Communites with Expanding Programs(2)	31	1	8	40
Types of Programs(3)				
Curbside collection (percent of respondents)	36 (71%)	1 (50%)	10 (91%)	47 (73%)
Drop-off centers (percent of respondents)	35 (69%)	0 --	7 (64%)	42 (66%)
MRFs (percent of respondents)	10 (20%)	1 (50%)	2 (18%)	13 (20%)
Yard Waste Composting (percent of respondents)	36 (71%)	1 (50%)	7 (64%)	44 (69%)

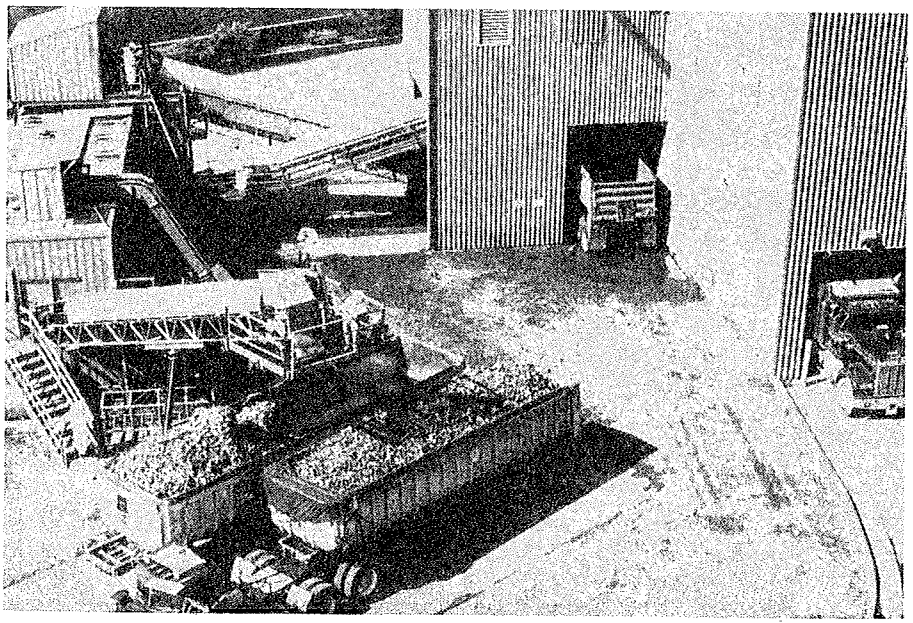
(1) 100 percent of respondents reported that they have off-site recycling programs.
(2) 100 percent of respondents reported that they have expanding recycling programs.
(3) Total respondents in each category for this question were: operating, 51; under construction, 2; planned, 11; total, 64.

Another example is provided by Frank Fasi, mayor of the city and county of Honolulu, Hawaii. "We now recover nearly 20,000 tons of ferrous metal each year [from the 2,160-TPD waste-to-energy plant], and we're installing another system to recover non-ferrous metals as well. The facility is an important source of energy for the island, too, with each ton of trash yielding the equivalent of 62 gallons of oil. Best of all, the energy is clean and [the plant] easily meets stringent state testing requirements."

Subsidies and Incentives

Waste-to-energy promotes recycling by way of direct and indirect subsidies and incentives. Examples of direct subsidization include:

—Paying for recycling personnel and



WTE Is Recycling
Waste-to-energy facilities "recycle" because they recover the energy value of the waste they burn and convert it into steam or electricity. But most WTE plants also recycle by recovering ferrous material and some recover non-ferrous metals. Pat Scanlon, of Wheelabrator Technologies says that about 1,200 tons of ferrous materials are recovered each month at the company's 2,250-TPD mass burn plant in Baltimore, Maryland. The photo shows 50-yard containers being filled with non-ferrous metals collected there, including aluminum, brass, and copper. (Photo courtesy Wheelabrator Technologies)

Survey Design

Here are the key questions asked of the participants in the Integrated Waste Services Association's survey on recycling and waste-to-energy:
—What type of recycling programs exist in the location served by the waste-to-energy plant?
—Is the recycling program(s) expanding?
—What percentage of the MSW stream is recycled?
—What community recycling program(s) really stand out? And,
—Do you believe that waste-to-energy and materials recycling are compatible?

Qualifications

—The term "community" means the area served by the waste-to-energy operation. A community can consist of several towns, a single city, a county, or a region.
—The responses provided by the waste management professionals on recycling and waste-to-energy compatibility sometimes reflect the answers of more than one waste management professional from a given community. In all, there were 73 respondents from 66 communities.
—The types and levels of recycling taking place within a waste-to-energy community vary. Generally, the entire community's average recycling rate is quoted.
—The tables reflect data available from communities in summer 1992. Data was not available from some respondents, and the number of responding communities varies from one question to another.
—The data in all tables assumes an 85 percent plant availability.

programs out of a portion of the waste-to-energy disposal fee fund. Fairfax County, Virginia, for example, pays the salaries of its community recycling staff plus the operation costs for 13 drop-off sites by adding about $2.50 per ton to the waste-to-energy disposal fee.

Two other communities applying tip fee surcharges are Hartford, Connecticut, and Hennepin County, Minnesota. In Hartford, the tip fee at the 2,000-TPD Mid-Connecticut waste-to-energy plant has been boosted by about $4 per ton in order to keep the tip fee at two nearby recycling facilities at $0. This encourages recycling, since communities are given an incentive to embrace programs that divert materials from the waste-to-energy plant, thereby avoiding a disposal fee ranging from $45 to $75 per ton.

The tip fee at the 1,200-TPD Hennepin County waste-to-energy facility is $95 per ton, but it includes $37 of surcharges to pay for such programs as curbside recycling, transfer stations, yard waste composting, and two new permanent household hazardous waste collection facilities.

Examples of indirect subsidization include:
—Revenue-sharing arrangements between the waste-to-energy plant operator and the community, whereby some funds generated at the waste-to-energy plant are returned to the community for use in promoting recycling and other activities. Baltimore officials established such an arrangement with Wheelabrator, which operates the 2,250-TPD mass burn RESCO facility. After the operator reaches certain revenue thresholds, it splits revenues with the city, by reducing the tip fee at the waste-to-energy facility. Shared revenues can come from steam sales, electricity sales, waste tonnage process fees, and the sale of metals recovered at the plant. According to facility officials, revenue-sharing has helped reduce the tip fee from the mid-$40s per ton to the low $30s per ton in the past few years.
—An arrangement stipulating that for every ton of MSW directed toward recycling, and not delivered to the waste-to-energy plant, the community is awarded a monetary sum. This type of incentive payment is in effect in Westchester County, New York, where the community is paid an incentive of up to about $17 per ton for materials diverted from the area's 2,250-TPD waste-to-energy plant.

Another example of indirect subsidization is to set the waste-to-energy tip fee for specific materials above prevailing recyclable market rates. Doing so has enabled Lancaster County, Pennsylvania, to provide an incentive to recycle newspaper even when the market for recycled newsprint is unstable.

A Safety Valve

Waste-to-energy provides communities with a safety valve during periods when material markets are uncertain, according to Phil Brown with the Greater Detroit Resource Recovery Authority. If the markets become unavailable, the Btu value in the combustible materials can be recovered. The revenues generated from electricity generation then can help keep the recycling efforts afloat. In addition to Detroit, officials in Babylon, New York; Tulsa, Oklahoma; and other communities have shared this type of experience.

Plenty of MSW Left to Manage

Even after a community has recycled to the maximum extent, there is still MSW remaining for waste-to-energy, according to officials in Connecticut, New York, and elsewhere. With the average rate of recovery for recycling at 17 percent—and even with some aggressive programs exceeding 30 percent—a majority of the waste remains to be managed in other ways. Therefore, recycling and waste-to-energy need not compete for the same waste. And, having both types of programs operating can ensure that a community will have the capacity to manage its entire MSW stream.

The excess capacity at some waste-to-energy plants should not suggest the two programs are incompatible. The size of waste-to-energy plants planned many years ago—in some cases well ahead of available recycling options—typically was determined by projecting growth in the community. The combined effects of higher than expected recycling rates and lower waste generation during the recession have resulted in excess waste-to-energy capacity. According to Toby Goodrich, recycling coordinator with the Southeastern Connecticut Resources Authority, this situation may be resolved by plant operators contracting for MSW from additional communities. Goodrich says preventing similar situations in the future depends on making conservative long-term projections of MSW stream

Table 4: Complete Summary of Recycling-WTE Programs Surveyed

State	Community	Recycling Rate (%)(1)	WTE Plant Information		
			Location	Capacity (TPD)	Start-up
Alabama	Huntsville	11	Huntsville	690	1990
California	Los Angeles County	<5	Commerce	380	1986
	Stanislaus	26(2)	Modesto	800	1989
Connecticut	Bridgeport	10	Bridgeport	2250	1988
	Bristol	10–<20	Bristol	650	1988
	Town of Groton(3)	25	Preston	600	1991
	Lisbon	N/A	Lisbon	500	1995
	Mid-Connecticut	10–15	Hartford	2000	1988
	Southeastern	20–25	Preston	600	1991
	Wallingford	N/A	Wallingford	420	1990
Florida	Bay County	15–20	Panama City	510	1987
	Broward Co. North	14	Pompano Beach	2250	1992
	Broward Co. South	14	Ft. Lauderdale	2250	1991
	Hillsborough County	33(2)	Brandon	1200	1987
	Lake County	27	Okahumpka	528	1991
	Lee County	22	Fort Meyers	1800	1994
	McKay Bay	15–17	Tampa	1000	1985
	Pasco County	30	Hudson	1050	1991
	Pinellas County	29	St. Petersburg	3000	1983
Hawaii	Honolulu	<10	Honolulu	2160	1990
Illinois	Robbins	30+	Robbins	1600	1994
Indiana	Indianapolis	10–<20	Indianapolis	2362	1988
Maryland	Baltimore (RESCO)	<10	Baltimore	2250	1985
	Montgomery County	20+	Dickerson	1800	1994
Massachusetts	Haverhill (MB)	10–<20	Haverhill	1650	1989
	Haverhill (RDF)	10–<20	Haverhill	950	1984
	Town of Newton(3)	37	Millbury	1500	1987
	North Andover	10–<20	Northeastern MA	1500	1985
	Saugus	10–<20	Saugus	1500	1975
Michigan	Detroit	5	Detroit	3300	1990
	Kent County	21	Grand Rapids	625	1990
Minnesota	Dakota County	33	Dakota County	800	1993
	Hennepin County	46	Minneapolis	1200	1989
New Hampshire	Claremont	N/A	Claremont	200	1987
	Concord	N/A	Concord	500	1989
New Jersey	Berlin Township(3)	60	Camden	1050	1991
	Camden County	45(2)	Camden	1050	1991
	Essex County	42(2)	Newark	2277	1990
	Gloucester County	47(2)	W. Depford	575	1990
	Haddenfield(3)	55	Camden	1050	1991
	Hudson County	N/A	Kearny	1500	1994
	Lincoln Park (3)	60	Morris County	1300	N/A
	Mercer County	19	Duck Island	1450	1996
	Milburn(3)	52(2)	Newark	2277	1990
	Morris County	40+(2)	Morris County	1300	N/A
	Morris Township(3)	60	Morris County	1300	N/A
	Newark(3)	51(2)	Newark	2277	1990
	Passaic County	N/A	Passaic	1300	N/A
	Union County	N/A	Rahway	1440	1993
	Warren County	25	Oxford Twp.	400	1988
New York	Babylon	30+	Babylon	750	1989
	Brooklyn Navy Yard	N/A	New York City	3000	1999
	Capital District	5–10	Green Island	1512	1994
	Dutchess County	15–20	Poughkeepsie	400	1989
	Hempstead	30	Hempstead	2319	1989
	Huntington	30	Huntington	750	1992
	Islip	35+	Islip	518	1990
	Niagara Falls	5	Niagara Falls	2000	1981
	Onandaga County	50(4)	Onandaga County	990	1993
	Washington County	30	Hudson Falls	450	1992
	Westchester County	14.7	Peekskill	2250	1985
Oklahoma	Tulsa	10	Tulsa	1125	1986
Oregon	Marion County	25	Brooks	550	1987
Pennsylvania	Bucks County	N/A	Falls Twp.	2250	1994
	Delaware County	20	Chester	2688	1992
	Lancaster County	20	Conoy Twp.	1200	1991
	West Pottsgrove	N/A	Berks County	1500	1994
	York County	14–17	Manchester Twp.	1344	1991
South Carolina	Charleston	3	Charleston County	600	1989
Tennessee	Sumner County	N/A	Gallatin	200	1981
Virginia	Alexandria/Arlington	20	Alexandria	975	1988
	Fairfax County	24	Lorton	3000	1990
Washington	Spokane County	15–<25	Spokane	800	1992

Notes:
(1) Reflects percentage of total MSW stream collected for recycling reported by MSW management professionals in the communities.
(2) Includes materials such as asphalt, auto bodies, scrap metals, C&D waste, white goods, etc.
(3) Reflects an individual local recycling program within the larger area served by the WTE plant.
(4) Includes waste reduction efforts as well as recycling.

growth and having the flexibility to add communities whenever excess capacity is realized.

Fewer O&M Problems for WTE

Removal of most types of recyclable materials before combustion results in fewer operations and maintenance (O&M) problems at the waste-to-energy plant. For example, removal of ferrous, aluminum, and other metal scrap helps prevent the clogging of the system. Removal of recyclables also provides a cleaner fuel with higher energy content, since many recyclables do not burn. The result is that the life of the waste-to-energy plant can be extended in the process, the need for additional waste-to-energy capacity is less of an immediate issue, and operating costs are lower (e.g., lower O&M costs and less ash to manage.)

Some communities, including Dutchess County, New York, also report that by recycling high-Btu products (such as certain types of plastic and corrugated cardboard), waste-to-energy throughput capacity can be maximized. The quantity of MSW that can be burned at a waste-to-energy plant is normally based on the heat release rate of the MSW in terms of Btu per pound. By removing the high-Btu items for recycling, the lower Btu value of the remaining MSW means that more can be processed by the combustor.

Conclusion

Evidence indicates that recycling and waste-to-energy work hand-in-hand to help communities fulfill their requirements for MSW management. Real world examples demonstrate the different ways this is happening and point to an important reality: Accomplishing effective solid waste management requires employing a combination of options and operating within a system that allows for maximum flexibility and creativity. As the IWSA survey has shown, for many communities, the combination of recycling and waste-to-energy provides an excellent foundation toward fulfilling this critical objective. □

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RECYCLING and Waste-to-Energy:

The ongoing compatibility success story

By Jonathan V.L. Kiser

More than 10 years after the first investigation documenting waste-to-energy's compatibility with recycling, a new comprehensive survey definitively demonstrates that the two waste management options work well together.

Communities with waste-to-energy (WTE) facilities across the country responded enthusiastically in favor of combining recycling with WTE for the management of household trash. The 2002 survey not only confirmed that recycling and WTE are compatible but also provided solid reasons why the two technologies perform better together than separately. (The compatibility survey, conducted as part of the investigation to compile *The IWSA* [Integrated Waste Services Association] *Directory of Waste-to-Energy Plants*, was conducted between April and September 2002. For a copy of the directory, contact IWSA at 202/467-6240 or e-mail *Zanneswte@aol.com.*) Key findings include the following:

- Fifty-seven percent of the responding WTE communities have recycling rates greater than the national average of 28%. The average recycling rate for WTE communities across the United States is 33%.
- Onsite WTE recycling, in the form of ferrous and nonferrous metals recovery, ash reuse, and other materials recovery, is occurring at 82% of US facilities.
- All WTE plants in the US are linked to offsite recycling programs.
- All recycling coordinators, municipal officials, and waste management professionals responding to the compatibility portion of the investigation provided evidence regarding why they believe recycling and WTE are compatible.

Survey Methodology

WTE communities were contacted by e-mail and telephone to discuss the compatibility issue. Data pertaining to onsite recovery of materials for recycling were collected for all 105 US facilities, including refuse-derived fuel (RDF) processing operations that do not combust trash but generate only RDF fuel. Offsite recycling data pertaining to WTE community recycling rates were obtained for 98 operating facilities (not including RDF processing operations). More detailed data relating to the type of offsite recycling materials and programs, as well as the compatibility question, were obtained for 64 WTE operations. More detailed interviews were conducted with public officials in seven communities.

Onsite Recycling

Among operating US WTE plants, 77% have onsite ferrous metal recovery programs. These facilities recover more than 773,000 tons of ferrous annually. Most of these metals are recovered at mass-burn WTE plants, postcombustion. In addition, 43% of the operating facilities recover other materials on-site for recycling (e.g., nonferrous metals, plastics, glass, white goods, and combustion ash). More than 853,800 tons of these recyclables are recovered annually. Combining all onsite WTE recycling, 82% of the US facilities recycle nearly 1,627,000 tons.

Offsite Recycling

All 98 communities with operating WTE plants are linked to offsite recycling programs. The recycling operations associated with these programs may be public or private, residential or commercial. The programs may also operate outside of the community in which the plant is specifically located. The types of recycling programs noted by the 64 WTE communities that provided actual details are shown in Table 1. The types of materials linked to these programs also are provided. Other programs and related materials include compost and mulch operations, artificial reef construction, household hazardous waste management, mercury reduction efforts, battery recycling, used-oil management, public and school outreach programs, computers and other electronics deconstruction, Christmas tree collection, aseptic packaging programs, and management of such materials as chipboard, sheetrock, pallets, bulky waste, telephone books, latex paint, tires, and plastic film. A combination of programs is typically found in the same community.

Table 1. Recycling Program(s) and Materials Recycled in WTE Communities

Type of Recycling Program	Responding WTE Communities
Drop-Off Centers	91%
Curbside Collection	83%
Materials Recovery Facility	52%
Other Programs	36%

Type of Recycling Material	Responding WTE Communities
Metals	95%
Plastics	91%
Glass	88%
Fiber	84%
Other Materials	67%

Source: J.V.L. Kiser and M. Zannes, Integrated Waste Services Association, September 2002

High Recycling Rates

According to the US Environmental Protection Agency, the current municipal recycling rate in the US is 28%. By comparison, 57% of the 98 WTE communities contacted for this investigation have a higher recycling rate. Further, the average recycling rate for all US WTE communities is 33%. Ten years ago, WTE communities had an average recycling rate of 21% versus the national rate of 17%. This trend is shown in Figure 1.

"Waste-to-energy communities tend to be knowledgeable and

Figure 1. WTE Community Recycling Average Vs. National Rate

	1992		2002	
	WTE Communities	Total US	WTE Communities	Total US
Recycling Rate	21%	17%	33%	28%

Note: Based on responses from 66 WTE communities during 1992, 98 WTE communities during 2002, and national rates determined by EPA.
Sources: J.V.L. Kiser and M. Zannes, Integrated Waste Services Association; and EPA

proactive about managing their municipal waste and therefore have more aggressive recycling programs," notes John Austin, plant manager of the Hampton/NASA Steam Plant in Virginia, as explanation for the ongoing recycling excellence in WTE communities. Other reasons are discussed in the following section.

Recycling-WTE Compatibility

The waste management professionals also were asked to comment on the compatibility of materials recycling and WTE. They cited many specific reasons why recycling and WTE are compatible. These are summarized in Table 2.

Table 2. Ways That Recycling and WTE Are Compatible

Compatibility Example Participants	Survey
Communities are more self-sufficient in terms of managing their own waste locally	84%
Fewer operations and maintenance problems at WTE plants when nonburnable recyclables are diverted	67%
WTE provides a short-term management option when recycling markets are not available	50%
WTE promotes recycling by way of subsidies and incentives (e.g., tip-fee surcharge)	38%
Other compatibility examples	46%

Note: 64 WTE communities provided specific data for this table.
Source: J.V.L. Kiser and M. Zannes, Integrated Waste Services Association, September 2002

Some of the other compatibility examples noted for recycling and WTE include the following:

- There is little need to collect ferrous metals as part of the curbside program since they are efficiently captured at the WTE plant.
- In accordance with the EPA waste management hierarchy, recycling and WTE work in partnership to significantly reduce landfilling.
- The more materials recycled locally, the more a WTE plant can tap the commercial and spot waste markets, resulting in higher disposal rates and improved plant economics.
- With aggressive local recycling, the WTE plant can serve a larger surrounding area and meet the needs of a fast-growing location for a longer period of time.
- Recycling higher Btu materials, such as paper and plastic, lowers the overall waste higher-heating value. This results in more efficient plant operations and greater waste processing capabilities.
- By recycling glass, metals, and other nonburnable recyclables, the municipal waste fuel characteristics at WTE operations are improved.
- Resource recovery is a pure form of recycling since it converts waste into energy and has a steady supply market in the form of municipal waste.
- WTE ash can be reused and recycled and does not create methane gas or groundwater contamination.

Compatibility Case Studies

The following case studies reinforce that, working together, recycling and WTE play a critical role in solving community waste management problems across the US.

Onondaga County, NY

Andy Brigham, public information officer with the Onondaga County Resource Recovery Agency, will tell you that the county always has been interested in managing its own waste in an environmentally sound manner. Recycling and WTE enables the county to be self-sufficient. When planning the county's recycling program, public officials kept two goals in mind: capture the largest portion of the wastestream that is recyclable and make sure there is a market for the recyclables. The plan worked.

The current county recycling diversion rate is 66%, 40% of which results from mandatory recycling programs and 26% being contributed through voluntary efforts. When the 990-tpd WTE plant became operational in 1995, the county's recycling rate was 50%. One of the reasons for the increase in recycling since the startup of WTE was the establishment of an aggressive and mandatory curbside collection program. Citizens are required to commingle glass, plastics, and metals in one blue bin, and a promotion is now underway to encourage them to obtain a second bin for fiber materials.

Onondaga County has a number of other recycling programs and systems, including a materials recovery facility (MRF), household hazardous waste (HHW) collection events, monthly computer recycling collection, a latex paint recycling program that donates reclaimed paint to charitable organizations, two compost sites (yardwaste is banned from the WTE plant), a household battery recycling program in conjunction with a local supermarket chain, and school and public education outreach programs. In addition to the large amount of recyclable materials collected by these programs, during 2001, 10,042 tons of ferrous metals were recovered postcombustion from the WTE plant.

"We have a very aggressive recycling program that produces twice as [many] recyclable materials than the nonrecyclable stream that is sent to the waste-to-energy plant," reports Brigham. During 2001, residents, commercial operations, and institutions recycled 749,000 tons of materials. This compared with 344,592 tons of MSW being processed at the WTE plant (the plant's permit capacity is 361,350 tons).

Spokane, WA

Jessie Lang, recycling coordinator with the Spokane Regional Solid Waste System, says that during 15 years on the job, no one has ever told her that a material could not be recycled because it needed to be burned at the 800-tpd WTE plant.

"We are recycling all we can of the materials for which there are markets. There hasn't been any conflict between recycling and waste-to-energy," maintains Lang. "The combustion facility is basically processing at full capacity and our recycling program prevents the need for additional waste disposal capacity. Also, our recycling rate has climbed over the years."

Similar to Onondaga County, recycling increased with continued WTE operations. When the WTE plant started commercial operations in 1991, Spokane's recycling rate was 31%. By 1993, the community's recycling rate jumped to 39%. The most current available rate, for 2001, reveals a recycling rate of 41%. According to Lang, this rate has remained relatively constant due to Spokane's distance from recycling markets and a population that has not dramatically changed over the past decade.

Spokane won an award from Washington State in 2000 for the best large government recycling program. It's no wonder. Spokane's curbside recycling program, started in late 1991, provides weekly service to city residents. Acceptable items include fiber products, glass, plastics, metals, and batteries. Three-compartment trucks are used to collect these recyclables, and the drivers sort the commingled materials into the appropriate bins. Other recycling programs in the

Spokane metropolitan area include buy-back centers, drop-off centers, HHW management, a yardwaste compost program, a thermometer exchange program, education programs, and private recycling centers.

"A lot of materials we are recovering don't burn well. We can therefore afford to subsidize the recycling of a material like glass since it tends to beat up the furnace and serves no other benefit at the waste-to-energy operation," Lang explains, noting that the current WTE tip fee of $98/ton covers not only the cost of plant operations but also the expense associated with various recycling programs. These include citizen drop off of recyclables and HHW at designated locations and the subsidized rates associated with Spokane's "Clean Green" yardwaste compost program.

Yardwaste does not burn very well either and is not accepted at the combustion plant. Lang reports that by pulling these types of recyclables from the wastestream, the remaining material has a higher Btu-per-pound value for generating energy.

"Our waste-to-energy plant also provides a very easy way to recycle 100% of the ferrous metals remaining in the waste delivered to the plant." During 2001, 10,227 tons of this material were magnetically recovered postcombustion and sold. This type of metal tends to be otherwise difficult to recycle and includes shock absorbers, metal rims from oil filters, nails, bicycle spokes, cans with dog food residue, and other contaminated materials.

York County, PA

"Some people have said that you can't have a successful recycling program in a community with waste-to-energy. York County is living proof that the opposite is true," asserts Ellen

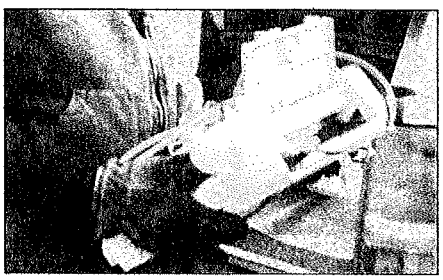
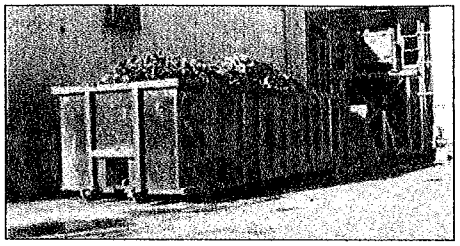


Photo: York County Solid Waste Authority

E-cycling

O'Connor, manager of the Community Services Division for York County Solid Waste Authority. O'Connor estimates that the 1,344-tpd WTE plant not only allows recycling to flourish but also preserves 13 ac. of land 35 ft. deep annually and produces enough electricity to displace 550,000 barrels of oil. The county's recycling rate increase



certainly supports this point.

In 1992, the county's recycling rate was 28%. By 1997 the rate jumped to 51% and included the recycling of WTE ash. The most current available rate is 83% for 2001. Recycled materials include all items collected curbside, commercial recycling, yardwaste, backyard composting, the land application of biosolids (dry tons), drop-off and special recycling programs, ferrous and nonferrous metals from the WTE plant, and the recycling of combustion ash into more than 145,000 tpy of aggregate.

"We are always looking for ways to expand our recycling program with new and innovative ideas, and last year we started an electronics recycling program," relates O'Connor. In addition, York County offers a public drop-off center, a compost site, two private MRFs, and curbside collection. Fifty of 72 county municipalities currently conduct curbside recycling programs, and more than 80% of the county's population participates. Residents place their commingled recyclables (newspaper, glass, metal, plastic) in a single bin for collection by contracted haulers. Christmas trees also are collected at curbside.

The $56/ton tipping fee at the WTE plant subsidizes the entire county recycling program. Residents are not charged any fee to drop their recyclables at any of the designated locations. The tip fee also covers administration of the recycling program and educational outreach efforts. The fee charged for county waste has remained constant over the last 10 years due to higher rates being charged for out-of-county materials. As York County grows, the quantity of waste accepted from outside (up to 30%) dwindles. This approach has allowed for maximum use of the plant and an ongoing flow of revenue.

According to O'Connor, WTE was developed in York County to ensure they could take care of their own waste, to stabilize the economics associated with waste management, and to be protective of human health and the environment. "We are doing the right thing for the environment by avoiding any potential of becoming a responsible party in a Superfund lawsuit," she points out. York County's WTE plant is also the only one in Pennsylvania designated as a source of clean power (i.e., as an alternative to fossil fuel). This is attractive to power purchasers.

Sumner County, TN

Bob Brown, general manager of the Resource Authority in Sumner County, TN, reports that the 200-tpd WTE plant in Sumner County has fewer operational problems as a result of glass recovery from the wastestream. Glass can cause problems in the boiler, leading to more maintenance and less availability of the plant to process MSW. "By getting recyclables out of the wastestream and properly maintaining the plant, our availability improved from less than 70% to greater than 95%. The plant is at full processing capacity," says Brown. Recycling efforts are in full force as well.

The county's 2002 recycling diversion rate is 60%, which includes construction and demolition materials. This compares with 52% in 2001, a 35% rate during 1995, and an estimated rate in the 10-15% range in 1992. According to Brown, several factors contributed to this trend. The first was the addition of a postcombustion ferrous recovery system at the WTE plant, which captured about 2,500 tons in 2001. The second was converting the MRF, located adjacent to the WTE plant, from a dirty to a clean operation. Materials from 34 drop-off locations throughout the county are brought to the MRF for processing. Commercial rolloff loads are sorted on the MRF tip floor, with wood being recovered for mulch and compost and corrugated cardboard also being separated.

In addition, the county has a school recycling program, aimed at collecting fiber materials. Any profits from this program are given back to the schools to help pay for computers and other equipment. Last year, about $20,000 was given back to county schools. "The $46-per-ton tip fee charged at the waste-to-energy plant includes the costs associated with all county recycling programs," explains Brown.

Palm Beach County, FL

Robin Ennis, director of recycling for the Solid Waste Authority of Palm Beach County (FL), notes that when you have an integrated waste management system such as the one in Palm Beach County, the components really work hand in hand. "There has never been a sense of competition for materials between the recycling programs and waste-to-energy. They compliment one another." She adds, "We have learned from a practical and economic perspective that all materials cannot be recycled, but it is still important to press

the envelope as much as possible."

During the 2001 calendar year, 1,171,660 tons of materials were recycled in Palm Beach County. This was equal to a 51% recycling rate. Of this total, about 37,000 tons of ferrous metals were recovered both precombustion and postcombustion at the authority's 2,000-tpd WTE operation, plus nearly 3,400 tons of other onsite recycling. Ennis also reports that, during the fiscal year ending September 30, 2002, the county recycling rate increased to 54%. And the recycling program is expanding, with the promotion of commercial recycling being at the top of the authority's agenda. Efforts are also underway to increase resident participation in the countywide curbside collection program that has leveled off at about 65% primarily due to missing bins throughout the system.

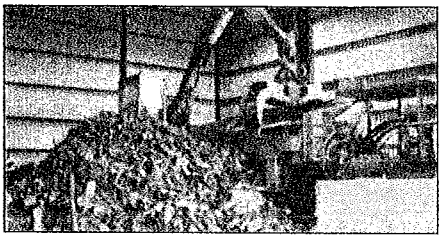
The curbside program provides residents with two 18-gal. bins: one for fiber materials and the other for commingled bottles and cans. These materials are collected weekly and transported to one of two MRFs located in the county. Given the effectiveness of ferrous recovery efforts at the WTE plant, authority officials are not concerned about whether the curbside program captures these metals. In addition, almost all yardwaste is composted since it is collected separately from the rest of the wastestream. Other recycling programs include five drop-off locations, computer teaching tools for schools, and an interactive Web site.

Ennis notes that all households are taxed $150 each year to help cover the cost of the integrated waste management system. She adds, "Even with population growth, we do not export any waste from the county. We are self-sufficient, and this was planned for when the waste-to-energy plant was implemented."

Springfield, MA

"There is plenty of rubbish to go around and only so much landfill space in the area. Recycling and waste-to-energy are compatible," maintains Greg Superneau, environmental director for the City of Springfield Department of Public Works. He believes recycling actually helps the Springfield WTE plant, permitted for 360 tpd, by removing glass and metals from the wastestream. These materials can be cumbersome to plant operations. Conversely, if certain recyclable materials are contaminated, they still could be burned at the plant and the energy value recovered.

Springfield's 2002 recycling diversion rate is 31%. This is down from 35% during 2001. Superneau attributes this drop to the implementation of an automated/semiautomated



waste collection system that tempts residents to place recyclables in the new carts. In response, the city is engaged in a public awareness campaign regarding its mandatory recycling ordinance. Telephone interaction with the public, newspaper ads, and random spot checks throughout the community all are geared toward increasing residential participation in the curbside recycling program.

A waste-monitoring directive from the state's Department of Environmental Protection (DEP) also helps, obligating the WTE operators to monitor incoming loads for recyclable materials. If recyclables are discovered, a written report is prepared for DEP review and the truck may be diverted to a recycling center. The WTE plant also serves as a drop-off location for fluorescent light tubes and batteries containing mercury.

The city's curbside program operates using a two-bin system (i.e., paper in one container, mixed bottles and cans in the other). These 18-gal. bins are picked up from residential neighborhoods every other week. Larger, multifamily accounts are provided with 96-gal. containers that also are collected every other week. Recyclables are taken to a MRF located in the city. The city also recycles yardwaste, televisions, and computer monitors. Further, Springfield has a designated HHW collection center, which is opened six times a year for hazardous waste collection events and weekly for used oil, car batteries, and mercury products.

"We have to deal with our own solid waste issues instead of shipping them out of state and forgetting about it. Our system heightens everyone's awareness in terms of properly managing our own waste materials," believes Superneau.

Fairfax County, VA

"Our recycling and waste-to-energy programs are mutually supporting. They provide consistent and reliable service to customers," remarks Pamela Gratton, manager of recycling for the Fairfax County (VA) Division of Solid Waste Collection and Recycling. "The county's recycling program collects the maximum amount of material that is actually being recycled, and the waste-to-energy plant processes materials that would otherwise be land disposed and converts it into power that can displace fossil fuels." She also believes that the county's decision to implement the 3,000-tpd WTE plant, as part of its integrated waste management system, allowed Fairfax to take a stand against reliance on out-of-county disposal destinations.

"We get very few comments about the waste-to-energy plant. There are no big traffic issues around the facility, and it operates in an environmentally sound manner, out of sight and out of mind," points out Gratton. County recycling efforts have been more visible.

The county's recycling rate has increased since 1990, when the WTE plant started operations. Twelve years ago, about 180,000 tons of county materials were recycled. By 1992, about 251,000 tons were recycled annually, which represented 24% of the total wastestream. The most recent statistics indicate that more than 401,300 tons of materials were recycled during 2001, a 34% diversion rate. "Since 1988, recycling in Fairfax County has basically quadrupled. We're pretty proud of that," says Gratton.

Curbside recycling is required throughout the county, with a two-bin system being used to collect fiber products in one and mixed plastic, metal, and glass in the other. County vehicles collect these recyclables from 40,000 residential customers in the eastern portion of the county, while the remaining citizens contract with private haulers primarily through their homeowner associations. Other recycling programs in the county include eight drop-off centers, two disposal facilities for private citizen use, three private MRFs, special collection events for electronics and other materials, public outreach activities, and a recent push to increase plastic and mixed-paper recycling across the county. In addition, the proceeds from one container designated for aluminum recycling, located at the Interstate 66 private drop-off facility, are donated to the Aluminum Cans For Burned Children Fund. This fund generates about $20,000 annually and pays summer camp expenses for burn victims.

"A portion of the waste-to-energy tip fee covers various elements of the county's recycling program," states Gratton, including the expense associated with public outreach efforts aimed at getting citizens to support recycling, as well as the eight recycling drop-off centers. **MSW**

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