

ECONOMIC COMPARISONS

COST CALCULATIONS AT MSW COMPOSTING SITES

Analysis of 10 facilities receiving from five to 1,200 tons/day shows capital costs from \$250,000 to \$78 million, with annual costs from \$240,000 to \$30 million.

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THE LEVEL of technology that a community can select for a municipal solid waste composting project is directly related to the amount of capital available. Between low level (e.g., static pile, windrow) and high level (e.g., in-vessel), there are many combinations of available technology and capital and annual financial requirements.

Ten MSW composting facilities are summarized in this report. Cost breakdowns are described for the Delaware Reclamation Project, Swift County, Fillmore County and Lake of the Woods County. The other six facilities — Portage, WI, St. Cloud, MN, Pennington County, MN, Sumter County, FL, Dade County, FL and Big Sandy, TX — are presented in summary table form because detailed cost data was not available. Data for this report were collected in 1990 and early 1991, therefore changes may have occurred at these facilities.

DELAWARE RECLAMATION PROJECT

The Delaware Reclamation Project is located in Wilmington, Delaware and is owned by the Delaware Solid Waste Authority (DSWA). The facility is operated by Raytheon. The Delaware Reclamation Plant is an example of a high technology system which incorporates mechanical separation of MSW and in-vessel composting.

The project is divided into three parts: the Delaware Reclamation Plant (DRP), the Energy Generation Facility (EGF), and landfills. The reclamation plant is divided into two modules, the Solid Waste Processing Module (SWPM) and the Sewage Sludge Processing Module (SSPM). The MSW composting process occurs in the SSPM part of the reclamation plant. The plant, with 140

to 150 workers, operates on a year round basis with three shifts (the third shift is used for maintenance).

Waste is received from Wilmington and private haulers from the surrounding area of New Castle County. The trucks of waste are weighed and currently charged \$45 per ton. The plant receives 1,000 tons per day of MSW and an additional 250 tons per day of wastewater sludge. Currently, there is no separation of MSW before it is received at the plant.

Financing was provided by a combination of federal and state grants and bonds issued by the DSWA. Capital expenses were \$78,145,000 — \$27,598,000 for the SWPM, \$43,927,000 for the SSPM, and \$6,620,000 for a transfer station, which transported residuals from the facility to the landfill. For 1989, the total operating revenue was \$37,583,488 resulting from the processing of 842,157 tons of MSW and 62,088 tons of sewage sludge. Nonoperating revenue, investment and other income was \$2,843,940. Operating costs were \$30,212,408 and nonoperating expenses were \$6,632,658. The net income was \$3,582,362. The Sewage Sludge Processing Module (where the composting occurred) accounted for \$9,860,234 of the operating income, \$8,322,526 in operating expenses, and \$1,537,708 of the net income. The net income of 1989 increased 126 percent from 1988's net income of \$1,587,687 (DSWA, 1989).

SWIFT COUNTY, MINNESOTA

Swift County began operating their year round composting facility in Benson, Minnesota on May 15, 1990. Homeowners separate their waste into three categories: a) recyclables such as ferrous, nonferrous, plastic, glass, and newsprint are placed in recycling bins; b) compostable products are placed in white garbage bags; and c) the remainder, called nonprocessables, is placed in black garbage bags.

At the composting facility, four full-time employees and two part-time employees handle about 17 tons of compostable material and nonprocessables and four tons of recyclables on a daily basis. The facility is equipped to handle 40 tons/day.

The capital cost of the facility was approximately \$1,615,900. The project was primarily financed by bonding \$1 million and by a grant received from the Minnesota Office of Waste Management for \$711,000. The remaining \$904,900 was funded by county sources. Tables 1 and 2 show the break down of capital costs and annual costs, respectively. Composting equipment costs and installation were about 27 percent of the total capital costs (Table 1). Annual expenses outweighed the income creating a loss of \$50,654 (Table 2). Since this was their first year of operation many expenses went into start up, for example, supplies (\$125,314) accounted for almost 50 percent of the total expenses. They also underestimated tip fees which will be raised.

Table 1. Capital Costs for Swift County, Minnesota Composting Project

Item	Amount (\$)
Site construction	
Contractor	631,300
County	112,200
Electrical contractor	120,500
Equipment	
Composting	398,000
Installation	31,400
Recycling	90,500
Other	232,000*
Total	1,615,900

*The other category includes various materials needed for equipment set up such as tools, a welder, etc.

Table 3. Capital Costs and Funding Sources for The Fillmore County, Minnesota Composting And Recycling Facility

Item	Amount (\$)
Expenses	
Advertising	4,619
Construction	259,055
Composting equipment	239,273
Recycling equipment	97,545
Other equipment (Computers, tools, etc.)	73,973
Contractor	28,980
Bonding expenses	5,880
Total expense	709,325
Funding	
State loans	48,044
Bonds	309,562
Grants	351,720
Total funds	709,326

Table 5. Annual Costs Of Lake Of The Woods County, Minnesota Composting Facility

Item	Amount (\$)
Capital recovery	33,473
Wages and payroll expenses	69,218
Utilities	7,438
Equipment, maintenance, supplies, and miscellaneous	78,441
Shipping	283
Publicity and advertising	1,459
Insurance	60
Contingency expense	46,715
Debt service	27,682
Total Annual costs	264,769
Deduction of 10%*	(26,477)
Net annual costs	238,292

*Deduction is applied to the annual costs of the recycling center

Table 2. Annual Income and Expenses for Swift County, Minnesota Composting Facility

Item	Amount (\$)	Amount (\$)	
	Income	Expenses	
Recyclables	5,258	Salaries	65,501
Tipping fees	145,625	Fringe	24,314
Interest	25,228	Utilities	16,104
SCORE ^a	27,500	Supplies	125,314
Miscellaneous ^b	1,270	Equipment	8,007
		Other	9,352 ^c
Total	204,882	Total	255,536
Profit or loss	(50,654)		

^aSCORE = Minnesota State program allocating tax money for county programs

^bMiscellaneous income includes fees from individuals dropping off their waste

^cIncludes postage, printing, travel expense, and SCORE expense

Table 4. Annual Income and Expenses for 1988 and 1989 for the Fillmore County Composting and Recycling Facility

Item	1988	1989
Income		
Tipping fees	169,980	138,676
Recyclables	52,617	43,825
Other	1,350	8,664
Total annual income	223,947	191,165
Expenses		
Employee related	101,485	130,724
Utilities	13,789	10,753
Repair and maintenance	19,973	24,718
Landfill	71,795	40,411
Other	44,627	72,190*
Total Annual expense	251,669	278,796
Profit or loss ()	(27,721)	(87,631)

*Other expenses include advertising, office and custodial supplies and office machinery rental.

FILLMORE COUNTY, MINNESOTA

Fillmore County, Minnesota opened its composting facility on September 15, 1987. Each city or community in Fillmore County handles the transport of its waste. If the waste is separated into recyclables, compostables and residue, the community is only charged \$30 per ton. If the city or community does not separate, it is charged \$70 a ton. The county employs eight people for the composting component and five people for the recycling component of the facility for an eight hour shift to handle an average of 18 tons of waste per day. The facility is designed to handle 30 tons per day.

The capital cost for the facility was \$709,326 (Table 3). Composting equipment comprised about 34 percent of the capital cost. Funding for the capital costs was obtained from state loans, bonds and grants (Table 3). The annual expenses in 1988 and 1989 were \$251,669 and \$278,795, respectively (Table 4). The facility experienced losses of \$27,722 in 1988 and \$87,631 in 1989 due primarily to an increase in landfill costs. They are planning to raise the tipping fees to cover the increase in landfill costs.

Facilities included in study range in pretreatment of waste from none at all to sophisticated mechanical separation.



LAKE OF THE WOODS COUNTY, MINNESOTA

This facility receives only the compostable fraction of MSW from Lake of the Woods County. A separate facility receives the recyclables from curbside collection and residual recyclables in the compostable fraction of the MSW. The composting facility opened in December 1989 and receives about five tons/day. It is designed to handle 10 tons/day. The facility operates year round with three people working at the compost part of the facility, and one full time and one part-time worker at the recycling component of the facility.

Capital cost of the facility as of January, 1991 was \$411,000 (\$230,453 for the building and the remainder for composting equipment). Costs of planned improvements are estimated to be about \$200,000. The net annual costs of the composting facility are \$238,292 (Table 5). The net annual cost is arrived at after deducting 10 percent from the total annual cost and adding that portion to the recycling facility's annual cost. Approximately 10 percent of the waste received at the composting facility is recyclable and is sent to the recycling facility. The recycling costs can be used as a tax deduction.

A summary comparison of the capital cost, annual income and expenses is shown in Table 6. Capital costs of the facilities vary considerably. The differences in capital costs are primarily due to the size of the facility and the type of composting system used.

Table 6. Comparison of Annual Income and Expense Breakdowns of Composting Facilities

Facility	Capital Cost	Annual Income(\$)			TOTAL Annual Income
		Recyclables	Tip Fees	Other	
Delaware	78,145,000	—	—	—	9,860,234 ^a
Swift County	1,615,900	5,258	145,625	53,999	204,882
Fillmore County	709,326	43,825	138,676	8,664	191,164
Lake of the Woods County	411,000	—	—	—	—

Facility	Salaries	Annual Expense			TOTAL Annual Expense
		Utilities	Equipment and Maintenance	Other	
Delaware	—	—	—	—	8,322,526 ^a
Swift County	89,815	16,104	133,321	9,352	255,536
Fillmore County	130,724	10,753	24,718	112,601 ^b	278,796
Lake of the Woods County	69,218	7,438	78,441	83,195	238,292 ^c

^aValues are from the Sewage Sludge Processing Module

^bOther expenses include items such as advertising, office and custodial supplies, telephone, machinery rental and landfill costs

^cAfter 10% deduction of costs to recycling

Table 7. Summary of Selected MSW Composting Facilities in the United States

Facility	Tons/day MSW Received	Pretreatment of MSW	Type of Composting	(1) (2)	Composting and Curing Time (days)	(1) (2)	Capital and Annual Costs(\$)
Delaware							
Delaware Reclamation Project ^a	1000	Shredding, mechanical separation	In-vessel (co-compost)	(1) (2)	5-7 60	(1) (2)	78,145,000 30,212,408
Wisconsin							
Portage	30	None ^b	In-vessel (co-compost)	(1) (2)	14 56-84	(1) (2)	1,000,000 ^c 100,000
Minnesota							
St. Cloud,	100	Manual and mechanical separation	In-vessel	(1) (2)	3 40-120	(1) (2)	7,500,000 ^c 1,000,000
Swift County	17	Manual and mechanical separation, shredding ^a	Windrows	(1)	180	(1)	1,615,900
Fillmore County	18	Manual and mechanical separation, shredding	Windrows	(1)	70	(1)	709,326
Lake of the Woods	5	Manual separation, shredding ^a	Windrows	(1) (2)	43-56 21-28	(1) (2)	411,000 238,292
Pennington County	40	Manual and mechanical	Windrows	(1)	43-56	(1) (2)	1,300,000 ^c —
Florida							
Sumter County	50	Manual and mechanical separation, shredding	Windrows	(1)	43-56	(1) (2)	5,000,000 ^c 500,000
Dade County	1200	Manual separation, shredding	Windrows	(1) (2)	14 21-28	(1) (2)	30,000,000 ^c —
Texas							
Big Sandy	20-25	Manual separation	In-vessel (co-compost)	(1) (2)	3-6 14	(1) (2)	250,000 ^c 500,000

^aHousehold separation of recyclables

^bUse odor control

^cApproximate figures



Delaware has the highest annual expense. The other three facilities (all windrow facilities with greatly different capital costs) are fairly close in annual expense.

SUMMARY OF PROJECTS

A summary of the selected composting facilities is shown in Table 7. The facilities receive from five to 1,200 tons/day and range in pretreatment of the waste from none at all to sophisticated mechanical separation. There are six windrow and four in-vessel facilities. The in-vessel composting systems all do cocomposting of waste with sewage sludge, except for the St. Cloud, Minnesota facility. Only one facility, the Delaware Reclamation Project had an odor control system at the time of this research. Composting and curing times vary from 17 to 180 days. Capital costs for these facilities range from \$250,000 to \$78,000,000, while annual costs range from \$240,000 to \$30,000,000. ■

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Operational details for the Delaware Reclamation Project were reported in BioCycle, Nov. 1990, pp. 52 - 54. The Minnesota projects were previously covered in BioCycle, Dec. 1990, pp. 42 - 47. A report on the closing of the Agripost facility in Dade County, Florida appeared in BioCycle, Dec. 1991, pp. 48-53.

SOURCE SEPARATION EMPHASIS

TRENDS IN EUROPEAN MSW COMPOSTING

DISTINCT differences are reflected in the policies of European countries that deal with composting organic waste. While source separation is required by some, mixed waste composting is the rule in others. The following is an overview of trends based on personal visits, telephone interviews and a literature review.

Mixed solid waste composting has been around for many years in Europe. Mixed waste compost has traditionally been used by farmers to increase their soil organic content. Analyses of certain composts produced from commingled waste processing have shown high levels of heavy metals. Concern has grown over the possible contamination of food crops grown in compost amended soils.

Until recently, the Netherlands practiced mixed waste composting. The mixed waste compost was used in agriculture. Although the issue of heavy metal contamination has long been studied, during the late 1980s, the public became aware of the issue and avoided buying crops grown on compost amended soils. Farmers using mixed waste compost noticed their sales declining. In addition, these farmers were unhappy with the levels of physical contaminants, such as plastic and glass that were visible on their fields after a heavy rain. Increasing numbers of farmers stopped buying mixed waste compost, to the point that these compost producers couldn't find adequate markets for their product.

In the Netherlands, several pilot source separated organic waste collection projects have been started in towns and cities, including Amsterdam. Various organic waste bins were distributed to households, depending on the type of building and pilot project. While participation has been high, organic waste diversion has been consistently lower in high rises than in single family and low rise apartment buildings. A national law was passed in the Netherlands requiring municipalities to provide all resi-

Review of national policies and municipal programs in European countries shows increasing recognition of compost quality as a key issue.

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