

WOOD PALLETS AND LANDFILLS – STATUS AND OPPORTUNITIES FOR ECONOMIC RECOVERY AND RECYCLING

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FIGURE 1. WOOD PALLETS AT A LANDFILL RECOVERY AREA.

ABSTRACT

Wood pallet recovery, repair, and recycling are sound environmental activities that can reduce both forest resource demands and waste in landfills. Our studies found that 6.16 million tons of wood pallets (or 223.6 million pallets) entered municipal solid waste (MSW) and construction and

demolition (C&D) landfill facilities in 1995. At the same time, wood pallet recovery, repair, and recycling by pallet firms reached 171 million pallets. Approximately 37.9 million pallets were recovered at landfills, mostly to low- or no-value uses. Because of the large amounts of recovered and unrecovered material landfills could be an additional source of

pallet materials to pallet recovery/repair companies. A business plan spreadsheet for a potential pallet landfill recovery operation that would feed recovery/repair companies is presented, as are other potential value-added products that can be made from recovered pallet parts. Based on early testing of the spreadsheet the economic potential looks good.

INTRODUCTION

Pallets break, many are repaired and at some point they need to be disposed because they are no longer useful, or are not needed. Most of these end up in landfills. Most wood pallets entering landfill operations are landfilled, but many are recovered and reduced to fiber by grinding. These discarded pallets (Figure 1) could provide parts to repair pallets, build new pallets or could be converted into other valuable products.

Before looking at a potential pallet landfill recovery operation and the economics of such a venture, we first present and discuss the magnitude of the problem or the size of the opportunity. Many questions need to be answered concerning pallets and landfills: How much wood waste is sent to landfills? What percentage of the wood waste stream consists of pallets? Can they be recovered? Are any being recovered? What recovery products are being made? Is this trend growing? Are there opportunities to recover more wood? Are there higher value options than present recovery, which often is grinding for fuel and other low-value products?

To help answer some of these questions a study was conducted by the Center for Forest Products Marketing and Management in cooperation with the USDA Forest Service Southern Research Station unit, both at Virginia Tech. The study focused on the disposal of wood pallets and wood waste at landfills in the United States. We collected information concerning both construction and demolition (C&D) landfills and municipal solid waste (MSW) landfills. Prior to our study, little information was available regarding the number of pallets reaching US landfills for landfilling as-is and for recycling. Additional studies conducted by the Center focused on pallet repair and recycling by the pallet industry.

We will discuss economically feasible opportunities to recover pallets, pallet parts and wood for other value added products. This will include a presentation of the results from a simulated recovery/recycling operation to determine the economic potential for recovering pallet material at landfill recovery areas.

Our aim is to develop alternatives to wood pallet landfilling and recovery options that are economical, while reducing environmental problems and lumber raw material, and timber demands.

NEW PALLET OVERVIEW

Wood has dominated the pallet industry as its principal raw material since palletized material handling began. Pallet production and use grew dramatically after World War II and wood remained the material of choice. Throughout this period the pallet industry has been an important market for lower grades of hardwood lumber and cants and for softwood lumber. Today, the demand for pallets continues to be strong, with recovered/repared pallets helping to meet this demand. We estimate that demand 1995 was 560 million pallets and this demand was met with 411 million new pallets and 149 million recovered/repared pallets. This means that about 1 out of 4 wood pallets purchased in 1995 was a recovered/repared pallet.

Firms in the U.S. making new wood pallets and containers used 4.53 billion board feet of solid hardwood in 1995. A comparison of the results of our 1992, 1993 and 1995 studies shows the use of solid hardwood for pallets decreased slightly over this period.

The pallet and container industry uses solid softwoods in addition to hardwoods. Solid softwood consumption was an estimated 1.79 billion board feet in 1995. Mirroring hardwood trends, the use of softwood lumber and cants decreased from 1992 to 1995.

The decreasing demand for new wood materials due to repair of pallet components has developed while the demand for pallets has increased. As you will read in the next section, the increased demand has been met by increasing sales of recovered/repared pallets or pallets made from recovered used pallet materials or parts.

PALLET REPAIR AND RECYCLING OVERVIEW

Pallet recovery and recycling occurs at several levels in the use cycle. Pallet users, new pallet manufacturers, recycle only businesses, landfill operations, and others are involved. We studied the recycling activities of firms in the pallet industry (SIC 2448). This segment accounts for a large percentage of pallet recovery. However, they do not represent all pallet recovery activity; other types of organizations are involved. For example, pallet users may repair and recycle pallets within their operations or contract for a company to repair pallets within their operations.

Many factors have contributed to the recent and rapid growth of pallet recovery and recycling by the industry:

- Increased awareness of the environment and activities that affect the environment have caused a previously unconcerned public to question the use of new wood for pallets;
- Pallet producers, concerned with the availability and price of new lumber and cants, have found it

economically advantageous to repair pallets and salvage material from used pallets;

- Pallet users have turned to recycled pallets as a way of decreasing their product handling costs;
- Pallet disposal costs can be significant and increasing attention is being paid to reducing or avoiding these costs through recovery and recycling;
- Barriers to entry into pallet recycling are relatively low, resulting in an increase in the number of pallet recovery and recycling only firms (i.e., firms that do not manufacture new pallets); and
- Public concerns over the capacity and cost of landfills have resulted in laws banning pallets from some facilities.

We estimate that firms in the pallet industry recovered 171.1 million pallets for recycling in 1995. The wood content of these pallets was estimated to be 2.6 billion board feet. In previous studies, we estimated that the industry recovered 65.8 million pallets in 1992 and 83.3 million in 1993. This means that between 1992 and 1995 the number of pallets recovered by the industry grew by 160 percent.

Once recovered from the waste stream, pallets are most likely to be repaired and reused for their original purpose. Eighty-seven percent of the wood contained in pallets recovered by the industry in 1995 was used again in a pallet. This percentage includes pallets that were inspected, found not to need repair, and sold as-is for reuse. Also included are pallets that were repaired and sold and the wood content of parts that were un-nailed and used to repair pallets or build complete pallets. Less than one percent of the wood in pallets recovered by the industry was eventually landfilled.

The impact of pallet recycling can be seen by comparing the volume of new solid wood used by the industry to recovered wood use. This comparison suggests that, in 1995, more than one in four wood pallets sold by firms in the industry consisted of recovered material.

In 1995 we found that approximately ten percent of the wood (by volume) in recovered pallets was ground or chipped. This material was used for non-pallet products such as animal bedding, mulch, and for composite products. A large portion of the ground pallet material, 43 percent in 1995, was used as fuel.

LANDFILL WOOD WASTE AND TIPPING FEES

C&D Landfills

In 1995, wood waste accounted for 37.8% of the total waste received at C&D (Construction and Demolition) landfills in the US. In other words, almost 16 million tons of wood waste went to C&D landfills in 1995. Wood waste includes not only pallets but also boxes,

dunage, packaging, yard trimmings and other non-industrial wood discards. Landfills in the South received the greatest amounts, approximately 62% of the estimated 16 million tons of wood waste. The regions of the US differed in terms of the percentage of waste that was wood. Approximately 46% of the waste received in the Midwest was wood waste and 38.9% of waste in the South was wood waste. In the Northeast and West regions wood waste accounted for 21.3% and 18.4% of the total waste received, respectively.

Nationwide, the average tipping fee at C&D landfills was \$24.20 per ton. However, tipping fees are quite variable among and even within regions. Landfills in the Northeast region assessed a higher tipping fee (\$49.20/ton) than landfills in any other region. The average tipping fee in the Midwest (\$19.80/ton) was lower than that of any other region. The tipping fees in the South and West were \$22.50 and \$20.60 per ton of waste, respectively. Within a region, tipping fees were almost always lower for pallets delivered for processing in a recovery area rather than for those put in the landfill.

MSW Landfills

In 1995 wood waste accounted for 7.3% of the total waste received at MSW (Municipal Solid Waste) landfills in the US. In other words, 21.4 million tons of wood waste went to MSW landfills in 1995. Landfills in the South received approximately 48% of the total. The Western region accounted for approximately 29% of the total wood waste received in 1995. There was little difference between the regions in terms of the percentage of waste that was wood.

Nationwide, the average tipping fee at MSW landfills was \$32.22 per ton. Again, tipping fees are quite variable between and even within regions. Landfills in the Northeast region assessed a higher tipping fee (\$53.30/ton) than landfills in any other region. The average tipping fee in the West (\$26.40/ton) was lower than that of any other region. The tipping fees in the Midwest and South were \$31.40 and \$29.30 per ton of waste, respectively. As with C&D landfills, some MSW facilities assessed lower tipping fees for separate loads of pallets received to be recycled at the landfill.

LANDFILL WOOD PALLET WASTE

C&D Landfills

Are wood pallets accepted at C&D landfills for landfilling as-is (i.e., without processing such as grinding)? If so, what percentage of landfills accepts wood pallets for landfilling as-is? What was the quantity of wood pallets landfilled as-is in 1995?

Currently some 67% of C&D landfills accept wood pallets for landfilling. However, almost one-third of C&D landfills have a wood or yard waste facility where pallets can be recycled. Table 1 provides the percentage of C&D operations in each region that accepted wood pallets in 1995 for landfilling. In the Northeast, only 49% of landfills accepted wood pallets for landfilling. In contrast, almost 71% of landfills in the Midwest and South accepted wood pallets for landfilling.

We were also interested in knowing the quantity of wood pallets received at landfills that were actually landfilled. We estimate that, in 1995, approximately 899 thousand

tons of pallet material was landfilled at C&D facilities in the US (Table 2). This equals 2.1% of the total C&D waste and 5.6% of total C&D wood waste landfilled in the US. If we assume that each pallet weighs 55 lb., approximately 32.7 million wood pallets were landfilled at C&D facilities in the US during 1995.

C&D facilities in the South landfilled the largest quantity of wood pallet material (i.e., 677.5 thousand tons, or 75.4% of the total wood pallet material landfilled in the US). The Midwest region landfilled the second largest quantity of wood pallet material, 15.2% or 136.3 thousand tons.

TABLE 1. PERCENTAGE OF C&D LANDFILLS ACCEPTING WOOD PALLETS FOR LANDFILLING AS-IS AND PERCENTAGE OPERATING A WOOD/YARD WASTE RECYCLING FACILITY: 1995

Region	Percentage accepting wood pallets for landfilling as-is (%)	Percentage operating a wood or yard waste recycling facility (%)
Midwest	70.8	25.0
Northeast	48.8	46.3
South	70.8	36.4
West	62.7	27.1
United States	67.1	32.4

TABLE 2. ESTIMATED QUANTITY OF WOOD PALLET MATERIAL LANDFILLED AT C&D FACILITIES IN THE CONTIGUOUS UNITED STATES BY REGION: 1995

Region	Estimated quantity of wood pallet material landfilled (thousand tons)	Pallet material as a percentage of total waste landfilled (%)	Pallet material as a percentage of the total wood waste landfilled (%)
Midwest	136.3	1.3	2.9
Northeast	56.9	1.9	8.9
South	677.5	2.6	6.8
West	28.0	0.8	4.6
United States	898.8	2.1	5.6

MSW Landfills

Currently some 32% of MSW facilities do **not** accept wood pallets for landfilling and over one-third have a wood or yard waste facility where pallet waste can be processed and/or recycled. Table 3 provides the percentage of landfills that accept wood pallets for landfilling. In the Northeast, only 56% of MSW landfills accepted wood pallets for landfilling. In contrast, 77% of landfills in the West accepted wood pallets for landfilling.

We estimate that, in 1995, approximately 4.2 million tons of pallet materials were landfilled at MSW facilities

in the US (Table 4). This equals 1.4% of the total waste and 19.6% of total wood waste landfilled at MSW facilities in the US. If we assume, again, that each pallet weighs 55 lb. approximately 153 million wood pallets were landfilled at MSW facilities in the US in 1995.

Municipal solid waste facilities in the South landfilled the largest quantity of wood pallet material, 2.4 million tons or 59% of the total wood pallet material landfilled. The Midwest region landfilled the second largest quantity of wood pallet material, 17% or approximately 726 thousand tons.

TABLE 3. PERCENTAGE OF MSW LANDFILLS ACCEPTING WOOD PALLETS FOR LANDFILLING AS-IS AND PERCENTAGE OPERATING A WOOD/YARD WASTE PROCESSING FACILITY: 1995

Region	Percentage accepting wood pallets for landfilling as-is (%)	Percentage operating a wood or yard waste processing facility (%)
Midwest	71.0	30.8
Northeast	55.9	38.2
South	63.6	49.5
West	77.3	27.0
United States	67.9	37.9

TABLE 4. ESTIMATED QUANTITY OF WOOD PALLET MATERIAL LANDFILLED AT MSW FACILITIES IN THE CONTIGUOUS UNITED STATES BY REGION: 1995

Region	Estimated quantity of wood pallet material landfilled (thousand tons)	Pallet material as a percentage of total waste landfilled (%)	Pallet material as a percentage of the total wood waste landfilled (%)
Midwest	725.6	1.8	29.3
Northeast	290.3	0.8	11.9
South	2,480.6	1.9	24.2
West	700.6	0.8	11.1
United States	4,197.2	1.4	19.6

LANDFILL PALLET RECYCLING AND TIPPING FEES

C&D Landfills

Almost one-third of C&D landfills operated a wood/yard waste recovery/recycling facility and 5.7% of C&D facilities indicated that they have plans to operate a wood/yard waste processing facility within the next two years. This suggests increasing interest in recycling of wood/yard waste, primarily to save landfill space and secondarily to reuse the wood.

Landfills that have a recycling facility are either banning the landfilling of wood pallets or providing incentives (in terms of lower tipping fees) to bring pallets to the wood recycling facilities. Landfills that have a recycling facility generally charge a higher tipping fee for landfilling wood pallets than for disposing of the pallets at the recycling facility. Among landfills with recycling facilities, the average tipping fee for wood pallets landfilled as-is was \$29.00 per ton while the fee for wood pallets that came to recycling facilities was \$22.20 per ton (Table 5).

Landfills in the Western region provide the greatest incentive to recycle pallets in terms of a tipping fee differential of over \$30 per ton.

MSW Landfills

As mentioned, over one-third (37.9% to be exact) of the responding MSW landfills operated a wood/yard waste processing facility (Table 3). In addition, over 6% of the respondents indicated that they have plans to operate a wood/yard waste processing facility within the next two years. As with the C&D operations, there appears to be interest in increasing the recycling of wood/yard waste.

In the US, the average tipping fee for wood pallets landfilled as-is at MSW facilities was \$34.90 per ton while the fee for wood pallets that came to processing facilities was \$23.90 per ton (Table 6). Landfills in the Northeast region provide the greatest financial incentive to recover pallets in the form of a tipping fee differential of over \$25 per ton.