



## Landfills Potential Source for Cores

Computer Model Analyzes Landfills For On-Site Recycling Operations

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Are you having trouble finding enough used pallet cores? Do you have trouble finding more than one reliable source of used pallet parts?

Have you ever considered your local landfill as a "source?"

In 1995, more pallets ended up in landfills than at pallet recovery-repair companies. Virginia Tech and the U.S. Forest Service have developed a business plan spreadsheet model to encourage pallet recyclers and landfill operators to work together to provide new sources of pallet parts and

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pallets while reducing landfilling. This source of pallet parts could work for you.

### **Pallets and Landfills**

Wood pallets break or end up in places where they are not needed. They can become a waste problem. Many find their way to pallet recovery and repair facilities, but many are sent to landfills. Some are taken to landfill recovery operations, but a large number are placed in municipal solid waste or construction and demolition no-further-use waste areas.

Landfilling is a waste of the pallet resource. There are better options that reduce landfilling of unwanted and discarded wood pallets and facilitate reuse of the pallet material. A feasible option returns the pallet material (parts or pallets) to pallet companies that rebuild, repair, and make pallets from used parts.

Consider the magnitude of the pallet situation. Each year a large number of new wood pallets are manufactured using a significant percentage of the hardwood lumber and cants produced in the U.S. — 4.5 billion board feet in 1995. Less significant portions of softwood lumber and cants are also needed — 1.8 billion board feet in 1995.

Once used, pallets are not necessarily discarded. In 1995 over 170 million wood pallets (2.6 billion board feet) were received by the pallet and container industry for repair or recycling. Almost 150 million were repaired and resold to pallet users.

However, the pallet retrieval-recovery system is not perfect, and wood pallets end up in landfills. The combined landfill totals (construction and demolition and municipal solid waste facilities) show that over 223 million pallets (6.14 million tons) passed through landfill gates in 1995. Approximately 17% (38 million pallets or 1.04 million tons) were recovered, mainly to low value uses and products.

Landfill operators would welcome markets for pallets or pallet wood that would return more money to their facilities. Many landfills have grinders and more would likely add grinders if they could be assured of an economical market for ground pallet material. They would also be interested in adding additional equipment to increase revenues and in partnering with pallet recovery firms.

Our research has found that discarded pallets at landfills could provide good

raw materials for repairing pallets and for building pallets from used parts. Some parts could be converted into other products. However, many questions need to be answered before landfill recovery operations or pallet companies will consider investing capital to reclaim material from pallets at landfills. How many wood pallets are sent to the landfill? Can they be recovered? Are any being recovered? Are there opportunities to increase recovery? Are there higher-value options than present recovery methods such as grinding for fuel and other low-value products? Is recovery economically viable?

To help answer some of these questions and provide information for business plans, the Center for Forest Products Marketing and Management and the U.S. Forest Service Southern Research Station unit, both at Virginia Tech, have developed a computer spreadsheet model called PROACT (Pallet Recovery Opportunity Analysis Computer Tool). PROACT focuses on pallet recovery and reuse options for pallets prior to landfilling.

In the remainder of this article we report on pallet recovery options and

# Table 1. Pallet Recovery Option Values

Pallet Recovery Option	Potential Market Value of a Standard 48x40 Pallet
Ground for use as fuel or mulch @ \$10/ton	25 cents
Ground for use in board products @ \$40/ton	\$1
Resold without repair (a)	\$3-\$6
Disassembled for repair replacement parts (b)	\$2-\$3.50
Disassembled for flooring, replacement parts (c)	\$5-\$8

(a) Standard size pallets not needing repair but of different grade or quality.

(b) Value range depends on number and type of reusable parts obtained from discarded pallet,

(c) Value based on number of parts useable for flooring, yield in flooring blanks from the parts, and remaining parts that can be sold as replacement parts.

present the results from a sample spreadsheet business plan developed using PROACT. The plan shows the economic potential of recovering pallet materials at a landfill given a set of conditions.

## Recovery Options, Values

Discarded pallets can have value based on their size, condition, and the species of wood used in the pallet parts. For example, pallets in standard sizes needing no repairs are reusable and marketable. This represents the highest value use. Pallets can also be disassembled and the parts can be converted to standard or marketable sizes and sold to pallet recovery-repair companies. Some of the better parts could also be converted to products such as flooring, paneling or furniture

The values of these recovery options can be expressed in terms of a standard 48x40 pallet as shown in Table 1. A ground pallet would be worth 25 cents for fuel or up to \$1 if a panel furnish market is available producing particle-board or medium density fiberboard. Other uses of the ground material would be densified fuel pellets, animal bedding, mulch and colored mulch. The same pallet could be worth between \$3-\$6 if sold as a pallet or between \$2-\$3.50 if taken apart for repair replacement parts. These values depend on the quality of the pallet and how many useable parts can be removed from the pallet. The 48x40 pallet could also be worth between \$5-\$8 in

flooring produced from good deck boards with the remaining parts sold as replacement pallet parts.

## Landfill Recovery Operation

To help private or public operations evaluate the feasibility of pallet recovery, we developed PROACT. The computer model requests basic information describing the pallet recovery project being considered. Among the input information requested are equipment and facility requirements, labor requirements, incoming pallet quantity and type, material processing plans, tipping fees, and product selling prices.

PROACT uses the input information to simulate the pallet recovery project's operations and to estimate the project's cash flows. Output includes a summary report, tables displaying the flow of material through the project's operations, revenues by source, and a complete cash flow analysis table. Charts illustrating the sensitivity of profits to tax rates, cost of capital rates, revenues by product or service, and key cost categories also are generated.

The summary report includes the initial cost of the pallet recovery project and the profitability using the net present value, the internal rate of return, and the modified internal rate of return methods. The tonnage of wood diverted from landfilling and the recycling efficiency is indicated as well as the total labor cost

over the life of the project. Lastly, in the summary report the average revenue generated per pallet recovered is estimated.

To illustrate PROACT and the potential economics of recovering pallets at a level higher than grinding, we created the following hypothetical operation. In this operation, a landfill recovery operation or an independent company would:

- receive pallets for a tipping fee
- separate standard 48x40 pallets needing no repairs to sell to pallet recovery-repair companies
- disassemble most of the remaining pallets and salvage usable parts for sale to pallet recovery-repair companies
- load pallet recovery-repair company trailers at the landfill recovery site with pallet parts and no-repair-needed pallets
- grind the remaining parts or bad pallets into fiber as currently done, and
- consider the possibility of, at a later time, separating the best parts for conversion to products such as flooring, furniture or paneling.

In year five, the sample recovery operation simulated in PROACT would:

- receive 1,000 pallets per week in year 1, growing to 1,800 pallets per week
- charge a \$25.00/ton landfill recovery area tipping fee
- offer no pallet pick-up service
- sell approximately 180 48x40 pallets per week not needing repairs at \$2.50

- per pallet
- dispose by grinding 360 pallets per week due to thin boards or an insufficient number of recoverable parts
- disassemble 1,260 pallets per week with industrial band saw dismantles (this equates to 36 pallets per hour or 0.6 pallets per minute)
- process, if needed, the recovered pallet parts to standard or demanded lengths with crosscut and trim saws
- sell the recovered pallet parts to pallet recovery-repair companies (20 cents per deck board, 50 cents per stringer and 15 cents per half-stringer), and

- employ eight workers.

The above operation would, over a 5-year period:

- collect \$966,500 in total revenue (\$230,000 in tipping fees, \$87,500 in whole pallet sales, \$237,000 in stringer sales, and \$412,000 in deck board sales)
- receive 350,000 pallets or 9,188 tons of wood, recycle 5,345 tons of pallets and parts, and grind 3,843 tons of wood
- achieve a 58% efficiency in solid wood recovery (if the ground material is sold or used this could approach 100%)
- return \$2.76 per pallet received

- cost \$96,000 to establish (purchase and set up equipment, building, working capital, etc.) and attain a 23% internal rate of return.

### **PROACT Bridges Gap**

PROACT, the spreadsheet program, can be used to plan and virtually test the feasibility of pallet recovery operations. Pallet recovery-repair companies can approach local landfills or recycling coordinators and demonstrate a sample operation using PROACT. They could show recycling coordinators the economics of setting up a pallet recovery operation to provide them with used parts. All parties could get a much better understanding of such things as the number of pallets needed and prices required for a viable operation. PROACT variable inputs can be easily changed to test different scenarios. PROACT can help bridge the gap between idea and implementation.

### **Summary**

Pallet material recovery-recycling operations at landfill facilities can be economical while reducing pressure on landfill capacity. They could supply needed pallet parts and pallets back to pallet suppliers and reduce hardwood and softwood timber demands. Furthermore, the anticipated banning of pallet landfilling at many solid waste facilities could force huge amounts of pallets to recovery operations.

PROACT, the computer spreadsheet model, can help to bridge the gap between landfill recovery operations and pallet recyclers by helping to plan and virtually test pallet recovery operations. These on-site landfill recovery operations are a real opportunity for pallet companies.

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