

THE PALLET INDUSTRY: A CHANGING HARDWOOD MARKET

Gilbert P. Dempsey and David G. Martens¹

Abstract: From its inception during World War II, the wooden pallet industry has grown to become the Nation's largest industrial consumer of hardwood lumber products. Since most of the raw material in wooden pallets is lower grade lumber, the pallet industry's growth, efficiency, and changing raw material inputs must be of concern to the grade hardwood lumber industry, the fine-hardwood lumber-using sectors, and hardwood resource investors and managers.

INTRODUCTION

The United States' wooden pallet industry currently provides a viable market for more than 5.1 billion board feet of mostly lower grade hardwood lumber (or lumber equivalent) annually. This represents more than 46 percent of the total U.S. hardwood lumber production. Therefore, significant changes in either pallet output or its manner of production is important to the grade hardwood lumber industry and its prime outlets--the fine-hardwood-using industries, such as manufacturers of wood household and office furniture, cabinets, etc., and, to varying degrees, hardwood resource managers. For example, economic activity in the pallet industry affects both the physical availability and price structure of grade hardwood lumber used by these higher valued domestic product markets, including the export market. Hardwood forest resource managers also would have fewer management options if there were no pallet market to utilize much of the lower grade timber resource.

The pallet industry is currently in a sustained growth mode and has more than doubled its unit product output since the economic recession of 1982. Despite the higher costs of productive inputs, the industry is producing more pallets with less labor and at lower output prices. Industry efficiency, as measured by labor productivity, has increased by more than 83 percent since 1972 (Dempsey 1988). This has been accomplished in the face of more stringent manufacturing standards and higher costs. Contributing to these efficiencies were structural and operational changes that affected the source, quantity, and form of raw materials as well as their in-plant utilization.

¹Research Economist and Research Forest Products Technologist, respectively, USDA Forest Service, Northeastern Forest Experiment Station, Forestry Sciences Laboratory, Princeton, WV 24740.

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Prior to World War II, the principal means of loading, moving, stacking, and storing industrial products was by hand, coupled with the use of wheeled hand jacks, platform carts, and various kinds of fixed and moveable hoists. Simple wooden platforms were used in these systems primarily for load separation and support. According to Wallin (1986), industrial pallets as we currently know them were introduced as a materials handling tool in the 1930's, though their use was minimal. For example, only 11 million wooden pallets were produced annually in the late 1930's. The early pallets were produced "in house" by the firms using them, or as specialty products by the manufacturers of wooden boxes and other containers.

Pallets were not used extensively in materials handling systems for two reasons. First, the technology to mechanize materials handling was not available until 1937 when the first generation of small, gas-powered forklift trucks was developed (Eichler 1976). Second, given the state of the economy and the surplus of labor during the 1930's, there was little economic incentive among the country's major industries to mechanize their materials handling systems.

During World War II, however, the urgent need for faster and more effective methods of handling vast amounts of materials stimulated the development of a variety of highly maneuverable, motorized forklift "trucks." The use of these vehicles allowed goods to be moved, stacked, and stored with extraordinary speed and versatility, and with a minimum of labor. The primary base structures used for these functions were the two- and four-way-entry wooden pallets. After World War II, the pallet industry continued to grow with the economy. As major industrial segments such as the food, beverage, chemical, metal, automotive, and transport industries expanded and sought more effective means of handling their products, the mechanization and use of wooden pallets became widespread.

TODAY'S INDUSTRY

Since its birth as a manufacturing segment, the United States' pallet industry has evolved from a "cottage" industry to a major supplier of base structures for materials handling. From an annual output of 11 million pallets in the late 1930's, the industry produced about 32 million in 1946 and grew to 505 million in 1989. Today, the wooden pallet industry is still growing. In units produced, the industry has averaged a 17.3-percent annual rate of growth over the past 9 years. In addition to the market's pallet replacement needs and an expanding economy, this growth has been in response to: (1) a broadened market as a larger proportion of industrial firms palletize; and (2) the increased mechanization and automation of materials handling systems by current users of pallets.

In 1989, pallet manufacturers produced more than 505 million new pallets and skids--the most ever according to estimates by the National Wooden Pallet and Container Association (1990). Pallet output in 1989 represented a 121-percent increase in production over that of 1982 (228.3 million) and more than tripled the 1972 output of 155 million. Since 1972, pallet

production has increased with general steadiness except for 1975 and 1982, both economic recession years. Between 1983 and 1989, the industry showed its strongest and most sustained growth since World War II.

The 17-year general expansion in pallet output brought about a corresponding but less than proportional increase in the total value of pallet products sold. This holds true whether shipment values are measured in either current or constant prices. In current dollars, the industry's value of pallet products shipped increased more than sixfold (642 percent), or from \$623 million in 1972 to \$4 billion in 1989.

In recent years, while both the total output and shipment values of new pallets have increased, the price per unit in terms of 1982 dollars decreased and then stabilized. Between 1972 and 1979, the inflation-adjusted average price of new pallets increased, reaching a peak in 1979 at \$9.99 per unit. After 1979, the price of pallets decreased and then became relatively stable at a lower level. The real price of pallets sold between 1972 and 1982 averaged \$8.83 per unit (1982 dollars). Similarly, adjusted prices averaged \$7.66 per pallet from 1982 through 1989--with average annual prices ranging from \$7.42 to \$7.92 per unit.

Such patterns in production and prices show that the industry's recent 7-year growth in value of shipments was due to increased quantity and quality of pallet production rather than to increases in unit price. This efficiency has allowed the wooden pallet industry to grow despite counteracting forces such as increased competition from alternate materials; steadily rising costs of raw material, energy, transportation services, and other production items; and adverse changes in the automotive and defense materials handling markets.

CAPITAL/LABOR SUBSTITUTION

A major reason for the improved competitive position of the pallet industry is the substitution of capital for labor (Dempsey 1988). This trend has been most obvious since 1977 and particularly in the more repetitive, labor-intensive operations. In 1985, the last year for which complete data are available--the pallet industry invested more than \$46 million in capital assets, 86 percent in new production items, and 14 percent in used assets. This investment was 8 percent higher than the annual average (\$42.9 million) for the previous 4 years and nearly double that invested by the industry in 1977 (\$24.1 million).

The industry's largest expenditures, \$39.7 million, were for "new" capital assets in the form of machinery and equipment, plants, facilities, and other production structures. Within this category, new machinery and equipment for mechanizing and automating production were the capital goods purchased most heavily, totaling 85 percent of investments. The balance of expenditures, 15 percent, was for new plants, facilities, and other structures.

A break with the practice of relying on labor to sustain increases in output first became evident in the late 1970's. Innovative new machinery and equipment were coming onto the market, and capital investments increased to \$1,418 per production worker. By 1979, there

was both a surge in capital investments and a leveling in employment of production workers. This production year represented a turning point in the pallet industry's capital and labor investment mix. And the manner in which these productive factors were used was changing. The developing trend emphasized the substitution of capital for labor in the production of pallets.

Capital investments continued strong from 1979 through 1985, and most likely to the present. Annual investments per worker nearly doubled (up 91 percent) from 1977 through 1985, increasing from \$1,190 to \$2,282 per production worker and continuing the trend toward a lessening dependence on labor to sustain output.

CHANGE IN RAW MATERIAL USE

Beginning in its formative years--in the late 1930's and early 1940's--and lasting over 2 decades, the pallet industry obtained its raw material almost exclusively from the lower grades of random-width, random-length lumber generated as a byproduct of the grade hardwood sawmills (Martens 1989a). The predominant grades used were No. 2 and No. 3 Common. Softwood lumber was substituted in some areas where hardwoods were difficult to obtain. In such cases, the softwoods used were primarily from the economy and utility grades of West Coast lumber and in the No. 3 and No. 4 southern pine structural grades.

As the pallet industry became a more consistent market for lumber, the hardwood sawmill industry began manufacturing a sound grade of lumber in 4-, 6-, and 8-inch widths commonly referred to as "pallet grade." The use of pallet grade lumber not only reduced the waste incurred by the industry's use of random-width lumber, but also assured the sawmill industry a steadily growing market for the difficult-to-move, lower furniture grades.

By the 1960's, the demand for the lower grades of hardwood lumber began to exceed the supply generated by the grade lumber mills in many areas. It was during this period that vertical integration began within both the sawmill and pallet plant sectors. Most of the integrated sawmills, however, still operated as traditional hardwood grade mills with high-value lumber going to the furniture industry and lower grade lumber going to the pallet industry. It also was about this time that we saw the advent of 4-, 6-, and 8-inch cants.

The cant concept quickly became popular because its use was advantageous to both the sawmill and the pallet mill. In the sawmill, the time that each log spent at the headsaw was shortened. This increased both the total volume of lumber produced and the volume of lumber in the higher valued grades. In the pallet plant, the use of cants eliminated the waste generated from random-width lumber and allowed greater flexibility in the variety of pallet part sizes that could be produced.

Cants, particularly the 4- by 6-inch size, provided maximum versatility in the production of pallet parts with minimum waste; they also could be handled and stored efficiently and breakdown could be automated, allowing increased production while minimizing labor costs.

The production of 1-5/8-inch thickness of lumber from cants also appears to be gaining in popularity for many of the same reasons--high flexibility, minimum waste, high production, and ease of handling. Full thickness is used for stringers, the lumber resawn once for 3/4-inch deckboards or twice for 1/2-inch deckboards. Many pallet plants with roundwood sawing facilities are cutting to 1-5/8 inch for internal storage and use.

In the 1970's, as raw material supplies tightened, more and more bolter mills and scragg mills were being used to produce pallet parts from pulpwood bolts. Also, in the captive sawmills there was less emphasis placed on producing grade lumber. The concept of going directly from roundwood to pallet parts became common. In the 1980's, a considerable portion of the pallet industry took this practice one step farther by shifting to tree-length material, thus eliminating the log step. With tree-length material, the stems are crosscut to the length, or multiples of the length, of the pallet parts to be produced. This virtually eliminates end trim waste, increases volume yield, and facilitates handling through multiple scragg saws, gang rip-saws, or other multiple sawing operations.

By 1986, according to McCurdy and Ewers (1987), the raw material used for pallet production in the predominately hardwood regions consisted of 24.4 percent logs, 36.7 percent cants, and 38.9 percent lumber. The lumber category also included 6/4 lumber that was resawn and pre-cut pallet shooks. Of the 24.4 percent in logs, 5.8 percent was purchased as stumpage, almost one-fourth of the total logs category.

THE FUTURE?

One of the more significant changes within the pallet industry has been the amount of raw material used in the manufacture of wooden pallets. In the last 20 years, the average volume of lumber contained in a pallet has decreased from 20 board feet to about 13 (McKeever 1987). Unpublished data from a 1985 survey conducted by Dwight R. McCurdy and James T. Ewers at Southern Illinois University showed that pallet part sizes had decreased. Where the deckboard thickness for nonexpansible hardwood pallets was 1 inch 20 years ago, more than one-half of these pallets now have deckboards that are 3/4-inch or less. Further, well over 50 percent of the expensible hardwood pallets produced had deckboards of 1/2-inch in thickness (Martens 1989a).

This trend in the reduction of raw material used per unit is expected to continue as the Nation's pallet-using industries progress toward faster, more automated materials handling systems to provide a more competitive service and reduce costs in the process. The demand is expected to increase for lighter, more versatile base structures of equal or better strength to complement such systems. In such a market, the challenge for the wooden pallet industry will be to produce a more tailored and better engineered product while maintaining tight controls over pallet manufacturing costs.

The trend away from the purchase of 1-inch lumber by the pallet industry will likely continue because of its comparatively high handling cost, limited flexibility, and lower efficiency. By

contrast, the use of sawn cants and 1-5/8 inch thick boards will likely remain strong because of their high versatility and low waste factors. The latter also can be used to supplement the raw material supply of pallet plants that maintain roundwood sawing facilities. Consequently, grade hardwood lumber mills producing these products should continue to have a steady market for them.

In recent years there have been considerable efforts to develop and market pallets produced from more energy intensive materials such as plastic, metal, corrugated paper, and reconstituted wood. Some have found their way into specialized use markets. To date, however, about 97 percent of all pallets are still made of wood. This probably will remain true for the foreseeable future. Wood is versatile, less energy intensive, and generally a less costly material to use for pallets.

In sum, the United States' wooden pallet industry has proven itself to be strongly competitive, both internally and externally. To meet the challenges cited, the industry is expected to continue its advancements in mechanization, automation, and communication processes as a means of improving quality and reducing costs in the more labor-intensive, production-flow processes, and provide better service in product marketing activities. In doing so, the wooden pallet industry may become even more aggressive in lowering the relative cost of raw materials and become less labor dependent and more capital intensive.

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