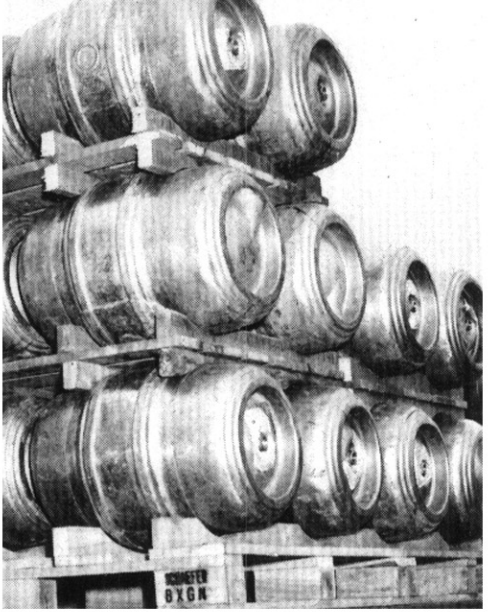

Use of WOODEN PALLETS in the Brewing Industry

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INTRODUCTION

LARGE quantities of wooden pallets are used by many industries. These pallets are used to stack material for handling, transporting, and storage.

Because many pallet suppliers have limited knowledge of the actual or potential market in any particular industry, the U. S. Forest Service undertook the study described below. The brewing industry was selected because it provides a large present market and a potentially greater future market for wooden pallets.

The objectives of the study were to analyze the market in terms of: (1) location and characteristics of the industry, (2) pallet-purchasing practices, (3) types of pallets in use, (4) pallet life and repair, (5) palletized handling systems, and (6) the future role of wooden pallets in the industry.

The study consisted of personal interviews with materials-handling officials in nine large U. S. breweries. These nine breweries accounted for 58 percent of the volume of domestic brewery products in 1966 *(Sanchagrin 1968)*.

LOCATION & CHARACTERISTICS OF THE INDUSTRY

Ninety-nine breweries were authorized by the Internal Revenue Service to operate in the United States in 1967. These breweries managed 157 plants in 31 different states (fig. 1).

There is a trend toward greater concentration in the brewery industry. In the last decade U. S. brewery products sales increased about 28 percent while the number of brewing plants decreased about 38 percent *(Crivella 1965, U. S. Brewers Assoc. 1967)*. The sales increase has been accounted for entirely by packaged brewery products. Kegged brewery products sales have changed little during the last decade (fig. 2).

In the past few years the largest breweries have been increasing their market share and probably will continue to do so in the future. In 1967 the 25 largest breweries sold 91.5 percent of the U. S. brewery products, and the 3 largest breweries sold 33.1

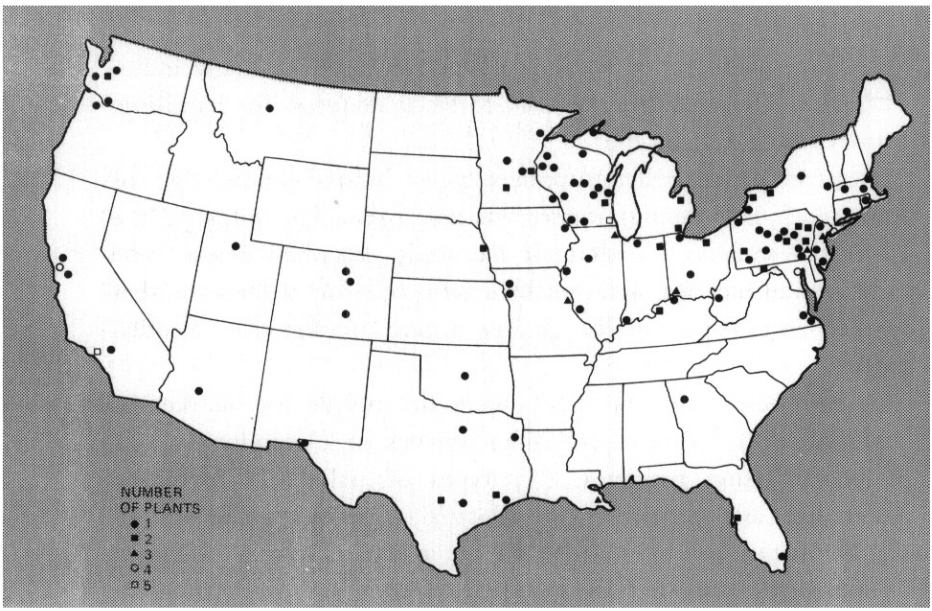
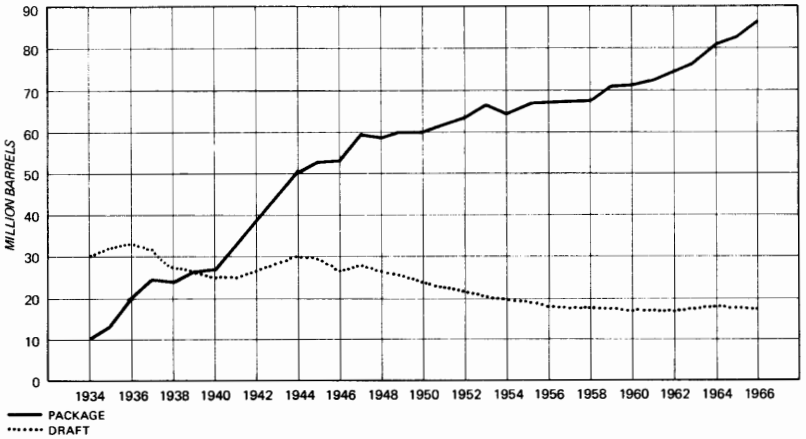


Figure 1.—Brewing plants authorized to operate in the United States as of July 1, 1967. Two other plants not shown are located in Hawaii.

Figure 2.—Draft and package sales of malt beverages for calendar years 1934 to 1966. (One barrel = 31 gallons.)



percent *(Sanchagrin 1968)*. Smaller breweries are being liquidated or merged because, in many instances, they cannot afford to modernize facilities and techniques enough to operate profitably in this highly competitive industry *(Crivella 1965)*.

PALLET PURCHASING PRACTICES

All the breweries surveyed were using wooden pallets. The earliest date that any of them started using wooden pallets in their main plant was 1949; the latest date was 1962. Some breweries experimented with wooden pallets in field plants before introducing them into the handling program of the main plant. Others did the initial testing in the main plant. Many breweries are conducting in-plant pallet-test programs to improve pallet design and style.

The main plant of some breweries is responsible for supplying pallets to all the other plants operated by the brewery. Other breweries allow the purchasing department within each plant to buy pallets locally. Sometimes, when pallets can be bought locally, the main plant must approve the source of supply.

Contrary to the practice of some industries, breweries buy practically all the pallets they use. Only one of the study brewer-

ies had made any pallets, other than experimentally, for its own use, and these were for a government order calling for fewer than 100 pallet-loads of brewery products. One study brewery did rent pallets, but the practice was discontinued.

When a brewery purchasing agent desires to buy wooden pallets, he usually asks for bids from pallet firms that are on a list of approved suppliers maintained by the brewery. The pallet suppliers are generally located within several miles of the brewery, and close working relationships generally exist between the suppliers and the brewery—in much the same manner as pallet suppliers and steel plants *(Carlson 1966)*.

Seven of the nine breweries had been contacted by firms trying to sell wooden pallets; and six of the seven had been contacted by more than one firm. Although several breweries were completely satisfied with the pallets purchased through brokers, one brewery official said he did not want to use brokers because they sometimes sell substandard pallets. One of the two brewery officials that had not been contacted by pallet suppliers said, "We have to seek them out". He added that many firms do not want to sell to him because his brewery requires tupelo deckboards. One brewery said they had only one supplier for a short period of time, and they were striving to prevent such occurrences in the future.

Pallet needs varied seasonally for all the study breweries because of the seasonal nature of the brewery business. From 1960 through 1966 production of brewery products was highest in March through August, with peak production in either June or July. Most of the breweries try to spread pallet buying throughout the year, but the spring and summer months still are the period of greatest pallet demand.

Five of the nine study breweries said that they could not always get enough pallets when they needed them. The reasons given for this were that Department of Defense pallet demand increased significantly, and sometimes breweries did not give the suppliers enough production time. One brewery tried to improve their supply situation by helping to channel lumber to their pallet suppliers. Another brewery said that many of

their wooden pallet suppliers indicated they would be better able to meet demand if the pallet specifications were relaxed. Seven of the nine breweries said they were searching for new sources of pallets.

The breweries were generally satisfied with the quality of the wooden pallets they received. While all but one of the breweries replied that the pallets usually met their specifications, one brewery said that their original specifications had to be relaxed. And another brewery said that close examination was required to make sure the specifications were being adhered to. The brewery that replied that pallets generally did not meet specifications also said that the main shortcomings were thin deckboards and distorted wood grain.

Most of the breweries inspect pallets before accepting them. In some instances, inspection procedures are defined in the pallet specifications. A random sample is usually used as a basis for inspection; for example, one brewery uses a 10-percent sample. Inspection may be on a point basis, with certain points being given for improper dimensions, defective lumber quality, faulty nailing patterns, etc.; or inspection may be on a visual basis. One brewery uses pallet weight as a criterion for measuring moisture content.

Seven of the breweries said that the prices they were paying for wooden pallets were fair. One brewery official, who believed that prices were not fair, said that prices had increased almost 20 percent during the preceding year; and one official had no comment. Only two of the nine breweries said they would pay more for better pallets. One brewery official said he did not know whether he would pay more for better pallets until pallet-test results in the brewery were compiled. Another official, who would not pay more for better pallets, said the only components of the pallets his brewery was using that could be upgraded were blocks: he believed that center deckboards could possibly be downgraded without seriously affecting pallet quality.

It was impossible to specify the size of pallet inventories. However, an estimate based on industry-wide data indicates

that about 10.9 million pallet loads of brewery products were shipped by the study breweries (as opposed to 18.6 million pallet loads by all breweries in 1966. This estimate was based on these assumptions: (1) a typical pallet load consists of 155 gallons of packaged brewery products or 124 gallons of kegged products, (2) 90 percent of all packaged brewery products and 70 percent of all kegged products were shipped on pallets, and (3) 83 percent of all brewery products shipped were packaged and 17 percent were kegged.

Officials of six of the study breweries said they preferred more services from pallet suppliers such as storing and testing, and advising on repair techniques. Four of the six officials said that their suppliers gave such services. And three of these four said they had suppliers who would store pallets; one contract with a supplier said that 300 to 500 pallets would be available at all times. The other recipient accepted a service he did not request—a suggestion on how to repair pallets.

PALLET SPECIFICATIONS

Packaged Brewery Products

Pallets differed greatly among breweries in size, structural characteristics, species of wood allowed, moisture content limits, and nailing patterns (table 1 and fig. 3). The home offices of the nine study breweries had specifications for 10 pallets. These included: nine different sizes; eight block-type pallets; and two stringer-type pallets, one of which had notched stringers.

Some of the specifications called for blocks consisting of two pieces fastened together with corrugated fasteners, while others called for blocks consisting of only one piece. The strictest moisture content requirement was 18 percent for deckboards and 20 percent for blocks. Some of the specifications called for green deck supports (stringers or blocks) and seasoned deckboards; others called for all unseasoned parts. Only one brewery had a specification calling for preservative-treated pallets. The same specifications also called for blocks that had been dipped in clear paraffin.

Table 1.—*Characteristics of packaged beer pallets*

Brewery	Dimensions	Number and type of deck supports	Species allowed[2]				Allowable moisture content				Maximum weight
			Deckboards	Stringer boards	Block	Stringers	Deckboards	Stringer boards	Blocks	Stringers	
	Inches[1]						*Percent*	*Percent*	*Percent*	*Percent*	*Pounds*
1	32 x 37	9 block	All Group IV species except pecan	All Group IV species except pecan	Oak or gum	—	25	25	25	—	60
2	44 x 33	3 stringers	Tupelo	—	—	Group IV species	Not specified	—	—	Not specified	Not specified
3	32 x 38	3 notched stringers	Not specified	—	—	Not specified	Not specified	—	—	Not specified	Not specified
4	40 x 35	9 blocks	Group IV species	Group IV species	Group IV species	—	Not specified	Not specified	Not specified	—	35
5	38 x 33	9 blocks	NWPMA Group IV species	NWPMA Group IV species	NWPMA Group IV species	—	25	25	25	—	Not specified
6	40 x 32	9 blocks	Ash, aspen, basswood, or approved equal	Group IV species	Group IV species	—	Not specified	Not specified	Not specified	—	55
	32 x 40	9 blocks	Group IV species	Group IV species	Group IV species	—	Not specified	Not specified	Not specified	—	Not specified
7	37 x 32	9 blocks	NWPMA Group IV species	NWPMA Group IV species	NWPMA Group III species	—	25	25	25	—	52
8	44 x 36	9 blocks	NWPMA Group IV species	NWPMA Group IV species	NWPMA Group IV species	—	20	20	20	—	Not specified
9	37 x 32	9 blocks	Poplar	Gum or hardwood	Gum or hardwood	—	18	18	Unlimited	—	Not specified

[1] The first figure refers to pallet length and is the dimension perpendicular to deckboard length.

[2] Some specifications call for NWPMA (formerly National Wooden Pallet Manufacturers Association; now NWPCA—National Wooden Pallet and Container Association) Group IV species: white ash, beech, birch, rock elm, hackberry, hickory, hard maple, red and white oak, and pecan. NWPCA now uses a new species classification scheme, and the Class C species group for hardwood pallets is the same as the old Group IV species category. When a specification calls for only Group IV species, it is assumed that the specification refers to the classification scheme used by NWPCA. Other specifications call for NWPMA Group III species: black ash, pumpkin ash, white elm, red and black gum, soft maple, sycamore, and water tupelo. Species from the old Group I and III categories have been combined under the Class B species group for hardwood pallets in the new NWPCA species classification scheme.

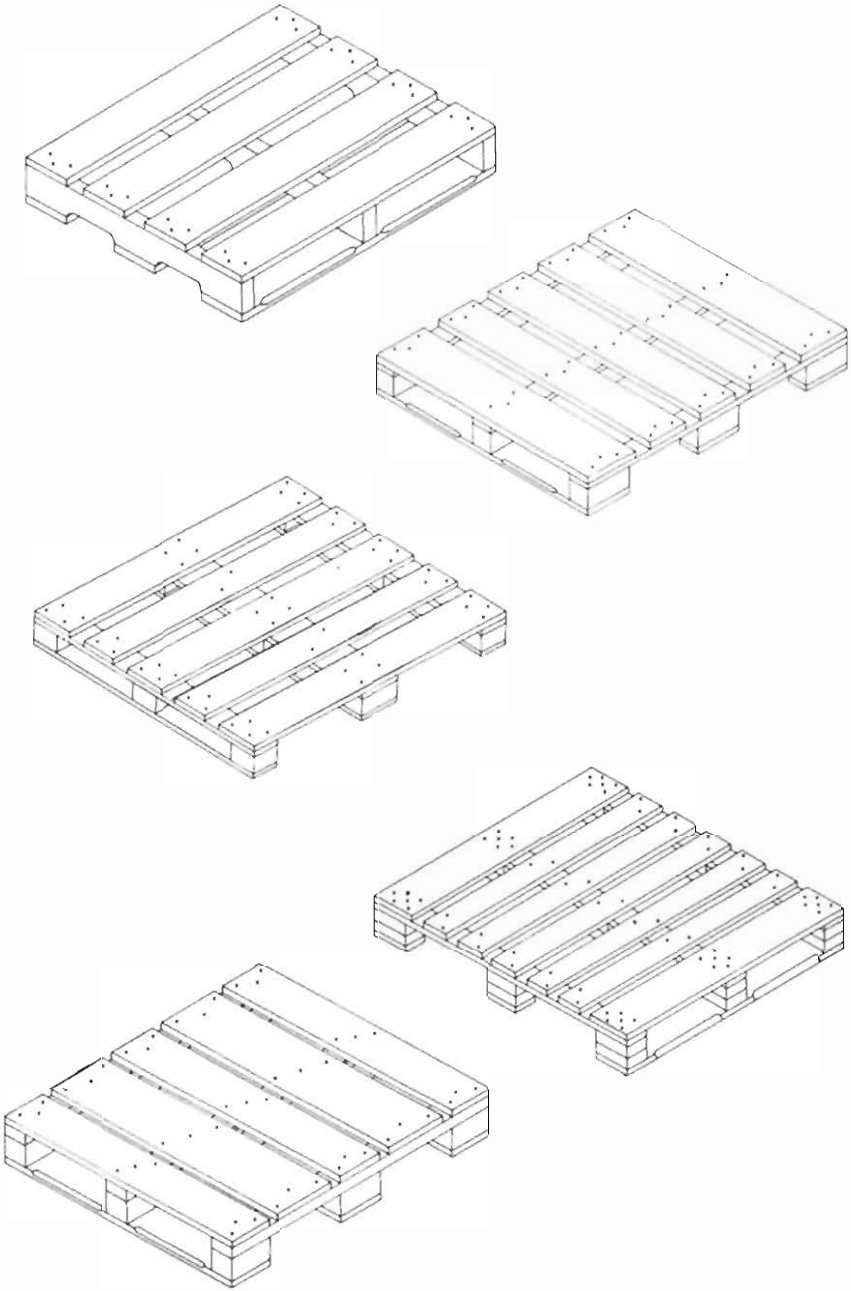


Figure 3.—Some of the different kinds of pallets used for packaged malt liquor.

The breweries have many different ways of specifying pallet nails. Some examples of nails to be used to fasten the bottom deckboards to stringers or blocks are:

- Two-inch long No. 11 gage drive screw or annular ring nails. The drive-screw nails require a minimum of four spiral flutes that have a helical angle of thread at the pitch diameter of $60° \pm 5°$ with a plane perpendicular to the axis. The annular ring nails shall have 20 threads per inch running entirely around the nail.
- Drive screws (helically threaded nails) with 5/16-inch diameter head and diamond point, 6d Parkerized, 6 flute, 6.5 threads per 1 inch of nail.
- 2½-inch x 9/32-inch drive-screw nails.
- 3-inch cement-coated screw nails.
- 2½-inch diamond-point drive screws.
- 3-inch No. 10 resin-coated screw-shank nails or approved equal.

For identification, five of the breweries required the pallet manufacturers' name to be stamped on the pallet; four required the year and month of manufacture; and seven required the brewery's name.

Some of the specifications were vague; for example, "pallet grade" lumber was indicated in several instances. However, other specifications were explicit; for example:

> . . . "specifications are for wooden pallets which are to be used in automated machinery for loading the pallet, unloading the pallet and conveying the pallet on automated machinery, fork trucks and hand trucks, and not merely warehousing, consequently, are of a grade which provides pallets constructed to close tolerances, and good dimensional stability and required high quality material and workmanship. This specification recognizes that wood is by nature an unstable material under some conditions and the intent is to weigh the requirements of the highly stable automated machinery against the unstability of wood. Machining by nature has a limited tolerance and consequently requires wooden pallets to be of much higher grade than the normal warehousing pallet."

In addition to pallet variation among breweries, pallets varied considerably among plants of a particular brewery. Variation

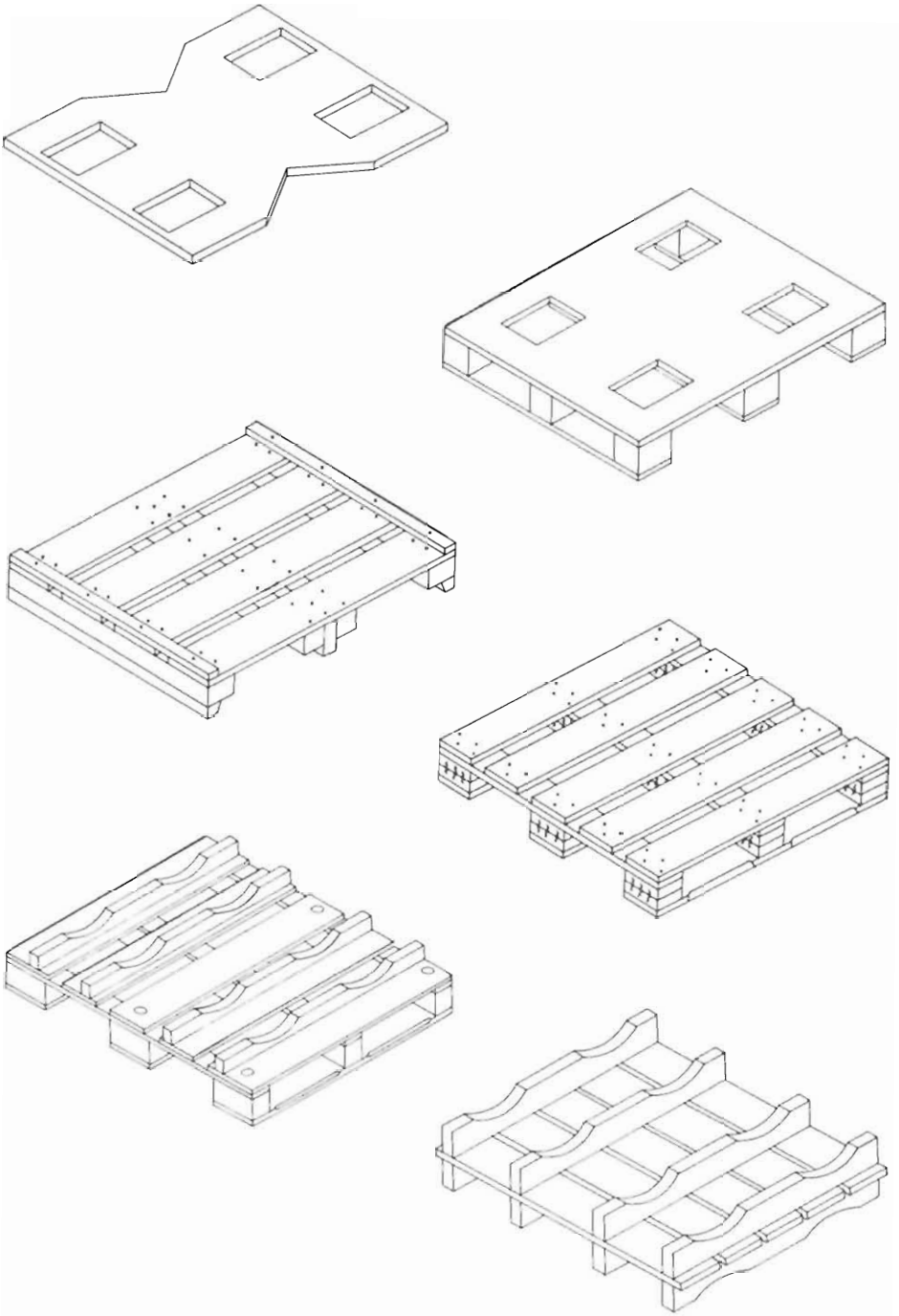


Figure 4.—Some of the different kinds of pallets used for kegged malt liquor.

among plants of a particular brewery may be caused by the following factors:

- Plants were often constructed or acquired at different times.
- Plants were sometimes acquired from another brewery that had equipment compatible with a particular kind of pallet.
- The method of transporting brewery products from plants to distributors varied considerably among plants.
- Transportation companies used a pallet that was similar to pallets being used by other firms in the same area.

Kegged Brewery Products

The main plants of six of the study breweries used pallets to move kegs, and the other three moved them manually. Two of the three breweries that did not use pallets for kegs in the main plant said they used them in other plants. The other brewery said they did not use pallets for kegs in any of their plants.

In most instances, species and moisture content descriptions for the keg-handling pallets were the same as or similar to descriptions for the package-handling pallets. Three of the breweries stacked kegs on lumber-base pallets; two of the breweries used lumber-base pallets in conjunction with lumber intermediate pallets (saddle pallets); and one brewery used plywood-base pallets in conjunction with plywood intermediate pallets (slip-boards) (fig. 4). The base-pallet specification called for "1-inch, C-D, plugged 1-side, exterior grade, rough-finish plywood," and the slip-board specification called for "1⅛-inch, C-C, plugged 2 sides, exterior grade plywood." Five different sizes for the six base pallets were used in the main plants: 44 x 33 inches, 44 x 36 inches, 40 x 40 inches, 32 x 40 inches, and 30½ x 34½ inches.

PALLET LIFE AND REPAIR

Only three breweries made estimates of pallet life in terms of number of moves. Two estimated that their pallets had a useful life of 20 round trips from brewery to distributor and return; the other gave an estimate of 100 round trips. Four breweries, who indicated they had no idea of pallet life in terms of trips,

made estimates of the useful life in years. These were 2 years, 3 years, 3¾ years, and 15 years. However, these yearly figures are essentially meaningless because the breweries could not estimate the average number of times a pallet is moved per year. One brewery said that some of their pallets were moved two or three times daily, while others were moved only once per month. The brewery that said that pallets had a useful life of 15 years estimated that they throw away about 6 percent of their pallets each year.

Four of the nine breweries said that damaged pallets were repaired in their plants. Three breweries indicated that they obtain repair parts from their pallet suppliers or lumber dealers. The other brewery maintains a stock of parts obtained from pallets that are damaged beyond repair. Most of the breweries have different criteria for deciding when a pallet is damaged beyond repair. One brewery considers a pallet to be damaged beyond repair when a stringer or inside block is broken.

The five breweries that do not repair damaged pallets in the brewing plant send them out to independent repair shops. These shops are generally located very close to the brewing plants. Most of the independent repair shops charge the brewery a standard rate for each pallet that is returned to the brewery. One brewery official said that about 85 percent of the pallets sent to an independent repair shop were returned.

One brewery utilizes its own repair facilities and an independent repair shop. If less than one-third of a pallet is damaged, it is repaired in the brewery; if more than one-third is damaged, it is sent to the independent repair shop if the estimated repair cost does not exceed a specified amount.

One brewery repairs about 40 percent of its pallets each year, compared with 60 percent several years ago. The reduction is a result of more mechanization and better handling practices, such as using blunt tips on the end of lift-truck forks.

For the breweries that sent pallets to independent repair shops, the repair cost ranged from $1.00 to $1.19 per pallet. And for the breweries that repaired pallets themselves, the estimated repair cost ranged from $1.19 to $1.25 per pallet. Several officials

of brewing plants that repaired pallets had no idea how much pallet repair was costing their brewery.

PALLET EXCHANGE

In the brewing industry there are few, if any, pallet-exchange programs. Because of the variation in size and design of pallets in use, the major obstacle to establishing an exchange program is deciding on a standard pallet. Most of the brewery officials said they would be reluctant to use a different kind of pallet because of the costs of changing handling equipment and warehouse layouts.

Some breweries have established limited pallet-exchange programs with firms that supply bottles, cans, labels, caps, and other materials. Other breweries buy the pallets and send them to their material suppliers.

The breweries mentioned several problems associated with the use of wooden pallets for malt liquor handling:

- It is difficult to get pallets back; sometimes railroad employees dump empty pallets out of rail cars.
- Discarding damaged pallets is a time-consuming process.
- Poorly manufactured or slightly damaged pallets sometimes jam automatic palletizers and depalletizers.
- Protruding nail heads damage packages.
- The bottom surfaces of some pallets are too smooth to allow proper movement on conveyors.

Unit Load Features

Generally, palletized unit loads consisting of cases of filled bottles or cans are stacked three pallet-loads high (fig. 5). Palletized unit loads consisting of cases of empty bottles or cans are stacked four pallet loads high.

Unit loads vary considerably in the same brewing plant as well as among breweries. For example, the unit loads in one brewery varied as follows:

- Weight range of a case of filled cans or bottles — 22 to 50 pounds.

Figure 5.—Stacking full cases of malt liquor in a warehouse.

PHOTO CREDIT: F. & M. SCHAEFER BREWING CO.

- Weight range of a case of empty returnable bottles — 14 to 25 pounds.
- Case length range — 14.25 to 19 inches (16 different lengths).
- Case width range — 9.38 to 12.75 inches (16 different widths).
- Case height range — 5.0 to 12.0 inches (14 different heights).
- Range of total number of cases on a pallet — 32 to 80.
- Weight range of a unit load of filled cans or bottles — 1,560 to 2,170 pounds.
- Height range of a unit load of filled cans or bottles — 52 to 58 inches.

This same brewery had 19 different case sizes and 9 different stacking patterns. Since this example shows only the variation in one plant, it becomes easy to understand the magnitude of unit load variations among breweries.

Methods of stacking kegs on pallets are also variable. When lumber base pallets are used in conjunction with lumber intermediate pallets, a unit load commonly is three kegs high (fig. 6) When the kegs are full, such a load weighs about 2,100 pounds.

Distribution

The distance brewery products are shipped from the plant varies considerably and depends on factors such as number of plants operated by the brewery and plant location. The maximum shipping distances within the continental U. S. for the main offices of the 9 study breweries ranged from 180 to 3,000 miles.

The method of transportation also varied considerably among the main plants of the study breweries. For example, the range of shipments of brewery products by rail car was 0 to 67 percent; and 42 to 51 pallet loads commonly were shipped in a 50-foot rail car.

Several breweries said they tried to ship as much as possible by truck because truck-return rates for empty pallets were more economical than railroad-return rates. One brewery was able to get lower railroad-return rates by showing the railroad that damage claims are reduced when pallets are used.

Most brewery products were shipped from the breweries to the warehouses of distributors who handle only malt liquor. However, a small percentage was distributed near the plants by brewery route trucks or was sent directly to food warehouses.

Figure 6.—Unit loads of kegged malt liquor.

A majority of the distributors serving the study breweries were equipped to handle palletized loads:

Brewery	*Proportion of distributors equipped to handle palletized loads (percent)*	*Proportion of volume handled by these distributors (percent)*
1	90	85-90
2	75	95
3	100	100
4	70-80	70-80
5	95	95
6	95	98
7	([1])	([1])
8	98	98
9	50	60-65

[1] Majority.

However, great inefficiencies will exist in the distribution process until those distributors who cannot handle palletized loads add the necessary equipment.

All but one brewery official said he believed that distributors handle brewery pallets carefully. The official who did not believe pallets were handled carefully said they were treated roughest in the Southeast. A main complaint was that the distributors often store pallets outdoors. Another complaint was that some pallets were damaged by distributors' employees who pulled the pallets out of the trucks by chain.

Only one official gave an estimate of the percentage of his brewer's pallets lost or damaged beyond repair by distributors—3 percent. Seven of the nine breweries charged distributors a deposit of $2 to $3 per pallet. However. the breweries said it is often difficult to enforce and collect the deposit.

A LOOK AHEAD

The brewing industry should provide a large and growing wooden pallet market for many years because of: (1) population growth and increased per-capita brewery products consumption (during 1962-66 total brewery products consumption increased 15 percent and per-capita consumption increased 9 percent), (2) the current high degree of dependence on a unit-load

handling system utilizing wooden pallets, and (3) expectations that a large volume of brewery products now being handled manually will be handled by unit-load on wooden pallets in the near future. All but one of the study breweries have considered adopting non-wooden pallets or a non-palletized materials-handling system. Aluminum, steel, and plastic pallets were usually rejected because the cost per trip would be unjustifiable.

Some specific shortcomings of aluminum pallets were: (1) they broke too easily and could not be repaired; (2) they required cleaning; and (3) many of them were stolen. Some breweries experimented with disposable pallets, but officials in these plants said they believed these pallets cost too much. Slipsheet and clamp handling were found to be unsatisfactory because the distributors would have to unload packages manually. Specific objections to clamp handling were: (1) clamps damaged the packages; and (2) because of the non-standard dimensions of some packages, they could not be stacked so they could be moved readily with a clamp truck.

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