



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

# A COST COMPARISON OF SHIPPING SYSTEMS FOR FROZEN FOOD

by

Robert C. Mongelli and Bruce E. Lederer  
Agricultural Marketing Research Institute  
Beltsville, Maryland

---

Makes a cost analysis of five systems for moving frozen food from the processing plant to the wholesaler's warehouse.

---

## INTRODUCTION

The research conducted with the frozen food industry was to examine and analyze five systems for handling and shipping frozen food products between processing plants and wholesale warehouses. These systems included: (1) handstacked: cases of frozen food that are handstacked in trailers at the processing plant and unloaded by hand onto pallets at the wholesale warehouse; (2) palletized: loaded pallets of frozen food move directly from freezer storage by forklift truck, placed in the trailer at the processing plant, and unloaded at the warehouse; (3) clamp-loaded: frozen food removed from freezer storage pallets by forklift truck with clamp attachment, loaded onto the trailer floor at the processing plant, and hand unloaded onto pallets at the warehouse; (4) clamp-loaded and clamp-unloaded: loading was the same as (3), but frozen food was clamp-unloaded onto pallets at the warehouse; and (5) slipsheeted: frozen food cases removed from freezer storage pallets by forklift truck with clamp attachment, placed on slipsheets, loaded into the trailer at the processing plant, and unloaded onto pallets at the warehouse.

The two parts of the handling system consists of loading and unloading.

Loading began when the commodity was removed from freezer storage and moved to the transport vehicle. Loading was completed when the last case was securely in place in the transport vehicle, the dock plate was removed, and the trailer doors were closed.

Unloading began when trailer doors were opened and the dock plate was positioned; it was completed when the last case was in place in the warehouse storage area.

The systems for handling frozen food from storage at the processing plant to storage at the wholesaler's warehouse were analyzed to measure the costs of labor, equipment, and material, based on 1,600 cases, a full trailer load. The labor man-hour requirements were converted to costs using the prevailing wage rates for these job categories as reported by the processors and wholesalers. A 20-percent fatigue and personal allowance was added to freezer labor requirements because employees needed additional time to warm up after working in the freezers, and 15 percent was added to all other labor requirements to provide a standard time for performing various operations.

In order to get the complete cost for the five systems, the transportation charge between processing plant and wholesale warehouse is included. For this comparison, Miami, Florida was chosen as the origin point and

Washington, D.C. as the destination. Transport charges were \$2.28 per hundredweight and a load of 384 hundredweight (\$875.52). With the palletized system an extra 14.4 hundredweight was added to the load because of the weight of the pallets (80 lbs. x 18 pallets = 1,440 lbs.). If a charge is made for the extra weight of the pallets this would amount to \$32.83.

## RESULTS

Handstacked system: In this system, loading began when the forklift truck operator transported loaded pallets from the freezer to the loading dock. Three loaders working in the trailer transferred the frozen food cases from the loaded pallets to the trailer floor. A checker was used in all five systems to direct the loader in the freezer, count cases, tell the crew when to remove a partly full pallet, and to watch for damaged cases. The labor and equipment cost to load a full trailer was \$14.51.

Unloading began after the rear doors of the trailer were opened and the dock plate was positioned. Warehouse personnel or the truck driver secured a stack of pallets by hand and positioned them on the loading dock near the rear of the trailer. As a pallet was needed, the driver either hand-carried it into the trailer or used a pallet jack. Occasionally assisted by a helper, he then handstacked frozen food cases on the pallet. The driver obtained the pallet pattern and number of layers to stack on the pallet from warehouse personnel. When the pallet was loaded, an empty pallet was placed on top of it and loaded. When this second pallet was loaded, both were removed from the trailer with an electric pallet jack and set down on the loading dock. From the loading dock a warehouse employee transported the double-stacked pallets into storage with a forklift truck.

The total cost to stack the cases on pallets, remove them from the trailer, and transport to storage was \$21.58.

The cost of the handstacked system to load the trailer at the processing plant, unload at the wholesale warehouse plus transport charges totaled \$911.61.

Palletized: During loading a forklift truck operator transported loaded pallets directly from freezer storage to the trailer at the processing plant. A helper was available for any reorganizing of cases on the pallets. The loading crew included one forklift truck operator, a helper, and a checker.

In this system a pallet pool arrangement between the processor and wholesaler was assumed and costs were synthesized. Pallet costs were assumed to include \$10 ownership and \$15 maintenance expense for 60 trips, totaling \$25 per pallet. The per trip cost was \$0.42 per pallet or \$7.56 per trailer trip (\$0.42 x 18 pallets).

The wholesale warehouse returned full trailer loads of pallets to the processing plant. At a transport charge of \$4.12 per hundredweight and a total of 20,000 pounds (250 pallets at 80 pounds each), charges were \$824 or \$3.29 per pallet and \$59.22 for 18 pallets.

Loading costs to transport 1,600 cases of frozen food from freezer storage and load in the trailer amounted to \$5.47 for labor and equipment and \$7.56 for the pallets. Total cost was \$13.03.

During unloading, pallet loads that had not shifted during transit were easily moved from the trailer to the dock by one man with an electric pallet jack. Occasionally pallet loads that had fallen together in transit were

difficult to separate and caused some delay in unloading. Where cases fell off the pallet, they had to be repositioned before the pallet load was removed from the trailer. One full pallet at a time was unloaded from the trailer. If the pallet load was too high for the storage racks, a few layers of cases would be removed and placed on another pallet. From the dock a warehouse employee transported the loaded pallets into storage and positioned them in the correct location.

The total labor and equipment cost to remove the loaded pallets from the trailer and transport to storage was \$8.94.

The cost of the palletized system to load at the processing plant plus the pallet cost, unload at the wholesale warehouse, plus transport charges, and return 18 pallets totaled \$956.71.

Clamp-loaded system: During loading with this system a forklift truck operator obtained pallet loads of frozen food from the freezer and transported them to the loading dock near the trailer door. An operator using a forklift truck with a clamp attachment positioned the clamp around the unitized load, picked it up from the pallet, transported it into the trailer, and placed it on the floor. A checker assigned to each trailer verified the number of cases loaded. The crew included two forklift truck operators, one loader who straightened cases on the unitized loads, and one checker. Labor and equipment time and costs to transport 1,600 cases from the freezer and load in the trailer totaled \$7.83.

Shipments clamp-loaded at origin were unloaded by hand at the wholesale warehouse in the same manner as incoming handstacked loads. The labor and equipment costs were \$21.58.

The cost of the clamp-loaded system to load at the processing plant, unload at the wholesale warehouse, plus transportation charges totaled \$904.93.

Clamp-loaded and clamp-unloaded: The wholesale warehouses studied did not employ clamp-unloading. If the clamp-unloading had been done, labor and equipment costs could have been less than hand unloading. Since clamp-unloading and slipsheeted unloading times and costs are nearly similar, clamp-unloading costs would be approximately \$9.00 for labor and \$1.00 for equipment. Clamp-loaded costs at the processing plant were \$7.83 for labor and equipment, approximately \$10 for unloading at the wholesale warehouse, and \$875.52 for transportation, totaling \$893.35 for this system.

Very few receivers use forklift trucks with clamp attachments for unloading, but this method could reduce labor and equipment costs for the receiver and thereby reduce the total cost for handling and transporting frozen food and make this the lowest cost system.

Slipsheeted system: During loading with this system palletized loads were transported from the freezer storage to the loading dock by a forklift truck. At the dock a forklift truck with a clamp attachment removed the cases from the freezer pallet and transferred them to a slipsheet, which was positioned on the plate of another forklift truck with a pull-pack attachment. The forklift truck with the slipsheet attachment moved the unitized load into the trailer and pushed it onto the floor of the trailer. A helper assisted the operators in the trailer. The crew included two forklift truck operators, one helper, and checker.

The cost of 18 slipsheets at 40 cents each for a full trailer load was \$7.20, and the labor and equipment cost to transport 1,600 cases of frozen food from the freezer and load in the trailer was \$12.85 for a total cost of \$20.05.

The wholesale warehouses studied did not receive slipsheeted loads. The slipsheeted unloading data in this report were simulated from studies and reports where slipsheet unloading was employed.

In unloading, a forklift truck equipped to handle slipsheets was used. This modified truck moved the slipsheeted load out of the trailer onto the dock and placed it on a pallet, which was positioned by an employee. The loaded pallet was picked up by a conventional forklift truck and moved into storage.

The labor and equipment cost to unload a slipsheeted trailer load was \$9.89.

The cost of the slipsheeted system to load plus the slipsheets, unload, and the transport charges totaled \$905.46.

#### CONCLUSION

A look at the total costs for the five handling systems shows that the costs per trailer load ranged from \$893.35 for the clamp-loaded and clamp-unloaded system to \$956.71 for the palletized system, Table 1. An analysis of labor, equipment, and material costs of the five systems shows that the clamp-loaded and clamp-unloaded system had the lowest cost (\$17.83), followed by the palletized (\$21.97), clamp-loaded (\$29.41), slipsheeted (\$29.94), and hand-stacked (\$36.09) systems.

The palletized system had the lowest total labor cost (\$12.50), and if a charge for the extra 1,440 pounds of pallets that had to be shipped with the product is not made \$32.83 will not be added to the transportation charge. Also, \$59.22 was added to the transportation charge to reflect the charge for returning pallets to the processor. If there is no extra charge for the shipped pallets with the product and if a pallet pool arrangement is made where there is no charge for returning empty pallets, then the pallet system will be very competitive with the other systems (\$897.49).

An advantage of the clamp-loaded and clamp-unloaded system was that there was no additional cost or charge for a shipping platform. With this system the handling cost (\$7.83 for loading plus \$10 for unloading) added to the transportation charges (\$875.52) was \$893.35.

Table 1. Costs for Loading, Unloading and Transporting Frozen Foods by Five Systems

System	Loading	Unloading	Transportation	Total Cost
	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Handstacked	14.51	21.58	875.52	911.61
Palletized	13.03	8.94	934.74 <sup>1,2</sup>	956.71
Clamp-loaded	7.83	21.58	875.52	904.93
Clamp-loaded and clamp-unloaded	7.83	10.00	875.52	893.35
Slipsheeted	20.05	9.89	875.52	905.46

<sup>1</sup>If a charge is made for the extra weight of the shipped pallets (\$32.83), this amount should be added to the transportation charge.

<sup>2</sup>Includes \$59.22 for pallet return to the processor. If a pallet pool arrangement is made and no charge is made for returning empty pallets to the processor, this charge (\$59.22) can be subtracted from the \$934.74 and reduce the total cost for the palletized system to \$897.49.