A Study of Containers Used for Fresh Meat

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Examines the proliferation in container types and sizes currently in use for fresh shipment. Suggests an approach to develop appropriate container sizes to remedy the problem and improve pallet utilization.

INTRODUCTION

Traditionally, fresh beef has been shipped on steel hooks in carcass form. However, starting in 1965 and accelerating in 1967 and 1968, meat packinghouses and chainstores began breaking fresh beef into subprimal cuts at central plants. These cuts, were frequently vacuum packaged and then packed in wax-coated corrugated fiberboard containers. (1) This method of shipping fresh beef will likely increase in the future, because it offers probable savings in handling and transportation costs, as well as better protection to the meat (in the form of less contamination and shrinkage). It has been reported that within 3 to 5 years, 40 percent of all fresh beef will be shipped as primal cuts in palletized units. (2)

This trend toward shipping meat boxed, instead of in carcass form, may present several problems to distributors as well as receivers of fresh meat. A multitude of container types and sizes for fresh meat may result. Many of these containers may not be readily adaptable to current handling methods, with the result that container damage may increase.

The proliferation of container types and sizes is not new in the distribution and marketing of food products. The multiplicity of containers in use today has been pointed out through various studies conducted in dry groceries, packaged meats, and fruits and vegetables. For instance, a study conducted in a large, typical food chain warehouse indicated that about 1,200 sizes and shapes of shipping containers were used. As many as six sizes of shipping containers were used for the same size item. (3) In another study in a large food chain warehouse, it was found that for 168 packaged luncheon meats there were 124 case sizes. (4)

PROCEDURE

Since it appeared that the trend toward boxing fresh meat products for shipment would continue in the future, the USDA undertook a study in 1970 to obtain information on the type, size and variability of shipping containers used for fresh beef and pork, and to identify specific problem areas associated with packaging, handling, and distributing boxed fresh meat. Four retail chainstore distribution warehouses were studied at different geographic locations on the east coast. Data were collected by personal observation during the regular operating work week at each of the warehouses. Only those shipping containers on the floor at that time were studied for type, size (outside dimension), packaging materials, and container performance.

RESULTS AND DISCUSSION

Container Types, Sizes, Pieces Per Box, and Net Weights

All the shipping containers used for fresh beef and pork products were corrugated fiberboard. No fresh lamb products or cuts were found to be received in shipping containers. Eighty-nine percent of the corrugated fiberboard containers were either regular slotted containers (RSC) or overlapping slotted containers (OSC). The remaining container types were one- piece tuck-in (OPT), full telescope (FT), and part telescope (PT).

It was found that 69 sizes of containers were used for 42 beef and pork products. Of these, 38 sizes were used for 31 beef products and 32 sizes were used for 11 pork products. One common-size container was used for both beef and pork. The multiplicity of container sizes was more pronounced for a specific meat cut than it was for different meat cuts. Up to ten container sizes were used for the shipment of pork loins. A tabulation of the number of container sizes used for selected meat products is listed below:

Meat Product	Number of Container Sizes
Pork Loins	10
Spare ribs	7
Pork shoulder butts	6
Flank steaks	6
Boneless beef briskets	6
Beef sirloin tips	5
Beef ribs	5

Despite the apparent proliferation of container sizes for fresh meat, there was some evidence of uniformity. The tabulation below shows the container sizes most commonly observed in this study.

Container outside dimensions (in.) (Length, Width, and Height)	Number of Meat Products
21.9 x 17.0 x 9.2	7
22.4 x 15.3 x 11.1	6
22.3 x 14.0 x 9.4	4
17.2 x 11.3 x 9.0	5

These four container sizes were used solely for 31 fresh beef products. More than one-half of these beef products were shipped in the four container sizes shown.

The number of pieces of fresh beef and pork per containers varied from one to 18 pieces. In addition, there was little uniformity in the number of pieces of fresh meat packed in the various sizes of containers for a specific meat product. The weight of the contents also varied considerably. Many of the shipping containers of fresh beef and pork were packed fairly heavy. The average net weight of fresh meat packed in the shipping containers ranged from 15 pounds to 97 pounds. The net weight of the meat packed in almost one-half of the containers studied ranged from 50 to 97 pounds.

CONTAINER PERFORMANCE

Some of the shipping containers were allowed to overhang beyond the basic dimensions of the pallet size used in the warehouses, which caused the containers to lose much of their inherent strength and damage more easily. Generally, the containers used for pork products exibited more damage than the containers used for beef products. Damage to pork loin containers accounted for 33 percent of all container damage; damage to fresh ham containers, 19 percent; and damage to pork shoulders, 10 percent. The most prevalent type of container damage was crushing, which accounted for 72 percent of the damage; followed by broken containers, 8 percent; and bulged containers, 7 percent. Probable causes of container damage, as identified by observation, were: (1) Too much overhead weight, which caused the container to weaken; (2) improper packaging of the meat cut, which caused drippage from the fresh meat; (3) underpacking or overpacking of the contents; (4) mechanical damage from a forklift or handtruck; and (5) inadequate construction of the container.

STANDARDIZATION

Most of the shipping containers used for fresh beef and pork could not be handled efficiently on the 48 by 40 inch pallet size used in the warehouses. As shown in the following tabulation, only 19 percent of the 69 container sizes used had a maximum pallet surface utilization of 90 percent or more, with no allowable overhang. About 38 percent utilized less than 80 percent of the pallet surface.

Pallet Surface Utilization of Space (percent)	Distribution of Container Sizes (percent)
90.0 or more	18.8
89.9 – 85.0	20.3
84.9 – 80.0	23.2
79.9 – 75.0	13.0
74.9 or less	24.6

Poor utilization of space on the pallet surface for these containers was further complicated by the use of the many sizes of containers in the distribution system. There is a real need for container standardization, therefore, because of broadening distribution patterns, trends toward increased volumes of boxed meat, and the development of palletized handling methods.

As an approach to reducing the multiplicity of container sizes and utilizing the maximum pallet surface, eight potential container sizes were developed which could be substituted for the many sizes presently used. These eight container sizes were derived by: (1) Making a frequency distribution of the outside dimensions found in the study; (2) locating the general areas where most of the dimensions fell when they were plotted on a graph; and (3) concentrating on those dimensions which would provide for the maximum utilization of space on the surface of the 48 by 40 inch pallet, with no overhang. These dimensions then became the basic dimensions under which all dimensions found in the study were grouped. The grouping was made on the basis of plus or minus 1 inch of the basic dimension. The height of a container was not considered in this approach. The main concern was the container length and width, because these are the only container dimensions that affect pallet surface area. Five of the eight container sizes utilized 100 percent of the pallet surface (table 1). The eight container sizes developed could be substituted for more than one-half of the 69 container sizes in use, and could be used by 76 percent of the 42 fresh beef and pork products.

There are many approaches around which standardization can be attempted. The eight container sizes developed are suggested only as a means of getting an industry effort to curb or reduce the proliferation of shipping containers used for fresh meat.

Standardization of shipping containers could mean savings in handling and storage costs as well as reduced

TABLE 1
Potential Container Sizes for Fresh Beef and Pork Products
on 48 by 40 inch Pallets (no overhang)

Outside Dimensions Length : Width	Percentage of Pallet Surface Utilization	Containers per Layer	Meat Products
Inches	Percent	Number	
16.0 x 12.0	100	10	Pork tail, pork feet, pork shoulder butt, pork spare rib, beef kidney, hanging tenderloins, fresh ham, beef flank steak
17.2 x 11.4	92*	9	Beef liver, pork spare rib, beef short rib, boneless beef brisket, beef flank steak, beef kidney, beef skirt pieces, pork shoulder butt, pork ears
18.3 x 9.6	92*	10	Pork shoulder butt, pork spare rib, beef flank steak
20.0 x 12.0	100	8	Beef flank steak, beef tenderloin, beef top round, pork loin
20.0 x 16.0	100	6	Pork shoulder butt, beef strip loin, boneless beef brisket, beef round, fresh ham, beef sirloin tip, veal clod, veal kidney
22.0 x 16.0	92*	5	Beef round knuckles, beef flank steak, beef trimmings, beef strip loin, beef tenderloin, boneless beef brisket, beef rib, beef trimmed loin, beef round, beef arm cut chuck, beef blade chuck, beef plate
24.0 x 16.0	100	5	Beef sirloin tip, beef tenderloin
24.0 x 20.0	100	4	Beef chuck, beef tenderloin, beef arm and blade chuck, beef sirloin, beef loin, beef rib, beef round

* Figure rounded to the nearest whole percent

packaged material inventories, and should be of considerable help in order selection and delivery.

CONCLUSION

A multiplicity of container types and sizes are used to ship fresh beef and pork products. Much of the container damage observed appeared to be a result of the many sizes of containers which prevented the use of proper stacking methods. Most of the shipping containers could not be handled efficiently on the 48 by 40 inch pallet size used in the warehouses. Industry consideration should be given to reducing or curbing the proliferation of containers in use. Particular emphasis should be directed toward the development of standard container sizes that can make maximum use of the pallet surface and thus be more readily palletized.

REFERENCES

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