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high volume and an average volume supermarket will be developed. The steps followed in deriving the improved system will be described in a step-by-step fashion including identification of the important factors and their quantitative values utilized in the process. Careful attention will be given to clearly identifying those factors which are applicable only to a given store location as contrasted to those having national applicability. Examples of the former include: (a) labor rates, (b) local ordinances, (c) salvage market availability and pricing structure, and (d) prevailing waste disposal charges and fees.

## V. Convenience Stores

A separate study is being conducted by the University of Delaware to evaluate waste disposal problems of convenience stores, and will be completed next summer. This study will determine the types, volume and weight of solid waste accumulated, the systems used for disposal, and the costs and problems associated with waste handling for small retail food stores. Recommendations and guidelines for solid waste handling procedures in convenience type food stores will be developed. Consideration will be given to store size and systems that are economically efficient and ecologically sound.

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## CONSOLIDATED ORDERING AND DELIVERY SYSTEMS FOR SMALL RETAIL FOOD STORES

by  
Harold S. Ricker  
Agricultural Marketing Research Institute  
Beltsville, Maryland

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Provides a look at current practices used in supplying small stores and future work will result in proposals for alternative supply systems.

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The supply system for small retail food stores is presently characterized by numerous deliveries of low wholesale value, poorly coordinated merchandise receiving practices, and a large number of orders and invoices. The typical small convenience type store may have sales approximating \$4,000 per week and yet have more than 70 trucks making deliveries to it in the course of a week. Many of the delivery trips occur during the morning rush hour and contribute to suburban and urban traffic congestion.

Most of the deliveries made by these different suppliers are small in size and have a low wholesale value. Many have a

wholesale value of less than \$20 and for some product categories the delivery costs may represent between 25 and 35 percent of the wholesale dollar value. The wholesaler's distribution system is usually designed to achieve economies of size in assembling and delivering supermarket orders. The general line wholesaler will reluctantly serve the convenience store, but usually adds a service charge for handling the smaller higher cost order.

Receiving and handling of the merchandise at small stores appears to be poorly timed, creates confusion, encounters unnecessary delay, and invites pilferage. Many vendors arrive during a busy customer shopping period, congesting the parking lot, experiencing delay getting into the store and getting orders checked. Current order processing methods for some commodities appear to require an inflated lead time and excessive store personnel order time.

An improvement in procedures for servicing these small stores should result in substantial cost savings for the small independent food retailer, and will have important implications for stores in rural and urban locations.

Recognizing the general nature of the situation confronting convenience type food stores, a cooperative agreement was initiated with the Pennsylvania State University to estimate the feasibility and potential impact of consolidating the ordering and receiving functions for small food stores. Objectives of this study were: (1) to describe and evaluate the existing supply systems of representative small retail food stores in urban and rural locations, and (2) to propose alternative supply systems for serving convenience stores which appear to offer advantages over existing supply systems. Information is being analyzed from week long observations in ten small stores in an inner city in Pennsylvania, and ten small stores of the suburban convenience type. The information being obtained includes: (1) Number of weekly deliveries received; (2) wholesale value by major commodity groups; (3) elapsed time involved in receiving products at retail stores including an analysis of services performed by vendors — broken down by commodity groups; (4) average ordering, stocking, and time spent verifying and checking in merchandise by store personnel; (5) weight, cubic volume, and environmental requirements of deliveries; and (6) variation in number of deliveries by daily time periods.

With this information to describe the existing supply systems for small retail food stores the feasibility of consolidated ordering and delivery systems will be examined. Recognition will be given to the cost-benefits associated with vendor deliveries and estimates will be projected of the potential impact of consolidated delivery systems on vendors, retailers, and wholesalers. Possible alternative systems for reducing costs of supply for small stores will be presented.

The data collection for the twenty stores has been completed and is being analyzed. A preliminary analysis of the data for three of the larger convenience stores

has been completed and some of the highlights of this study are as follows:<sup>1</sup>

Data was collected and analyzed for three typical Pennsylvania convenience stores, each of which represents a different convenience store chain. The chains were selected to provide a description of the variations in supply methods being practiced in Pennsylvania, and were also representative of different sections of the state. The stores had a weekly sales volume adjusted to \$5,000 for comparability. The data collection procedure was similar to that described for the larger 20 store study. There were two types of convenience store suppliers. The first was the convenience store chains own supply source from the firms own distribution point and the second was the independent wholesaler.

The total number of suppliers for the stores ranged from 30 to 42. With the exception of one store's chain supplying 51.6 percent of its total weekly store volume, independent wholesalers delivered over half of the study stores' total weekly wholesale value of merchandise, total volume, and gross weight.

The total number of weekly deliveries ranged from 70 to 83. The number of deliveries in chain owned trucks ranged from 4 to 22 for the three stores.

Of the total deliveries for all the stores, 58 percent had an adjusted wholesale value of \$20 or less. Two-thirds of those were due to the delivery of bakery products.

The magnitude of the chain operated delivery system varied among the stores. Chain A supplied the entire portion of its milk, tobacco, candy, and almost all of its produce, deli and meat. Chain B supplied the entire portion of only one commodity—milk. Chain C supplied the entire portion of its milk and produce, over half of its bakery and ice cream, and less than half of its snack and cookies, grocery, deli and meat.

The 12 commodity groups were delivered separately with three exceptions. Store B received a bi-weekly consolidated delivery from a grocery wholesaler and Store C re-

ceived two consolidated deliveries from its chain supply system.

Bakery, beverage, grocery, and milk commodity groups together accounted for a range of 58.8 to 75.9 percent of the total weekly cubic volume received by all study stores, while the same commodities accounted for a range of 65.8 to 84.4 percent of total weekly gross weight received by all study stores.

The 12 different commodity groups received by the stores were grouped into four general commodity groups based upon similar transport characteristics. The first group included bakery, snack and cookies. The second group included beverage, grocery, tobacco and candy, and non-foods. The third group included produce, milk, deli and meat, and egg commodities. The fourth group included ice cream and frozen foods. These four commodity groups were derived from the relative similarity of their transport temperature recommendations and average density.

The proportion of total weekly deliveries received by the stores between 7 a.m. and 1 p.m. ranged from 62 to 81 percent. Deliveries made between 7 a.m. and 9 a.m. appeared most likely to experience and contribute to traffic congestion. Between 11 a.m. and 1 p.m. delivery personnel experienced delay time due to customer activity. Customer inconvenience was also caused by the delivery operation.

Store A and Store C's own delivery system made 8 and 26 percent of the total weekly deliveries, respectively, between the hours of 11 p.m. and 7 a.m. when the stores were closed. During this period delivery vehicles did not experience traffic congestion or customer activity.

All vendor suppliers spent a total of between 15.5 and 28 hours per week in the stores in connection with the total store delivery operation time. This represented between 33 and 47 percent of the total store delivery operation time, while store personnel accounted for the balance.

A description of the stores' information system included the order method and invoice handling procedures. Most store

orders were placed by driver-salesmen, store-door salesmen and chain drivers. All non-store personnel delivered their order forms to the source of supply, while most of the store personnel transmitted their orders through a telephone and messenger. Order lead time was as follows: driver-salesmen and chain drivers required no lead time, store-door salesmen required from one to five days, and store personnel required from one to seven days.

Invoice handling procedure required store personnel to check each invoice's wholesale price and extension, to extend each invoice's retail price and to transfer each invoice's total wholesale and retail figures onto a daily sales report. According to estimates given by each of the three store managers, time required to perform this work each week ranged from three to four and a half hours.

Two proposed alternative supply systems simulated the use of consolidated deliveries to determine their economic feasibility. Alternative one assumed the consolidation of commodities with similar transport characteristics and would require 11 weekly deliveries as compared to the existing system's 73 average weekly deliveries. Alternative two assumed the consolidated delivery of all commodities and would require only six weekly deliveries.

Comparison of alternative one and two with existing convenience store supply systems indicate that considerable savings in delivery cost may be attainable by changing the delivery system. The potential weekly delivery cost savings per store were slightly more than \$200.00 with either alternative (4% of total weekly sales).

Additional advantages of both alternatives would be as follows: fewer deliveries, less pilferage, less customer inconvenience, less traffic congestion, less driver delay time at the store, less store personnel hindrance, fewer invoices to process, and a less time-consuming ordering system.

Apparent disadvantages of both alternatives would be as follows: additional store labor would be required to perform

work done previously by driver-salesmen and store-door salesmen, the operator would have to absorb the cost of stale merchandise, and store personnel may not have the merchandising ability possessed by driver-salesmen or store-door salesmen. Existing work rules may require modification of some of the assumptions.

As indicated earlier, this study represents a small portion of the larger 20 store study. Data for the latter is presently being analyzed and it is planned that this study will be completed early next year. The preliminary analysis of the data has substantiated the desirability of proceeding with the next phase of the project.

The second phase of the project is designed to evaluate the cost-benefits of consolidated ordering and delivery system for small retail food stores. The plan calls for consolidating orders within specific commodity categories and where possible combine categories that are compatible in terms of environmental requirements in an effort to reduce the number of deliveries to a store. It is anticipated that the product categories may include bakery, snack items, dairy products, produce and selected grocery items. Detailed information will be

obtained on the conventional method of ordering, handling, delivery, receiving, price marking and shelf stocking for the specific categories of food items. The extent to which it will be possible to combine categories and consolidate orders will be determined in consultation with potential co-operators. It may only be possible to consolidate orders within one food category for a particular cooperating firm. For each consolidated delivery operation, the time involved, relative costs, problems and benefits will be determined and compared with the conventional delivery system.

Future research projects may involve further consolidation of deliveries and/or an evaluation of the potential use of containers for moving merchandise to the small retail food stores. Containers are presently being used to supply most of the food for some fast food and service restaurants in the Washington area. They are being delivered at night, reducing traffic congestion, delivery time, delays and customer congestion at the store, and have reduced the costs of supplying these establishments.

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<sup>1</sup>Hoffman, Linwood A. "A Description of Supply Systems Serving Pennsylvania Convenience Stores", an unpublished MS Thesis at the Pennsylvania State University, September 1972.

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