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# SOLID WASTE MANAGEMENT METHODS AND COSTS IN INDEPENDENT RETAIL FOOD STORES

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The authors provide an analysis of the types of solid wastes and their removal costs in independent retail food stores.

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## Introduction

In recent years, one of the main concerns of many has been the preservation of the environment in the United States. Yet, our disposable culture is in direct conflict with our desire to use and enjoy our land and its resources.

An increasing population and mass consumption have caused alarm throughout the country. Demand for irreplaceable resources and destruction of the environment, are the issues which have caused the emotional outcry from those concerned with our environmental heritage. However, emotional issues are seldom resolved by emotions alone. Ultimately, such issues are resolved by determining the aspects of the problem and the enterprise of concerned individuals. Waste disposal is one area which has received the attention of many individuals, although not much information has been gathered to indicate its magnitude. Many food stores have turned their efforts toward improving waste collection and storage procedures.

Waste is necessarily a part of the operation of food stores, since it would be impossible to imagine how produce would be kept fresh-looking without trimming or how meats would be cut without

scraps. Owners are constantly faced with the question of how to handle wastes.

For many years, food stores accumulated their wastes in open holding areas without any real regard for sanitation or odor. More recently, supermarkets and high-volume food stores have found that compactors, balers, and incinerators have lessened labor costs and made waste collection areas more acceptable to the public. Yet, small and independent food stores have not been able to afford these devices. Many of these small food stores are located in rural areas and provide service to an agrarian community. Although their volume of sales is not large or their store operations sophisticated, these stores are subject to some of the same ordinances which govern waste disposal procedures in the large metropolitan stores. Unfortunately, there is not much information available concerning the many nondescript stores which must handle and dispose of waste each day and what problems are encountered in complying with waste disposal ordinances.

Hence, this study is an effort to analyze the waste disposal problems of independent food stores.

## Objectives

The objectives were as follows:

1. To determine the types, volume and weight of waste in independent food stores.
2. To determine the methods of disposal for solid waste.
3. To determine the costs and problems associated with waste disposal.

### Procedures

The sample for the survey of waste removal in independent food stores was conducted during the fiscal year, July 1, 1972, to June 30, 1973, and consisted of 35 stores located in three counties of Delaware.

Cost and time were the major limitations in extending the sample beyond its size. Approximately one-third of the stores in the total sample were from each county.

The stores were each contacted by letter explaining the nature of the study. An interview was then conducted at each store to determine the store characteristics, waste categories, and costs associated with waste removal. The stores were grouped corresponding to weekly sales volume as follows: under \$1,150 per week; \$1,150 to \$3,800 per week; \$3,801 to \$7,700 per week; and over \$7,700 per week.<sup>1/</sup>

To determine the methods of removing waste from stores, questions were directed at ascertaining the step-by-step procedures used to move waste material from the moment it was no longer useful until it was ultimately destroyed or removed from the premises. The time involved in the removal process was also assessed from discussions of the removal methods and indications by store owners as to the normal time required to complete the

removal and disposal of waste. Waste materials were divided into categories which were most prevalent in the stores: paper, cardboard, metal, wood, meat scraps, and produce waste. Weight and volume measurements were made for each of the categories to determine the magnitude of waste present and the difficulty it represented to stores. Weights were determined by physically weighing as much waste as possible or was available in each waste category. Likewise, volume measurements were based on hand-crushed volumes of waste from each of the categories.

Waste plastic and glass were observed but never appeared in measurable quantities. Although plastic is widely used, it represents only a small portion of the weight and volume of daily store wastes. Hence, plastic was measured as part of paper waste. Glass waste was also present, but the shift to plastic containers for liquid products and the more extensive use of cans for sodas has reduced the amount of measurable glass waste. Hence, glass waste was measured as a negligible part of metal waste.

The costs of waste removal were divided into those items which would be directly attributed to a particular waste disposal system. The costs, other than labor, were determined during the interview. Stores were asked to give a breakdown of the costs of waste removal and an accounting picture of any equipment used as part of waste disposal.

### Analysis of Store Waste by Weight and Waste Category

A meaningful analysis can be made of the weight of the waste problem of food stores by considering the average pounds of waste per store per week, for the 35 stores. For the low sales group, an average of about 130 pounds of waste

had to be removed from each store per week, Table 1. For the medium sales group, about 475 pounds of waste had to be removed from each store per week; the medium-high sales group, 859 pounds; and the high sales group, 6,579 pounds per store.

It appears that small stores received many partially filled cartons which might be unnecessary. The weight of the cardboard combined with its bulkiness makes removal and disposal a constant problem. When cartons were unloaded, they often took up space in aisles and required a cart to carry the waste to the disposal area.

Paper waste was another major contributor to total weight of waste, much of it due to newspapers. The portion of paper weight to total store waste weight indicated that in the high sales group only a small percent of the weight is paper, but paper weight was almost a third of the total weight in all other store sizes.

The problem indicated here is that newspapers are the heaviest paper waste in the low, medium, and medium-high sales groups, but in many instances newspaper sales were not listed in sales characteristics, since return was so low. Most stores indicated that newspapers were a good customer draw.

Most of the accumulated wood waste was found in stores of the high sales group. A large portion of produce is sold to stores in wood packing crates. Cardboard produce crates are being used more than ever, and wood only represented 6.51 percent of total weight of store waste. Each of the smaller store groups had some wood waste, but it was based mainly on store organization and the infrequent delivery of produce in wooden crates.

Waste in the form of meat scraps was very dependent on store size and organization. Stores in the medium sales group were one of two types: (1) convenience stores with mostly deli-scrap, or (2) meat butchering stores which had large quantities of meat scraps. Again, it was the owner's preference that established the quantities and types of meat sold.

There were more stores in the medium sales group oriented toward meat operations. The weight of the meat scraps did influence the totals for waste somewhat. Meat scraps accounted for 135 pounds or 28.54 percent of the total weight of waste in that store size. In the medium-high sales group, 159 pounds or 18.55 percent of the total weight of the store waste was in meat scraps.

Metal is another waste which is largely found in the small stores. Most of the metal found in the high sales group was metal meat containers. The major portion of metal in all other stores was soda cans. The characteristics of stores in the low sales group made it more likely that food and beverages would be consumed on the premise than with stores in the other sales groups.

#### Cost Analysis

Costs which are associated with waste removal from food stores include vehicle costs, equipment costs other than vehicles, collection payments to private trash collectors, and municipal payments for trash collection by town.

Costs per week were \$31.57 for the low sales group with an average of \$5.26 per store (Table 2). The medium sales group had weekly costs of \$342.41, or an average of \$22.83 per store. The medium-high sales group incurred weekly costs

Table 1. Average Pounds of Waste per Week per Store by Waste Category and Store Size, for Independent Retail Food Stores, Delaware, 1972-73.

| Waste Category       | Weekly Sales Volume |                     |                     |                 |               |
|----------------------|---------------------|---------------------|---------------------|-----------------|---------------|
|                      | Under<br>\$1,150    | \$1,150-<br>\$3,800 | \$3,801-<br>\$7,700 | Over<br>\$7,700 | All<br>Stores |
|                      | -Pounds-            |                     |                     |                 |               |
| Paper                | 44.23               | 122.63              | 308.38              | 425.40          | 196.86        |
| Cardboard            | 79.91               | 195.12              | 365.97              | 2,788.80        | 520.61        |
| Metal                | 3.25                | 1.73                | 5.85                | 6.25            | 3.68          |
| Wood                 | 1.68                | 2.93                | 7.71                | 427.73          | 52.63         |
| Meat Scraps          | .33                 | 135.72              | 159.41              | 1,581.25        | 284.48        |
| Produce Waste        | 1.00                | 17.50               | 11.80               | 1,350.38        | 165.37        |
| Average Per<br>Store | 130.40              | 475.63              | 859.12              | 6,579.81        | 1,223.63      |

Source: Interview and calculations.

Table 2. Cost Analysis for Waste Management by Cost Category and Store Size per Week for Independent Retail Food Stores, Delaware, 1972-73.

| Cost Category                 | Weekly Sales Volume |                     |                     |                 |               |
|-------------------------------|---------------------|---------------------|---------------------|-----------------|---------------|
|                               | Under<br>\$1,150    | \$1,150-<br>\$3,800 | \$3,801-<br>\$7,700 | Over<br>\$7,700 | All<br>Stores |
|                               | -Dollars-           |                     |                     |                 |               |
| Labor Costs                   | 19.68               | 277.96              | 439.59              | 1,464.24        | 2,201.47      |
| Vehicle Costs                 |                     | .99                 |                     |                 | .99           |
| Equipment Costs<br>Collection |                     |                     |                     | 39.45           | 39.45         |
| Payments                      | 9.58                | 63.46               | 121.92              | 347.31          | 542.27        |
| Municipal<br>Payments         | 2.31                |                     |                     |                 | 2.31          |
| TOTAL                         | 31.57               | 342.41              | 561.51              | 1,851.00        | 2,786.49      |
| Average Cost<br>per Store     | 5.26                | 22.83               | 56.15               | 462.75          |               |

Source: Interview and calculations

of \$561.51 for an average of \$56.15 per store. The high sales group's weekly costs were \$1,851.00, averaging \$462.75 per store.

Labor was the single largest cost in removing waste. The low sales group was faced with labor costs of \$19.68 per week. The medium, medium-high, and

high sales groups labor costs were \$277.96, \$439.59, and \$1,464.24 per week, respectively.

The only vehicle costs associated with waste removal occurred in the medium sales group and was approximately a dollar a week.<sup>27</sup>

Under equipment costs, the only waste equipment found in the survey was a compactor used by a supermarket in the high sales group. The cost per week was calculated from the estimated operating time per week multiplied by the approximate kilowatt hour rating (13kwh). Also the compactor was valued at \$12,500 with five-year straight line depreciation. The operating cost per week is approximately \$40. The compactor also represented some savings in collection payments since payments were made on a flat-rate for picking up bulk waste containers, rather than labor involved in making more frequent smaller collections.

Collection payments for the low sales group were \$9.58 per week. The other sales groups had collection costs of \$63.46, \$121.92, and \$347.31, respectively, Table 2. The collection payment for rural stores in low and medium sales groups were not as large as might be expected because many of the rural stores burned rubbish--paper, cardboard, and wood waste. So if these stores are eventually forced by law to contract with collectors, the total average collection costs per week will increase.

Stores in the medium-high sales group were very discouraged by the high collection costs per month; most were \$40 or more and in some cases the service was unreliable. Service to many of the stores located south of New Castle County were by small companies who were effective as long as the owners

made collections. As soon as the owner expanded his operation and delegated his collections to employees, the service decreased in quality.

Municipal payments were made in only two stores. Both stores were very small and the accumulated trash did not exceed the town ordinances for trash quantities. The cost to both stores was \$2.31 per week.

#### Analysis of Labor Costs

Since the labor involved in removal of store waste is the largest cost, a breakdown of labor associated with the waste categories will lead to a better understanding of the high cost figures.

Labor for waste removal in low sales group stores is part of daily operations for the grocer or his employees. Measurements of the time required to remove wastes were made from the time the grocer had shelved the sellable products until final disposition of containers of waste.

Many stores maintained several small waste containers located throughout the store. The containers were emptied at least once a day and sometimes twice a day whether they needed it or not. Use of larger containers and centralization of waste receptacles will improve labor costs in many stores.

Newspapers required extra labor time, since double handling was necessary. First, left-over newspapers were stacked and carried to a central location. Then banner lines were cut and carried to a storage point. The storage point was often inside the store and papers had to be carried again to the waste collection point.

Cardboard, on the other hand, required less labor because orders come into the store only once or twice a week and all cardboard waste is handled on that same day.

A vivid picture of the weekly waste management labor functions can be obtained from the average weekly labor costs. The stores in the low sales group averaged labor costs of \$3.28 per week, Table 3. Stores in the medium, medium-high, and high sales groups averaged \$18.53, \$43.96, and \$366.06 in labor costs for waste removal, respectively.

The percent of labor costs that each store size expends for the removal of waste is a good indicator of the types of waste which demanded the attention of store operators. The low sales group stores as has been previously mentioned must deal with a lot of paper. Consequently, 53.65 percent of labor costs (Table 4), and the time associated with these costs, was spent emptying trash cans full of paper wrappers from on-premises consumption. Also newspapers were very labor demanding. Likewise, a high percent of labor costs (14.02 percent) were spent removing soda cans from the premises.

The medium sales group had 45.16 percent of its labor costs tied up in meat scraps. The reason for the significance of this figure is that butchers are high-paid trash collectors. In those stores who specifically employed personnel to cut meat, the time spent in removing meat scraps was very expensive.

The two largest percentages of total store waste management labor costs for the medium-high sales group were attributed to collection of paper and cardboard. Paper again, was a labor-demanding waste category, with 48.72

percent of store waste management labor costs involved with removing out-of-date newspapers and magazines, and emptying trash cans.

Handling cardboard accounted for 42.58 percent of store waste management labor costs because of the organization of many of the stores. They operated extended hours each day, volume of trade was important and several personnel were involved in stocking the shelves. Associated with these factors two other factors were influential in increasing the labor costs: (1) the wages paid were generally higher than the previous two sales groups, and (2) many partially-filled cartons were required to stock the shelves.

The high sales group required 48.57 percent of store waste management labor costs to remove cardboard. Another significant point, however, is the .12 percent of labor costs to remove metal wastes. In all other cases, the percent of labor costs is more than one percent of store labor costs per year. The main reason was deli and meat cans were handled by few people and went into one waste container. They seldom required more than one trip to the central collection point a day.

#### Relationship of Gross Sales to Waste Management Costs

The relationship between waste management labor and other cost categories as a percentage of gross sales per year, is shown in Table 5. Stores in the low sales group required .416 percent labor, .202 percent collection payments, and .049 percent municipal payments for a grand total of .667 percent of gross sales per year devoted to waste removal.

What is deceiving about this percentage is that some of the stores did

Table 3. Average Labor Cost for Waste Management per Week per Store Attributed to Selected Waste Category, by Store Size for Independent Retail Food Stores, Delaware, 1972-73.

| Waste Category    | Weekly Sales Volume |                     |                     |                 |
|-------------------|---------------------|---------------------|---------------------|-----------------|
|                   | Under<br>\$1,150    | \$1,150-<br>\$3,800 | \$3,801-<br>\$7,700 | Over<br>\$7,700 |
| - Dollars -       |                     |                     |                     |                 |
| Paper             | 1.76                | 4.41                | 21.41               | 109.73          |
| Cardboard         | .57                 | 4.14                | 18.72               | 177.80          |
| Metal             | .46                 | .42                 | .47                 | .42             |
| Wood              | .05                 | .16                 | .23                 | 16.16           |
| Meat Scraps       | .04                 | 8.37                | 2.27                | 34.49           |
| Produce Waste     | .40                 | 1.03                | .86                 | 27.46           |
| Average per Store | 3.28                | 18.53               | 43.96               | 366.06          |

Source: Interview and calculations.

Table 4. The Percent of Labor Costs for Waste Management Contributed by Each Waste Category to Total Store Labor by Store Size for Independent Retail Food Stores, Delaware, 1972-73.

| Waste Category | Weekly Sales Volume |                     |                     |                 |               |
|----------------|---------------------|---------------------|---------------------|-----------------|---------------|
|                | Under<br>\$1,150    | \$1,150-<br>\$3,800 | \$3,801-<br>\$7,700 | Over<br>\$7,700 | All<br>Stores |
| - Percent -    |                     |                     |                     |                 |               |
| Paper          | 53.65               | 23.81               | 48.72               | 29.98           | 33.15         |
| Cardboard      | 17.48               | 22.35               | 42.58               | 48.57           | 43.79         |
| Metal          | 14.02               | 2.24                | 1.06                | .12             | .70           |
| Wood           | 1.63                | .86                 | .52                 | 4.41            | 3.16          |
| Meat Scraps    | 1.07                | 45.16               | 5.17                | 9.42            | 13.01         |
| Produce Waste  | 12.15               | 5.58                | 1.95                | 7.50            | 6.19          |
| TOTAL          | 100.00              | 100.00              | 100.00              | 100.00          | 100.00        |

Source: Interview and calculations.



Table 5. The Percent of Total Gross Sales for Waste Management by Store Size Attributed to Cost Categories for Independent Retail Food Stores, Delaware, 1972-73.

| Item                | Weekly Sales Volume |                     |                     |                 |
|---------------------|---------------------|---------------------|---------------------|-----------------|
|                     | Under<br>\$1,150    | \$1,150-<br>\$3,800 | \$3,801-<br>\$7,700 | Over<br>\$7,700 |
|                     | - Percent -         |                     |                     |                 |
| Labor               | .416                | 1.195               | .848                | .659            |
| Vehicle Costs       |                     | .004                |                     |                 |
| Equipment Costs     |                     |                     |                     | .018            |
| Collection Payments | .202                | .273                | .235                | .156            |
| Municipal Payments  | .049                |                     |                     |                 |
| TOTAL               | .667                | 1.472               | 1.083               | .833            |

Source: Interview and calculations.

not appear financially solvent and reductions of the amount of gross sales devoted to waste removal can help to give some stores a better chance of survival. Enforcement of restrictions on burning laws or refusal of municipalities to collect store waste would increase the cost as a percentage of gross sales such that some of these stores might cease to operate.

The medium sales group required 1.195 percent of gross sales per year for labor, .004 percent for vehicle costs, and .273 percent per year for collection payments. The result was 1.472 percent of gross sales per year devoted to removing waste. Stores in the medium sales group for the most part were not very aggressive in terms of trade volume. Owner's organization and operational preferences, along with enforcement of laws prohibiting burning is going to have a serious effect on many stores, since the cost as a percentage of gross income will be increased. Consolidation of waste containers and not emptying them until necessary will reduce the percentage of gross income devoted to waste removal.

The next group of stores, the medium-high sales group, required a total of 1.083 percent of gross sales per year to remove waste. The convenience stores were not effective in terms of overall waste removal. However, the extended hours of operation, and the increased number of employees for different shifts were offset by slightly higher prices paid for goods. The medium-high sales group owners or managers were very aware of the costs of waste disposal and some had changed their operations to make waste removal more effective.

The high sales group was most effective in waste removal when viewed in terms of size of stores and number of employees. This sales group only expended .833 percent of gross sales per year on waste removal.

One of the most significant points was the compactor which required only .018 percent of gross sales per year to operate, yet was truly a time and labor saving method of waste disposal. Also, special collection rates help to decrease

percentage of gross income involved in waste removal.

### Recommendations

1. Consideration should be given to the feasibility of converting boxing of foods to plastic wrapped cases. Plastic cases can be adapted to wrapping and heating to bundle partial cases, allowing wholesalers to cut back on re-packing by hand and the costs of cardboard boxes.

2. In some stores, costs could be reduced by improved waste handling methods such as: (a) Stores where meat cutters are required to move wastes could realize some cost economy by hiring part or full time nonskilled help to move waste, since butchers receive higher wages, (b) Use of larger waste containers would reduce the total number of receptacles. These containers could then be placed in more strategic locations to reduce travel time when the containers are emptied, (c) Containers should only be emptied when full or just prior to collections, not each day. The last item must take into consideration sanitation requirements.

3. Determine if a better system for returning unsold newspapers and magazines can be established. Presently, banner lines are the only portion of newspapers required to receive returns for initial purchase. Stacks of unsold newspapers and magazines occupy space in many stores and require considerable time to remove.

### FOOTNOTES

1/ For simplicity of discussion, the following terminology will be used in lieu of dollar sales: low sales group--under \$1,150; medium sales group--\$1,150 to \$3,800; medium-high sales group--\$3,801 to \$7,700; high sales group--over \$7,700 gross sales per week. These sales categories were based on gross yearly sales volume, divided according to overall store characteristics and observed waste management practices. Chain stores were not included, as this study was designed to supplement a chain store study conducted by Dr. Harold Ricker, Agricultural Research Service, U.S. Department of Agriculture.

2/ The vehicle costs were incurred in the medium sales group. The owner had a pick-up truck which he took to the dump about every other week. The \$.99 costs consist of gas, oil, and servicing costs for a year to include parts, divided by 52 weeks. There was no depreciation accounted for because the vehicle was over fifteen years old. Likewise, there were no fees collected by the landfill because the owner limited his trips below the number set by ordinance.

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