3 SPECIAL REPORT 19 SEPTEMBER 1965

WARREHOUSE OPERATIONS IN THE FARM SUPPLY BUSINESS

FOSCHIA

Agricultural Extension Service, University of Minnesota
in cooperation with
U.S. Department of Agriculture, Federal Extension Service,
Division of Marketing and Utilization Sciences

AGRICULTURAL EXTENSION SERVICE, UNIVERSITY OF MINNESOTA SEPTEMBER 1965

WAREHOUSE OPERATIONS IN THE FARM SUPPLY BUSINESS.

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ACKNOWLEDGMENTS

Thanks are due Dr. Leon Garoian, Mr. Max Glass, Mr. Richard O'Connell, and Dr. Homer Preston who served on an advisory committee for this project. Their assistance in helping us formulate various ideas as well as their constructive criticism at various stages is gratefully acknowledged. The final responsibility for the material published herein rests with the author.

A special word of thanks is due Mr. Paul O. Mohn of the Federal Extension Service who represented the U. S. Department of Agriculture in developing and coordinating the agreement under which this work was done. His efforts in "smoothing the path" greatly implemented the conduct of the work.

This publication was prepared under the provisions of a cooperative agreement between the Agricultural Extension Service, University of Minnesota, and the Federal Extension Service, U. S. Department of Agriculture, Contract No. 12-05-300-54.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture. Luther J. Pickrel, Director of Agricultural Extension Service, University of Minnesota, St. Paul, Minnesota 55101.

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INTRODUCTION

The purpose of the analysis reported here was to appraise the operation of a representative wholesale farm supply warehouse to determine methods of increasing efficiency that would prove applicable to farm supply wholesalers in general. Both observational and survey procedures were employed, and time studies were used to determine labor efficiencies for the principal operations performed.

To assist in the selection of analytical procedures and to determine the most appropriate measures of productivity, reference was made to a number of the studies published by the U. S. Department of Agriculture relating to food wholesaling operations. A list of the examples of secondary data used in this study will be found in the bibliography.

The analysis is concerned with the general characteristics of farm supply wholesaling as well as the specific firm analyzed. Chapter 1 describes the operations of farm supply wholesalers, particularly such physical warehousing operations as unloading, receiving, and checking of incoming merchandise, movement to storage areas, order assembly, order checking, and the loading of outgoing orders. Attention is also given to types of merchandise handled by farm supply firms. Emphasis is on cost reduction efforts as a means of improving the competitive positions of farm supply wholesalers.

Chapter 2 is concerned with the warehouse operations of the firm under study. A brief history of "J & F Enterprises, Inc." is presented first. Then a detailed description of the company's warehouse operations as they existed prior to the study is made. Also included in chapter 2 is the formulation of the general plan of analysis. The purpose here is to give the reader an insight into the reasons for choosing the methods used and their adaptability to the farm supply industry.

Chapter 3 reviews and summarizes the time and cost analyses that have been made on the principal warehouse operations of receiving, order assembly, and loading of merchandise.

In chapter 4 an effort has been made to explain methods of increasing efficiency in the farm supply warehouse analyzed and their general applicability to other farm supply wholesalers.

Chapter 5 contains a number of operating guidelines for improving farm supply warehousing operations. These guidelines were the result of observations made of several leading farm supply firms and the data obtained from the firm under study.

Chapter 6 describes a method for initiating additional studies of farm supply distributive systems.

This report can be used as a starting point for initiating further studies of physical operations in the farm supply industry by extension personnel. The analysis also indicates that many methods used by the U. S. Department of Agriculture to improve efficiencies in food wholesaling firms can be applied to farm supply firms; therefore, the marketing research reports listed in the bibliography will be helpful.

The findings of this analysis will provide farm supply firms with an evaluation of warehouse operations and recommendations for achieving greater warehouse efficiences.

CHAPTER I

WAREHOUSING PROBLEMS OBSERVED IN FARM SUPPLY FIRMS

Wholesalers of all types of merchandise must achieve higher degrees of efficiency in the physical operations of their warehouses in order to improve their competitive positions. This need has long been recognized by the food wholesaling industry. Research efforts on the part of individual food wholesaling firms and by the U. S. Department of Agriculture in cooperation with these firms, have been specifically aimed at cost reductions. Studies include measurement of labor productivity, work quality, and effective plant and equipment use. U. S. Department of Agriculture research shows that warehouse labor cost, one of the largest single costs of the food wholesaler, can be reduced considerably through the use of more effective work methods and improved warehouse facilities.

A primary purpose of this particular case study was to determine if methodology employed by the researchers to lower operating expenses in food wholesale warehouses could be advantageously applied to the farm supply industry.

Although farm supply warehouses differ from food warehouses as to type of business, many aspects of warehouse operation and facilities are similar. Observations of several leading farm supply wholesaling firms show that their warehouses are similar in construction and layout to many food warehouses. They are constantly faced with the same basic day-to-day problems of receiving, storing, order selection, and shipping the merchandise in question. Many of the same techniques are employed in carrying out these functions. The greatest single difference, however, between the food and farm supply wholesaler is in the type of merchandise handled. Practically all items carried by food wholesalers are supplied in fairly uniform case cartons whereas the farm supply wholesaler, by the nature of his business, contends with merchandise of all shapes and size, much of it not supplied in standardized containers. Farm supply equipment such as shovels, pipes, buckets, wheelbarrows, watering tanks, and large tractor tires, to name a few, are examples. The many different types of merchandise tend to increase operational problems in all areas of the warehousing operation from the time the merchandise is received to the time it is delivered to the customers. This emphasizes the need for cost reduction efforts to improve the competitive position of farm supply wholesaling firms.

The Warehousing Function

A general description of the warehousing function follows: Customer orders for merchandise are usually taken by telephone. Many firms now use an improved telephone system (WATS) to speed the order-taking process.

The billing process has become more efficient in recent years with the introduction of computerized equipment specifically designed for this function. The invoice usually contains several copies. In most cases the invoice copies are used for posting accounts receivable, dispatching, file copies, and as the customer's receipt. One or more invoice copies, or reasonable facsimiles, are sent out to the warehouse and used for filling the order.

Various types of material handling equipment, such as forklift trucks and two-and four-wheel hand trucks, are used for filling the orders. The particular type of equipment used is determined by the merchandise ordered. Items such as large drums of lubricating oil or heavy appliances require forklift trucks whereas two-and four-wheel hand trucks are used for the smaller items.

Completed orders are usually placed in designated areas near the shipping dock where they may be checked for accuracy prior to loading on the delivery trucks. Some farm supply marketing firms may be large enough and have sufficient volume of business to warrant the use of two working crews, one for assembling ordered merchandise during the day and another for filling incomplete orders and loading the merchandise on delivery trucks at night. Merchandise from the firm's suppliers is usually received at odd times during the day. In many cases the trucks are unloaded by the drivers with the assistance of warehouse personnel.

The one-floor warehouse facility selected for this analysis was chosen primarily because of its similarity to numerous leading Midwest farm supply wholesale firms. Consequently, the basic findings should have general applicability to firms marketing farm supplies within this regional area. While both single and multi-floor supply warehouses are in use, this analysis has been limited to the single floor structure in view of its general operational advantages and the notable increase in construction and use of this type.

The management of the firm analyzed has requested that its name and exact location remain undisclosed.

CHAPTER II

DESCRIPTION OF J & F ENTERPRISES WAREHOUSING OPERATIONS

The J & F Enterprises warehouse was constructed in the 1950's. To get an approximate idea of warehouse space needed for this new facility, the company's buyers were asked to estimate maximum orders for their respective lines. Warehouse space was calculated on this basis plus 25 percent to allow for increased volume until 1962. But the company grew faster than the estimates, and one addition to the warehouse was constructed in 1959 and another shortly thereafter to handle heavier farm supply equipment. The most recent addition is an 8,000 square-foot shipping dock at the rear of the warehouse.

Material handling equipment in use includes 14 forklift trucks, 4 tow tractors, 100 four-wheel tow carts, and approximately 12 two-wheel hand trucks. This equipment is used interchangeably throughout the various "product locations" in the warehouse. These "product locations" consist of five distinct areas allocated to specific items and include the following product lines:

Area "A" -- Small line items (hardware, fanbelts, toys, etc.)

Area "B" -- Lubricating oils ranging in size from 1-quart to 55-gallon containers; anti-freeze ranging from 1-quart to 1-gallon containers.

Area "C" -- Tires, ranging in size from the smallest to largest tractor tires and automobile tires in all standard sizes, tire tubes, batteries for tractors and automobiles, battery acids.

Area "D" -- Greases and related items.

Area "E" -- Heavy farm supply equipment such as appliances, chemicals, shovels, pipes, wheelbarrows, and large water tanks.

The warehouse employs 53 people working two shifts. The day shift starts at 7:45 a.m. and ends at 4:15 p.m. The night shift begins work at 4:00 p.m. and ends at 12:30 a.m.

Approximately 38 employees work the day shift with the remaining 15 working the night shift. Most truck loading of assembled orders occurs during the night shift.

The standard size pallet used in the warehouse measures 36 by 48 inches. In addition, there are some 48 by 48 inch pallets used for palletizing 55-gallon oil drums, and 60 x 60 inch pallets for several specialized commodities.

The warehouse contains nine outside truck docks and eight enclosed docks, excluding the recently constructed dock used for storage of heavy farm supply merchandise. Two of the docks are used primarily for receiving merchandise. Approximately 90 percent of incoming merchandise is received by truck and the remainder by rail.

The company presently leases 45 tractors and 62 trailers. However, they are forming their own leasing organization and will shortly own their tractor-trailer trucks. The warehouse manager feels this method will be less expensive in the long-run than leasing the equipment outright. To operate the delivery trucks, the firm employs 60 full-time drivers and 35 part-time drivers; the part-timers average approximately one-half time. The truck fleet services about 700 accounts. Maximum delivery range extends to approximately 550 miles from the warehouse. The warehouse manager indicated that an average round-trip delivery of merchandise would cover 450 to 500 miles.

Recently, J & F Enterprises, Inc. merged with another corporation. All hardware and appliance lines were transferred to the J & F facility.

The order-taking function is performed in the office sales department by assistants who specialize in fertilizer, hardware and appliances, and petroleum. Incoming orders are either received by telephone or are handwritten and sent by mail. The company is converting the order-taking process to the new rapid dial telephone system whereby customers place all orders by phone after being called by the company at designated times. At the time of writing, approximately 50 percent of the rapid dial system was installed and has resulted in a marked decrease in time required for this function.

The company uses an IBM computer system. Incoming orders are key-punched to the system and a total of five order copies are made. These copies are sent out to the warehouse where the shipping clerk time-stamps and separates the copies according to the five "product locations" from which the merchandise will be selected. The assemblers actually use this copy to fill the orders. After the orders are completed, one of the order copies is sent to the traffic department for routing the delivery trucks.

At this point, a brief description of how each "product area" within the warehouse actually operates will serve to illustrate how the various types of merchandise are handled once the orders are received:

Area "A"

All orders are placed on a designated desk. After picking up an order, the assembler obtains a four-wheel hand truck. This is the only type of material handling equipment used in this area because all items handled can be carried by hand. If the order happens to be a small one containing one or two items the assembler will make the selection without a hand truck. Upon completion of an order, the assembler marks the merchandise with a load number corresponding to the order in which the items will be loaded in the delivery truck; the order copy is left with the merchandise. The loaded hand truck is then taken to a special designated area where two workers check the order for accuracy and repack any small, loose items. The loaded hand trucks are then wheeled to the shipping dock where the assembled orders are loaded into delivery trucks by the night shift.

Area "B"

Two assemblers using forklift trucks select all orders for this area. The orders are placed on a designated desk. After picking up an order, the assembler obtains his forklift truck and may or may not pick up a pallet, depending on the size of the order. All orders in this area, however, are ultimately palletized due to the heavy weight of the merchandise.

Upon completion of an order, the merchandise is returned to the desk where the assembler checks the number of items selected against the order. Each item is then stenciled with the name and location of the customer. The completed palletized orders are then taken to a special area near the shipping dock and placed on metal racks for loading by the night shift.

Area "C"

Two men fill all orders in this area and use a combination of tow trucks, four-wheel electric hand fork trucks, and four-wheel hand trucks. The type of material-handling equipment to be used for a particular selection run will be determined by the size and weight of the order. Orders are placed on a designated desk to be picked up by the assemblers. Upon completion of a selection run, the merchandise is returned to the desk where one man is in charge of checking the items for accuracy and placing stenciled labels containing the name and location of the customer on each item. The completed orders are then taken directly to the shipping dock for loading by the night shift.

Area "D"

This area will soon be combined with Area "B" due to the similarity of the merchandise in both areas. Orders for items in this area will be filled in the same manner as previously described for Area "B".

Area "E"

Orders are obtained at a designated desk and are filled by using a combination of forklift trucks, four-wheel hand trucks, and two-wheel hand trucks. Here again, the type of material-handling equipment to be used for a selection run depends on the size and weight of the order. Some larger items handled in this area are taken directly to the shipping dock, but most of the completed orders are returned to the desk where a worker checks them for accuracy, and then taken to the shipping dock for loading.

Warehouse Costs

In order to emphasize the importance of controlling costs arising from the warehouse operation, the actual 1963-64 warehouse revenue and expense statement for J & F Enterprises, Inc. is presented:

J & F Enterprises, Inc.
Warehouse Revenue and Expense Statement
September 1, 1963 to July 31, 1964

	Year to Date	Percent of Sales
Sales	$8,531,621	100.00%
Cost of goods	6,961,898	81.60
Gross margin	1,569,723	18.40
EXPENSES:		
Warehouse	$ 286,864	3.36
Property and occupancy	54,400	.64
General	122,362	1.43
TOTAL EXPENSE	$ 463,626	5.43
NET MARGIN	$1,106,097	12.97

As the statement indicates warehouse expenses represent a sizable portion of total costs--61.88 percent of total expenses in this particular company.

As in any analysis of this type, it is extremely important to gather pertinent information from persons directly concerned with the operational areas involved. In this particular case it was important to obtain the cooperation and confidence of the warehouse foreman, as the operational areas studied were his direct responsibility.

In analyzing the order selection procedure, time study techniques were used. By using this method, it was possible to obtain reasonably accurate figures of order selector productivity and, even more important, to pinpoint significant weaknesses within the order selection function. In order to make the time studies more meaningful, each "product area" was treated as a separate unit rather than time studying all areas as a whole. With this approach it was possible to compare the work methods and equipment used in each area.

Time studies were also made of the receiving operation. The primary purpose was to evaluate the work methods and determine how they could be improved.

Production records were installed and kept by the warehouse foreman. Since all nonmanagement aspects of the warehouse operation are his direct responsibility, the records were designed to determine time spent on each major function of his particular duties. Because the warehouse foreman's job involves a multitude of functions time study techniques could not be applied. Although the production records are not as detailed and accurate as elemental time studies, they do provide an adequate alternative method of time determination.

Production records were also installed and kept by the truck drivers on their delivery runs. These records, kept over a period of 1 month, provided data concerning efficiencies in delivering merchandise to customers located within the geographical areas served by J & F Enterprises, Inc.

The following are facsimilies of the data forms used in this study for keeping production records.

<table>
<tr><td colspan="3">WORK PERFORMED
WAREHOUSE MANAGER DATE ______</td></tr>
<tr><td rowspan="2">FUNCTIONS</td><td colspan="2">TIME</td></tr>
<tr><td>HOURS</td><td>MINUTES</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
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<tr><td>REMARKS:</td><td></td><td></td></tr>
</table>

UNIVERSITY OF MINNESOTA

DELIVERY COSTING STUDY

FIRST DAY'S DELIVERY

AREA OF DELIVERY ______________________ DATE __________

TIME LEFT WAREHOUSE ______________ ODOMETER READING __________

TIME ARRIVED AT PLACE OF STOPOVER ________ ODOMETER READING __________

STOP NO.	NO. PIECES DELIVERED	TIME OF ARRIVAL	TIME DEPARTED	NAME OF TOWN

UNIVERSITY OF MINNESOTA

DELIVERY COSTING STUDY

SECOND DAY'S DELIVERY

AREA OF DELIVERY ______________________ DATE __________

TIME LEFT PLACE OF STOPOVER ________ ODOMETER READING __________

TIME ARRIVED WAREHOUSE ______________ ODOMETER READING __________

STOP NO.	NO. PIECES DELIVERED	TIME OF ARRIVAL	TIME DEPARTED	NAME OF TOWN

CHAPTER III

PROBLEMS IDENTIFIED FROM THE ANALYSIS

Product Area Analysis

Time studies of the order selection procedures were analyzed for all areas except "D" to evaluate the efficiency of operations existing at the time of the study. A wide range in selector productivity between each "product area" was evident. Area "D" was not studied because demand for greases and related items at the time of the analysis did not warrant a full-time selection operation. In addition, management plans to combine the section with Area "B" (lubricating oils). Combining these two areas should not materially affect the findings of the study made of Area "B".

Time studies made in Area "A" indicated a productivity rate of 517 itmes selected per man hour--the highest rate in the four "product areas." This area, as stated earlier, handles small items of merchandise. Most of this merchandise such as toys, small hardware items, fan belts, etc., are selected from broken case lots. This means that the majority of orders received by Area "A" specify merchandise in less than case quantities. Consequently, an order assembler must select more individual items per selection run than in the other "product areas." This accounts for the extremely high productivity rate in this area.

Product area "A" has more operational problems and need for improvement than any other area in the warehouse. The productivity rate is misleading because most merchandise selected is broken case and small bin items. Under present operating conditions, the time studies have shown an excessive amount of total selection time consumed in searching for merchandise. The first two aisles in this area, which contain the smaller bin items, are especially inefficient in this regard. Aisle widths are extremely narrow (about 3 feet, 4 inches) and merchandise is stacked so high as to require the use of ladders to obtain approximately one-third of the items. The problem of excessive selection time is compounded because many items, mostly sporting goods, are stored in a mezzanine area. This area has a less-than-minimum ceiling height and requires most order assemblers to select merchandise in a stooped position. Studies of this area show an excessive amount of selection time, especially during the busy spring season when movement of these items is rapid. The studies also indicated a large amount of time spent to break open cases of merchandise and to select "bag items." Selection of the so-called "bag items" involves an order, for example, of one-half dozen nuts and bolts of a stated size. In selecting this merchandise the assembler is required to obtain a paper bag, travel to the bin containing the nuts and bolts, select and bag the items, seal the bag, and write the number of items selected on the bag. Many aspects of the material handling operations in "area A" are similar to those found in a retail store.

"Area B" showed the lowest rate, 119 items selected per man hour. This area handles lubricating oils only in standard size containers ranging from 24-quart cases to 55-gallon drums. Thus, individual product size and weight, as handled by the order assemblers in the farm supply industry, is one of the greatest determining factors affecting labor productivity. This factor alone will necessarily determine the types of material handling equipment to be used.

"Area B" appears to have a fairly smooth running selection operation. Several factors contribute to this. Most important, products handled in this area are grouped into uniform sizes and all products are palletized. The aisles are wide enough to allow all merchandise to be selected by forklift trucks. According to time studies made in this area, the most significant time-consuming elements of the order selection function consisted of bringing the selected merchandise back to the desk area where the customer's name and location are stenciled on each item by the assemblers and then placed in specially marked racks for loading by the night shift.

Area "C" had a productivity rate of 212 items selected per man hour. This area maintains one full-time worker who checks and labels all merchandise at the desk area. When merchandise accumulates in this area, it is wheeled to the loading dock by either the full-time checker or one of the order assemblers. Time studies have shown that a significant amount of time is spent searching for ordered items. Assemblers found it especially difficult to locate the larger tractor tires, because many of these were stored in areas not designated for them due to the lack of adequate storage space within Area "C". Personal observations indicated that one entire indoor truck well was used as one of the storage areas for these tires. Although space had to be allocated for this merchandise, a great deal of labor expense is incurred, not only in order selection time but also in the double handling of the merchandise when space becomes available for it within the designated area.

Area "E" showed a productivity rate of 154 items selected per man hour. This area has a problem similar to that found in area "A", namely product size. Many of the items such as snow fencing, pipes, brooms, shovels, pitchforks, etc., cannot be selected with forklift trucks and have to be handled with whatever equipment is suitable. The majority of selected merchandise is taken to the desk area where it is checked for accuracy and tagged by one full-time worker. An analysis of the time studies made in this area did indicate an excessive amount of time spent by the order assemblers at the desk area on the following elements: rearranging the merchandise on the pallet, tagging and taping some of the items together, and putting some of the items together--such as attaching nuts to pipe and repacking loose items. These seemingly insignificant duties take away a surprising amount of the order assembler's productive time. Area "E", however, does have the advantage of adequate aisle widths to allow the use of forklift trucks; also, there is more storage space here because of a larger amount of floor space and ceiling height than in any other product area.

Receiving Area Analysis

As stated earlier, about 90 percent of incoming merchandise is delivered to the warehouse by truck and the remaining 10 percent by rail. Time studies of unloading the incoming truck merchandise have shown several inefficient areas within this operation. Almost all merchandise is unloaded by the truck drivers with the assistance of one or two warehouse employees. In many cases, a truck load of merchandise will be mixed and destined for other firms as well as J & F Enterprises, Inc. In these instances the studies have indicated a significant amount of time spent sorting and rearranging the merchandise prior to unloading. Too much time is being consumed in palletizing merchandise for pickup by forklift trucks; this inefficiency is also compounded when productive time is unnecessarily wasted in waiting for the return of the forklift trucks before loading another pallet. As was previously observed in the order selection operation, the type of material handling equipment to be used for the receiving function is determined by size and weight of the merchandise. In many instances, the studies have shown time spent in deciding which equipment to use and, in some cases, of abandoning one type of equipment in favor of another.

The Small Order Problem

An analysis of the delivery operation by means of the installed driver records as well as the time studies of the order selection function has emphasized that one of the most important factors affecting warehouse productivity is the small order. Small orders result in selectors having to waste valuable time breaking cases of merchandise and they increase travel time. Order selector productivity will increase as order size increases, primarily because more time is devoted to selection of merchandise than in traveling. By the same token, small orders will also affect the efficiency of the delivery operation. The following data, obtained from the installed driver records, serve to indicate significant elements that comprise the delivery operation:

Average length of delivery run (round trip)	329 miles
Average number of items per truckload	335
Average number of delivery stops	10
Average number of items delivered per stop	32
Average time to unload per stop	20 minutes

The above data emphasizes the problem of small order sizes. The first two averages show that only a little over one item is delivered per truck mile driven (average number of items per truckload divided by average length of delivery run). The average order size over a period of 1 month's delivery was only 32 items. Just as order selector productivity increases as order size increases, so will driver productivity because more time will be devoted to the actual unloading of the merchandise than in travel time.

Analysis of Warehouse Foreman's Function

Production reocrds were installed and kept by the warehouse foreman for 29 working days. The following is a list of the functions he performed during this time and the percentage of time spent on each function.

Functions	Total Time (hours)	Percentage of Time Spent on Each Function
Control:		
Determine a.m. work load	9.00	3.56
Check order flow	94.42	37.38
Line up night crew	15.17	6.00
Inventory checks	8.17	3.23
Special project — order flow charts	2.83	1.12
Supervisor's meetings	4.00	1.58
Conferences with supervisor	10.33	4.09
Session on arrangement of grease	1.50	.56
Noncontrol:		
Miscellaneous office and paper work	19.42	7.69
Location shifting	21.83	8.64
*Trade show	33.08	13.10
Check errors	9.83	3.89
Talk with survey engineer	4.00	1.58
Check receipt handling	3.67	1.45
Check claims	3.25	1.29
Check order filling accuracy	3.25	1.29
Assist shipping clerk	2.08	.82
Lube plant	.75	.30
Check on shortages	1.00	.40
Check on scale and post meter purchases	.75	.30
Follow up on handling of factory orders	.50	.20
Check on frozen rail switches	.75	.30
Check handling of PP orders	1.00	.40
Read literature	.33	.13
Talk with supervisor	1.67	.70

* The percentage of time indicated as "trade show" (13.10 percent) was necessarily spent in getting merchandise ready for the annual trade show which occurred during the course of this analysis. This time would ordinarily be spent in one or more of the "control" functions.

Activities relating to his primary supervisory functions are listed under "control" while minor activities are under "noncontrol."

An excessive amount of the foreman's time (over 29 percent) was spent on noncontrol functions; this does not include time spent on the trade show. The foreman should be charged with the responsibility of maintaining overall control of the flow of merchandise through the warehouse. In a large operation such as J & F Enterprises that has experienced a rapid period of expansion it is not difficult to understand why these noncontrol duties increasingly interfere with the foreman's major responsibility. This is not to say, of course, that the noncontrol functions should be eliminated; rather, an assistant foreman should be hired to perform these duties. Subsequent to this study, an additional man was hired.

CHAPTER IV

RECOMMENDATIONS RELATING TO IDENTIFIED PROBLEMS

Improving Order Selection Operations

An analysis of the time studies in "area A" in fall 1964 indicated that efficiency could be increased by using improved work methods and plant equipment. Several changes were made within the area after the study. Some aisles were widened to allow passage of the order selector's 4-wheel handtruck. This greatly reduced the travel and selection time previously required by the selector to park his truck in the main aisle, walk down the narrower aisles to the point of selection and return to his truck with the selected merchandise. Merchandise location numbers were attached to the racks; also, since this particular company uses IBM equipment for invoicing, an effort was made to place the commodity code numbers of the merchandise in specific sequences on the IBM order copies used by the selectors. This combination of the location numbers on the racks and the sequential commodity code numbers on the order copies made the location and selection of ordered merchandise easier and more efficient. More merchandise was placed within reach of the order selectors. Although this has not yet been done in all areas, it has largely eliminated use of ladders which previously increased order selection time and created aisle blockages. A second time study of "area A" conducted in spring 1965 showed an average order selection productivity increase of 23 items per man hour--a substantial 5 percent.

The mezzanine section in "area A," where the sporting goods merchandise is stored, has a less-than-minimum ceiling height and requires most order selectors to travel through this section in a stooped position. Nothing can be done about this situation unless the ceiling is raised which is impractical. Initial time studies indicated that more selection time was consumed in this section than any other area of the warehouse because merchandise was stored without regard to any particular order. However, after the period of heavy spring demand, an all-out effort was made to assemble all merchandise in this section in commodity groupings and place it in bins or on specially constructed racks. Commodity location numbers were also placed on all line items with the result that this section has developed into a highly efficient operation in spite of the low ceiling height.

Time study observations of "area C" indicated excessive time consumed in searching for merchandise. Part of this problem is the large variety of tires and sizes within each type which this section handles. Placing location numbers and commodity descriptions for each item on the storage racks would greatly ease this problem. It was also observed that sometimes order selectors would assist the full-time checkers in labeling selected merchandise and taking loaded trucks to the shipping dock. Under these circumstances it is obvious that order selector productivity will be reduced considerably. The checker should have the responsibility of checking and labeling all selected merchandise and keeping the desk area clear of loaded trucks.

Time study observations made in "area E" also indicated a significant amount of the order selector's productive time was spent in assisting the full-time checker. The problem is compounded in this area because of the variety and sizes of the merchandise handled which, in many cases, requires rearrangement on the pallets, repacking loose items, etc. Again, the ideal solution here would be to leave whatever has to be done to the worker in charge of checking the orders for accuracy.

Improving Small Order Handling

One of the most important factors affecting warehouse productivity, particularly in "area A," is the small order. Small orders result in selectors having to waste valuable time breaking cases, and they increase travel time. Order selector productivity will increase as order size increases, primarily because more time is devoted to selection than traveling.

Solutions to the problem of small order sizes, as in any wholesale operation of this type, are not easy to come by. Many customers served by J & F Enterprises have limited physical facilities (small service stations, hardware stores, etc.). These customers simply do not have the space to carry larger inventories. Thus, the responsibility of frequent deliveries of small orders falls on the wholesaler.

Nevertheless, some improvement can be made. Minimum order sizes can be placed on some of the items handled by "area A". Merchandise such as small boxes of nuts and bolts should not be broken to obtain a half-dozen or a dozen pieces. As mentioned earlier, these orders require the order selector to repack the items and consume a great deal of their productive time. Other small hardware items, such as fanbelts, could also fall into this category and an effort should be made to place minimum size orders on them.

Part of the inefficiencies involved in selecting broken case merchandise in "area A" can be traced back through the distribution system to the point of manufacture; the basic problem is one of packaging the merchandise. Many smaller items are packaged loose in case cartons or crates. When the wholesale firm receives the merchandise in this form it requires breaking the cases in order to store the items in open bins and repacking when orders for this merchandise are filled. Manufacturers should try to understand the physical handling problems involved once their merchandise reaches the wholesale outlets; wholesaling firms should also get together with their suppliers to explain these problems and seek solutions based on the needs of their customers.

"Area B," which handles all lubricating oils and greases, could very well be cited as the "model" operation; it also illustrates the significant effects of product size on operational efficiency. Because of standard product sizes all merchandise in this area can be palletized. The aisles are wide enough to allow all merchandise to be selected by forklift trucks. Two men can adequately fill all orders in this area, and no cases of merchandise are broken. According to time studies in this area, the most significant time-consuming elements consisted of returning the selected merchandise to the desk area and stenciling the customer's name and location on each item. Significant increases in selector productivity could be realized if, during days of more than normal orders, a worker could be transferred from another area to handle this function.

Improving Receiving and Loading Operations

Time studies of the receiving operation showed that efficiency is considerably reduced by having one or two warehouse personnel assist the truck driver unload the incoming merchandise. Assisting the driver in unloading merchandise that can be handled alone reduces efficiency and provides a costly service that is not usually required by the warehouse. A large amount of productive time was also being consumed in waiting for the return of the forklift truck before loading another pallet. This problem can be solved by providing the driver with an adequate supply of pallets for a particular load and having the forklift operator request that another pallet be loaded while the merchandise is being placed in the storage area. Adequate holding areas at the truck and rail docks to serve as a temporary storage area would prevent storing the merchandise in the aisles and creating problems for the order selectors.

The same material handling principles can be applied to the loading operation. To achieve maximum efficiency, only one man should be used to load a delivery truck where the merchandise can be handled by one man. As in the receiving operation, adequate surge areas should be provided at the shipping dock to allow storage of the selected merchandise prior to loading the delivery trucks.

CHAPTER V

WAREHOUSING PRINCIPLES AND GUIDELINES FOR FARM SUPPLY FIRMS

Identifying the Problems

As noted earlier in the study, there was a noticeable lack of adequate initial facilities planning prior to the construction of the new warehouse, and the company still lacks sufficient warehouse space. This lack of planning is not limited to the farm supply industry; many examples can be cited in the food wholesaling industry as well. Firms operating under these circumstances cannot hope to achieve minimum warehousing costs regardless of efforts directed toward cost reductions. There are no simple solutions to this problem. Each firm has its own particular marketing environment in which it must operate and therefore must plan its facilities accordingly. Nevertheless, observations of firms in the farm supply and food wholesaling industries have shown that some of the methods presently used in facilities planning can be improved upon.

In firms that do not have a facilities planning department or personnel within the organization capable of performing this function, a joint effort on the part of the company's management directly responsible for the warehousing operation and a reputable outside consulting firm is in order. In this case, it is extremely important for the consulting firm to become thoroughly acquainted with the firm's business. A thorough understanding of the firm's marketing operation is necessary before any specific recommendations on plant layout are made. By the same token, it is the responsibility of the marketing firm to indicate present and future facility needs in light of its total marketing operation. In other words, the company must make known its present and future objectives and what part their plant facilities will play in the attainment of these objectives in order for the consulting firm to perform an adequate job. This is not to say that a pat solution will be found in this joint effort. Changes in the marketing of farm supplies are bound to occur; these changes will affect the firm's facilities needs as well as many other areas of the total marketing operation. However, firms who place more effort on facilities planning will reap cost advantages over the long run.

Developing and Using Records

Along with management's apparent need for improved facilities planning is the noticeable lack of adequate use of records and forms to effectively measure operating efficiencies within the warehouse. In the company under study, it was recommended that it would be advantageous to measure the performance of individual warehousemen, particularly the productivity of each order selector in "area A." In order to accomplish this, it was suggested that a timeclock be installed at the desk area where the selectors obtain the orders. With this system, the order selector stamps the top page of the order on the timeclock before starting the order, and again when the order is completely filled; also, the selector places his initials or clock number on the order. This system allows computation of elapsed time and an accumulation of daily summaries for each order selector. This information is then posted to a daily production worksheet which is used to compute production in items selected per man hour; the daily production is then posted on a weekly summary sheet. The weekly summary sheet provides a record showing the influence of workload on order selector productivity and furnishes information necessary for action to achieve a more balanced workload. It is also possible for the personnel responsible for checking the merchandise to keep data on the number of selection errors. Since some mistakes in order selection are inevitable, keeping a record of the mistakes by the checkers is a good means of holding errors down to an acceptable level and maintaining the quality of an order selection operation.

Plant Layout Considerations

On the basis of observations of a number of leading farm supply warehouses and the findings of this particular analysis warehouse operating guides which may prove useful to farm supply wholesalers in reducing costs associated with the warehousing function were developed. Although farm supply warehouses will vary greatly as to location, size, and marketing environments, the suggestions can be adapted and used as a set of warehousing principles for a particular operation.

In planning a new warehouse facility, regardless of size, careful attention should be given to the layout to guard against any restriction on proposed work methods. After the decision is reached on the final layout, the building itself should be designed around it. One of the major considerations given to an efficient layout should be based on facilitating the flow of merchandise through the warehouse. Placing the faster moving items in locations which minimize the travel time involved in receiving and shipping is a necessary requirement. In large warehouses which handle a multitude of farm supply and related merchandise, a greater degree of operating efficiency can be achieved if, as in the company under analysis, the merchandise is separated into related product lines and sizes and stored within designated areas. To achieve this, it is necessary for each area to have a specific set of work methods, material handling equipment, and layout which will determine the type of merchandise handled.

An efficient warehouse layout will provide adequate aisle widths to allow passage of all material handling equipment used. Aisles 10 feet wide will be necessary for use of counterbalanced forklift trucks; 7 foot aisle widths are in order for the straddle or reach-type forklift trucks. No warehouse can hope to achieve a high degree of merchandise flow and efficient use of plant equipment without this provision.

Providing adequate ceiling heights is an extremely important part of facilities planning. The ceiling height in any warehouse will be determined by the number of loaded pallets that can be stacked without causing damage to the merchandise. In farm supply warehouses this will differ considerably due to the variance in product sizes. The ceiling in the main section of the warehouse of the company under study has a clear stacking height of 20 feet; this seemed to work well for most of the merchandise handled. The newest addition to the warehouse which handles the heavier farm supply equipment has a clear stacking height of approximately 26 feet; such items as appliances and building materials can be stacked higher in this section without causing damage. Consideration should also be given to providing the proper material handling equipment. Forklift trucks should be able to reach the last pallet load in a stack in order to avoid double handling of the merchandise.

As pointed out earlier,serious consideration should be also given to expansion. The design should provide for future building additions that will not materially affect the efficiency of the initial layout.

Increasing Worker Productivity

The order selection operation is one of the most important functions performed in any warehouse. Observations of this function in farm supply marketing firms, food marketing firms, and the company in this study indicate several suggestions that could be used by farm supply wholesalers to increase efficiencies in this operation.

Order selectors should be given the responsibility of assembling customer orders and nothing else. In too many cases, order selector productive time is drastically reduced by allowing them to perform other duties such as assisting in loading and unloading merchandise, helping checkers in checking assembled orders, and tagging or marking the individual items.

When order selectors report for work, a backlog of orders should be waiting for them so that order assembly starts immediately. The orders should be routed for delivery to allow them to be loaded in the proper sequence after the orders are assembled and checked for accuracy; to maintain this system, order selectors should not be allowed to sort through a stack of routed orders and assemble whatever they choose.

An adequate supply of handtrucks should be located near the start of the selector runs. It was noted in "area A" of J & F Enterprises, Inc. that, in many instances, order selectors had to travel two or three areas removed from "area A" to obtain an empty handtruck.

All aisles should be wide enough to allow the order selectors to have their trucks with them at each point of selection. As noted earlier, too much time was being consumed in traveling down narrow aisles.

Merchandise should be within reach of the order selectors. Requiring the use of ladders or any other means to obtain overhead items consumes a great deal of the order selector's time.

Limits should be placed on the number of broken case items that require repacking by the order selectors and these limits should be strictly adhered to. Companies that allow the handling of too many small broken case items cannot hope to achieve maximum order selection productivity.

An excessive amount of time is unnecessarily consumed by order selectors in locating merchandise and backtracking to select items that should have been obtained initially. To trust the selection of merchandise to the order selector's memory is a poor system at best. To achieve a more orderly selection system, location numbers for each line item can be placed on the storage racks which coincide with the numbers of the items on the order used by the selectors; the items can be listed in the same sequence as they occur along the order selector's travel route. In order for this system to work effectively and avoid possible confusion, the sequential numbering system would have to be properly maintained when merchandise is relocated or no longer carried by the warehouse.

Production records should be kept on a periodic basis for each order selector. This can be accomplished by having each order selector keep a separate tally sheet on which he records his name, order number, time at the beginning and end of each selection run, and the time for any unusual circumstances encountered during each run. A simpler method would be to install a time clock to enable the selectors to stamp the beginning and ending times of each selection run directly on the order as was suggested in the previous chapter for J & F Enterprises.

Periodic records should also be kept of the error rate for each order selector so that corrective action might be taken. This is easily accomplished by having the checkers record the name and number of errors on a tally sheet for each selector.

As a final note, any changes by management in the existing facility for the purpose of increasing warehouse efficiency should be made clear to the employees whose work methods will be affected. Each employee should know exactly what the company expects of him as a result of any change. To go a step further, management should hold training sessions with the employees especially if major changes are contemplated. After the changes are made it would probably be well worth additional followup time to see how employee efficiency was affected by the new conditions.

CHAPTER VI

METHODS OF INITIATING FARM SUPPLY DISTRIBUTION STUDIES

Storage and transportation costs constitute a substantial portion of the total marketing costs for farm supply firms, and such costs have risen appreciably since World War II. Management, in an effort to control these costs, has found it imperative to devote more attention to the various alternatives available for the physical distribution. Obviously, warehousing costs and transportation costs must be balanced to determine the lowest cost combination. Previous U. S. Department of Agriculture studies of food wholesaling firms indicate that there are many savings to be made in general inventory control and in order handling costs --areas of control that have been largely neglected in the past. These potential savings must be brought to the attention of farm supply marketing firms if they are not now aware of them.

In addition to these cost considerations, many new developments in data processing equipment and materials handling equipment have taken place. Properly used, computers can improve efficiency and provide greater control over operations. However, to achieve these advantages may necessitate a revision of the traditional organizational structure to allow close coordination of all phases of the physical distribution system. So it stands to reason that a continued emphasis on cost reduction efforts and the proper planning and coordination of the physical distribution process cannot be stressed too strongly as a means of improving the competitive positions of farm supply firms. If proper planning and coordination are obtained, not only will efficiencies be realized but the customer will ultimately receive better service. And this is the primary objective, or it should be the primary objective of the entire marketing operation.

One of the greatest single costs of farm supply marketing firms, as well as most other multiproduct wholesaling firms is warehouse labor. One would be hard pressed to find a company that is not presently feeling the pinch of rising labor costs. The modern emphasis on physical distribution has, in fact, been brought about by management's need to reduce costs and improve customer service.

For those interested in furthering the work begun by this study, a number of suggestions follow which may prove useful in working with farm supply firms and initiating analysis of this type.

First, the analyst must become thoroughly acquainted with the firm or firms that he intends to work with. This means knowledge of the firm's operation in detail. Discussions with key executives in charge of the firm's various departments will usually accomplish this. The use of questionnaires (structured or unstructured) may facilitate these discussions.

A guided tour of the firm's facilities will give the analyst a general picture of the organizational structure in operation. Another tour may be in order to get a more detailed picture of a specific area that the analyst is interested in. If, for example, he is contemplating an analysis of the effect of order size on order selector productivity, he will want to contact the warehouse manager, arrange a tour through the warehouse with him, and explain the purpose of the analysis.

During the time the person is working with a particular firm, it is always good policy to cultivate the personal friendship of all the personnel he will come in contact with--from key management executives to the forklift truck operators in the warehouse. He will want to create the impression in his every action that he has the welfare of the industry and the company at heart, rather than his own personal advancement.

After the study is complete, he will want to show operating personnel how his recommendations make their job easier and, therefore, more efficient. He should not be afraid to stand on the facts gathered in his analysis but he should be the first to recognize any deficiencies or limitations.

During discussions of the recommendations he should make every effort to emphasize the major issues and avoid debates on techniques employed and minor points.

The final and most satisfying point to be made is the review of the progress made by applying the findings. If improvements in the firm's operation are evident, he will have the pleasant task of letting everyone know about them.

A great deal of the research performed by the U. S. Department of Agriculture has been very useful in the formulation of this analysis; this same research should be very useful to anyone contemplating other studies of this type. Analysis of the operation of numerous food wholesaling warehouses by the U. S. Department of Agriculture have shown that distribution costs can be reduced considerably through the use of more effective work methods and improved warehouse facilities. This publication has shown that the U. S. Department of Agriculture research can be successfully applied to many areas of the farm supply industry due to the similarities found in the warehousing operation; similarities in other areas of the total marketing operation are bound to become apparent. In view of this, it would be well worth the time to review the U. S. Department of Agriculture publications prior to initiating an analysis of any facet of farm supply distributive systems.

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