Designing Basic Warehouse Movement to Mechanize Slow Movers

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Our purpose is to present an analysis of a prototype warehouse movement from which one may better judge the problems of mechanized warehouse design. Table 1 has been developed from an actual movement in an average-size supermarket. The data have been projected to simulate a dry grocery warehouse movement servicing 100 average supermarkets. Tables 2, 3 and 4 are derived from data developed in Table 1.

Table 1 analyzes a 7500 item warehouse assortment in which each item is placed in one of 10 categories based on its average rate of sale in a $30,000 - $40,000 supermarket (Item 2). From this, the percentage of sales in each of the 10 categories was applied to the 7500 items of the assortment to obtain the movement by rate classes (Item 1) and then the average movement per day of items in each category in the average supermarket (Item 3).

The movement volume per store is converted to that of 100 average supermarkets (Item 4) to provide the warehouse volume of 100 average-size supermarkets. Item 4 indicates that the total daily movement of such a warehouse is about 80,000 cases. Item 7 shows an arbitrary decision to deliver Classes 1, 2 and 3 daily; Classes 4 and 5 for four days; and, Classes 6 and 7, three days weekly, while Classes 8, 9 and 10 are delivered one day per week only.

In Table 2, items of Classes, 8, 9 and 10 are distributed so as to balance out the workload each day to minimize the daily volume variation yet achieve the total volume of 475,000 cases moved weekly. Such a warehouse volume is relatively large and would justify a sophisticated automated handling system such as you will see at the New England Grocer Supply Automated Warehouse on the Tuesday tour. However, this large warehouse is an exception among wholesale grocery warehouses.

Table 1 also shows the volume movement by the 10 rate of movement classes for warehouses between $25 and $150 million annual volume. These data are further developed in Tables 2, 3 and 4 to equalize the average rate of movement by days of the week for use in selecting mechanized and automated handling systems. In Table 2, the average out-of-warehouse movement of about 14,000 cases per hour of the $150 million volume warehouse certainly justifies full automation. In Table 3, the average movement rate of 4500 cases hourly appears to justify mechanization but no more than partial automation. Table 4 depicts the volume which is too low for full mechanization or any automation but is large enough to justify the electronic, console-type sorting of items which allows picking in batches of about 10 stores at a time and then sorting into truck-bay destinations mechanically.

The latter type of mechanical system might be added in many existing conventional warehouses for volumes from 1000 to 2000 cases per hour average movement.

The upper level of capacity of console-unit operators is about 2000 pieces per hour. Beyond 2000 pieces per hour, either a second similar unit, or an automated unit fed by a moving belt-type continuous input to sorter is needed. The latter type might be adapted to existing warehouses in many instances. Whereas a simple 10-unit sorter might be installed for $50,000 to $100,000, when automated it might cost from $250,000 to $400,000.

The problem is how to increase the productivity of small warehouses without losing the competitive advantages of a reasonably large assortment.

The NARGUS Syndrome

In 1965, the National Association of Retail Grocers of the United States (NARGUS) recommended to manufacturers the reduction of SKU-counts of numerous items in 10 basic product categories in order to decrease marketplace investment in slow moving items by about 50 percent. Thusfar, but little has been accomplished in this direction.

Recently, California fruit and vegetable canners were asked to consider the cooperative operation of regional distribution centers of the industry so that they could get maximum benefit of low-cost, unit-train transportation during the packing season and low-cost consolidated-delivery to wholesalers in the market areas later. They would use the "bright-can" technique developed by the Green Giant Company, whereby they could ship unlabeled, uncased products in bulk to distribution centers and ship to wholesalers as orders are received, after labeling and casing pertinent products. However, use of the "bright-can" technique would have to be demanded by marketplace distributors.

The combination of the two methods could solve the NARGUS Syndrome. Green Giant having already perfected the clear plastic overwrap of their two-layer tray-packs, the California canners might do the same for the slow-selling canned items whose rate of wholesale warehouse movement falls in Classes 8, 9 or 10, of Table 1, <u>by packing them in single, over-wrapped trayloads</u>. This would reduce the SKU-counts by 50 percent and double the rate of the warehouse movement of such items.

Although we have been discussing matters from the wholesaler's viewpoint thusfar, we now emphasize that the development of manufacturers' cooperative distribution facilities, which might reduce the SKU's of as many as 2500 items, could greatly accelerate the rate of turnover of slow-movers and thereby greatly lower wholesaler and retailer investment in merchandise. We must not forget, however, that few, if any, manufacturers would be considering the benefits to wholesalers through their so-called "bright-can" development. To get them to pack slow movers in smaller modules, it is necessary to persuade them to do so right at the start when plans are being laid. Otherwise their facilities in the cooperative distribution centers might not be adaptable for later changeover. (Figure 1 shows a 2-way cooperative delivery scheme of this sort capable of logistically increasing distribution productivity.)

The Food Distribution Research Society might very well consider sponsoring such a public relations project, at least insofar as making the grocery industry aware of its potential for increasing productivity in physical distribution and encouraging this industry to support an application for federal funds to conduct a demonstration, using the California canning industry as a cooperator with the New England grocery distribution industry, as an example.

Table 1. Designing Basic Warehouse Movement to Mechanize Slow Movers

Item No.	Columns	A	B	C	D	E	F	G	H	I	J
	Movement Rate Classes	1	2	3	4	5	6	7	8	9	10
	% Assortment by Classes	.1	.3	.3	1.1	2.8	6.8	11.5	14.5	13.5	48.9
1	% Assortment by Items	8	23	22	83	210	510	862	1088	1027	3667
2	Cases Sold/Day/Item/ Av. Store	2.5	1.7	1.3	.9	.5	.3	.2	.07	.03	.025
3	Cases/Day/Class Av. Store	20	40	29	75	105	153	172	76	31	92
	$150 Million Warehouse Volume										
4	Cases/Day/Class/ 100 Stores	2,000	4,000	2,900	7,500	10,500	15,300	17,200	7,600	3,100	9,200
5	Sales/6 Day/Week/Class 100 Stores	12,000	24,000	17,400	45,000	63,000	91,000	103,200	45,600	18,600	55,200
6	Cases/5 Delivery Days/ 100 Stores/Day	2,400	4,800	3,480	9,000	12,600	18,160	20,640	45,600*	18,600*	55,200*
7	No. Deliveries Per Week	5	5	5	4	4	3	3	1	1	1
8	Cases Delivered/Day/ Class	2,400	4,800	3,480	11,250	15,750	30,267	34,400	45,600*	18,600*	55,200*
	$100 Million Warehouse Volume										
9	Cases Delivered/Day/ Class	1,600	3,200	2,320	7,500	10,500	20,178	22,933	30,400	12,200	36,800
	$75 Million Warehouse Volume										
10	Cases Delivered/Day/ Class	1,200	2,400	1,740	5,625	7,875	15,134	17,200	22,800	9,300	27,600
	$50 Million Warehouse Volume										
11	Cases Delivered/Day/ Class	800	1,600	1,160	3,750	5,250	10,089	11,467	15,200	6,200	18,400
	$25 Million Warehouse Volume										
12	Cases Delivered/Day/ Class	400	800	580	1,875	2,625	5,045	5,733	7,600	3,100	9,200

* Classes 8, 9 and 10 items delivered once weekly.
** Classes 1 through 7, delivered as in Item 7.

Table 2. Mechanized $150 Million Volume Warehouse

Apportioning Slow Movers, to Even Daily Work Load

Movement Class	Delivery Days	Weekly Movement	Cases Delivered Per Day					Totals
			Mon.	Tues.	Wed.	Thurs.	Fri.	
1	5	12,000	2,400	2,400	2,400	2,400	2,400	12,000
2	5	24,000	4,800	4,800	4,800	4,800	4,800	24,000
3	5	17,400	3,480	3,480	3,480	3,480	3,480	17,400
4	4	45,000	---	11,250	11,250	11,250	11,250	45,000
5	4	63,000	15,750	15,750	15,750	---	15,750	63,000
6	3	91,800	---	30,600	---	30,600	30,600	91,800
7	3	103,200	---	34,400	34,400	---	34,400	103,200
8	1	45,600	---	---	---	45,600	---	45,600
9	1	18,600	---	---	18,600	---	---	18,600
10	1	55,200	55,200	---	---	---	---	55,200
Totals		475,800	81,630	102,680	90,680	98,130	102,680	475,800
Average Cases Per Hour			11,661	14,669	12,954	14,019	14,669	13,974

Table 3. Mechanized $50 Million Volume Warehouse*

Apportioning Slow Movers, to Even Daily Work Load

Movement Class	Delivery Days	Weekly Movement	Cases Delivered Per Day					Totals
			Mon.	Tues.	Wed.	Thurs.	Fri.	
1	5	4,000	800	800	800	800	800	4,000
2	5	8,000	1,600	1,600	1,600	1,600	1,600	8,000
3	5	5,800	1,160	1,160	1,160	1,160	1,160	5,800
4	4	15,000	---	3,750	3,750	3,750	3,750	15,000
5	4	21,000	---	5,250	5,250	5,250	5,250	21,000
6	3	30,600	---	---	10,200	10,200	10,200	30,600
7	3	34,400	---	---	11,467	11,467	11,466	34,400
8	1	15,200	---	15,200**	---	---	---	15,200
9	1	6,200	6,200**	---	---	---	---	6,200
10	1	18,400	18,400**	---	---	---	---	18,400
Totals		158,600	28,160	27,760	34,227	34,227	34,227	158,600
Average Cases Per Hour			4,023	3,951	4,889	4,889	4,889	4,531

* The $50 volume dry-grocery warehouse represents an average volume warehouse. It is normal to include slow movers with fast movers to achieve an acceptable average productivity. However, such factors as: the slow-mover layout, method of order selection and whether slow-mover selection is done manually, semi-mechanically or automatically, affects productivity. Maximum productivity might be achieved only at uneconomical investment in equipment. Each warehouse must be a separate study to achieve maximum economy.

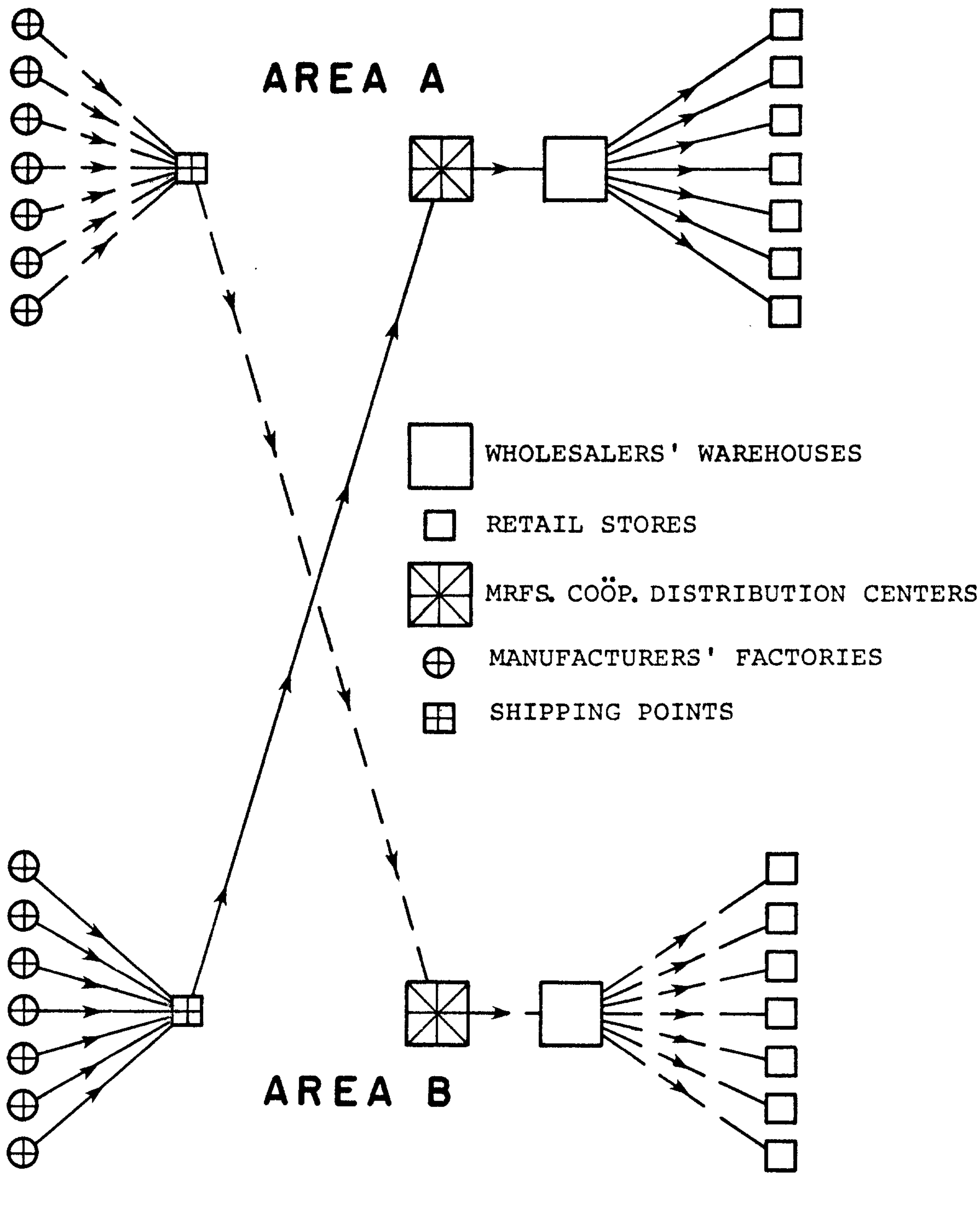
** See explanation in note on Table 4.

Table 4. Mechanized $25 Million Volume Warehouse

Apportioning Slow Movers, to Even Daily Work Load

Movement Class	Delivery Days	Weekly Movement	Cases Delivered Per Day					Weekly Totals
			Mon.	Tues.	Wed.	Thurs.	Fri.	
1	5	2,000	400	400	400	400	400	2,000
2	5	4,000	800	800	800	800	800	4,000
3	5	2,900	580	580	580	580	580	2,900
4	4	7,500	---	1,875	1,875	1,875	1,875	7,500
5	4	10,500	---	2,625	2,625	2,625	2,625	10,500
6	3	15,300	---	---	5,100	5,100	5,100	15,300
7	3	17,200	---	---	5,733	5,733	5,734	17,200
8	1	7,600	---	7,600*	---	---	---	7,600
9	1	3,100	3,100*	---	---	---	---	3,100
10	1	9,200	9,200*	---	---	---	---	9,200
Totals		79,300	14,080	13,880	17,113	17,113	17,114	79,300
Average Cases Per Hour			2,011	1,983	2,445	2,445	2,445	2,266

* The 3 classes of slow movers (8, 9 and 10) are processed on Monday and Tuesday because their rate of selection is much slower than that of classes 1 through 7. Monday and Tuesday are selected because they usually are the lowest in sales volume in supermarkets.



2-WAY REPLENISHMENT OF RETAILERS