



Albert J. Heijn's distribution center at Geldermalsen, The Netherlands distributes slow-medium movers to 457 corporate stores and 143 franchised units. The facility ships 1,350 orders per week. The facility

was developed for the purpose of relieving three other warehouses from handling slow-medium movers, thereby achieving greater efficiencies in all four facilities.

Centralized distribution center for slow movers lowers inventory levels, allows more frequent store deliveries

Albert Heijn, a major grocery chain and wholesaler in the Netherlands consolidated its slow-medium movers in one facility, using carousels and other techniques to gain maximum efficiencies in minimum space.

BY RICHARD KINGDON, consultant, KOM International, Inc., and **PETER LEEGSTRATEN**, project coordinator, carousel, Albert Heijn BV.

The grocery chain, Albert Heijn, is well known throughout Europe. It is the largest retail supermarket chain in the Netherlands and it employs a bold and innovative approach to distribution. With a network of 600 stores, Albert Heijn accounts for 8 billion Dutch guilders (approximately \$4.6 billion U.S.) sales per year, accounting for 26 percent of the Dutch grocery market.

In 1991, Albert Heijn constructed a national distribution center solely for slow-moving dry grocery products and installed within

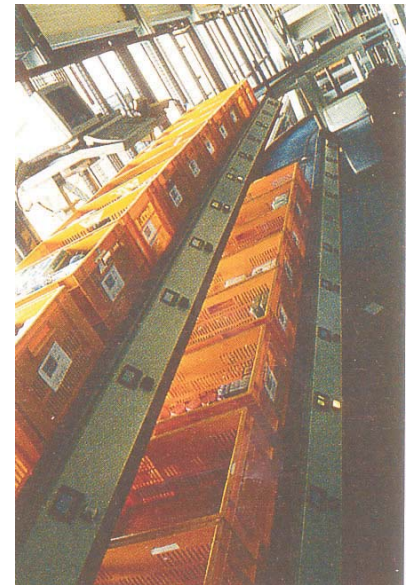
this facility a carousel system for small, split-case (repack) items. Part and parcel of the splitting of the fast and slow moving goods is the application of horizontal carousels to store slow movers. This will be discussed later in this article, but first the background leading to Albert Heijn's decision to split warehousing along fast and slow movers is in order.

During the 1980's, Albert Heijn experienced significant variety and sales expansion, projected to outgrow the three existing distribution centers at Zwolle, Zaandam, and Tilburg. Expansion was, and still is, coming from aggressive store construction and increased customer demand. At the same time as volume was escalating, customers were demanding greater product variety. Due to this rapid expansion program, and a desire to improve customer service, Albert Heijn's management decided to separate products

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These photos depict the activity that takes place at the carousels at Albert Heijn. Top left, an overview shows the carousel workstation ready for replenishment. Top right, an operator replenishes product in the carousel. Near right, photo shows a close-up of selection activity, and far right, a carousel workstation in the midst of a selection run.



according to turnover, placing slow moving products in one national location while keeping the fast-moving articles in regional distribution centers.

Applying the 80/20 rule of inventory, Albert Heijn kept 1,700 fast moving items in the regional distribution centers, relieving those facilities of more than 6,800 items for the new national distribution center. Previously all the slow-moving products had been held at Zaandam and were then transshipped through Zwolle and Tilburg, resulting in a minimum 72-hour lead time. Consequently, stores often received only one delivery a week, forcing them to store excess slow moving goods to compensate for infrequent deliveries. As a result, transport expenses were high and stores were bursting with slow moving goods in their receiving areas. Some stores, due to their small footprint, could only hold product at the shelf.

Because a distribution center for slow-moving items could not be built overnight, Albert Heijn opted for an interim solution. In 1988, it modified an existing building to suit its purpose. While planning and constructing the new facility, the company went to work in the interim facility testing procedures, storage and retrieval systems to get better ideas for the intended national distribution center. Following these tests, the new national distribution center at Geldermalsen was constructed.

Geldermalsen, a site in the heart of Holland, provides easy access to all major centers. Yet, it is slightly south of the congested area surrounding Greater Amsterdam. Just south of the interim distribution center at Utrecht, Geldermalsen sits in between the major population centers of Amsterdam, Zwolle, Arnhem, Eindhoven

and Rotterdam.

Returning to the split between Geldermalsen and the regional distribution centers, the stores can now increase their orders of slow moving goods from weekly up to two times per week. In doing so, total inventory has been lowered, trans-shipments eliminated, customer service improved and the Albert Heijn store managers can breathe easier.

Geldermalsen, operational since 1991, stores approximately 6,800 items as follows: 2,950 large articles are stored in racking, 1,650 medium-sized articles are stored in flow racks, and 2,200 small split case articles are stored in a carousel system. Both flow racks and the carousel were extensively tested at the interim national distribution center prior to becoming operational at the new site. In fact, all of the testing done at the interim national distribution center (Utrecht) is now being applied at Albert Heijn's next facility. Albert Heijn is implementing a composite distribution center for perishable goods. By implementing a composite center store deliveries will be decreased through order consolidation. Both of these new facilities allow lower inventory for the entire operation while decreasing store deliveries.

At the heart of the innovation at Albert Heijn's national distribution center at Geldermalsen is the horizontal carousel system provided by Electrolux Constructor. Although the installation of carousels is not new in warehousing, its application to grocery distribution is relatively recent. Considering that many automated systems are not producing the desired results, there is clear application and benefit from carousels. Carousels, when applicable,

are an innovative response to space, productivity and investment problems. (See the accompanying article for a detailed discussion on the role of carousels in warehousing.)

In implementing a carousel system, the order and item profile is critical; carousels function best when handling small, slow to medium movers with many batched orders. For the most part, carousel items should sell less than 10 cubic feet/week to be prime candidates. On average Albert Heijn's items account for 7.8 cubic feet/week with a maximum movement of 35 cubic feet/week.

By handling small orders in batches, Albert Heijn obtains high selection and replenishment productivity. Processing approximately 1,320 orders/week accounting for about 130,000 pieces/week, the carousel controller batches 12 orders at once.. This maximizes the pieces/ selection to increase selector productivity. On average each selection totals two pieces and each orderline, 1.2 pieces. Each workstation feeds 24 crates per order batch, on average 16 are filled for shipping 12 orders. This process results in approximately 430-450 pieces/hour (360-375 orderlines/ hour). Productivity is, therefore, the most important advantage of horizontal carousels.

Other anticipated advantages have also been realized. The carousels offer approximately 50 percent space savings over flow racks when storing the same inventory. Selection errors of approximately two percent have been pared down to less than one percent using carousels. Still this one percent can be mainly attributed to misplaced replenishment of product and not to selection



An overhead view at Albert Heijn gives a good indication of the carousel workstation arrangement at the Geldermalsen facility. Orders are batch processed twelve at a time. Selection rate is in the approximate 430-450 pieces-per-hour range.

VITAL STATISTICS

NAME OF COMPANY: Albert Heijn BV
LOCATION: Randweg 2, 4191 NN Geldermalsen, The Netherlands
CONTACT: Ing. Peter Leegstraten, Project Manager—Tel.: 31-3455-86811 Fax.: 31-3455-87778
SIZE OF DISTRIBUTION CENTER: 247,000 sq. ft.
SITE AREA: 32 acres
NO. OF PERSONNEL: 430 full-time equivalent
NO. DOCK DOORS: 39
NO. OF SHIFTS: 2
 Receiving—6 a.m. to 10 p.m.
 Selection—6 a.m. to 12 p.m.
 Loading—7 a.m. to 12 p.m.
CONSTRUCTION STATISTICS:
 Opening date: Spring 1991
 Engineering firm: Haskoning Royal Dutch Engineers
 Material handling firm: Kom International
 Carousel supplier: Electrolux Constructor
 Conveyor supplier: Egemin
PRODUCT STATISTICS:

Department	# Items	Weekly Case Movement	Storage System	Clear Height	Aisle Width
Full case	2,750	450,000	Pallet racks	30.7 ft.	12 ft.
Full case (flow rack)	1,850	130,000	Flow racks	30.7 ft.	12 ft.
Carousel	2,200	130,000	Horizontal carousel	19.7 ft.	
TOTAL	6,800	710,000			

NO. STORES: 457 Albert Heijn stores—143 franchise stores
AVERAGE CASES PER ORDER: 525
ORDERS SHIPPED PER WEEK: 1,350
SERVICE LEVEL: 98%
AVERAGE INVENTORY LEVEL: 1.3 weeks
AVERAGE NO. PALLET MOVES PER WEEK: 5,000
PALLET POSITIONS: 15,400

methods. Ergonomically, the carousel offers a more pleasant working environment than previous flow racks and shelving units. All products are selected from a narrower range and items are placed in crates directly behind the selector.

Most importantly, the tradeoff between advantages and disadvantages hinges on the fixed investment and the computer changeover. In order to obtain high productivity from the carousels, management and the software vendor must thoroughly understand the anticipated order profile for the carousels.

At Albert Heijn, the store orders are sent to the Warehouse Management System, which prioritizes orders and sends them in waves to the warehouse floor. Orders are sent to the carousel and racking areas. Carousel orders are further batched into 12 store orders for optimal carousel operations, then once picked into crates, they are conveyed to the flow rack area and selection continues through the flow racks on pallets. Orders from the carousel/flow rack route are merged at the shipping dock with full case pallets. In this way, each stage separates family groups for the stores. The carousels generate a packing list indicating each order line, quantity ordered, item and family group.

By combining a logical logistics decision (concentrating slower moving items in a centrally located distribution center) with innovative high tech systems (carousels), Albert Heijn continues to reduce its operating costs, and improve its customer service levels, while enjoying a growth in store count and volume increases.

WHY BUY A CAROUSEL? BY RICHARD KINGDON

In considering the use of carousels to handle products in food distribution centers, a number of questions must be answered. Foremost, of course, is "Why buy a carousel in the first place?"

A carousel, by definition, is a storage and retrieval device for small products, which are slow to medium movers. Carousels consist of horizontally or vertically rotating bins (or shelves). Products are stored in the bins and retrieved by the order selector. Therefore, the product moves to the selector minimizing the selector's traveling and decision-making time.

Horizontal carousels range in size from approximately 6 to 14 feet in height and 40 to 120 feet in length. Typically in high volume applications, selectors access all levels with the aid of a lift table. Standing upon a lift table, the selector generally has three or four carousel strings facing him.

Because carousels are designed for many small, slow-medium moving items, they are being implemented or studied extensively as items proliferate due to intensive marketing as new products are introduced, and spin-offs of old products come into being.

Other trends are forcing carousels to the forefront of distribution:

1. Order selection productivity is a prime target for many firms trying to lower operating costs
2. Inventories are being squeezed reflecting similar cost reduction efforts
3. Firms are intent on quality, which really means that orders must be delivered without fault, faster and with less product damage

Carousels respond to all three of these aims. Most effectively, they are able to store a greater variety of products in less space.

When considering the use of a carousel, the first and foremost question to ask carousel vendors should focus on the system software. Carousel hardware technology has been in place over 30 years, used predominantly in dry cleaners and pharmacies, yet the software for each installation is unique to the needs of each facility. Therefore, it is important to concentrate on the computer support.

We suggest breaking the computer support down into manageable pieces ... interface with mainframe, order downloading and confirmation, hatching routines, reporting routines, and back-up procedures in the event of system failure. From the outset, the scope of responsibility of the carousel computer must be defined. Most importantly, will the carousel accept the "main warehouse" orders only or will the carousel take an active role in maintaining the inventory of off-site articles, combining orders, setting order priorities, etc.

Other areas requiring close examination include:

1. Does the vendor have similar installations for viewing'?
2. Does the vendor offer a turnkey installation or must the buyer acquire and manage conveyor systems, computer hardware, etc.?"
3. What support does the vendor include during start-up (we recommend one person on-site throughout startup) and what support is available after operations begin"
4. Is support available throughout all hours of production for each of the vendors'!
5. What is the relationship between the suppliers (carousel, software, conveyor): Who is ultimately responsible for system performance')
6. What response rates and productivity rates are guaranteed'?
7. Define response and productivity terms for each component in the system (for example: maximum tolerable waiting time for selectors while carousels are unavailable for selection).
8. How will the system handle the anticipated peak volume versus average? How does this differ for inbound area, carousel

workstations and conveyor sortation, area?

Implementation of a new storage system, such as a carousel, involves a good deal of time and patience. But, more importantly, it necessitates a modular approach, which can be reassessed at the end of each step to examine mistakes, re-engineer the final solution and allow employees to adjust to the new environment.

The test carousel at Albert Heijn was implemented in five steps:

1. Carousel Installation: The carousel, conveyors and lift table were installed and verified against the purchase order agreement.
2. Carousel Software and Hardware: The computer control unit and workstation PC were installed and their functions verified. Communication to and from the warehouse mainframe was tested.
3. Limited Functionality: All the functions that the carousel must support were tested (receiving, batching, selection, inventory checks, "hot" picks, replenishment, etc.)
4. Employee Training
5. Controlled Production: The carousel system ran parallel to the current storage system, receiving orders identical to the "live" orders and executed the portion of the orders for which it had inventory to select.

Once the system was verified in parallel with the current system, Albert Heijn installed six carousel workstations in the new national distribution center. When complete, these carousels took over from the interim distribution center when the remaining departments were ready.

The experience of a firm such as Albert Heijn in installing a carousel system can be very beneficial to food distributors who may consider adopting this system. Personnel at Albert Heijn were asked the question: "What would we do differently next time'?" The consensus among the persons responding focused on six main areas:

1. Test period
2. Carousel interfaces (inbound and outbound)
3. Anticipated volume
4. Isolate the installation
5. Train, train, train
6. Cultural change

Test Period

During the testing of the carousel one family of goods was placed on the carousel; because 12 different families were eventually destined for the carousel, all with different characteristics, more of these families should have been placed on the carousel during testing. Each family has a different number of SKUs order size and movement profile, possibly bringing unique problems and therefore needed learning experience prior to implementation.

Carousel Interfaces

Most importantly, the interfaces (conveyors, sortation, loading and unloading) must not be bottlenecks slowing the carousels' performance. The interfaces must be equipped with appropriate buffer to accommodate segments of the operation, which get ahead of or behind other segments. Both the control of each element of the installation and the control of overall output must be firmly anticipated and outlined. Finally, the sensitivity of all components, most importantly the conveyors, must be tested against the quality and weight of the crates/cartons being shipped.

Anticipated Volume

It is critical, as evident from the previous paragraph, that the inbound and outbound volume of crates/cartons be known. These

figures should be outlined for the weekly and daily averages as well as peak volumes. The performance of the carousel system will depend heavily on its ability to handle extremes.

Isolate the Installation

As much as possible keep the carousel physically separate from the rest of the operation. Do not select the remaining order after the carousel has been picked, but merge the finished orders at the shipping dock. Try to keep the carousel to the ground floor of the building to simplify all interfaces, especially conveyors.

Train, Train, Train

Begin training employees as soon as the carousel functional

testing is finished. Continue the training process throughout the life of the carousel. Above all, ensure that supervisors understand and play a part in the entire system. It is the supervisor who will be running the operation and dealing with disturbances long after the management team is tackling another project.

Cultural Change

The carousel is fundamentally different from the prior systems because the selectors need not move, products are brought to the selector, and there is greater amount of computerization (most importantly on the warehouse floor). Therefore a positive dialogue must be consistent between management and employees in order for the carousel to be accepted.

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