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PACKAGED FOOD

Solutions for Streamlining
Packaged Food Warehousing



swisslog

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Highly-automated systems for handling the warehousing of packaged foods have evolved to facilitate rapid and accurate throughput of increased numbers of SKUs and smaller order quantities. Such systems are meeting the just-in-time order requirements for retailers and the changing purchasing habits of consumers.

The packaged foods industry is in the midst of a supply chain evolution. Bulk processing of product SKUs has been giving way to the demand for smaller quantities of a larger number of products and orders, with more varied packaging containers and just in time ordering requirements by food retailers. This trend has tended to shift packaged foods distribution away from traditional pallet based, single SKU loads, and more toward multi-SKU layered pallets, single case picks and small quantity picking of individual products.

To meet this market demand, distribution technology has adapted with the introduction of a) highly automated, individual case picking systems; b) extremely efficient mini-load tote/tray pick systems for handling small quantities of individual SKUs and enabling more streamlined goods to man picking; and c), integrated order processing and product tracking to ensure order accuracy, and better product integrity and product safety. Additionally, traditional automated storage and retrieval systems (ASRS) used for high-bay pallet handling and storage have become more streamlined and energy efficient.

This paper examines some of the latest and most efficient automation technology used in the storage and handling of packaged foods in warehouses, and the implications such automation is having on throughput and cost-efficiency for food manufacturers, distribution centers and retailers.

Changing Packaged Food Market

Traditionally, food processors would manufacture bulk quantities of product at their discretion, store it in their plants and ship single SKU pallet loads out to distribution centers (DCs) where they were

also stockpiled. The DCs would then distribute these single SKU pallets to retail outlets where they were kept in stock, ensuring that they had a continuity of supply, until needed on the floor. This pallet load based system has worked efficiently for many decades in the packaged foods industry to move products from the manufacturer through the supply chain to retailers' shelves.

But now, the packaged foods market is changing, and has been for some years. Those single SKU pallets of dairy products, snacks, soups, ice cream, sauces and dressings, baked goods, canned foods, ready meals, and chilled and frozen processed foods are more consistently being replaced by pallet loads and roll cages comprised of lesser quantities of layered and mixed product SKUs when received at retail locations.



Increasing application of roll cages

The trend toward smaller pallet loads with more product SKUs is being driven primarily at the retailer level. Supermarkets and other packaged foods retailers are trying to maximize their shelf and floor selling space to accommodate the growing number of SKUs. The store stockroom is now virtually gone because most retailers have converted that inventory storage space to floor selling space for the added SKU volumes. Consequently, retailers have less on-site room to stock items, even fast-moving products. So they need to re-supply their stores more frequently with smaller quantities. Some retailers, like Tesco, have virtually eliminated backroom storage completely. As product arrives it is immediately put out onto the floor.

PACKAGED FOOD

Solutions for streamlining Packaged Food Warehousing

Retailers are pushing the storage issues back to the manufacturers. And manufacturers are more closely looking at their storage and how they can satisfy the needs of retailers.

Along with this growth in SKUs is an increase in the variability of primary and secondary packaging of food products. Packaging styles include boxes of all sizes, cans and jars in cardboard trays, open and closed cartons for beverages and bags, and large tissue packages.

Consumers, becoming more concerned about green issues, want less packaging on their products. This influences packaging rigidity and increases difficulty in picking, pallet load building and shipping.

There is little sign that the increasing number of SKUs being introduced to the packaged foods market will abate. According to Euromonitor International 2011, increasing demand for convenience foods has resulted in a considerable rise in sales of packaged foods. The global size of packaged food sales is estimated to have had a total retail market value of \$1.952 trillion (USD) in 2010, with Western Europe accounting for 31 percent of that market share. Growth rates are expected to reach as high as 8 percent within the next years.

Challenge for Distribution Centers

For DCs handling prepared foods, the continually growing number of different SKUs with their varied packaging, and the growing need to deliver orders in more store-friendly formats, is becoming

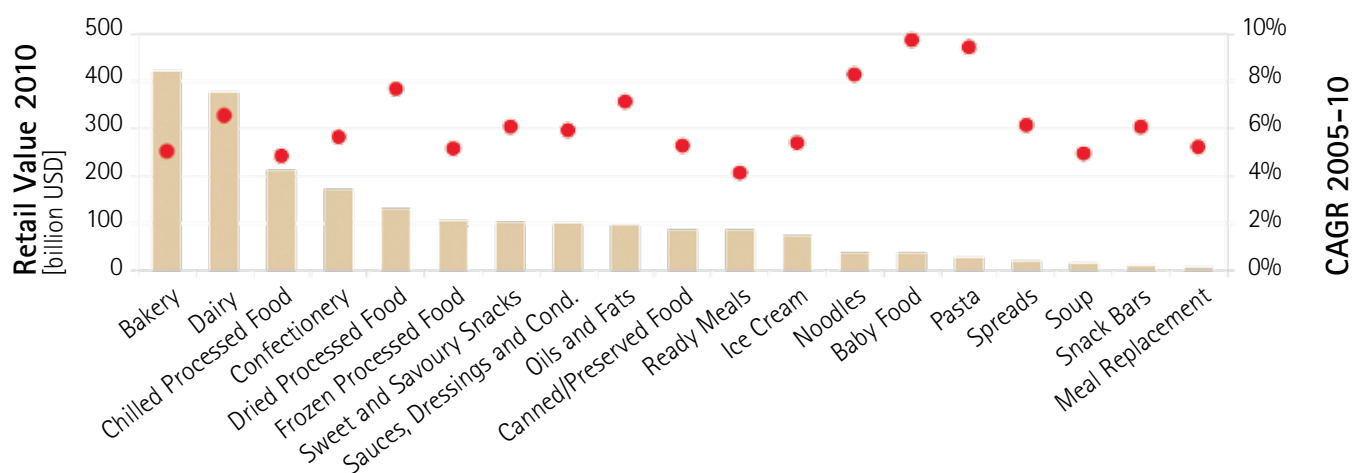
increasingly difficult to handle with manual and conventional automated systems.

The problem is magnified for DCs because of the significant growth of smaller, localized specialty foods manufacturers. Such companies tend to lack adequate automated end of line packaging and distribution capability within their own facilities. Non-standardized packaging and labeling, and lack of load tracking capability especially with chilled and frozen food products, adds complexity to highly automated DCs.

It is estimated that private label, small, local producers could make up 50 percent of the global volume of prepared foods market share by 2025, according to a 2011 research report released by Rabobank's Food and Agri Research division. Private label sales from chains such as Walmart, Kroger, Aldi, Tesco and Carrefour currently account for 25 percent of total food sold in grocery stores, the report states.

Complementing this are the prepared food manufacturers that supply relatively high volume product SKUs, many of which are putting their products on display units or merchandising units which can crossdock straight through the distribution center and go right out onto the floor of the retail outlet. This is not just for promotional products, but also the higher-volume moving SKUs.

Comprising thousands or tens of thousands of different SKUs and in an assortment of package styles, prepared foods in DCs need to be stored, picked and stacked on pallets or roll cages ready for outbound transport to retailers with a very high level of efficiency to optimize labor usage and minimize operational and shipping costs.



Global packaged food market segments: Size and growth by retail value 2010, source: Euromonitor International 2011

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Automation Flexibility is Key

To manage this diverse mix of product SKUs, packaging variations, small order quantities, case picks, layered pallet loads and unit loads, packaged foods warehouses require an integrated composite of automated systems to handle this throughput efficiently and cost effectively. Systems with the flexibility to adjust to market conditions very quickly and accurately, like for increases in SKU range and shortened lead times, and monitoring production batches expiration dates.

Such equipment should encompass a range of fully automatic and semi-automatic options, including high-bay ASRS, tote-based mini-load pick systems, robotic picking systems for cases, modular conveying systems for throughput and crossdocking of unit loads, a load tracking and verification system, and an efficient and flexible warehouse management system capable of integrating these automated processes. In a word, the keynote is automation flexibility.

Streamlined High-Bay ASRS – Still the core system of highly automated warehouses handling packaged foods, high-bay ASRS will continue to fill the need for high throughput, full and layered pallet storage distribution, particularly at the manufacturer level. As retailers push back on manufacturers to supply orders in a more just in time format, manufacturers have an increased need to maintain a buffer of high throughput SKUs in pallet loads.

High-bays optimize space, and those warehouses that are the most cost efficient have achieved a high density of space utilization. This means they have a space configuration that allows for the maximum number of pallet positions to fit into the facility.

High-bay systems optimize cubic space usage, not only by their vertical stacking capability, but also by minimizing aisle cubic footage. By eliminating the need for forklift trucks, aisles can be made significantly more narrow, allowing up to 3.7-meter (12-feet) wide aisles to become just 1.5-meter (5-feet) wide. This space can then be used for more pallet positions.

ASRS are computer controlled systems for automatically depositing, storing and retrieving unit loads from defined storage locations. They allow full pallet load and layered-pallet inventory to be moved quickly, safely and precisely within a warehouse environment.



Double-deep storage of packaged food manufacturer

The latest generation of ASRS provides a uniquely flexible and modular design that is equipped with a multi-load remote pallet handling capability, ideal for moving pallets of packaged foods in ambient, chilled and deep freeze environments. These ASRS allow rapid configuration to the right storage and retrieval need for almost any food storage application. From floor level to up to 40 meters (131 feet) tall, they provide single deep, double deep, triple deep and multi-deep stacking, with the flexibility to handle one load at a time or multi-loads

When a pallet is on the load handling device it is carried off the ASRS machine into the rack. It can then perform a function called deep lane storage. Conventional ASRS machines only go one or two pallets deep, using a fork attached to the machine. The latest systems can go three pallets deep utilizing a telescope fork. Then with a satellite remote unit they can run a pallet 12 meters (40 feet) into the racking, as much as 10 pallets deep, and then return back to the ASRS machine.

ASRS cranes are now designed to deliver energy efficiency in distribution centers that handle packaged foods because of their flexibility. Warehouse cranes are typically optimized for peak throughput, performing many moves in and out of the racking. These modern systems reduce energy consumption by operating at variable speeds depending on the demand load in the warehouse.

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Solutions for streamlining Packaged Food Warehousing



Energy recuperation in warehousing

These systems also generate electricity from lowering their lift carriages, using their motors as a generator. The power gained is used to aid horizontal travel. The system can also contribute energy when braking during horizontal travel to aid vertical motion. This energy regeneration both reduces the ASRS' total power usage and, with other measures, can reduce the size of incoming supply required.

Integrated Controls Architecture – The most advanced models of ASRS use integrated controls architecture for material flow control, enabling optimized speed and precision positioning. Infrared or wireless is used to communicate between ASRS units and the control system, which instructs the ASRS where to place incoming pallets and where to retrieve pallets for shipping.

Because of the precision of the ASRS controls and its integration with the warehouse management system, the ASRS always selects the correct inventory, item numbers, and they always rotate the product properly. These state-of-the-art ASRS integrate with other automated equipment in the warehouse creating one single, efficient transport system that provides optimum throughput under any system capacity.

The latest warehouse management systems maximize supply chain efficiency by automating key processes from inbound goods arrival, through inventory storage, to fulfilling outbound shipping orders. Such integrated WMS ensures optimized storage by distributing SKUs over multiple aisles, improved delivery execution and maximized labor resources. WMS with total inventory transparency allows the packaged food warehouse to link every process in its supply chain, streamlining the flow of goods.



Processes optimized by WMS

Case and Tote/Tray Pick Systems – Of any area in packaged foods storage and distribution that has been most affected by automation improvements, it may very well be in the storage and picking of individual cases and small-quantity, mixed-SKU products.

Traditionally, a hand-pick activity, the need to prepare small quantity, mixed-SKU orders of packaged foods to ship and arrive on schedule with near zero tolerance of errors is a growing critical function if a packaged foods warehouse is to be run as a cost efficient, successful operation.

Case pick and tote/tray mini-load systems support goods to man pick stations and employ very light, high speed cranes or robotic shuttles that transport individual totes or trays, providing high case pick and piece pick throughput. Inbound product loads are stored in high-bay pallet locations for case picks, or de-palletized and stored in trays or totes. Product is then automatically retrieved in any sequence to build customized loads.

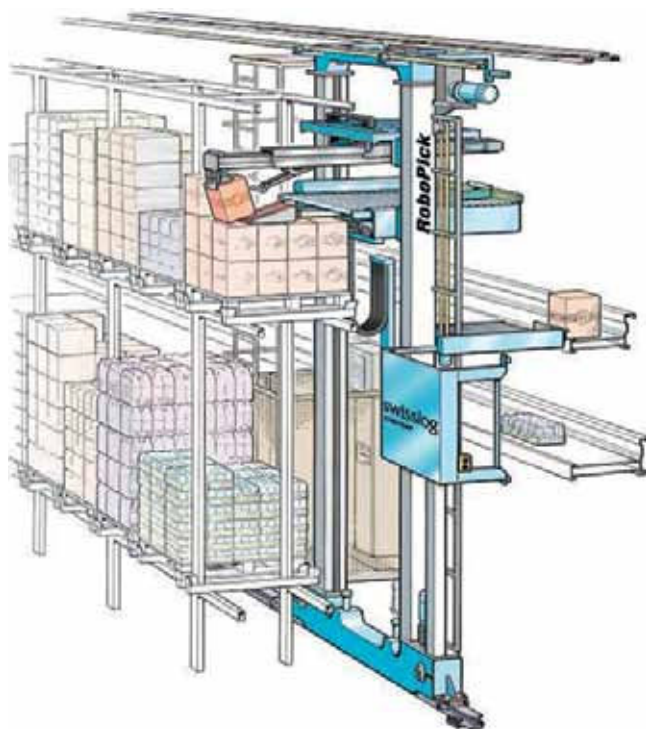
Some recently introduced alternatives to mini-load ASRS designs have significantly increased speed of order processing, without losing any degree of accuracy. These newer systems provide more than high throughput and cost efficient distribution, they also deliver a higher density of storage capacity, and more modular flexibility.

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Solutions for streamlining Packaged Food Warehousing

Some individual case picking solutions automatically remove the pallet from the high-bay allowing automated picking of cases in other areas of the warehouse, then return the pallet into the high bay for storage. This type of system is particularly beneficial in chilled and deep-freeze warehouses where case picking is required, but where the cold environments can negatively impact workers.

One newer system, designed for picking product cases direct from high-bay warehouse shelves, utilizes a versatile gripper head mounted into an automatic stacker crane. The crane, instructed by controls software, travels automatically to the correct picking location. The gripper head then extends to support the case. The load, which can weigh up to 25 kg, is then brought onto the crane's carriage platform for transport to the output station. This technology can be combined with belt conveyors to form an efficient pick to belt solution. This case pick system delivers high pick rates per hour and consistent, reliable picking down to -28° C with a low product defect rate.



Direct picking from warehouse stelves

The newer, more advanced piece-pick systems provide ideal requirements for small product, packaged foods warehousing. Modular in design, these systems are now highly adaptable and can be expanded as needed, unrestricted to one size or form.

Some systems can be configured to fit different building heights, span multiple levels and even surround obstacles in the warehouse, such as pillars or walls. For example, if the need warranted in the future, the systems could be extended without interfering with the warehouse's throughput. Additional storage space could be added by simply extending the mini-load system without interfering significantly with ongoing warehouse operations.



Highly compact storage

Another innovation in piece-pick systems is the elimination of single point system failure, in effect, providing near 100 percent system availability. By employing the use of multiple, independently controlled robots instead of mini-load ASRS cranes, if one section of the system was to be disabled for repairs, the system would continue to operate at 100 percent functionality because of built-in redundancy.

To improve delivery of goods to the picking stations, some mini-loads have equipped their shuttle vehicles with an autonomous onboard intelligence capability to further optimize speed and efficiency of processing.

Also, to allow added picking flexibility, some of the latest mini-loads allow integration with external, manual pick stations into their shuttle systems, such as for handling single items and small cases. A function that can give added flexibility for warehouses handling packaged foods.

System components, such as trays and totes used in these mini-loads can be made of stainless steel and rated for heavy wash-down for handling packaged food products like specialty meats or fish, to comply with sanitary regulations for cleanliness.

The more advanced mini-loads are extremely energy efficient. Not

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Solutions for streamlining Packaged Food Warehousing

only reducing energy consumption by operating on low energy requirements while maintaining excellent weight to payload ratios, but also equipped with energy recuperation modules to generate and store electricity from the lifts and shuttles while in operation.

Robotic Layer Picking – Packaged food suppliers faced with the increased demand for less than full pallet deliveries can achieve a first level of automation with robotic layer picking. The robot can efficiently build layers of different SKUs on a pallet in the exact order quantities and delivery sequences required by retailers. The system can operate with a high level of flexibility and error-free picking.

Modular Conveyors – Transporting piece, case and unit loads throughout the packaged foods warehouse with optimum flexibility and efficiency requires a modular conveyor system capable of continuous operation in ambient, chilled or deep-freeze environment.

Modular conveyor systems provide a unique flexibility for integrating automated systems within the packaging foods warehouse into a continuous fluid throughput. In addition to connecting major material handling systems like ASRS and mini-loads, modular conveyors enable a unique flexibility of configuration with components like chain conveyors, roller conveyors, transfer units, turntables, vertical conveyors, and pallet carriers and dispensers within various sections of the warehouse.

These modular systems can integrate shuttle cars in a variety of functions, such as feeding multiple order picking stations and for use in staging areas. They can integrate profile gauges to measure pallet dimensions and weight without stopping the load, and can be used at entry points to prevent incorrect load units from entering into the system. Some modular conveyors are frequency controlled for high speed operation and gentle load handling.

Integrated Ordering and Load Tracking – High-bay, packaged foods warehouses are ideal candidates for the precise and efficient tracking of products because of their highly automated and computer controlled systems. The warehouse's WMS, along with PLCs in the ASRS, mini-loads, tote/tray pick systems and conveying systems, are capable of monitoring batch numbers, production dates and weight as the unit loads, cases and individual SKUs are stored and moved through the facility.

In an ideal packaged foods warehouse, and particularly within distribution centers, incoming product is tracked with pallet and case labels. As soon as each pallet and case is received and scanned it associates with a prior electronically-received purchase order in the WMS. It can then be put straight into the conveyor system where it is automatically booked in and moved into either the automated high-bay warehouse or into tote/tray mini-load storage. The warehouse knows precisely what that product is and how

many pallets, cases and individual SKUs are entered into storage.

Additionally, ordering IT systems are being more and more integrated between retailers, manufacturers and distributors. Packaged foods are now almost always produced to order and streamed straight through the supply chain, even at levels smaller than pallet load. If a company is producing sausages which have a defined shelf life, a manufacturer may only want to manufacture what it knows that retailer can sell within a defined period of time. So, the manufacturer may opt to produce those sausages in smaller, more frequent quantities. This satisfies the consumer and retailer demand better, and produces less product waste.

With fresh, chilled or deep-freeze products, temperature data loggers and/or radio frequency identification (RFID) tags help monitor the temperature history of the product in storage at the manufacturer, through the DC and until the shipment is received at the retailer.

This level of supply chain analytics allows packaged foods warehouses to maintain precise control on their products through every stage of the supply chain handling, from manufacturing through storage, picking, shipping and receipt of products.

With the emergence of such automated systems, a new level of flexibility and efficiency above and beyond the capabilities of conventional automated and manual material handling systems can be realized for the movement of packaged foods.

Improved throughput productivity at the manufacturer, the DC and the store level; and the ability to deliver more SKUs in flexible store formats with increased speed and accuracy are but some of the key benefits of this automation, which is designed to facilitate the changing packaged foods market.

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Solutions for streamlining Packaged Food Warehousing

SUMMARY

Driven by retailers' need for more floor selling space to accommodate consumers' appetite for more products, the packaged foods market is shifting from handling lesser SKUs to more product SKUs, from bulk-volume orders to smaller just-in-time orders, and from retailers maintaining backroom storage to low store inventory and more deliveries in floor-ready formats.

This shift has impacted packaged foods manufacturers and distribution centers in a number of critical ways:

- a) Manufacturers' growing need to maintain buffers of higher moving SKUs, and provide just in time order fulfillment of smaller quantity orders, to offset reductions in retailer inventory;
- b) Streamlined crossdocking at DCs to handle more store ready pallets;
- c) Integrated ordering, tracking and identification of products in the supply chain;
- d) Need for faster picking and higher order fulfillment accuracy;
- e) Efficient mini-load picking capability for case and piece-picking of small orders;
- f) Flexibility in conveying systems to accommodate retailers' requirements.

Highly-automated systems for handling the warehousing of packaged foods have evolved to facilitate rapid and accurate throughput of increased numbers of SKUs and smaller order quantities. Some of the latest automation designed to optimize throughput in the packaged foods supply chain includes:

High-Bay ASRS

These systems will continue to fill the need for high throughput pallet load storage and distribution in packaged foods warehousing. Swisslog's Vectura™ ASRS provides a uniquely flexible and modular design of ASRS equipped with a multi-load remote pallet handling capability. The system allows configuration to the right storage and retrieval need for almost any application and provides single deep, double deep, triple deep and multi-deep storage

Case and Tote/Tray Pick Systems

Supporting goods to man pick stations and employing very light, high speed cranes or shuttles for high pick throughput. Swisslog provides several extremely efficient mini-load systems for packaged food warehouses, such as its case-pick solution, called RoboPick™. Based on a pallet crane, RoboPick utilizes a versatile gripper which travels automatically to the correct picking location and then picks individual cases from a stored pallet.

Another is Swisslog's high-bay, piece-pick, mini-load system called Tornado™. Inbound product loads are automatically de-palletized and stored directly into high-bay shelves within trays or totes, which can be automatically retrieved in any sequence to build customized loads.

Swisslog's SmartCarrier™, one of the latest generation of streamlined mini-load shuttle systems for piece picking and case picks, is exceptional for its ability to consolidate and release totes at high rates in required sequences. Its extreme modularity has the flexibility to integrate exterior pick stations into its shuttle system. AutoStore®, a piece-pick system distributed by Swisslog, can easily be configured to fit different building heights and obstacles. By using independently controlled robots instead of mini-load ASRS cranes, AutoStore eliminates single point system failure.

Warehouse Management System

Swisslog's WarehouseManager™ maximizes supply chain efficiency by automating key processes from inbound goods arrival and processing through inventory storage to fulfilling outbound shipping orders.

ABOUT SWISSLOG

Swisslog (www.swisslog.com) is a global provider of integrated logistics solutions for warehouses, distribution centers and hospitals. The company has considerable know-how and special expertise within the prepared foods sector. Its comprehensive services portfolio ranges from building complex warehouses and distribution centers for food manufacturers, wholesale distributors and retailers, to implementing Swisslog's own software for intra-company logistics solutions with an extensive number of projects realized

Swisslog's solutions optimize customers' production, logistics and distribution processes to increase flexibility, responsiveness and quality of service while minimizing logistics costs. With years of experience in the development and implementation of integrated logistics solutions, Swisslog provides the expertise that customers in more than 50 countries around the world rely on.

With Global Headquarters in Buchs/Aarau, Switzerland, Swisslog currently employs over 2 000 staff in 20 countries worldwide.

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