Three Facilities that Practice Leading-edge Supply Chain Technologies

ABSTRACT

In the summer of 2012 the entire National Center for Supply Chain Technology Education (SCTE) team, with top-level Industry Advisory Council (IAC) members, toured three major distribution warehouse facilities in the Ontario, CA area. The team was exploring the technologies and skills being used within the warehouses including: hardware, software, and many productivity processes. These technologies, with the addition of human power, enable goods to be manufactured, assembled, and distributed effectively. To insure efficiencies throughout the distribution center, companies need to effectively use supply chain technologies. These technologies require highly-trained technicians in electronics engineering technology, manufacturing technology, maintenance, automation and control technology, information technology and geospatial technologies. Currently, knowledge in all technology areas is required to be hired and valued by 21st Century Warehouse employers. The field of Supply Chain Technology is interdisciplinary requiring technology education programs that integrate installing, operating, supporting, and maintaining these new technologies. The goal of the NSF Supply Chain Technologist team is to increase the supply of highly qualified supply chain technicians by 14,000, over four years, to meet the growing national need across the private and public supply chains. This paper discusses current distribution center uses of supply chain technology in three California facilities. In meeting our goal of increasing the number of Supply Chain Technologists the SCTE team is evaluating the emerging occupation of Supply Chain Technicians, and existing education and training models.

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Warehouse Technologies and Employee Skills

The three distribution warehouse facilities researched include**: Skechers** (a shoe distributor), **UPS** Supply Chain Solutions (3PL facility) and **Cardinal Healthcare** (a medical products distributor). We found that each facility was striving to continuously improve the use of their material handling technology. Some facilities had a mix of legacy and new technology while one, Skechers, was a new distribution warehouse built in 2011.
Warehouse facilities have different characteristics including:

Heated and unheated general warehouses
Refrigerated warehouses

- Controlled humidity warehouses
- Temperature controlled warehouses
- Special-designed warehouses to meet strict requirements (radioactive material, ammunition, etc.)

This white paper begins with an analysis of Skechers, due to its most modern material handling and warehouse design. The remaining two facilities include similar processes and equipment.

Skechers

Skechers is now the No. 2 footwear company in North America with 2010 sales exceeding $2 billion. The company is known for its Shape-ups line of fitness shoes that are designed to "change your life by changing the way you walk." The idea is that a good shoe design can make individuals more efficient and effective in the manner in which they perform every day activities. Skechers took a similar approach in the design of its new temperature controlled 1.82-million-square-foot, $225 million distribution center in Rancho Belago, CA. An inland community about 80 miles west of the port of Long Beach, Calif., where Skechers imports all of it footwear and athletic gear. The new facility shapes up distribution processes by consolidating activities that were once spread across 1.7 million square feet and five leased facilities in southern California into one highly automated distribution center to handle all of the footwear company's North American distribution. Each of those buildings had different equipment and each handled a different piece of the order fulfillment process. The five facilities proved to be more costly due to the additional handling required to move product between buildings, therefore, they consolidated.

The new facility is not only one of the largest distribution centers in California, it was designed to be one of the most efficient. The new facility is designed using an automated materials handling system that not only minimizes the number of times a pair of shoes is handled between receiving and shipping, but is capable of managing an inventory of 70,000 stock keeping units (SKUs) and processing approximately 17,000 pairs of shoes per hour. That is more than double the 7,000 pairs per hour handled in Skechers old facilities. The number of times a product is touched between receiving and shipping has been reduced by at least 50%. Similarly, the new facility requires about 300 employees for average volumes and an estimated 500 during peak periods. That is less than half of the 1,200 associates used during peak periods when Skechers was operating five facilities.

At the heart of the system are two mini-load automated storage and retrieval systems (AS/RS).

• The first is a 12-aisle system with 58,000 square feet of storage space and nearly 106,000 storage positions. This system was implemented to store partially filled master cartons, known as loose picks.

• The other is a 44-aisle system with 150,000 square feet of space and more than 257,000 storage positions. This system holds packed orders until they are ready to ship. Both mini-load

AS/RS units are able to accommodate a random range of carton and box sizes, from 34 x 24 inches to 10 x 10 inches.

Both also use motor driven roller conveyor and transfer stations to sort cartons rather than conventional sortation technology. In addition to the two mini-loads, Skechers installed a cross-belt sortation system to feed the facility's packing stations; energy-saving motor driven roller conveyor; a narrow-belt shipping sorter servicing 26 shipping door accumulation lanes; an estimated 800,000 square feet of very narrow aisle reserve storage area; and a 135,000-square-foot mezzanine that was the winner of the 2011 design award from the Steel Joist Institute. The mezzanine is used for value-added services, print and apply, and taping prior to shipping. The facility allows Skechers to meet two important strategic goals: It consolidates operations, and it sets the stage for continued growth. And while it is one of the largest distribution centers in California and the largest LEED-certified (energy efficient) building in North America, 1.82 million square feet under-represents the sheer size of the facility. It has 45-foot ceilings and uses very narrow aisle racking for reserve storage in addition to the two AS/RS. If this were a traditional facility with 30-foot ceilings and conventional pallet rack, they would need significantly more space.

Skechers was founded in California in 1992 to import Doc Martens into the United States. The company focuses on designing and marketing its line of shoes while working with contractors in China and other emerging markets to manufacture its lines. The Skechers story is about more than just sales growth. Over the past 19 years, Skechers has broadened its product line to encompass nearly all of the categories of footwear, from athletic shoes to casual shoes to sandals to kids shoes—a total of some 70,000 SKUs. The company is also a multi-channel marketer. In addition to 300 retail and outlet stores around the world, Skechers sells to wholesalers, to other retailers and directly to consumers. And they have no direct competitor; they compete with every other shoe company and on a different level with each. Growth across those different lines and channels was a key factor in the decision to build a new structure. Years earlier, for instance, after outgrowing its original facility in Compton, the company took over an LA Gear facility, and then took over a second nearby building with a tilt tray sorter when it outgrew the first building. This type of automation led to the same type installed in the new facility.

To earn LEED (energy efficiency) certification, the new facility features solar panels that generate electricity; has a reflective roof and a natural ventilation system that relies on prevailing winds maintain a comfortable working environment even in desert heat; native plants and plumbing fixtures that conserve water; and plug-in stations for electric vehicles (fork lifts, etc.)

Like most retailers and manufacturers of consumer products, Skechers distribution processes have to accommodate seasonal swings in demand and labor. During the peak season, the company would have as many as 1,200 employees, most of whom were temporary employees. The training and managing of that many people, for seasonal spikes, is always a challenge. What's more, bringing on seasonal labor in conventional systems has an impact on throughput and order accuracy. One of the goals then was to develop a system that could handle the day-today order activity with a core group of associates—in this case about 300—and accommodate seasonal spikes with a minimum amount of temporary help. Automation, including the two miniload AS/RS units and the cross-belt sorter, were central to controlling labor in the new facility. For instance, packing and shipping were two areas that required a large labor component under the old model. Shoes are shipped to Skechers in solid color master packs

of six pairs of adult shoes or 12 pairs of children's shoes. Most customers, however, order an assortment of styles, sizes and colors. To fill those orders required breaking down the pre-packs, picking and re-packing the number of "loose pairs" required for an order, and returning the partially depleted carton to storage. All that processing required many hands and touches. Similarly, Skechers often packed orders and staged them on the shipping dock for customers who did their own pickups. The process not only required labor, it consumed valuable shipping area real estate. The mini-loads addressed both of those issues. One system is designated to store and deliver partially depleted loose pick cartons to an induction platform for the cross-belt sorter. It takes many people to pull those pairs from the shelves and repack them. Now, the mini-load delivers a carton to the induction station, an associate picks the pairs needed for an order and places a pair in a box, a bar code is automatically applied to side of box and the box continues down the conveyor. The bar code contains all shipping information and routes the box to the appropriate truck.

Skechers' new facility brings together automated storage, cross-belt sortation and conveyors to handle multi-channel order fulfillment from one system. The major material handling equipment within Skechers is as follows:

- Programmable logic controllers (PLC)
- Mini-load automated storage and retrieval systems (AS/RS)
- Conveyor system with tilt-bed sorter
- Double-chute sorter
- Variable speed drives (variable frequency drives)
- Cross-belt unit sortation system
- Narrow belt shipping sorter
- Lift trucks, walkies, pallet jack & pallet inverter
- Bar code scanning
- Pallet rack
- Cubing and weighing
- Systems integration

New Skecher's distribution warehouse

Sometimes, specialized pieces of equipment (material handling equipment) are used to handle the various types of containers. The following is a list of some of the names and characteristics of common storage containers:

- Intermodal containers (shipping containers) are used for the efficient transportation of goods. Standards specify the volume and dimensions of containers to facilitate efficient handling.
- Pallets are one of the most commonly used means to store and move product in a distribution center.
- Gaylords are large single boxes usually connected or attached to a pallet.
- Cases and Cartons are boxes usually containing many items. In distribution centers there is a generally accepted distinction made between the terms "carton" and "case", although both are boxes. Goods are received and stored in cartons, while goods are shipped in cases. A stored carton is called a case once it has been picked or pulled for shipment.
- Totes are reusable containers used to hold and transport goods.

UPS

The 600,000 square feet UPS warehouse toured had leased space for 15 – 20 well known customers. Each customer controlled their inventory going to customers and they received returned goods from customers. Another customer required secondary operations to soccer balls. Compared to Skechers the UPS facility had more manual labor controlling the smaller volumes of product. Some cross-docking took place as well as other processes including:

- Programmable logic controllers (PLC)
- Conveyor system
- Variable speed drives (variable frequency drives)
- Narrow belt shipping sorter
- Lift trucks, walkies, pallet jack & pallet inverter
- Bar code scanning
- Pallet rack
- Cubing and weighing
- Systems integration

Cardinal Healthcare

Cardinal had recently purchased the distribution warehouse from Baxter Healthcare which included older technologies. The newest technology was a new automated conveyor system purchased from the Intelligrated Co. (Mason, OH) with automated controls from Control Logic Inc. (Danville, KY). Bar code scanning controls were implemented and conveyor technologies were used to route the containers of product through the warehouse. This new system increased product throughput by 18 – 23% over the older systems. One older system was a storage and retrieval system with very narrow pathways. This system efficiency was reduced as only one storage and retrieval system could work at a time compared to the newer systems where multiple systems could work, simultaneously. The fixed narrow pathways did not allow

for an easy and inexpensive upgrade. Another recent upgrade to the facility was the addition of a cold room where medical products could be stored in a temperature controlled room. Where Skechers has 45-foot ceilings Cardinal Healthcare has an average ceiling height of 30 feet, limiting vertical stacking of more product. This facility was the oldest compared to the other two facilities and contained both legacy and new technology. Due the facility age and the variety of systems, Cardinal had a well-organized and skilled maintenance crew to keep all the systems maintained. Cardinal uses the following technologies:

- Programmable logic controllers (PLC)
- Conveyor system with tilt-bed sorter
- Variable speed drives (variable frequency drives)
- Double-chute sorter
- Cross-belt unit sortation system
- Narrow belt shipping sorter
- Lift trucks, walkies, pallet jack & pallet inverter
- Bar code scanning
- Pallet rack
- Cubing and weighing
- Refrigeration
- Systems integration

Skechers new automated storage and retrieval systems (AS/RS)

Summary

The three facility tours demonstrated many technologies that are critical to ensuring the integrity of the supply chain. The supply chain technicians, who install, operate, support, upgrade and maintain the various software, hardware, and material handling equipment require the following skill sets:

Fundamentals of Mechanics
Hydraulics/Pneumatics
Electrical/Electronic
Scanners/Optics
Programmable Logic Controllers
Network Communications
Blueprint Reading
Conveyors/Material Handling Equipment
Radio Frequency Identification
Robotics
Troubleshooting
Maintenance Overview
Safety/OSHA

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This work is sponsored in part by the National Science Foundation's Advanced Technological Education Program under DUE Award #1104176. Any opinions, findings, conclusions or recommendations presented on our social media platforms are only those of the presenter grantee/researcher, author, or agency employee; and do not necessarily reflect the views of the National Science Foundation.