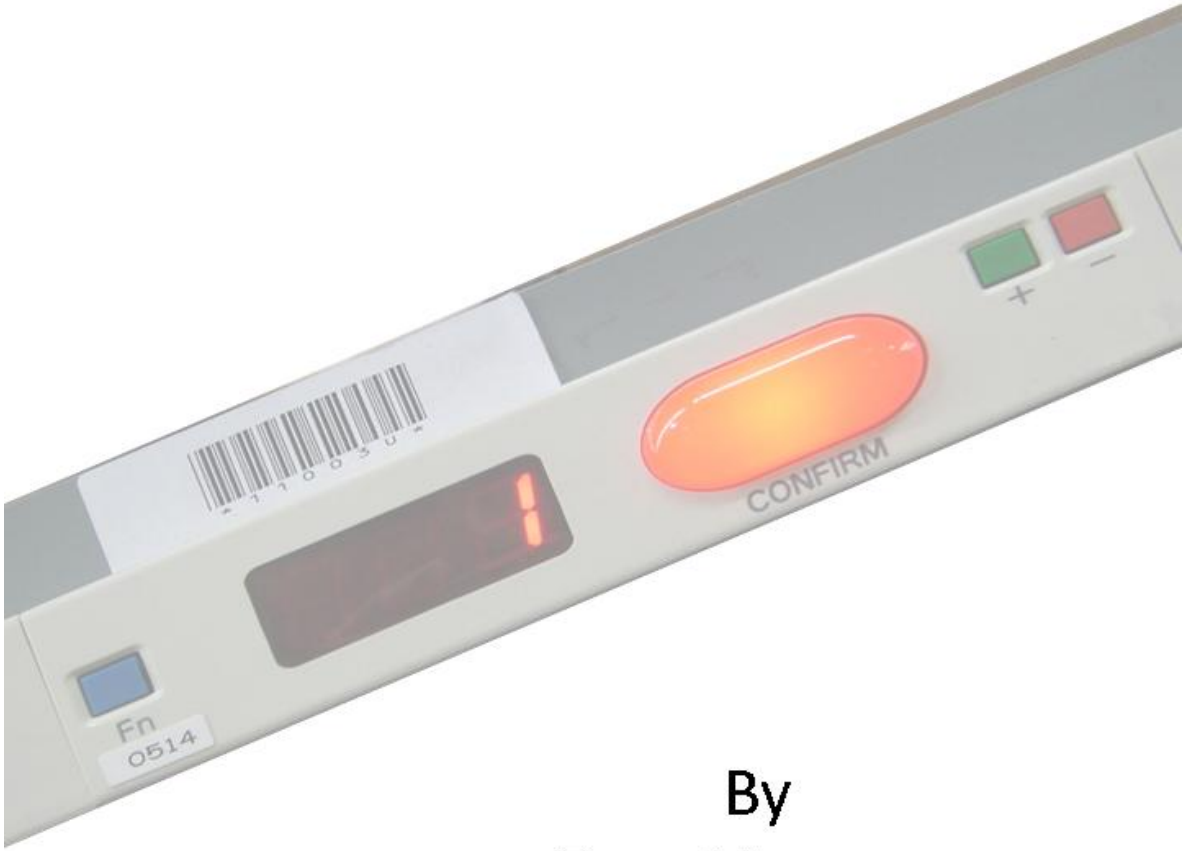
Case Study:
Implementing a Pack to Light Solution
in a
Major Retail Distribution Center



By
Greg Morneau

Sekel Associates Inc.

SEKEL ASSOCIATES, Inc.

Case Study: Implementing a Pack to Light Solution in a Major Retail Distribution Center

In the Fall of 2008, the Distribution Center (DC) for our client, a specialty women's apparel retailer, arranged to install a Pack to Light (PTL) system. Due to the economic down turn, a PTL vendor approached our client and offered very favorable pricing and terms to provide and install the system. The special terms of the offer required a rapid implementation (reduced from 6 months to only two) to begin immediately rather than in the spring or early summer of 2009 as originally scheduled.

The client was motivated by the offer, as the current manual packing operations were a bottleneck to DC throughput. Despite the aggressive schedule, the newly appointed Vice President responsible for Logistics was quick to see the benefits of an early installation. He formed a team charged with making the implementation work. The job became a two-phased effort to install the PTL system in two separate implementations, one before and one after a Distribution Center material handling upgrade.

The results were phenomenal. Throughput increased from 408 units per hour to 598 units per hour in the first month following completion of the install. Order cycle time in the DC was decreased from 8 business days to 1 business day. This paper describes how it was accomplished and how Sekel Associates contributed to the successful implementation of the PTL solution.

The DC Environment Before PTL Installation

The client operates a 165,000 square foot distribution center from which it serves over 800 stores in 2 divisions and 2 ecommerce stores across the United States.

Because there was no WMS system the operations of the DC were supported by a merchandising management system which provided item information, and assisted with purchase order management, receiving and allocations.

The process for picking and packing in the DC was a manual operation. Picking Tickets were still being printed on a dot matrix printer. The absence of a WMS and the manual processes being used in the DC did not support any method of identifying merchandise when it was presented to a pack to light system.

The pack lanes, then, were the real bottleneck in the system. Merchandise could be fed to the pack lanes at a rate of approximately 2000 units per hour (uph), but was only leaving them at a

rate of 300 uph. Additionally the manual packing process did not provide for carton content information, impacting both the regular stores and the 2 ecommerce stores.

Our client uses 3 distinct merchandise profiles:

Loose units: These are units that are packed at style, color, and size in a carton for distribution in Pick and Pack. (For example, 50 units of style 1 in color red and size small)

Bundles: These are multiple pre-packs packed in a carton for distribution in Pick and Pack. Bundles are generally packed in a poly bag. (For example, 20 poly bags of style 1, each bag contains 1 small, 2 medium, 2 large, 1 xlarge in red or in red and blue)

Re-shippable: These are pre-packs designed to be shipped as full case picks in the original vendor carton. (For example, a shippable carton of 15 lbs or more with a pre-pack of style 1, including 3 small, 6 medium, 6 large, 3 xlarge in red, or in red and blue)

The existing operation was divided into the processes of receiving, allocating, picking, packing and shipping. Below is a basic description of each of these processes:

Receiving: At the receiving stage, merchandise is received and sorted by Purchase Order (PO) and by merchandise profile. An Inventory Specialist then counts the merchandise and enters the count on a *green sheet* printout of the PO. The green sheet is then used to manually key the receipt information into the host system.

Allocation: Once the receiving step is complete, the merchandise is allocated to the stores and lane header and store pick tickets are printed.

Picking: Order expeditors split the merchandise by Loose Units and Bundles using the lane header label. They present the correct quantity to each lane with paper pick tickets for each store to receive the merchandise. Stores are assigned to lanes by division

Packing: The packers place the merchandise on a conveyor in the center of the pack lane and check the quantity against the lane header label. Then, using the pick tickets, they pack the required quantity to the proper store carton. When the carton was full, the packers push the carton onto a powered conveyor and set up a new carton for the next order.

Shipping: When the carton arrives at shipping, the carton label is scanned and a shipping label printed. The carton is then loaded onto a trailer in preparation for pickup by the shipping company.

They were still using paper pick tickets printed on dot matrix printers and locating stores visually. No carton content information was being collected or sent to the stores and there was no mechanism in place for checking the contents of the cartons after they were packed. There was also a 15-20% misread rate of carton labels at the shipping system which caused the user to key in the carton number manually, increasing the chance of shipping errors. Printing lane header and pack tickets on the outdated dot matrix printers was resulting in a 6-8 day turnaround time from the time the receipt was entered until it reached the DC floor for processing during busy times.

Another consideration was the merchandise shipments to the 2 ecommerce stores. Online services are provided by a 3rd party logistics vendor. The vendor was required to check in merchandise at an item level because the cartons lacked content information. They had expressed concern that the error rates had at times reached 30%. In an effort to fix some of this, the Logistics Manager had implemented changes by expanding manual processes beyond those normally used to assure shipment accuracy and improve the error rate. While the measures had achieved improvement, the processes were tedious and slowed down production.

Another motivational driver for the VP was the fact that newly negotiated shipping rates made it more cost effective to ship heavier cartons to stores. The client's previous paradigm had been to re-ship vendor cartons directly to stores. This accounted for 70% of their business. Packing merchandise had only been 30% of their business. As a result of the new rates, re-shipping was down to 15-20% of business, and packing was up to 80% increasing the bottleneck in the pack lanes. Having a high error rate on quantities of that percentage would have been detrimental to the business. However, the primary driver for the VP's decision to go through with the early install was the problem with throughput in the pack lanes.

The Implementation Team

The VP assembled a team to oversee and execute the implementation. He acted as the Executive Project Sponsor and appointed Greg Morneau of Sekel Associates the Consultant Project Manager. The team also included the Directors responsible for Distribution Operations, and for Logistics, and a representative from the Vendor team who acted as the Vendor Project Manager.
Additional team members included representatives from the hardware, software and Information Technology groups as needed.
The kickoff date was early November 2008 with a go-live date of mid January. The schedule was aggressive.

Requirements Analysis

Sekel Associates leveraged their experience in this industry to perform a thorough business requirements analysis. Requirements were gathered through a detailed study of current business processes and interviews with stakeholders from several departments including the distribution center, store operations, merchandise allocations and IT. The Distribution Control Room Lead helped the implementation team understand the manual process. The Distribution Outbound Lead enlightened the implementation team as to the procedures being used in the pack lanes. Morneau also sought inputs from the client's Allocations team, the Director of Distribution, the Stores Team and the primary developer of the Merchandising system. He carefully reviewed the interface points that would be required between the PTL system and the merchandising system. He also worked with the client's IT department to review server, networking and power requirements. The Pack to Light vendor determined the hardware needed in the pack lanes and developed an engineering document for review by Morneau and approval by our client. The Pack to Light vendor also prepared an Interface Specification document reviewed by Morneau and approved by our client.

During the course of requirements gathering, Morneau developed requirements which were reviewed and accepted by the stakeholders and signed off by the VP prior to beginning work. It was important to Sekel Associates that all those concerned had a good idea of what was about to happen and that they concurred on the approach. Sekel Associates knows from experience that getting concurrence on requirements is the first and fundamental step in a successful implementation. It also is essential to clearly define the scope of the implementation and set expectations for anticipated results.

A Phased Approach to Implementation

Determining requirements for the new PTL implementation was complicated by the fact that our client was about to embark on a major rebuild of their conveyors and pack lane shelving planned for late Spring - early Summer of 2009.

The PTL system would therefore be implemented in two separate phases, each phase being tailored around the upgrade. There were other considerations that needed to be addressed as well. For example, the PTL system would need to interface with the existing host system due to the lack of a DC system.

There were several manual checks against the PO performed during the course of the processes described above that would need to be duplicated by the new system. Additionally, electronic store manifests would need to be created at the carton level. The implementation team also planned on replacing the dot matrix printers with more modern technology.

To accommodate the phased approach the team decided to install temporarily on the existing shelving and then implement a second phase of installation on the new shelving following the shelving upgrade in the spring of 2009.

The existing shelving was old and did not have the channels built in to accommodate the light ducts that would be needed for the new PTL implementation. The implementation team therefore could not anticipate installing the number of light ducts that would ultimately be needed for the new shelving. The old shelves were in 8 feet long bays and the new shelves were planned for 10 feet long bays.

In order to take advantage of the price being offered in the timeframe, it was decided to go ahead and build and configure the 10' light ducts in Phase I even though some of them would not be used until Phase II. It provided the complication of the light ducts being too long, rendering some of the lights unusable in the first phase. Despite this drawback, the results from the first phase implementation were extremely encouraging.

The team determined that the best approach would be to break up the phases in the following way:

Phase I:

- Support for 1012 store locations
- 140 10' ducts each with 7 store lights, 4 8' ducts each with 5 store lights and 4 5' ducts, each with 3 store lights

Phase II:

- Support for 1,260 store locations
- 180 10' ducts each with 7 store lights

Implementation Approach

First the implementation team needed a way to identify merchandise using information on the Lane Header.

Greg Morneau devised a system, and worked with host system developers to refine it, such that all potential merchandise profiles could be handled by combining allocation number, carton code, size or pre-pack code and lane number. This *Grab ID* became the unique identifier for product for the PTL system and a barcode of the Grab ID was added to the lane header.

The team also needed a method for attaching the light ducts to the existing shelving for Phase I. For Phase II the shelves would be replaced, so the method needed to be simple, inexpensive, and easy to replace. Hardware engineers from the Pack to Light vendor suggested using plastic zip lock ties for the initial phase. They also determined that several ducts would need to be cut

in Phase I to handle interruptions in the existing shelving due to support columns. Figure 1 below shows the pack lane lights that were used.

Morneau of Sekel Associates worked with stakeholders from the allocations group, the DC control room (where pick tickets are printed and collated) and the Pack Lane Supervisor to analyze the checks that were currently taking place manually. He developed functional designs for system checks.

Each store location on the upper shelf was fitted with a 3-digit red light module with increment/decrement capability and a programmable Function key.

Each store location on the lower shelf was fitted with a 3-digit green light module with increment/decrement capability and a programmable Function key.

Figure 1: Pack Lane Lights

The PTL system required several pieces of information including:

- Grab ID
- Store Number
- Quantity
- Merchandise Profile (Loose or Bundle)

Additional information was required for our client's internal management and reporting purposes. The PTL vendor modified their database to provide specific information including PO number, allocation number, carton code, pre-pack code, size code, style and color. This information is included in the carton message that is sent from the PTL system to the host system. The information is also used in the creation of Store Carton Manifests and multiple levels of carton audits in the DC. Once a carton is "closed" the carton content information is transmitted from the PTL to the host.

Streamlining the Process

Once a day, shipping information is extracted from the shipping database for all merchandise cartons that have been scanned that day. Using the extracted information the host produces a

carton manifest which merges the carton information, ID and contents from the PTL with the shipping tracking number for the carton.

For ecommerce stores, the 3rd party vendor required some system and process changes to handle carton level manifests, so the team decided to leave the implementation of carton level manifests for ecommerce stores to a later time; however they were able to bring the ecommerce stores into the pack lanes for packing. This would enable future carton manifesting for the 3rd party vendor enabling them to receive at carton level rather than unit by unit receiving.

Pack lanes were reconfigured into a single lane configuration instead of a dual lane configuration and volume was balanced across lanes to smooth the volume of incoming merchandise to each lane.

Elimination of Paper Pick Tickets

Eliminating the need for paper pick tickets was a critical step in streamlining the DC process. The implementation team introduced the use of Blue Tooth scanners (see figure 2 below) to scan the Lane Header label Grab ID barcode. This first stage of the process identifies the order in the PTL system and illuminates the lights at the locations where stores have a demand for the merchandise. It also displays the required quantity on the LED display.

The user then packs the required quantity to the Store carton and presses the light to confirm the pick. When a carton is filled, the user pushes the carton out onto the conveyor system.

Figure 2: Blue Tooth Scanner.

The user opens a new carton by scanning the location barcode and the new carton label. This single action not only opens the new carton, but also closes the previous carton. The previous carton information is automatically sent to the host.

Technology Implementation

Zebra printers were selected to replace the existing dot matrix printers. Zebra specializes in printers for barcode printing and enjoys a strong reputation in the industry for reliable printer technology. The lane header labels were redesigned to print as a 4” wide by 6” high label on the

Zebra printer with the Grab ID barcode. Store Carton Labels were redesigned to print as a 4" wide by 2" high label on the Zebra printer. This provided highly readable lane headers and accurate carton labels that fit any carton.

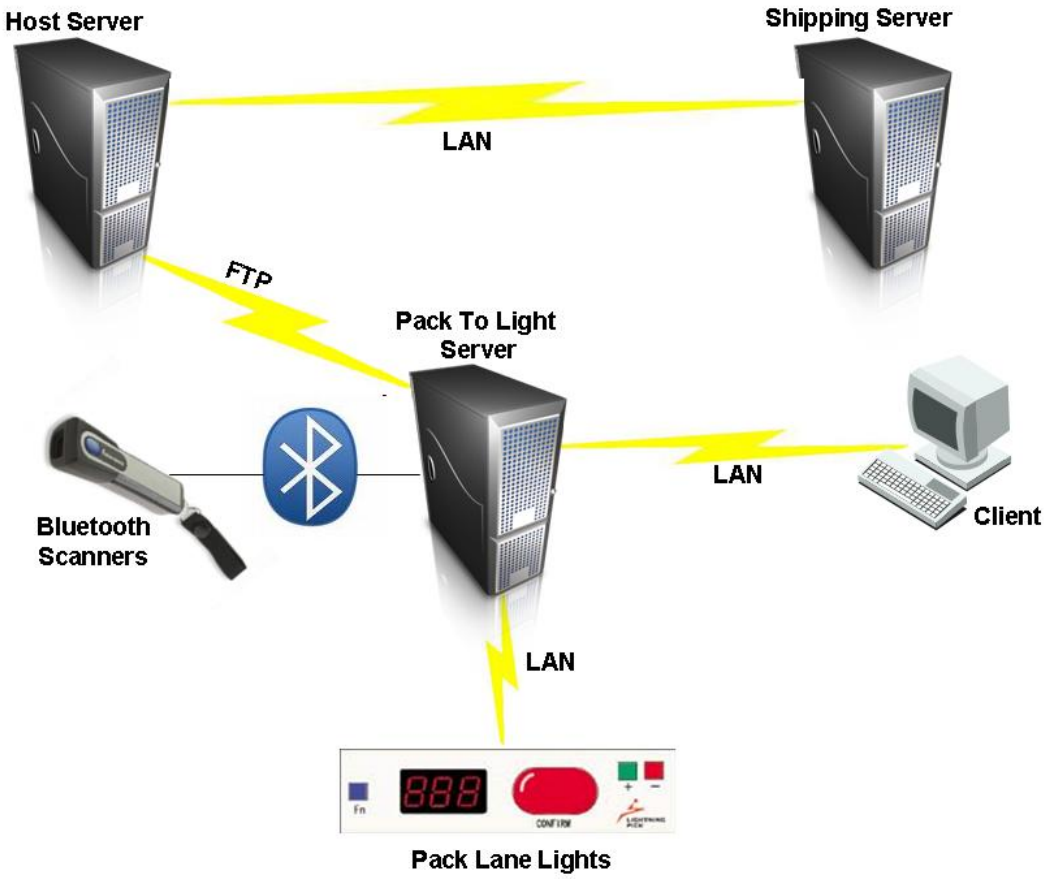


Figure 3: PTL Configuration

Figure 3 shows the configuration of the system. The host sends the order to the PTL Server. The PTL server sends information to the Pack Lane Lights indicating which stores have demand for the merchandise and the location of that store. Once the packer closes the container, the carton content information is sent to the host which uses it in conjunction with information from the shipping system to create the carton manifest for transmission to the store. The Management client on a PC located near the pack lanes can be used to create a carton content report to be used for internal DC audits and run diagnostics on the lights.

Extensible Markup Language (XML) was used to transmit allocation information to the PTL system using a File Transfer Protocol (FTP) transport. XML over FTP is a convenient, fast and easy way to transfer information using industry-wide best practices technology.

The PTL system was implemented on a Dell Server using Windows Server and SQL Server database. LPT supplied a software engineer to install the software on the server and to support testing the lights, running system tests and conduct train the trainer training.

Proof of Concept Testing

In order to develop confidence in the approach and ensure they had chosen the best possible implementation for the PTL installation, the implementation team sent key members to the LPT site. They installed the software on the new server and the Project Manager (Morneau) provided some test data and testing scripts for the system. The implementation team then set up a prototype environment as it would be implemented at the DC including light ducts, the controller and the Blue Tooth access point.

After an initial testing phase they implemented the solution at the DC.

46% Increase in Productivity

The results of the phase I implementation became evident in the first two weeks following the PTL installation. The pack lanes were able to increase to 600 units per hour immediately and increased to 750 units per hour over the next few weeks. The total throughput per hour for the DC rose 46% from 408 units per hour to 598 units per hour within a month.

Additionally, the need for temporary labor was significantly decreased by the automation. Processing cycle time from entry of receipt to the order on the DC floor fell from 6-8 business days to 1 business day. The DC was able to process priority orders in just one hour – a time which was inconceivable under the old system.

Improved Shipment Tracking

Not only did productivity increase, but errors in packing orders were significantly decreased. Carton level manifests are now created with shipping tracking numbers and sent electronically to stores overnight. Ecommerce stores are being packed in the PTL system with uniform cartons and carton content information. Designs are also underway for sending carton manifests to the ecommerce vendor as soon as they are ready to receive them.

Sekel Associates Brought Focus and Leadership

When Greg Morneau of Sekel Associates undertook the project management of our client's PTL installation, he quickly determined that, due to the ongoing upgrades in the DC, organization and a focused approach to a phased implementation would be key to success. He began with a detailed approach to requirements gathering. In essence, due to the nature of this particular

project, there were two sets of requirements. The first was a thorough analysis of the existing DC operation which would lead to list of requirements for process improvement. Key factors which needed improving were the DC throughput for order fulfillment and the error rate resulting from the manual carton packing and lack of manifest documentation accompanying the shipped cartons.

The second set of requirements dealt with the logistical approach to implementation needed to ensure that a preliminary installation could be put in place with existing conveyors belts and shelving and then a final installation would follow the warehouse upgrade of shelving and conveyor belts. The approach was critical because the price advantage would not be available to our client if they waited until after their planned upgrades were in place.

Sekel Associates leveraged their experience in project management, system implementation and the retail distribution process to come up with the right solution. Morneau made a point of defining the appropriate scope for the project at both phases and then ensuring the team stayed within scope and were able to complete the project within the projected schedule.

Executive leadership within the client company was motivated and responsive. When consultants are called in to lead an effort as complex as this one, support from Executive Leadership is absolutely critical to success. In large part the success of this project was because the Vice President stayed in touch with the project team and kept himself apprised of status, giving his support where needed. Another factor that contributed to the success of this project was the fact that the PTL system vendor had a strong installed base and was skilled in implementing their system under various different circumstances. It also worked to our advantage that the Host developer was dedicated and knowledgeable with a strong business sense as well as outstanding technical competency.

Essential factors, therefore, to a successful PTL implementation are a well-rounded team with experience and technical expertise in the solution domain, a clear focus and comprehensive requirements analysis, along with the right technical solution and a technical engineering team who understand how to interface new technologies with existing legacy systems supporting your enterprise.