

Customer Case Study

## Material Handling



# PCs Control Conveyors at Distribution Centers – PC-based control proves superior to PLCs for automation of 15 distribution centers.

### Summary

- A leading distributor of medical supplies wanted to automate its labor-intensive, manual material handling system
- PeakLogix, a system integrator specializing in full-service material handling solutions, designed and installed a three-level picking system with pick-divert technology and sortation
- The automation system is based on Phoenix Contact PC-based controls, software, communications modules and I/O
- The system has been installed at 15 locations so far, and the distributor’s customers have recognized and enjoyed the overall improvement and consistency in service



**Figure 1 - PC-based automation keeps this 250-ft long pick module with 4,000 pick locations running smoothly.**

### Customer Profile



PeakLogix ([www.peaklogix.com](http://www.peaklogix.com)) is a systems integrator in Midlothian, Va. The company provides full-service material handling solutions.

For more than 10 years, PeakLogix has worked with a leading distributor of medical and surgical supplies to the acute-care market. This distributor operates 55 distribution centers across the U.S., through which it supplies a comprehensive offering of medical and surgical products to 4,500 hospitals, integrated healthcare systems and alternate care locations. The U.S. federal government is also an important customer.

### Challenge

Until a few years ago, this distributor wasn’t automated. Order picking was a manual process, and their labor-intensive layout required excessive manual handling of products during processing as well as an inordinate amount of travel by employees within the distribution centers while processing orders. Order accuracy wasn’t acceptable, and there were too many late deliveries. When business increased, the distributor decided to implement automated material handling, picking and order processing to keep up with demand and improve customer satisfaction.

### Solution

After several years of development for the distributor, PeakLogix designed and installed a three-level picking system with pick-divert technology and sortation. This addressed the concerns of manual handling and excessive employee movement within the

facility, improved picking accuracy, and increased overall efficiency. The automation system is based on Phoenix Contact PC-based controls, software, communications modules and I/O and has been installed in 15 distribution centers so far—with more to come.

### Sorting and Picking

Each distribution center provides inventory for hospitals in the surrounding area. Orders are received throughout the day at the distribution center. These orders are fulfilled and shipped to the requesting hospital each night.

Pick orders are sent to the distribution center’s warehouse management system (WMS) which, in addition to controlling all picking in the warehouse, also directs where totes should be sent as they move down the conveyor. The Pick Module (Figure 1) is 250 ft long with more than 4,000 pick locations. When the WMS sees an order for a product, it directs the automated picking system to place a tote on the conveyor.

Once a tote is placed on the conveyor, workers place one or more products in it as it moves along the conveyor, until the tote eventually reaches the sorter. Once the products destined for a particular tote have been picked in the sub zone, the tote will return to the conveyor and proceed to either the next zone or to divert, or to sortation if all picks have been completed.

At sortation, the tote is scanned and the barcode is sent to the WMS. The WMS determines the tote’s destination and returns the appropriate “destination code.” The PC control program maintains a sortation matrix that allows 20 destination codes for each sortation spur. This matrix is maintained by the warehouse personnel and allows for adjusting of the load “on the fly” as needed.

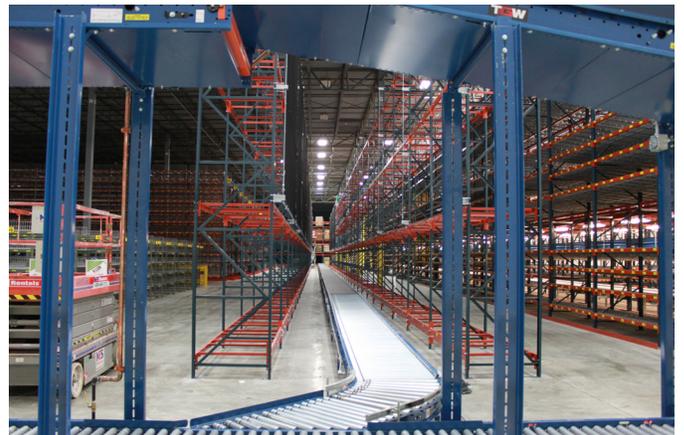
When the destination code is received from the WMS, the PC control program scans the matrix for each spur until the code is found. Once found, the tote is directed to the appropriate spur. If the code isn’t found, the case is sent to the “Jackpot” spur. As the totes arrive at the spur, warehouse personnel load them onto pallets/carts that will be transferred to delivery trucks. The conveyors (Figure 2) transport totes and cases through the distribution center and significantly reduce required manual effort.

### Picking Controls

Conveyors are traditionally controlled by PLCs. PeakLogix selected Phoenix Contact PCs, however, instead of PLCs because



**Figure 2 - The conveyor system winds through the entire distribution center, from the pick modules to sub-picking stations to sortation to shipping.**



**Figure 3 - PeakLogix supplied pallet racking and conveyors.**

the control system had to provide troubleshooting, supervisory and reporting capabilities which were easier to implement with PCs than with PLCs.

PLCs from major vendors tend to be expensive, require licensing of all software supplied by the vendor, and are hard to upgrade. Service and maintenance contracts can also be very expensive. PC hardware, on the other hand, is relatively inexpensive to purchase and maintain, and easy to upgrade.

For the installation, PeakLogix provided pallet racking and conveyors (Figure 3). Phoenix Contact provided the PC controls including a Valueline industrial PC, bus couplers, I/O, safety relays, power supplies, and surge protectors.

The Valueline PC (Figure 4) has two expansion slots used for an RS422 serial card and a 512 megabyte retentive memory card.

The built-in 32 gigabyte solid state hard drive brings a few very important features in regard to support. First, it's solid state with no rotating media, reducing the chance of failure. Second, the dedicated physical slot for the drive makes it very easy to swap should a failure occur.

The Valueline PC is a ruggedized industrial computer, which means it can handle temperature and humidity variations, vibration, and electrical noise much better than an office PC. In fact, the Valueline PC has the same or better environmental and noise immunity specifications as a typical PLC.

The control panel has a large touch screen (Figure 5) for ease of use by warehouse personnel. The narrow depth of the touchscreen doesn't require shifting devices mounted on the interior rear panel DIN rail to make room, as would be the case for deeper touchscreens.

Because the PC has built-in web server capabilities, the automation system line can be easily configured using any Web browser. For example, software changes required to add/remove input or output blocks can be accomplished very quickly on-site via a browser. The variety of physical configurations for the I/O blocks with 2, 4, 8, 16 or 32 points of I/O allowed great flexibility when designing the physical panel.

The Quint power supplies provide clean 24 volt power, and have the added benefit of extending the warranties on Phoenix Contact products installed on the supply side of the power supplies when installed with Phoenix Contact surge protection. The warranty on the Valueline PC, for example, increases from two years to five years.

The PC connects to the corporate network using standard TCP/IP via Windows networking. Rockwell's FactoryTalk is also installed in the PC and is used as the middleware between the conveyor controls and the WMS. The WMS directs movement on the conveyor based on data passed back and forth via FactoryTalk. The PC controls physical conveyor activity based on directions received from the WMS. To perform this real-time control, the PC runs Steeplechase software supplied by Phoenix Contact. The Steeplechase software is programmed in a flowchart-based language and supports connectivity to the most commonly used I/O fieldbus networks including Ethernet/IP, Modbus TCP/IP, Profibus, Interbus and DeviceNet. This makes it easy to connect the control system to almost any type of industrial I/O network. The automation system scans totes/packages as they move down



**Figure 4 - This control cabinet contains a Phoenix Contact Valueline PC, I/O, safety relays and power supplies.**



**Figure 5 - This large touchscreen provides operator interface for warehouse personnel.**

the conveyor. The conveyor has bi-directional diverts at each pick zone to move totes off the main line and into a sub zone if a pick needs to be made. The automation system sends the scanned barcode to the WMS as well as to the current location.

### **I/O Requirements**

A three-level pick module will typically consist of nine picking zones with approximately 40 motors, and the sorter will have 12 sortation spurs. Most installations also have a small quality control area. A typical system has about 200 inputs and 40 outputs.

### **Installation and startup**

One advantage of using the Steeplechase software to program the PC is that it's very easy to duplicate or change the code for additional systems. For example, after starting up and debugging

the first system, PeakLogix was able to use 95% of the code for the second system, and have continued to use the same basic code for all 15 systems.

## Results

“The Valueline PC and Phoenix Contact’s complete line of automation products have made setting up, installing and reconfiguring the conveyor hardware very easy and straightforward,” said Matt Cummings, software engineer for PeakLogix.

PeakLogix makes extended use of the Phoenix Contact Pluscon M12 Quickon connectors for making sensor connections in the field. Sensor cables can be quickly terminated using these connectors with nothing more than a pair of wire strippers and diagonal cutters—no screwdrivers or solder are needed.

Ron Turkaly, PeakLogix director of engineering, said, “We work closely with the distributor during all startups to ensure that each system is running and functioning properly, but it has become a routine job. Startups are almost always fast and very successful.” Since the automation began, the distributor’s customers have recognized and enjoyed the overall improvement and consistency in service. Additionally, they have enjoyed many benefits including but not limited to reduced teammate turnover, improved morale, improved safety, and savings in operating expenses.