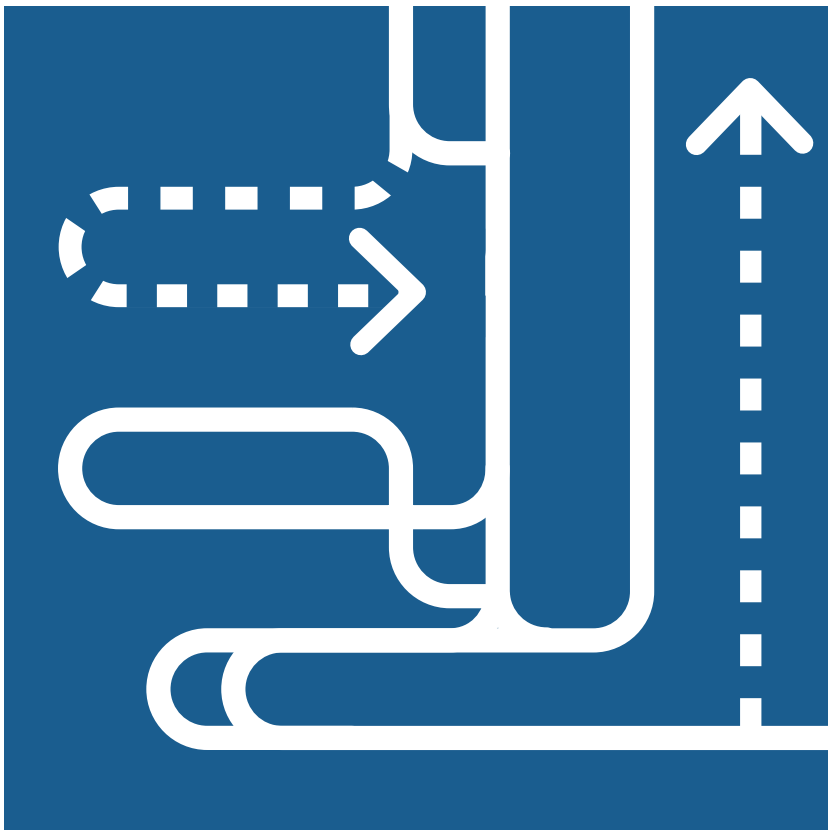
FORTE

# Planning, Designing and Implementing DC Improvements



*How to successfully complete the process of developing a retrofit/expansion or new facility project that's aligned with overarching supply chain goals*

## New or Improved DC: An Introduction to the Process

*When your distribution center (DC) reaches or exceeds design capacity, it is time for action, a thoughtful, positive response so the goals of your business are achieved and the expectations of your customers are satisfied. As the executive responsible for your organization's distribution supply chain activities, it is decision time. Should you: retrofit and/or expand in your current location; build new in an existing facility; embark on a greenfield project; or maybe engage the services of a third-party logistics (3PL) provider, at least temporarily?*

Perhaps the current situation snuck up on you. After all, it's not like there's a reliable crystal ball out there to help predict future growth or a paradigm shift in the marketplace. And while having more business than you can effectively handle is a good problem, it is, nonetheless, a problem – one that needs to be addressed, with a clear sense of immediacy.

How to handle current and future growth can often best be determined through a comprehensive supply chain network optimization process, which includes a thorough evaluation of the facilities in your supply chain. You should look for any of the following three capacity problems as a trigger for seeking a better solution:

- *Reserve storage capacity* runs between 95–100 percent of available space on a continual basis, as opposed to seasonal overflow. Perhaps you've been forced to adopt outside storage methods to handle excess inventory, either in another facility or in trailers stationed on your lot. The best-designed facility allows for normal operations to require only 85 percent of reserve storage space, permitting easier accessibility of products for putaway and replenishment and capacity for peak periods.
- *Pick locations* no longer effectively support your active stock keeping units (SKUs). Whether handling full or split cases manually or through a highly automated system, if you don't have enough pick locations to adequately meet the volume demands of your customers, or if you can't replenish those pick locations fast enough, a change needs to be made.
- *Additional personnel or shifts* cannot keep up with demand. Many facilities can generate added capacity for both picking and replenishment by adding a second or third shift. When that solution, however, reaches critical mass—for example, business is growing by 30 percent a year but a 35 percent staffing increase is required to accommodate the increased volume, or if picking can only be done during the first two shifts because the third shift is dedicated to replenishment—a new approach is clearly needed.

Arriving at that better solution requires a thorough understanding of your current situation, as well as company goals and market projections for future growth. With these parameters in mind, you can then work toward your "ideal" DC, whether it be the retrofit/expansion of the current facility, or the building of an entirely new facility.

We will now take a look at how to examine both short- and long-term operations goals to frame your ideal solution. We'll review the planning, design, testing and implementation phases that will produce a "best-in-class" solution to your current DC needs with the inherent flexibility to adequately and cost-effectively address future capability/capacity requirements.

## Retrofit or Build New: Balancing Short-term and Long-term Objectives

Certainly most companies would like to extract the maximum useable value from a current facility. At face value, it seems like the least costly and "painful" course of action. Some organizations are reluctant to sign off on construction of a new building because of its capital expense and managerial time commitments. Yet, the most important consideration is this: How long can the current DC support projected growth?

Sometimes an existing warehouse can be retrofitted and/or expanded to adapt to current and forecasted demands. To determine if this is the right approach, several factors should be considered.

First, start with an evaluation of the existing structure and its location. If the need for additional square footage is confirmed, a series of questions must be addressed: Is the property landlocked? Is there room on the property to permit the building to be expanded in at least one direction? Are load-bearing walls, offices or key mechanical junctions in the way? Can the roof be raised to create additional cube?

Then, look closely at the current materials handling equipment (MHE) and system. Was it designed for future expansion? Perhaps more importantly, is the current system oriented in such a way that it can be expanded in the same direction as the physical building? Too often, new facilities and the equipment within are designed as separate projects, with little or no consideration of potential future flexibility.

Finally, consider cost. Sometimes the cost of overcoming obstacles as those described above clearly dwarfs the cost of building new. Additional costs may also be significant and should be considered if not calculated. These include the possible disruption of service to customers, along with the reduction in efficiency and throughput that will almost certainly result while operating out of a DC under construction.

For these reasons, many companies often undertake a retrofit as a short-term solution, making small changes to yield incremental improvements in current operations while a new facility is planned. After all, it would not be feasible to stop serving customers while waiting for a new building to break ground. The installation of a new piece of equipment that could later be relocated to a new facility; the implementation of some new, more efficient handling processes and practices; or layout and organization changes are often enough to yield more economical and accurate distribution performance in the short term.

While addressing short-term needs with a retrofit, a new, scalable and flexible facility can be planned, designed and implemented to meet long-term operational goals. These include optimized operations from receiving to shipping and the maximum utilization of labor, as well as provisions for future growth.

## How to Evaluate a Supply Chain Expert as a Potential Partner for Your Facility Improvement Project

Only the largest companies might possess the manpower, training, and insight to undertake the evaluation and management of a retrofit/expansion or new facility project. For most, a third-party distribution supply chain expert is usually necessary to help develop the parameters of the design, as well as guide it through to implementation. The right partner can be of invaluable assistance as you work to align your corporate objectives with customer service requirements, contain costs, and better integrate enterprise resource planning (ERP) and warehouse management systems (WMS) with managing warehouses and inventory. Additionally, the selection of a warehouse control system (WCS), especially now with the advent of smart or intelligent software, is of critical importance. A knowledgeable partner can help with this as well.

Here are a few of the criteria you should use when evaluating a potential partner for your facility improvement project:

- **How does the supply chain expert work?** Traditional consulting firms analyze a situation, develop a concept solution, and then request competitive bids from suppliers for all facets of the project (e.g., from design and implementation to technology and equipment used within the DC). Although it may intuitively seem that the competitive bid process will yield the maximum cost savings, it actually tends to cost more, particularly in time. Alternately, parterning with a firm that takes a full system integration plan-design-build approach—coupled with a genuine commitment to help you achieve your supply chain objectives—and manages the entire process from start to finish, typically yields a new facility that's fully operational from three to nine months faster than the traditional consulting method. And this is routinely achieved at a lower total cost of MHE, controls and software as well.
- **How much experience does the supply chain expert have with actual DC operations?** Although anyone can study warehousing operations and learn about the equipment, technologies and systems used within a DC, don't underestimate the importance of working with a firm whose staff has actual "in the trenches" experience. A partner who offers both experience and broad knowledge of all those factors will best understand your current situation while bringing real-world empirical insights into the subtleties that yield the most efficient design.
- **Does the supply chain expert represent equipment or technologies from a materials handling supplier?** If the answer is yes, then that firm will be contractually obligated to develop your solution based on the technologies available in that supplier's product line—even if those technologies are not the best, or most cost-effective, solution. The ideal partner is an impartial one who is free to evaluate and specify the most appropriate equipment and systems for your project.
- **Can you obtain an uncensored list of references for every project the supply chain expert has completed?** Some projects run more smoothly than others, but every project, big or small, should not be considered complete until the customer is satisfied with the outcome. If a potential firm only provides a limited list of references, ask around to learn about other projects he or she has handled. Then call those companies for their evaluation/endorsements too. The partner you ultimately work with should have nothing to hide; you should be able to get a reference for every project they've completed, even those less than satisfactory ones.

## The Planning Phase

The first step in the planning phase of your DC improvement project is to establish key performance indicators (KPIs). These metrics—including estimated productivity by functional area, storage space requirements, facility and equipment capacities, and estimated labor costs—form the benchmarks against which the design of the final solution will be measured. As always, these KPIs should be directly tied to your organization's overarching supply chain goals in order to attain the ideal optimized network.

Then, develop both short-term and long-term solutions via a thorough analysis of operations data. Much of this information can be mined from your warehouse control system (WCS) software, if you have one with the capability and capacity to collect, store, aggregate and categorize it. This analysis is key to determining optimal flow of SKUs through a facility and supported by information handling processes (aka smart or intelligent WCS software). Each functional area is examined, with product and order characteristics evaluated to help establish distribution projections for the future. Additionally, processes and functional areas are examined during this phase to determine if changes—such as pre-labeling or advance shipping notifications from vendors—would yield improved efficiency and faster, more accurate throughput in the short term.

Areas that should be evaluated include receiving, putaway, reserve storage, replenishment, picking, value-added services (VAS), shipping and WMS-WCS capabilities/integration. Practically speaking, reserve storage and picking are almost always the two most critical areas for improvement. They are the linchpins to both problem and solution identification, and, therefore, the ones to pay closest attention to. Typical data to examine includes:

- *Item information for each SKU handled.* This includes all item numbers, descriptions, grouping information, special handling needs, length, width, height, and weight of one unit and one caseload of each item, and pallet load details.
- *Order history information for the past year and for peak seasons.* This includes order numbers, shipment identification numbers, order and ship dates, customer number, name, and ship to location, carrier code and service level.
- *Order details.* This includes order numbers, line numbers, units of measure, quantity ordered and shipped, and carton identifier information.
- *Location in the warehouse.* This includes internal location identifier, zone, aisle, bay, level and position of each SKU stored, quantities, type of storage location (such as primary pick or reserve station), and type of storage media (such as pallet rack or carousel).
- *Inbound receipt details.* This includes purchase order numbers, item numbers, the number of items ordered, quantity of items received, and order and receipt dates.
- *Customer data.* This includes customer number identifier, name, type, and billing and shipping addresses.

Once the data has been collected, it forms the basis for establishing distribution capacity requirements in the short term; it also helps determine the types and amount of equipment and space needed for each area of a planned new facility. Bigger picture, the consistent collection and analysis of this information through an enhanced WCS can be used to identify trends and predict scenarios requiring future DC network optimization strategies. Smart WCS software installation should be considered in any DC expansion or new construction project.

To achieve the optimal facility, analyze each functional area independently of the others. Propose one to four possible solutions for the problems identified in each. Then evaluate all of the proposed solutions in terms of design, efficiency and cost. For example, when examining reserve storage solutions, options might include narrow aisle storage, very narrow aisle storage, double deep storage and drive-in rack. Each option should be considered not only in terms of efficiency and affordability, but also regarding its capacity for future expansion. Rank each according to your KPIs.

Next, it's time to start assembling the process on paper through conceptual facilities layout. It may be surprising to note that sometimes the best solution for a functional area may not be the best solution for the overall DC handling system. This may be for a variety of reasons. For example, very narrow aisle storage might be your ideal solution in the reserve storage area because it offers the densest storage in the least amount of square footage. But when applied in a system model utilizing the most ideal picking solution, you may discover that the very narrow aisle storage solution couldn't support the rate of replenishment required to keep up with picking. Looking at the sum of the parts is key to finding the best one of the possible solutions.

Other areas to contemplate during the planning process include assessing the potential use of third-party logistics (3PL) providers or the possible consolidation of several facilities into one. Either requires transition planning, compliance program conformity, network analysis, and the increased use of state-of-the-art technologies such as radio-frequency identification (RFID).

This planning phase of the process, which typically takes anywhere from 12 to 16 weeks, concludes with an evaluation of two to three potential facility concepts. Issues to consider include budget limitations, personnel needs, equipment requirements, and how the concepts can achieve the KPIs identified at the beginning of the phase.

## The Design Phase

In the design phase, it's time to refine the one to three concepts deemed best from the planning phase of the process. Consulting with upper management is prudent and advisable. Are growth projections still valid, or should they be increased? Are acquisitions being considered that might affect the future growth and handling capability of the facility? Does marketing plan to implement a new e-commerce option or a performance promise that might dictate different fulfillment requirements? During the design process, it's important to ensure things haven't changed—or if they have, that you have selected the design concept to best accommodate it.

Next, it's time to work with the building architect to develop detailed drawings of the facility and the system. Hardware and software system plans are included in the design, along with the physical footprint of the facility. Detailed equipment layouts should be configured. Additionally, future expansion plans—for both systems and facility—should be anticipated and envisioned to provide flexibility to accommodate future growth.

In fact, some designs are drawn to deliberately show progressive upgrades as future budget years allow. For example, a company might ultimately desire to automate their sortation system, but simply can't afford that technology in the initial phase of implementation. The final design, therefore, would be planned in stages, with a manual sortation process developed for the first year, and the implementation of automation technology later when additional capital becomes available.

Working with an architect not only yields a better understanding of the feasibility of each concept, but also the potential cost. A skilled architect can also point out necessary structural modifications to either a retrofit or new facility project that might offer additional convenience or cost savings. For example, in order to expand an existing facility, one option might be to reinforce the ceiling so that equipment can be suspended from above, rather than anchored to the floor. The latter solution might impede future facility layouts and prove prohibitively expensive or disruptive to reconfigure. An architect has the insight to examine the actual cost differences and future value of each option to help narrow down the selection of the ultimate design concept.

The design phase also includes a plan for integrating automation systems, process engineering, material handling engineering, meeting compliance program requirements and objective vendor selection. All these elements should take into consideration overall supply chain initiatives as set forth through the network-wide optimization process. In addition, any functional specifications for the recommended WMS modules required to manage inventory at this facility as part of overall ERP strategies should be detailed at this point to aid in vendor selection. And of course, the WCS software to run the automated warehouse at optimal efficiency should also provide holistic operational awareness and the information to more insightfully and effectively manage the DC in both the immediate and longer terms. This document should detail all the known requirements for both the current and future operations. This helps to avoid costly post-integration modifications to either the automation system or the WMS.

Comparing the relative cost/benefit differences of each concept will ultimately yield the final design. Before jumping in to the implementation phase, however, be sure to have both a firm fixed price for the final step, as well as a detailed schedule for completion of the project. Finally, a budget detailing both the initial system as designed and the expected cost of projected future enhancements and expansions to the system should also be developed.

## The Testing Phase

It is essential to confirm a new system will perform as designed long before implementation–and to know it will function under a multitude of complex operating scenarios.

In essence, there are three major aspects of a DC processing system that require testing to validate its performance and ensure success:

- Integration with external systems, such as an ERP or a WMS
- Proper WCS configuration, and
- The MHE systems themselves

While several simulation software packages are available, FORTE's Warehouse Simulation™, a component of its Smart Warehouse Suite™, has proven to be the most powerful and capable in its class. Warehouse Simulation helps you comprehensively test and certify system performance from systems and controls to system data communications flows to WMS-WCS integration.

First, Warehouse Simulation certifies the reliability of all interfaces with ERP or WMS systems prior to being deployed on-site. This ensures that required interactions are defined, tested and documented.

The next step is unique to supply chain simulation. The simulation program runs the actual production-ready WCS software application as if it were installed in your facility. It is tied into your WMS to prove the critical message handling, message translations and other transactions are completely accurate and functional.

It achieves this by using real operational data in its algorithms, not made-up abstractions. It takes actual data from your WMS or from the certification process and performs real-world system scenario tests as if it were running on the floor. It can even speed up the processing to multiples of real time, allowing you to test an entire day's processing volume in a fraction of the time.

In summary, Warehouse Simulation answers the all-important question: "How is it going to work?" It emulates all the different components and subsystems necessary in a full-blown automated DC. And it does so by running the actual WCS software with real-time orders against the systems as if they really existed in your facility.

The value of testing by simulation in terms of cost and time savings cannot be overestimated. If changes to MHE layout and specifications, WCS software or any of the myriad components in the automated DC warehouse need to be made, these must happen in the planning and design phases–not during implementation.

## The Implementation Phase

Now it is time to "break ground" on either your expanded facility or your new one. Design phase drawings are expanded into the detailed installation drawings. Equipment is placed on order. The electrical controls and the system software are engineered. Areas of particular importance to monitor are the seamless integration of the automation systems with the WMS, again with particular consideration paid to relating that data as a component of the overarching supply chain goals as managed in ERP strategies. Finally, the system comes together on-site. Extensive testing of the system to an agreed to commissioning plan is the final step before going live.

Also critical is training of your new or existing staff. Be sure to provide extensive systems operations and maintenance training for supervisory, operator and maintenance employees. A combination of hands-on and classroom training generally offers the smoothest transition from the old to new system. This reduces confusion during system ramp-up and generates the quickest, most productive utilization of the new or expanded facility. This training should begin during the installation of equipment and continue through commissioning.

Finally, to ensure maximum return on investment from your expanded or new facility, it's important to continue to review the KPIs established at the beginning of the process. By continuing to monitor and review actual results as compared to those baseline standards, you will be able to isolate trends and react quickly if things get off course. Ongoing refinement of the process will help the DC keep up with the constant change and growth in business, ensuring that your improved facility meets your operational goals and performance expectations.

## Real-world Examples

### Case Study: Handbag manufacturer sustains growth with strategic DC planning

One of the fastest-growing Midwest manufacturers and retailers of handbags, luggage, accessories and gifts continues to gather pace. In 2004, the company engaged FORTE to design a highly automated 200,000 sq ft distribution center (DC). Within seven years, a 190,000 sq ft expansion was needed to accommodate the fulfillment requirements of its thousands of independent and company-owned stores plus an explosion of e-commerce business.

The original strategic plan for the DC operation anticipated rapid growth with a flexible, scalable approach to facility expansion over a multi-year period. The high performance of the original DC as conceived and implemented by FORTE, coupled with the phased approach to expansion identified in the strategic plan, has resulted in the achievement of many remarkable KPI metrics:

- Order fulfillment was reduced from two days to only 10 minutes
- Picking accuracy improved from 89% to 99.5%
- Labor productivity increased by 25%

- Training time for seasonal help has been dramatically reduced
- Peak order processing increased from 1,500 to 3,000 orders per day
- During peak seasonal periods, 140,000 items per day are shipped
- Visibility of in-process order status is available at the item level
- System investment payback is less than two years

FORTE's Smart Warehouse Suite software has been the key to the continuously improving performance of their distribution operation. At the heart of the system is FORTE's Integration Director™, a real-time, multi-directional middleware that allows any number of systems to communicate and interface instantaneously. Driving conveyor and sortation controls is FORTE's Automation Director®, one of the industry's most proven and reliable warehouse control system (WCS) software packages. The newest addition to FORTE's Smart Warehouse Suite, Simulation Director™ was employed to test system hardware and software constraints, data flows, and WCS integration to confirm the expanded operation's expected performance. These FORTE intelligent software applications have been fully integrated into the company's enterprise-level warehouse management system (WMS).

## Case Study: DC upgrade and Smart Warehouse Suite software triple throughput

The original distribution center (DC) for one of the fastest-growing fashion retailers in the country, offering a broad assortment of fashion apparel and accessories for girls and guys employed a manual, paper-based, put-to-store system. It simply could not keep pace with the company's rapid growth of eight to 10 store openings per month, much less the needs of its existing 750 outlets spread across 45 states.

Working with the company's management team, FORTE designed and implemented a technology and capacity expansion solution to convert the manual paper-based system to an automated environment. A mezzanine level built over the 16 existing put lanes doubled its physical capacity. The manual breakdown was completely eliminated. Pallet loads of individual SKUs are now brought to a case conveyor that sorts them into the appropriate put lanes. A state-of-the-art, put-to-light system was installed and is controlled by FORTE's Smart Warehouse Suite warehouse control system (WCS) software.

Several Smart Warehouse Suite intelligent software applications manage and execute DC systems and operations. The key is Automation Director, which receives the store requirements from the warehouse management system (WMS) and dynamically routes and re-routes the cases to the appropriate put lanes. Automation Director even has a unique algorithm that automatically assigns residual/excess units to the highest volume stores. After the new upper-level mezzanine went live, the first level was converted to match, resulting in zero loss of downtime or productivity during downtime. In 2012, storage capacity was doubled, and additional inputs were added to the automated processing.

The increased capacity has shortened the delivery time from DC to store shelf while enabling to add related product lines to its broad assortment of fashion apparel. Other DC performance and efficiency benefits include:

- Tripling unit volume and doubling the number of stores serviced with one less shift
- More than 25% efficiency increase in the put-to-store process

- Order accuracy to stores increased from 93% to 99.5%
- Elimination of the manual breakdown process
- Reduction of overtime to handle seasonal peaks

## Case Study: Sportswear Manufacturer Addresses Constraints With Phased DC Expansion

A leading marketer of customizable sportswear with manufacturing and distribution operations under the same roof was faced with a perplexing, yet "good problem to have": they were quickly running out of room due to growing demand and high annual SKU growth. The company engaged FORTE to develop a long-range strategic plan with the following constraints:

- A major facility expansion had "maxed out" available land use
- The DC expansion plan had to work within the facility's existing footprint
- As manufacturing was phased out, DC storage and picking capacities would simultaneously expand in carefully planned phases

The four-phase strategic plan laid out a road map for a flexible and scalable rearrangement of the space over several years. The initial phase added 18 pick zones, manifest and close-out work stations, as well as shipping sortation. At the center was a three-level pick module utilizing FORTE's Smart Warehouse Suite control software.

Phases Two and Three required a little imagination and a lot more work. Levels Two and Three of the Phase One three-level pick module were extended on mezzanines to the limits of the perimeter walls. State-of-the-art voice pick and replenishment technology were added for hands-free picking and putaway. As manufacturing began to relocate, more space became available for storage. The 18-foot ceiling height, however, was a significant encumbrance, requiring the services of a specialized firm to raise the existing roof to 31 feet.

When completed, Phase Four will add another three-level pick module with 18 new pick areas. A total of 36 zones will be servicing more than 30,000 locations. All original lineshaft equipment has been replaced with quieter and more maintenance-friendly MHE. Over the next several years, the strategic plan enables the sportswear company to expand to 48 pick areas within the facility's existing footprint before a building expansion becomes necessary.

"FORTE has been our strategic business partner for over nine years. During that time they have provided excellence in planning, designing, and implementing distribution center operational improvements that have made our operation one of the leaders in our industry. Over that time we have expanded our order picking operations infrastructure more than five times to enable us to keep up with the growth of our company. They have been a diligent partner and have treated us with integrity, respect, and an intelligent application of cutting-edge technologies. There is no one else I would do business with other than FORTE." — Director of Distribution

## Summary

Transitioning from your current distribution center operations to implementing a strategic plan for its operational potential can be challenging. Several important questions need to be pondered: Will the facility's structural space support a retrofit? Is building a new DC altogether prudent? Which option best streamlines internal systems and presents the best business solution? How seamless will the transition be from its current to future operations, for the staff, the supply line and deliverables? And perhaps most importantly, how economically feasible will this be for our DC?

# Why FORTE

## Single-Source Accountability

Whether we're helping you develop a strategic plan, design and build a distribution facility, or optimize a distribution operation through performance metrics and analytics, FORTE provides a true single point of contact responsible for the complete performance of your distribution network. No finger pointing. No fragmentation of responsibility. No multiple suppliers for technical support. You have performance goals, and it's our job to make sure they're met on an ongoing basis.

## Total Objectivity

We don't manufacture equipment. We don't develop WMS software. We don't have commercial arrangements with any suppliers for expected volumes of business. We're simply interested in delivering the most efficient distribution solutions at the lowest total cost. Our client-side service approach means our only allegiance is to our customers. So with every engagement, you know we'll choose the most appropriate level and blend of technologies integrated into an effective operational system.

## Expertise

Our team is deeply rooted in the hands-on implementation of distribution center design and warehouse automation. FORTE's engineers and technicians integrate today's best practices in supply chain management and distribution center operations while developing next-generation technologies. As a result, our solutions employ the best combination of practical advice, data-driven analysis and technology-enabled systems. With FORTE, you get:

- More accountability than a consultant
- More experience than a systems integrator
- More objectivity than a manufacturer

***That's why the world's fastest-growing companies are making distribution their FORTE.***

274-WP-1008

**MAIN** (513) 398.2800 **FAX** (513) 398.2837 6037 Commerce Court / Mason, Ohio 45040 / **FORTE-Industries.com**