FRESH DIRECT:

SIMULATION HELPS ONLINE GROCER OPTIMIZE ORDER FULFILLMENT OPERATIONS

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INTRODUCTION

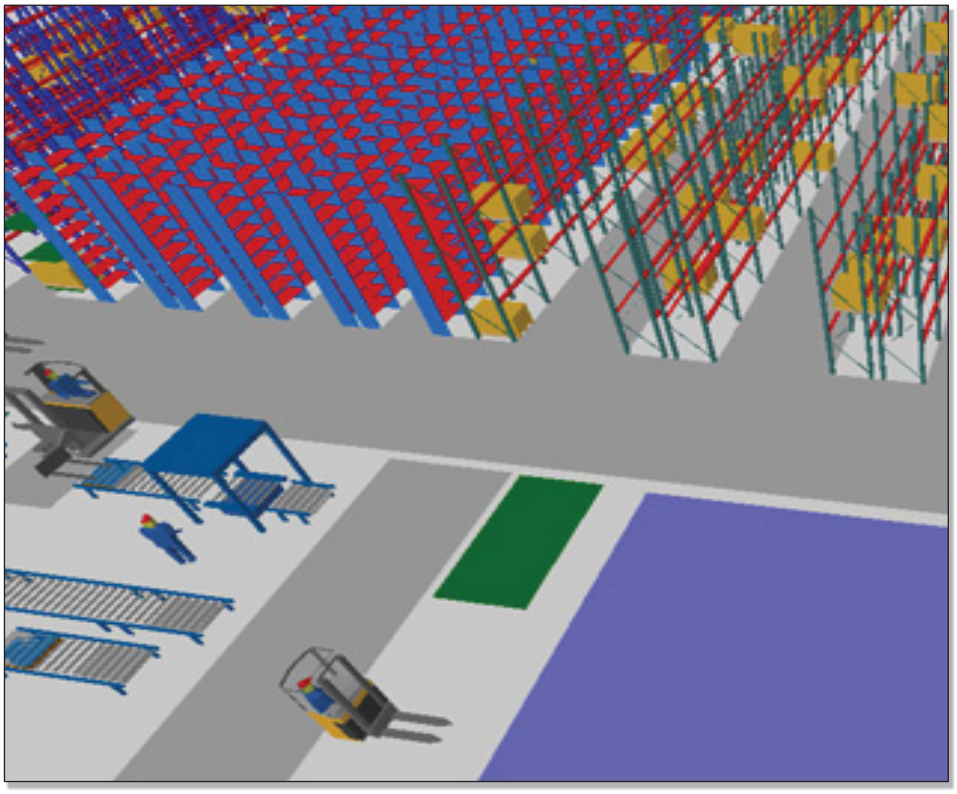
FreshDirect, based in NYC, is one of the very few online grocers to have made a go of it since the "new economy" version of shopping for groceries via the internet first came to the public's attention in the late 1990s. Many other grocers did not survive the internet business shakeout of the early 2000s, including such high profile cases as WebVan.

FreshDirect started up operations in late 2002, and has been growing rapidly since. In 2004, the percent of New Yorkers that had ordered groceries from FreshDirect rose to 52 percent, and the company now claims over 100,000 regular customers. The grocer's 300,000-square foot facility in Long Island City, Queens (NY), employs about 1,000 butchers, bakers, produce pickers and other food workers. It includes miles of conveyer belts, which carry tubs from the far-flung departments, to order consolidation, staging, packing and finally shipping areas. All in all, a very large facility representing a significant investment.

CHALLENGE

Greater demands on operations and capacity generate need to re-evaluate resources and processes.

In 2000, when the FreshDirect team was in the process of creating the business and designing the order processing and distribution facility, they needed a way to analyze and test their design. They contracted TranSystems to develop a detailed simulation model of the final proposed system design as a "proof of concept" engineering exercise. This "virtual business model" simulated the process of receiving, batching and processing the orders, based on assumptions made regarding the volume of orders and the mix of items. The model mimicked the operation of all material handling, storage, and control equipment, as well as the activities of the various staff throughout the facility – butchers, bakers, order pickers, etc. The model was used to "fine tune" the design and test assumptions about growth rates and ordering preferences in the future. One of the basic facility operating assumptions was driven by the targeted number of daily orders to process (approximately 10,000) and number of trucks (and loading doors available) needed to handle the deliveries. This required that orders would be



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batched and processed together in groups, or "waves," for efficiency and to meet targeted delivery route schedules, which were to depart the facility approximately every hour throughout the late morning and afternoon.

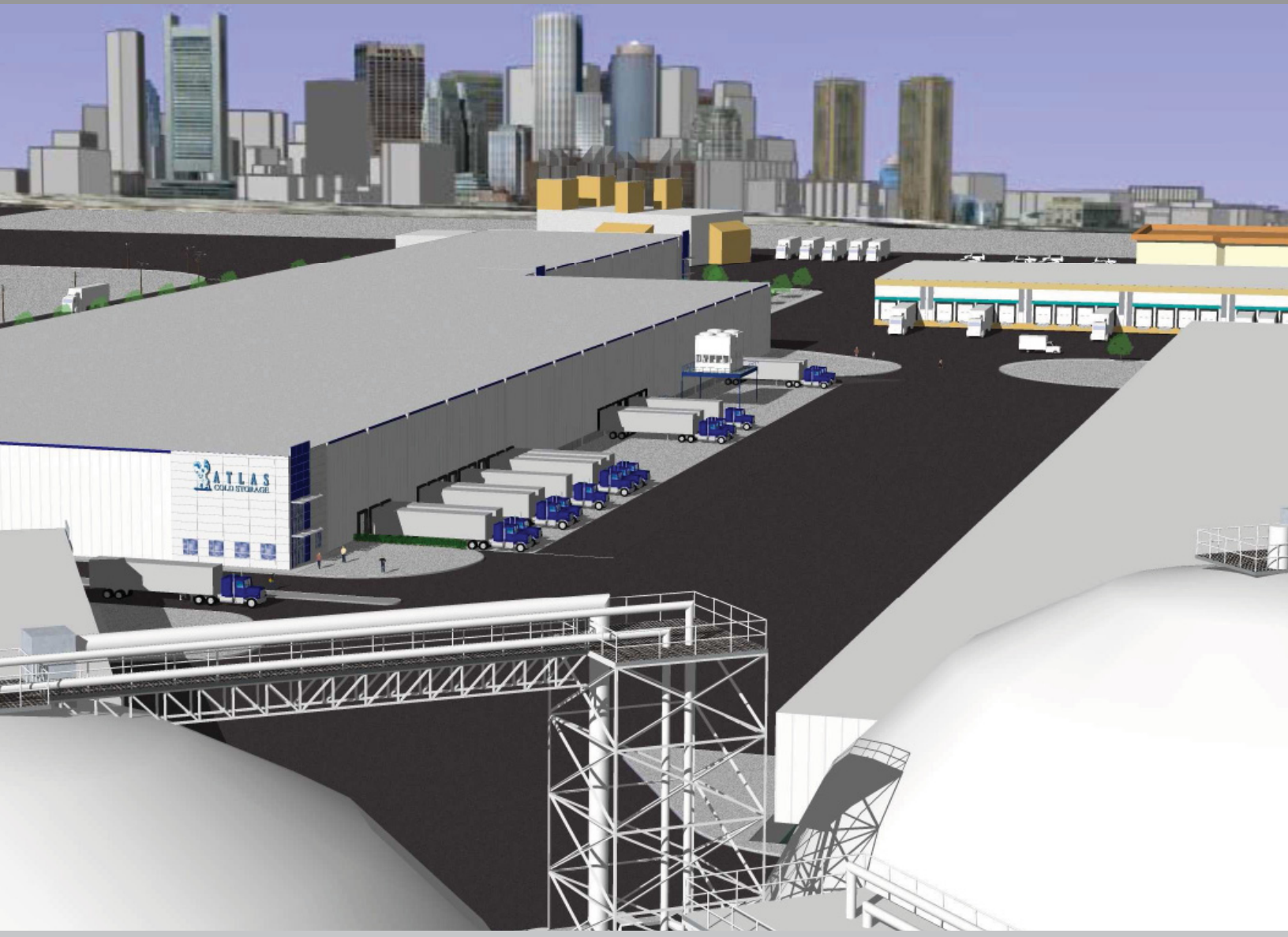
Processing customer orders together in such a fashion – which is typical in most modern distribution and order processing facilities – requires an intricate and very well planned process of picking and bringing together (sorting and staging) the components for each order from the various parts of the facility at the same time, and just in time for the truck schedule. Activity literally surges through the facility in waves. Bottlenecks, congestion or late processing of any component can have a significant "ripple effect"on the entire facility and create havoc with shipping schedules.

As the business became successful through 2003 and 2004, customer order volume grew and began to reveal problems related to assumptions made early in the design phase. These assumptions related to the accuracy rates that could be expected from order picker staff and their impact on the conveyer staging and sequencing of waves, to the timing of order components arriving at the sortation/staging areas and to the relative popularity (and resulting order volume) of the different product items. Bottlenecks were developing, additional staff was needed to expedite order items and truck departure schedules were suffering.

SOLUTION

Develop a simulation model to prove which alternatives would best mitigate operational challenges and allow an adequate response to growing demand.

By mid-2005, intending to solve the problems that had developed and improve the flow of orders through the system, FreshDirect management had developed a series of proposed updates or changes to the facility operation, arrangement and material handling and control equipment. However, making such changes to the system while in-use on a daily basis would be extremely disruptive, and – if not totally successful – could even intensify existing problems. In addition, it was not at all clear which of the proposed changes – or combination of changes – might have unexpected and possibly negative side effects. This is often the case in any large automated system. So the modeling team at AAI was called back into update the original model to reflect an "as built" state and assist with analyzing current operations to test the effectiveness of the proposed system updates "off line." The objective was to determine which of the changes would be most cost effective, and to identify any side effects and find solutions, without disrupting operations within the facility.



In addition, the model was to be delivered to FreshDirect management so that they could directly use it for ongoing planning support as the business continued to grow and evolve.

"It made sense for us to turn to a proven technique after experiencing first-hand the benefits of simulation when building a streamlined operations facility," explained Jason Ackerman, vice chairman and chief financial officer of Fresh Direct. "We have since made simulation an essential part of our planning process, and we're confident that TranSystems's expertise will help us get to our current goal of predictable expansion requirements."

The project began in the summer of 2005 with surveying the existing system to determine the changes since the initial design, and collecting data for current order profiles, staffing levels and actual work rates, for example. By the fall, the model changes had been documented, completed and tested. Actual order files from FreshDirect's SAP enterprise system for specific high volume days were used to test the model. In fact, one of the more interesting parts of the project was the development and delivery of a "synthetic order generator" – a program that can be used by FreshDirect staff to generate order files that would reflect possible future business scenarios or changes that may be of concern – to see how the facility would respond. This could include the daily volume of orders, order size profiles (number of large, medium, small, etc.), relative frequency of ordering different products (i.e., milk, meat items, coffee), even the addition of new products or moving products to different areas of the facility.

Results

Successful implementation of operational changes that increased efficiency and established growth metrics for future strategies.

Working together with the FreshDirect project team, a series of simulation experiments were run to test the impact on the "virtual facility" model. The first key result was to test the impact on order flow of several proposed control changes to the conveyer-sortation system. The surging of waves through the system required more sophisticated timing control to smooth out the downstream flow and implement a more orderly flow of completed orders to the shipping area. Another important result was to fully understand the ripple effects of operator picking errors, and how these caused intermixing of waves further "down-stream" in the order sortation area. By implementing operator procedure changes and by modifying the sortation stations to accommodate late-arriving order items, the down-stream effects of mis-picks were minimized. The model was also used to further optimize the way in which orders were sorted and staged for each truck door, to minimize the impacts of different sized orders. As many as two dozen separate ideas or proposed changes were tested, both individually and in combinations, to determine which would have the most positive impact and be implemented.

The recent project enabled FreshDirect to determine the ultimate capacity of its current facility and establish metrics that will signal need for a second location. They are now using the model in-house to fine-tune their upgrade strategy, and have started rolling out the changes determined through the modeling exercise. Stay tuned to a future edition of Innovations for a follow up report on their progress.

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