



September 2007

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smoothing the waves

By Peter Bradley

Waveless processing in the DC could result in gains in productivity and throughput. But it may not be for every operation.

Imagine that you're standing by the seashore watching the breakers roll in. Each builds height and force as it approaches the shore. Then, as it drags over the bottom, it loses energy before crashing on the beach.

That buildup and subsequent loss of energy could serve as a metaphor for wave-based picking, say some critics of the popular order-picking technique. Early in each wave, activity can be frenetic as order pickers in zones around the distribution center pick goods for batched orders. Then toward the end of the wave, activity and productivity fall off as some order pickers finish ahead of others.

To avoid these productivity losses and increase throughput, some DCs are shifting to waveless picking, also called continuous-flow picking or dynamic-wave processing. The principal difference between waveless and wave-based, or fixed-wave, processing is the way tasks are assigned and controlled. In waveless or continuous-flow processing, new orders are continually added to the work flow with no pauses between batches. In wave processing or fixed-wave picking, by contrast, all of the orders in a wave are completed before the orders in the next batch begin, and the number of orders in a wave is limited by the number of end points on the sorter, according to Sam Flanders of 2wmc.com Consulting Group. "That way, every time you induct something into the system, you know it has a place to fall," Flanders explains. "That is truly straightforward."

Wave planners do go to great lengths to try to ensure a balanced workload, making use of sortation systems so that each order picker finishes a wave at about the same time. But a variety of factors work against seamless execution. As a result, many DC managers build expensive buffers to ensure that work continues smoothly, and they depend on the time between waves to get back in sync.

Waveless picking, however, makes use of intelligent warehouse control systems (WCS) that can perform dynamic workload balancing, adjusting work flow to changing circumstances. This ability to juggle flows in real time makes continuous-flow picking possible. (For more on intelligent WCS, see "[WCS learn to think for themselves](#)," *DC VELOCITY*, April 2007.) By using this technology, managers avoid wasting energy in planning and executing waves and improve DC productivity substantially. In fact, picking productivity can increase by as much as 20 percent and throughput capacity by up to 35 percent by switching from waves to waveless processing, according to Fortna Inc., a supply chain consultancy and systems integrator.

These factors have won over Fortna's director of optimizing technology, Arturo Hinojosa, who has become a vocal advocate of waveless picking. He argues that wave-based order processing is a relic of paper-based picking systems and that waveless picking is, well, the wave of the future.

Remove waves, remove inefficiency

Inefficiencies in wave-based processes result from the way the work is segmented; new orders are added only at the beginning of each wave rather than dynamically as orders in the current batch are completed. "The problem is that as the wave nears completion, many of the orders are already complete, but because with a fixed wave you have to wait to complete all the orders, you are not utilizing the sorter to its maximum efficiency," says Flanders. "Where you lose productivity is in the close-out." A waveless process, on the other hand, keeps adding new orders into the work flow as individual orders in the current batch are completed.

Further, with wave-based picking, unexpected occurrences in one part of the DC—say, a stock-out—can delay the entire wave and every order in it. Waveless processing, however, is more adaptable, according to Hinojosa. "These systems bail you out if slotting or other things are not perfect. It helps if it's perfect," he says, "but it is not necessary."

To illustrate the differences, Flanders cites the example of a sorter with 200 destinations. In a fixed-wave operation, all 200 orders in a system would have to be completed before more are added. "With a dynamic wave or continuous flow, you don't have to pick all 200," he says. "When an order is complete, a light comes on that says that order is complete, and you can push that out and bring in a new tote or carton for another order."

Efficiency is also improved because pickers aren't required to return to the start point whenever orders are added. Instead, they continually move through their assigned zones. In fact, for pickers directed by voice, radio-frequency, or pick-to-light systems, the completion and addition of orders is transparent, says Hinojosa. "Nobody has to worry about which wave you are working on," he says. "Wave integrity goes away. Everyone works as fast and hard as they can. The picker does not know if he is working on an old order or on an order just recently added to his tasks, and he does not need to know. There are no wave transitions," he says. "You are always picking at the crest of the wave."

Waveless wipes out costly buffers

Not only can fixed-wave systems be inefficient, they can also drive up costs by forcing companies to build buffers. Hinojosa explains that when workers in one zone finish a wave ahead of other zones, workers in that zone may be directed to start picking for the next wave rather than remain idle. Those goods often move to a buffer conveyor, where they are held until shipping is ready for the next wave. "I've been to a facility with a \$6 million buffer," he reports. "And these are supposed to be facilities with very efficient and sophisticated wave-planning tools."

Besides being costly, buffers can create issues of their own. Hinojosa says he asked a manager at the DC with the \$6 million buffer why some shipping doors were not being worked. The answer was that the DC was at the end of a wave, and that goods for those doors were mixed in the buffer with other goods for the next wave. "They were spending money to solve problems that they themselves created," Hinojosa says.

Those problems are eliminated in a waveless process, he contends. In a waveless system, he explains, every order being picked has a shipping location ready for it. "You eliminate the need for buffers," he says.

But you may need more employees. Flanders says that in fixed-wave systems, the end points, where orders drop, do not need to be continually manned. In a dynamic-wave system, however, workers must be ready to move completed orders out when finished and bring in a new carton or tote for the next order.

From wave to waveless

For these reasons, some companies have shifted or are shifting from a fixed-wave system to a waveless system. But that raises the

question of how to go about making the change.

The first step, Hinojosa says, is to determine a way to keep the overall system balanced, eliminating the need to rebalance between waves. He argues that DC managers and supervisors should not try to keep work balanced by determining when to release orders to the floor. "In my mind, that works just so far," he says. "Orders are out of the control of the DC. A much better way to do this is to say 'Send us the orders in priority. When we see things start to get out of sync, we'll just move people.'"

Hinojosa does admit that this balancing act requires sophisticated software that can help supervisors make decisions in real time. "You want decisions made by the warehouse control system," he says. "It has the widest view of what is happening. The problem is that you can have a system that is too smart for its own good. The WMS [warehouse management system] still needs to tell the WCS what to pick. The role of the WCS is just the processing of those orders."

Not without its difficulties

Despite the potential advantages, Hinojosa acknowledges that few companies are considering a shift to waveless processes.

"Implementation is not that simple," he says, "especially when you are working with systems that are designed for wave-based picking."

Implementing waveless picking can be especially daunting for operations that handle vast numbers of stock-keeping units (SKUs). Flanders says that moving to dynamic waves in operations with a large number of SKUs requires a significant amount of management effort. "It's like a game of solitaire," he explains. "If all the slots in the game are full, the game is over, and you lose. If you have 10,000 SKUs and 1,200 drop points, you can have a lot of SKUs on the sorter with no place to drop into. If you want to work with continuous flow, you have to be cognizant of this."

If you do have a large SKU set, it is still possible to implement a dynamic wave system, says Flanders, but it requires much greater care in planning to assure that all of the goods for each order can be handled by the sortation system. "With a large SKU set, you have to be much better about managing the way orders come in," he says.

Today's warehouse control systems can manage the release of orders to balance workloads in real time among pick lanes, the sortation devices, and the shipping lanes. The key, according to Flanders, is to develop an effective plan for inducting batches of orders into the system so that they can be completed and cleared out. Obviously, the greater the SKU count, the more difficult that becomes.

Flanders warns against trying to implement a WMS and dynamic wave processing in a DC simultaneously. "You are taking on some tall orders," he says. "Trying to do too much at the same time can result in failure."

Such difficulties can lead to resistance from DC managers and employees, acknowledges Hinojosa. "People say, 'This is wonderful, much better than what we have now. But imagine how much work it will take to change to this approach.' That's a valid concern," he says.

In these cases, the best champion for waveless processing may be the chief financial officer. "Imagine having a sorter operation, and you are in the middle of two waves. You see all the chutes empty. Everything is finished at the sorter and ready for the next wave. Go to the sorting supervisor and ask how he likes it, and he will say he thinks it's wonderful. He can start the next wave right away. Show the CFO the same picture and ask how he likes seeing all that equipment doing nothing, and the answer will be very different."

While considerable effort may be required to make the changeover, Hinojosa believes that DCs that switch to waveless picking will realize tremendous benefits. "In places where I have seen this done, if you tried to go back to the old approach, you would have a riot in the DC," he says. "The operation becomes so much simpler for everybody."

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