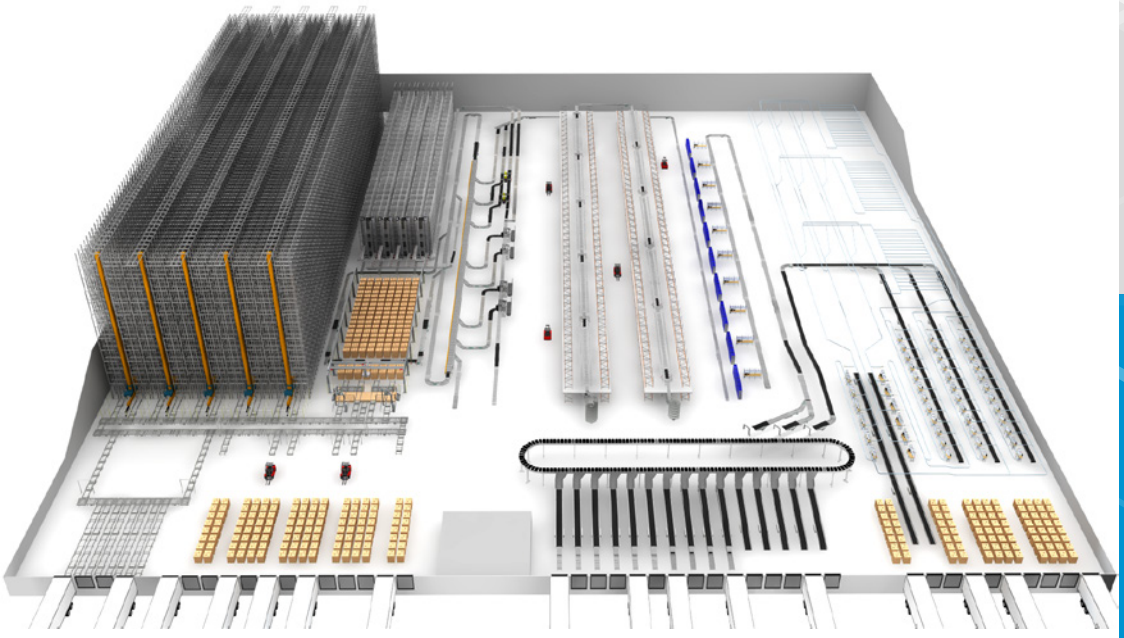
DEMATIC

Smart Task Activation Processing Maximizes Order Fulfillment Efficiency



WHITE PAPER

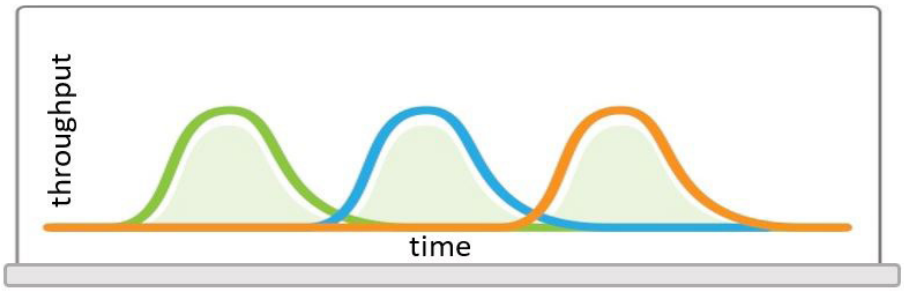
Overview

Batch processing has proven to be a highly effective order fulfillment method for retailers, wholesalers, and business-to-business distributors. There are two types of batch processing: Wave Batch and Smart Task Activation. Wave Batch order processing is effective and widely embraced by order fulfilment operations worldwide. However, order fulfillment operations that have transitioned from Wave Batch processing to Smart Task Activation processing have experienced increases in throughput capacity of up to 40% with labor productivity increases of up to 20%. A description and comparison of Wave Batch and Smart Task Activation are presented in this white paper.

Batch Picking in Waves

In the beginning, order fulfillment operations were designed for workers to process one order at a time. As the order fulfillment process evolved, warehouse managers determined that order assembly could be made more efficient by picking multiple orders with one pass through the warehouse. This process assigns a group of orders to a batch. It became known as batch picking. As order volume increased, order management software was developed to batch pick and process orders strategically in waves.

However, Wave Batch processing has some inefficiencies. Each batch of orders to be picked, known as a wave, must be completed before a new wave batch is started. And that batch cannot finish until all the orders are picked and until there is a position/destination for each of those orders to be placed. The number of available destinations needs to equal the number of orders. Even if a fast worker has completed all picks assigned, this worker cannot start the next wave batch. This means workers become idle, as there is no available position/destination to send the picked items. To increase productivity for wave-based processing, a buffer is included to temporarily hold picked items until a destination is available.

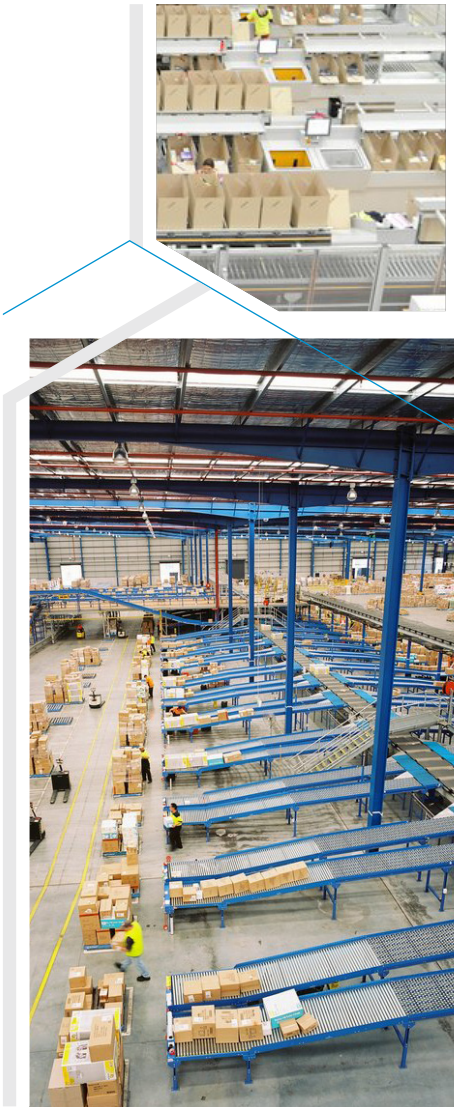


WAVE BATCH PROCESSING HAS THESE ISSUES:

- **Wave transitions:** A wave transition occurs when operators complete a wave batch. During wave transitions, the productivity drops significantly as warehouse staff is idle waiting for work.
- **Wave tails:** Even before a wave finishes, during the wave tail, productivity drops as a result of diminishing wave batch size.
- **Exception handling:** Exceptions, such as shorts and picking errors, delay the completion of a wave. These anomalies diminish productivity until resolved. Problem resolution teams need to fix exceptions prior to the start of the next wave.
- **Priority orders:** Urgent or special handling orders cannot be introduced or activated immediately. These orders need to wait for the current wave to complete. When multiple waves are planned, all waves must be complete before processing priority orders. And the planned waves must be re-planned again with the priority orders.

TWO METHODS TO IMPROVE THE EFFECTIVENESS OF WAVE BATCH PROCESSING ARE AVAILABLE:

- **Wave buffers:** Conveyor or storage buffers can be used to stage future wave containers (totes or cases), allowing warehouse staff to work on future waves after completing the current wave. This method requires capital investment in conveyor or storage infrastructure as well as warehouse space.
- **Wave overlapping:** Requires twice as many physical order consolidation destinations as the number of orders in a wave batch. This allows staff to start working on the next wave after completing the current wave. However, with wave overlapping, the batch size is cut in half, potentially forcing workers to walk twice as much as if the waves were sized for all the destinations.



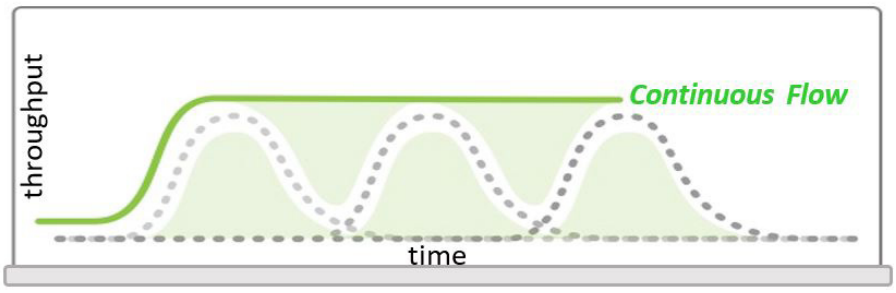
Smart Task Activation

Smart Task Activation is a single batch processing order fulfillment method that increases productivity and operational effectiveness by synchronizing workflows in real time. It uses a dynamic strategy that is based on a revolving queue of orders. Smart Task Activation "pulls" work to resources and processes orders on-demand, continuously and dynamically instead of in static waves. It is a highly effective waveless method of managing order fulfillment.

Every time an order completes, a new order is activated for processing. Smart Task Activation evaluates each order immediately upon receipt and calculates urgency level for real-time prioritization, planning, and execution. It adds the next best order to execute based on priority and resource availability. The Smart Task Activation queue is always revolving and re-prioritizing.

This approach includes real-time decision making — the processing plan is not pre-defined and rigid, but rather determined based on current conditions. Since the warehouse staff and order destination status is available in real time, the execution software can direct the order fulfillment process with an "on-demand" strategy, thereby processing orders in a Smart Task Activation.

For example, with manual picking applications, as soon as one task is completed, pickers are assigned the next task based on their current location and the inventory in the pick module. In Smart Task Activation processing, automated inventory storage fully uses the capacity of a buffer to maintain an even and steady workflow in and out of storage.



▷ **Smart Task Activation processes orders "on-demand" instead of in pre-defined, static waves.**

Benefits of Smart Task Activation

The dynamic/revolving order batch is the basis of Smart Task Activation processing. The order pool is always morphing and adjusting to current conditions. New orders can be added to the ongoing batch at any time. This strategy improves productivity, reduces overall order processing time, and supports faster fulfillment of priority orders. It produces a smooth and consistent operating environment. Operational and business benefits include:

OPERATIONS:

- Up to 40% increase in throughput capacity
- Up to 20% increase in labor productivity
- Reduces order cycle time
- Maximizes utilization of material handling automation
- Dynamic and responsive, reacts in real time to demand signals
- Priority orders processed without delay
- Provides constant, real-time insight to work-in-progress status
- Removes peaks and valleys in activity, the entire operation remains balanced
- Eliminates wave transitions with a revolving dynamic batch
- No wave tails, batch size never shrinks, stays at its maximum feasible value
- Picking errors, shorts, or exceptions affect only one order, not the whole wave
- Operational effectiveness for proposed application confirmed using simulation modeling

BUSINESS:

- Reduces initial capital investment with less automation hardware (wave buffers not required)
- Reduces cost per order
- Requires less warehouse space
- Retrofits into existing wave batch operations
- Supports omnichannel strategies
- Increases customer satisfaction, profits

Smart Task Activation in Operation

Smart Task Activation processing releases work based on order priority, order age, shipping request, worker status, available resources, and available inventory. It anticipates when and where resources will become available. Resources of a distribution center include inventory, labor, and material handling automation such as storage sub-system, conveyor, goods-to-person workstations, pick modules, put walls, circular unit sorters, packing workstations.

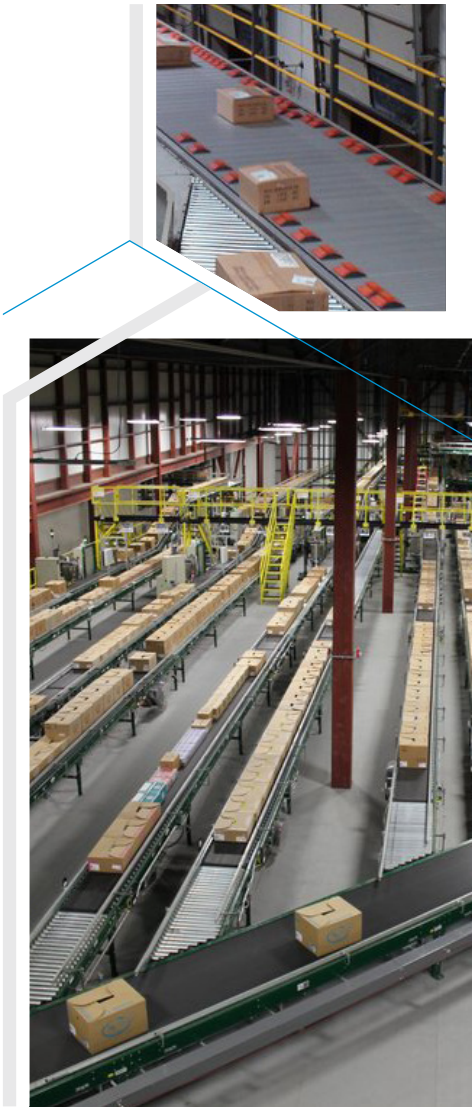
Smart Task Activation execution software uses an “in-transit queue” to manage the work release process. Smart Task Activation systems do not limit the size of the batch to the number of physical destinations. With dynamic/revolving order batch, the work-in-process or in-transit queue is larger than the total number of destinations. It accounts for activated orders that are still in transit to the destinations and synchronizes the timing of resource availability.

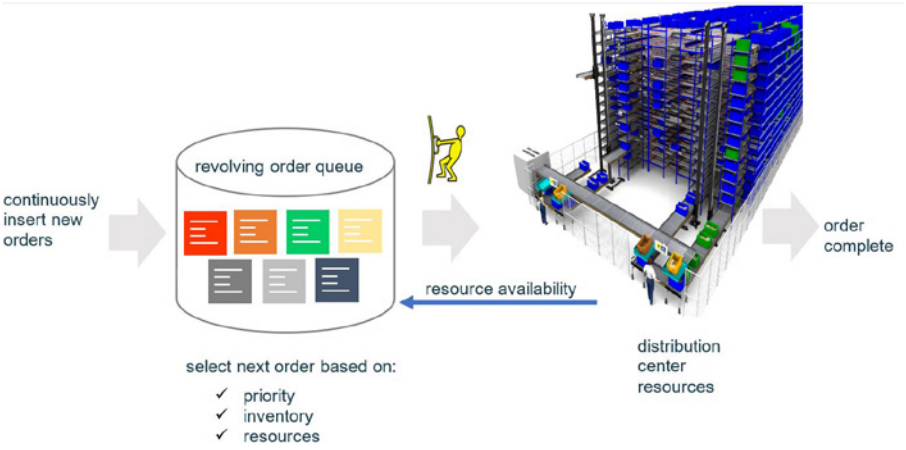
Smart Task Activation processing anticipates the amount of resources needed and then releases the optimum number of orders. By the time the order arrives at the destination, a space will be available. For example, in an e-commerce application with 1,000 order positions in the put walls there can be 1,400 active orders in the in-transit queue of the dynamic/revolving order batch.

RESOURCE OPTIMIZATION

Sharing the same revolving order batch across an entire operation may result in smaller active orders for each of the functional areas, which diminishes the effective use of staff. To avoid this, Smart Task Activation processing deploys resource optimization strategies. Resource optimization manages each area of the operation independently. Resource optimization algorithms allow each section of the facility to maximize the number of orders processed while ensuring that downstream resources will have available capacity to handle arriving work.

Resource optimization algorithms allow the different areas of the facility to operate more efficiently. Each area of the facility is an independent entity de-coupled from other areas. Each area can maximize its throughput without risking diminished performance. Orders don’t get delayed in the transition points between areas. Managing all the areas of the facility with resource optimization algorithms keeps all areas in synchronization. Each operational area can be managed and optimized more effectively as a de-coupled unit.

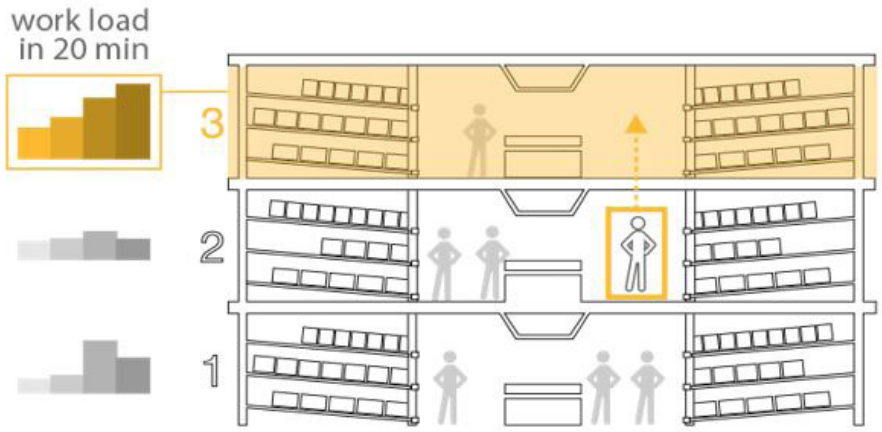




MOVE LOGIC

Move Logic is a real time labor re-allocation algorithm. It is used to determine the best allocation of staff performing tasks to complete x work in the most efficient amount of time. Move Logic looks ahead, in a time window, to assess the amount of work that needs to be completed in the coming hour.

The allocation of staff and other pre-defined business priority rules, re-allocates workers only as needed, and only the workers specifically needed, to balance the work and complete it as targeted. This applies to any functional area defined by the user, such as replenishment, picking, packing, etc.

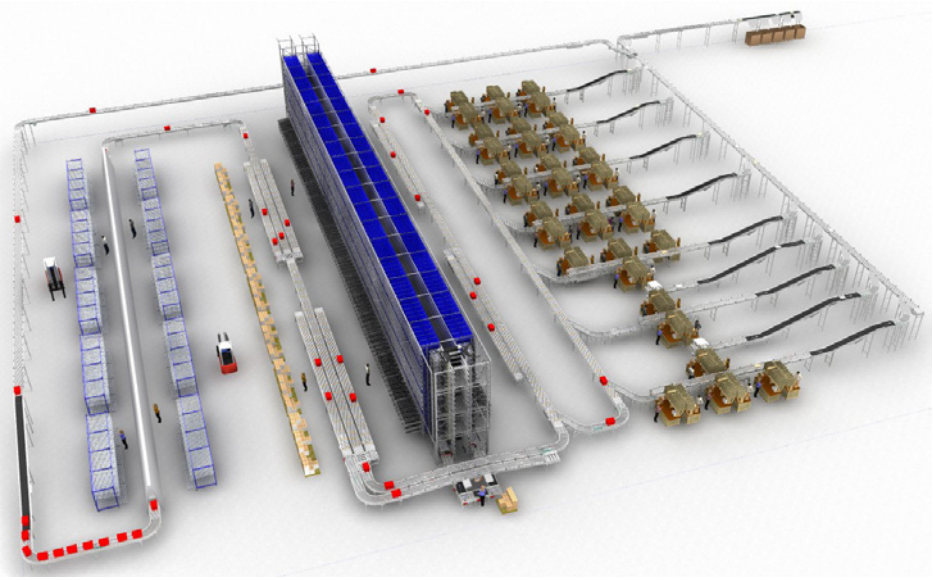


SYSTEM DIRECTION

System Direction is the application that releases work in real time in a way that makes the best use of staff. It uses order/task priority and worker proximity, along with other defined factors, to assess at the end of each task the next best task for that worker at that time to complete the overall set of work in the area.

In summary, Move Logic is the look ahead planning and estimating application. System Direction is the real time, at-that-moment-next-best-tasking application.

Resource optimization algorithms allow each section of the distribution center to maximize the number of orders processed while ensuring that downstream resources will have available capacity to handle arriving work.



Glossary

Batch: Set of order or order lines to be processed together in a distribution center area or workstation. The orders or order lines within a batch can be processed in any sequence.

Smart Task Activation: An order fulfillment method that processes orders continuously instead of in waves. The dynamic/revolving order queue is the basis of Smart Task Activation processing.

Smart Task Activation Queue: A batch operation where order or order lines can be continuously added to the queue as order or order lines complete in a released batch. Smart Task Activation has a dynamic/revolving queue that releases batches that have been continuously modified prior to release for execution.

Destinations: The physical maximum number of orders or order lines that can be processed together, as a batch, in distribution center area. The physical limitation can be the number of shipping doors for a shipping sorter, the number cubbyholes for a put wall, the number of chutes for a unit sorter (if consolidating one order per chute), and the number of put locations in a goods-to-person workstation.

Productivity: The number of completed tasks by a resource in a unit of time.

Resources: The three main categories of resources in the distribution center are labor, inventory, and material handling automation, such as storage buffers, conveyor buffers, pick modules, goods-to-person workstations, put walls, circular unit sorters, and packing workstations.

Resource Optimization: Software algorithms that manage each area of the operation independently. Resource optimization allow each section of the warehouse to maximize the number of orders being processed.

Wave Batch: An operation where a batch needs to complete before a new batch can be started. Wave batches are static batches that cannot be modified once processing starts. Wave batch size is equal to the total number of physical destinations.

Waveless: An order fulfillment method that processes orders continuously instead of in waves. Waveless is a generic name for Smart Task Activation processing.

Wave Tail: The period of time at the end of a wave batch with low throughput and activity. The wave tail phenomenon reduces efficiency and productivity. The concept of wave tail applies to individual areas or individual workstations.

Wave Transition: The period of time between the end of a wave batch and the beginning of the next wave batch. The concept of wave transition applies to a set of areas or a set of workstations.

Work-in-Process (WIP): Active orders in the system that have been released for processing but have not completed.

About Dematic

Dematic is an intralogistics innovator that designs, builds and supports intelligent, automated solutions for manufacturing, warehouse and distribution environments for customers that are powering the future of commerce. With engineering centers, manufacturing facilities and service centers located around the world, the Dematic global network has commissioned thousands of customer installations for some of the world's leading brands.

Headquartered in Atlanta, Dematic is a member of KION Group, one of the global leaders in industrial trucks and supply chain solutions, and a leading provider of warehouse automation.

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