TECHNICAL NOTES

VASFT004

Static, Dynamic and Virtual Batching

Batch picking or batch order fulfillment is an operation where multiple orders are filled simultaneously rather than filling a single order at a time. Batch picking fulfillment systems can normally improve productivity. Productivity or efficiency of batch picking operations can be further extended through both dynamic and virtual batching. Dynamic batching allows new orders to be incorporated into the order "pick pool" on the fly. With a larger pick pool, efficiency is improved because better, or more efficient orders, may be selected for a batch. Virtual batching is where orders are added to a single batch as existing orders in the batch are completed. In static batching, a batch is created by selecting orders from the order pool, and the batch is complete only when all orders in the batch are complete. Static batching systems are the least efficient batch fulfillment systems. Using real time dynamic optimization, as described later in this document, can further optimize dynamic and virtual batching.

To demonstrate the differences in each of these batch fulfillment systems the following application examples are provided.

Static Batch

Incoming orders are received in two daily order downloads. Each of the daily downloads are processed into two processing (delivery) waves making a total of four daily delivery waves. Once a daily download is processed, new orders cannot be added, modified or deleted from either of the two created waves. As waves are created, product (inventory) is allocated to fill the orders. The inventory allocation defines the pick locations for each of the orders in a wave. Orders within the wave are grouped together in pick batches. The number of orders in a pick batch (batch size) for this example is six, which in this case is limited by the pick cart. In this example the average number of line items (different SKUs) in an order is five. Orders are shipped in a single carton. Each pick batch will require the picker (order selector) to make a "loop" in the fulfillment zone, starting at fixed location and ending back in that location when all orders and thus the pick batch is complete. The software sequences the orders for the order selector to make the shortest trip around the loop. During pick batch creation (download processing) the specific orders selected for each batch may be optimized based on some criteria (i.e. reduction in the number of locations to visit) to help improve efficiency.

Dynamic Batching

This application example allows new orders to be received continuously throughout the day. The received orders include an individual priority code specifying either a delivery wave or just a delivery priority. All received orders are kept in an "order pool". Pick batches are not created until needed (a pick cart needs a new pick batch). The software creates a pick batch by selecting the orders with the "highest" order priority from the "order pool". Pick batch optimization may occur just as in static batching. Orders in the "order pool" may be deleted or modified as necessary. Dynamic batching maximizes operational flexibility to place last minute orders and to make modifications to existing orders. There may be productivity improvements due to the larger order pool size that could benefit order selection optimization in batch creation.

Virtual Batching

This application provides for a single "virtual batch" where new orders may be added to the batch as individual orders complete. In virtual batching, the notion of a "batch completing" does not exist. In this example, the batch size is still limited at six by the cart. The picking loop no longer has a beginning or an end, as it is just

an endless loop. As orders (or cartons) complete, they are removed as soon as possible from the cart "put" locations (cells) to provide room for a new order. Completed carton removal may be accomplished by several operational means including using ergonomically unusable pick locations as temporary holding places for completed cartons or by providing multiple unloading locations in a loop. Virtual batching is most useful when one or more of the following conditions exist: 1) the picking loop is very long, 2) average lines per container is small or 3) when dealing with multi-case orders. The estimated walking time reduction factor when using virtual batching compared with static batching can be calculated with the following formula:

Static Batching To Virtual Batching Transit Time Reduction Factor =

$$1 - (((L - 1) / L) * (1 / C))$$

where:

L is average line items per container

C is average containers per order

In this example there are five line items per order and one carton per order. The transit (walk) time reduction factor is 1–(((5-1)/5)*(1/1)) = 1–((4/5)*(1)) = 1–(.8) = .2. Transit time is reduced by 20% if virtual batching is used instead of ordinary static batching.

Additional Optimizations in Dynamic and Virtual batching

Real Time Optimization of Next Order to Release: Transit time reduction factor can be increased further in a virtual batching application with real time optimization of new order selection. New orders added to the virtual batch can be selected from the available orders based upon which order will complete in the shortest distance from the current location. This optimization is more efficient with the greater number of available orders as provided by dynamic batching.

Dynamic Order Inventory Allocation

Using real-time order inventory allocation can reduce further the transit (walking) time. In many situations an item can be picked from more than one location. Instead of having an order stock allocation process that pre-defines the location from where an item needs to be picked, the software can decide, in real-time, the most convenient place from where to pick the item. Dynamic order allocation not only increases the picking productivity of the operation, but also simplifies the handling of shortages.

Summary

The features described in this document are examples of real time dynamic optimization. Batch picking with carts or modules is an in-expensive approach to increased productivity. Some of the described features may not apply to a specific batch picking application; likewise, other dynamic features may be advisable for that specific application. Carts, modules and systems based on Mandate® based SOFT™ technology, provide ideal solutions for Dynamic and Virtual Batching applications. Real time optimization and Dynamic Order Inventory Allocation are built in features of the Mandate® AWMS™.