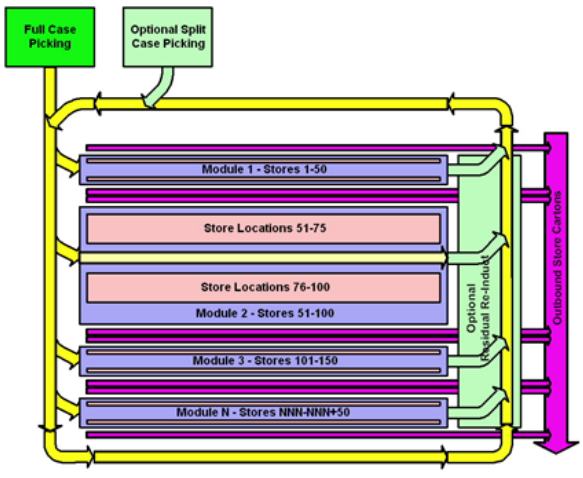
WHITE PAPER

VASFT020

Put To Store Operations Using Dynamic Optimization

Many retail distribution facilities use a technique commonly called a "put to store operation" or a "PTS" operation. These operations are characterized by: a process where product is bulk pulled from stock in containers, and then delivered to distribution modules where the product is divided or sorted to individual retail store destinations. Some PTS operations allow for no-residual from the inbound case by "pushing" the residual to stores located in the module while other PTS operations allow residual quantities (excess from the absolute needed by the stores within the module) to be discharged for routing to other modules or for routing to re-stock areas. Another variation of this distribution model provides for picking (pulling) less than full case quantities to eliminate the need for dealing with residual.

A simplified diagram of a put-to-store operation is shown at the right. Some operations use RF exclusively for both picking and putting product to store cartons while others use Put-To-Light or voice directed systems to aid the fulfillment process. Regardless of the specific technology used such operations have the benefit of relatively high processing rates and relatively low capitalization costs when compared to more elaborate sorting machine technology.



Coupled with the benefits of this processing methodology there are a number of drawbacks that require attention. These drawbacks manifest themselves in various forms depending upon the specific application. One obvious one is how residual is dealt with and how handling residual impacts the operation. Another is how imbalance in work in each of the modules as well as the "clumping" of picked product impacts the product flow and the amount of recirculation due to full modules. A third drawback is the size of the queues provided into and out of the modules as well as the re-circulation queue. A forth is how the system is expanded and it's sensitivity to the number of stores serviced. A fifth drawback is how "merchandising groups" or providing store cartons with specific product types is handled and any associated wave transisition issues.

Vargo Adaptive Software (VAS) has dynamic optimization technology that provides some unique opportunities for eliminating or reducing the impacts of the associated drawbacks of put-to-store operations. The put-to-store operation has three distinct areas of functionality – pulling or picking of product, routing of product and putting or sorting of product to the individual stores. This paper specifically addresses the last two areas of functionality namely the routing of inbound product and the actual put operation itself. The optimization of picking or pulling of product is addressed separately in another white paper.

Recirculation of inbound product: nearly everyone using a PTS operation knows the impact of re-circulation. Recirculation is created when arriving product cannot be routed to the intended destination. Recirculation reduces the capacity of the entire system since the inbound conveyance path is performing non-productive work. Most (non-dynamically optimized) PTS operations statically define the destination of a pulled carton at the time the carton was pulled. Additionally the PTS modules have daily work imbalances where the modules require more or

less product than neighboring modules. A second component to the work imbalance is how picking can "clump" arriving PTS product either by pure random probability or by pick requirements where arriving product is disproportionately distributed creating an inbound flow imbalance. Regardless of the underlying cause or recirculation, dynamic routing can dramatically reduce the amount of recirculation and thus increase system capacity. VAS dynamic optimization of routing evaluates and determines the destination of each arriving container at the time the container actually enters the sorter to the various modules. The determination is based upon the contents of the container, the demand for the contained product in each of the modules, the current fullness of each of the modules input queue and the modules current consumption rate of each of the modules. By making these decisions dynamically, an inbound container is routed to a destination module that may currently accept the container and use it's contents eliminating the need to re-circulate it.

This dynamic routing solution requires an alternate approach to the putting of product to the store destinations within the modules. This approach requires that functionality to identify the product in the arriving container and make a decision based upon the current demand of that product within the module. Additionally for PTS systems that do not provide for the discharge of residual containers, the solution requires dynamic "pushing" of residual product to stores within the module. VAS offers solutions for meet all these requirements.

The other major drawback in PTS operations is how residual product is dealt with. Some mechanical configurations provide no opportunity to discharge a residual container. Such systems often include a separate "break case" pulling operation where containers are filled with partial case quantities for specific PTS module usage. Such systems are not only inefficient, the occupy expensive space for the break case operation and are more prone to exceptions since the two separate operations are both prone to error. Systems incorporating the ability to release a residual container from one module to be further depleted in another can be greatly benefited by dynamic optimization. VAS in these circumstances treats all arriving containers whether they come from picking or from another module identically. The container is evaluated based upon it's current contents for routing decisions. This model not only improves overall capacity, it reduces the amount of excess product that is eventually pushed to stores. This benefit may eliminate the entire need for a break case operation. VAS dynamic rounding logic for pushing excess product may be configured to dynamically prioritize stores to balance the flow with business requirements.

One other benefit of dynamic optimization of PTS operations is the reduction of the size of the queues into each of the PTS modules. For new construction, the conveyor saved in the reduction in the size of the individual queues may be pocketed or used to provide a more universal queue that may be used to aid in transitioning between re-use of modules in situations where the number of stores or store-merchandising groups exceed the number of available store destinations.

In summary, for existing operations dynamic optimization techniques can dramatically increase the effectiveness of PTS operations. In new operations, dynamic optimization coupled with an optimized mechanical configuration can reduce capitalization cost and provide a degree of flexibility for the system to accommodate changing business requirements. VAS is the recognized leader in dynamically optimized software for distribution operations.