WHITE PAPER

VASFT019

Maximize Sorter Resources Through Dynamic Optimization

Article sorting machines such as tilt-tray, cross-belt and bomb-bay sorters used for sorting individual items have two primary physical resources or features that ultimately determine their effectiveness in operations. Those physical resources are sort rate and the number of sort destinations. With changing business requirements many operations using sorting machines are faced with challenges of how to effectively use the expensive machine in situations well outside the original design criteria. This paper addresses some alternatives that have been successfully implemented by Vargo Adaptive Software (VAS) in overcoming these challenges. Although each situation has it's own unique characteristics this paper may provide some ideas that could be explored in solving the challenge.

Maximizing Sort Rate

The maximum theoretical sort rate is mechanically determined in sorting machines. A lost sort opportunity may not be recovered. Recirculation, no reads and jackpots reduce the effective sort rate. Many operations use a "wave" technique where one wave must be complete or near complete prior the starting of the next wave. This technique may cause a reduction in the sort rate during these wave transitions. When sortation systems are required to meet maximum sort rates continuous processing sort methods are preferable to wave based systems. In actual practice continuous processing methodologies over a wave based system has achieved a sort rate of 97% of the theoretical sort rate. Continuous processing systems yield addition benefits over wave-based systems by continuously production of completed orders rather than having orders complete in cycles. In wave-based sortation systems order completion is skewed toward the end of the wave and systems with larger orders have greater skewing.

Maximizing Sorter Destinations

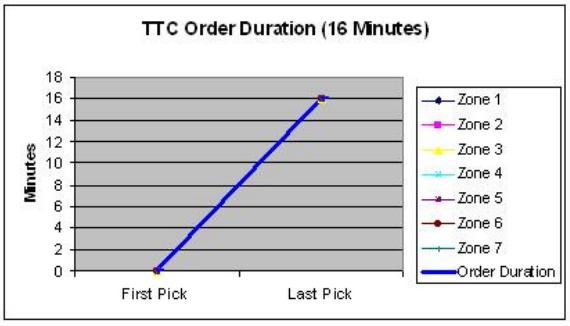
It may seem odd that sorter destinations can be "maximized". In many sorters a sort destination is required to be re-used repeatedly. In some operations a sorter there may be sufficient sorter destinations to allow the destination to be fixed to accumulate only one group of articles however if the operation or business grows other alternatives must be considered. Normally the best alternative is to cycle the use of destinations alternating between usages (time multiplexing of the destination). In sorters that are intended to have the destinations be "time multiplexed" a sort destination divider is often used. This may be called a wave divider, an order divider or a chute or hopper divider. The divider is used to allow the destination to be re-used near immediately following the completion of the previous sort group. In using chute dividers is that it is best if the chute dividers are capable of being actuated individually rather than in groups.

It is in this case of "time multiplexing" of sorter destinations that dynamic optimization can have a great impact. The most common method of alternating sorter destination usage is to create "waves" where each wave of goods has it's own destination usage. This method creates an undesirable effect called wave transitioning. One wave must be completed freeing up all the used sorter destinations before another wave may begin. This situation increases sorter "idle" time that effectively reduces the sort rate. The situation also dictates increased exception handling efforts. An incomplete destination must have it's product removed and the missing units must be handled less efficiently than they would have been if the destination could have been used until the missing items were found and sorted.

Waveless, continuous processing techniques have been successfully employed in sorters

where destinations are re-used in less than 15 minutes. The increasing of the frequency of re-use of a sorter destination effectively increases the number of destinations. Several dynamic optimization techniques are required to make this possible. Dynamic assignment of chutes where a chute is assigned to a sort group only upon arrival of an initial item for the group is required. Secondly the time constricted picking of product that insures that most orders are picked in a time window less than the re-use rate. Third, a technique devised and named by VAS called "Travel Time Compensation" or TTC is used. This technique used in conjunction with continuous waveless picking "offsets in time" picking in various pick zones by the normal travel time of picked product to sorter induction. This technique "bunches up" or draws the units together in time required to fill a order. All work zones are continuously filling the same size batch of continuous orders, but they are working on a differing groups of items.

One other optimization technique developed by VAS is using a sorter with a fixed number of destinations to efficiently sort items in to many more groups than there are available chutes. This technique is called optimized multi-pass sorting (OMPS).



VAS is the leader in implementing the most efficient highest productivity sorting machine operations. Whether it is double sort systems, sorter packing solutions, overlapping wave, pre-sort and post sort operations, intelligent merchandise group packing, or dynamic cartonization, VAS knows sorters.