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Designing a Fast-Pick Area for Cases or Individual Items

Part Two in a Series

In the last issue of the *ASAP Automation E-Newsletter* (Spring 2006), I wrote the first in a series of articles on Fast Pick Area Design, a topic that's been generating lots of discussion wherever I go (client sites, industry conferences, tradeshows). Depending on their size and throughput requirements, the capital outlay required for rack, conveyor and controls and automation interface technology can be significant. By optimizing the way these areas are designed and slotted and by selecting the most appropriate picking strategies, management can dramatically improve the economic return generated by these investments.

In that first article, I reviewed the two most popular methods used to determine the amount of space to allocate to each SKU stored in a given fast-pick area: the "Equal Space Method" and the "Equal Time Method." I then introduced an equation developed by Georgia Tech Professors John Bartholdi and Steven Hackman that can be used to determine the optimal amount of space (volume) to allocate to each SKU stored in the fast-pick area (i.e. "how much" of each SKU). The equation allows the designer to minimize the total cost of labor associated with picking AND restocking the fast pick area. Comparisons of the results generated from the use of the three methods in several examples demonstrated the fact that the "Optimal Method" is the superior method for determining space allocation.

Ranking Fast Pick Candidates

Before we determine "how much" of each SKU to put in the fast pick area, we need to choose the set of SKU's to put in the fast pick area (the "what"). When a DC operates a fast pick area, it replaces a relatively expensive "pick" with a relatively inexpensive "pick" AND a replenishment. We want to generate as many picks as we can from the fast pick area for a given period of time (for now, we'll assume the total size, or volume, of the pick area has been determined and remains constant). In order to generate the maximum number of picks for a given period of time, we should store those SKU's with the greatest number of picks for the space they occupy. This metric has been given a name that is commonly used in warehousing and distribution: ***pick density***.

While we can look at order history to determine the number of picks for each SKU, we cannot calculate pick density because the space allocated to any SKU depends on the number of SKU's in the fast pick area. Fortunately, we can develop a metric that can act as a proxy for pick density! If the space assigned to any SKU is given by the Bartholdi and Hackman equation, the pick density for any SKU is:

$$\frac{p_i}{\left(\sqrt{f_i}\Big/\sum_{j=1}^{n}\sqrt{f_j}\right)V} \quad \text{(eq. 1)}$$

Since *V* (the volume of the entire fast pick area) is constant and since the eventual value of *n* has no effect on the ranking, the pick density is proportional to:

$$p_i \Big/ \sqrt{f_i} \quad \text{(eq. 2)}$$

Selecting Fast Pick Candidates

It's time to do some optimizing! To do that, we need to define some costs.

Let c_r = cost of restocking a SKU ($)
Since f_i/v_i = the number of restocks per year (see last issue),

$c_r(f_i/v_i)$ = the cost of restocking a SKU over on year

Let c_1 = cost of picking one item of any SKU from the fast pick area ($)
Let c_2 = cost of picking one item of any SKU from reserve ($)

Let p_i = the number of picks forecast for any SKU (from order history)

Given the above, we want to MAXIMIZE the following:

$$\sum_{i}^{n}\left((c_2 - c_1)p_i + c_r f_i \Big/ v_i\right) \quad \text{(eq. 3)}$$

Now, for the method:

1. Rank the SKU using eq. 2 above.
2. Put only the highest ranking SKU in the fast pick area (use all the volume, V)
3. Calculate the net benefit using eq. 3
4. Put the first AND second highest ranking SKU's in the fast pick area (use the "optimum method" described above to determine volume allocation).
5. Calculate the net benefit using eq. 3
6. Put the first, second and third highest ranking SKU's in the fast pick area...
7. Continue this process UNTIL the CHANGE in Net Benefit is negative. Voila! You have determined the optimum set of SKU's to place in you fast pick area that MAXIMIZES the net economic benefit generated by using a fast pick area in your DC!

Let’s Do It

I went back to the Excel file I created for last issue and set up a very basic evaluation (the numbers are arbitrary):

Volume	500
Cost to Restock	40
Cost to Pick from Reserve	20
Cost to Pick from Fast Pick Area	3

SKU	Picks	Flow	Eq. 2
A	100	13	27.74
B	90	11	27.14
C	80	10	25.30
D	70	9	23.33
E	60	8	21.21

ONLY A

SKU	Volume	Benefit
A	500.00	**1698.96**

ONLY A and B

SKU	Volume	Benefit
A	260.43	1698.00
B	239.57	1528.16
Total		**3226.17**

ONLY A, B and C

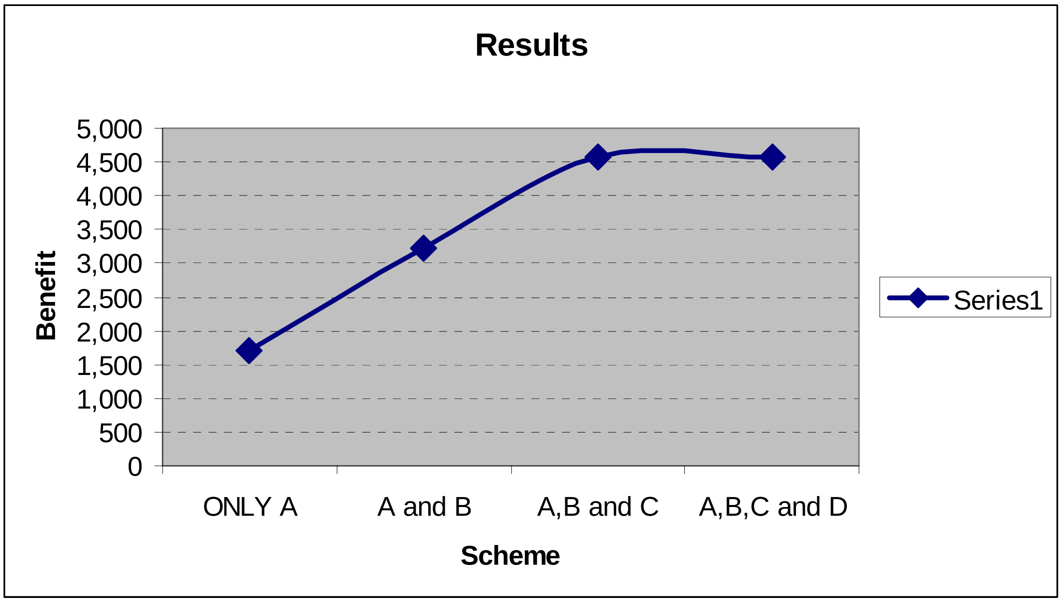
SKU	Volume	Benefit
A	178.77	1697.09
B	164.44	1527.32
C	156.79	1357.45
Total		**4581.86**

ONLY A,B,C and D

SKU	Volume	Benefit
A	137.78	1696.23
B	126.74	1526.53
C	120.84	1356.69
D	114.64	1186.86
Total		**4579.44**

Summary

Scheme	Benefit
ONLY A	1698.96
A and B	3226.17
A,B and C	4581.86
A,B,C and D	4579.44



More to follow next issue...