



# Profiling vs. Slotting:

Thought leader, Dan Basmajian, prompts a deeper look at the difference between two important, yet different, warehouse optimization tools



**O**ptimization has become a topic of increased interest in the Supply Chain (SC) industry. Distribution Center (DC) managers seek to optimize operations by cutting costs while exceeding customer service levels. Both profiling and slotting optimization techniques respond to these dual demands by trimming distribution costs, minimizing capital expenditures, increasing efficiencies and reducing labor; however, confusion exists regarding the difference between the two processes. This article identifies the differences between slotting and profiling so that the benefits and application of each can be understood.

## Profiling Defined

Proper profiling maximizes space utilization within a slot type. Using a spreadsheet or specialized profiling software, an item's slotting unit dimensions are evaluated relative to each slot type's dimensions to determine which slot type(s) can accommodate the targeted periods in pickslot with the least amount of space left over in the slot type. Note that in a profiling exercise only slot types are evaluated, not specific slot locations; hence, the assignment of an item to a unique slot location is not accomplished during a profiling exercise. Rather, location assignment must be done as part of a slotting exercise.

## Profiling Benefits

Generally, selector productivity is not significantly enhanced

by profiling alone, although an opportunity to shorten the pick path and reduce selector wait time (minimize stock-outs) exists by adhering to the slot type analysis that profiling generates. Replenishment activities, however, may be significantly reduced by profiling items to proper slot types, with higher opportunities for savings in mixed slot type environments. An operation can achieve replenishment cost reductions by moving an item from one slot type to another and/or changing the facings and stackings of an item to align with outbound item movement. In many pickline environments, selector travel distance reductions are difficult to attain, especially due to product grouping rules that are applied down the pick path. In these situations, profiling items to the right slot types provides the benefits of better space utilization and reduced replenishment costs.

For Greenfields, profiling provides additional benefits by helping to determine how many of each slot type would be required to store the targeted periods in pickslot for any given set of items. Profiling may be used to evaluate an existing warehouse to determine how well it is racked relative to the set of items being slotted. Warehouses that appear to be "out of space" can undergo a profiling exercise to learn that appropriate re-racking could provide additional space without significant expenditure.

## Profiling Extensions

Basic profiling is essentially an academic exercise. In an actual warehouse, more elements must be considered. Examples include safety elements like weight limitations by level or product groupings (e.g., retail/product groups, ABC velocity groups, hazardous/toxic groups, conveyable/non-conveyable groups, etc.). There are warehouse management systems that provide very basic profiling (with extensions) as an integrated function.

By including profiling extensions as part of the exercise, DC management can attain usable results. Items can be profiled into the correct levels of slot types based on weight restrictions or other level related data (e.g., no glass items above the shoulder). Furthermore, a true rack bay count can be determined within each product grouping across the entire pickline. Profiling with additional considerations can provide real-world, usable results for racking a Greenfield or re-racking an existing (or portion of a) facility.

Once the profiling exercise becomes multi-dimensional due to the inclusion of the extensions, it becomes difficult to profile using two dimensional spreadsheets. Stand-alone profiling software considers all factors simultaneously to generate a usable, optimal result.

## Slotting Defined

Slotting extends the functionality of profiling by considering actual

## Terminology

To understand why it's important not to use the terms "Profiling" and "Slotting" interchangeably, key terms are defined:

- **Item** – a stock keeping unit (SKU) that needs to be slotted in the pick line
- **Slotting Unit** – the configuration of the item to be slotted (e.g., pallet, case, inner, each, bin, etc.)
- **Slot Type** – the type of slot to be evaluated, including opening dimensions (e.g., bulk three deep pallet, single high pallet, two high pallet, four level flow rack, etc.)
- **Periods in Pickslot** – Usually based on outbound item movement, the number of periods (e.g., days, weeks, etc.) of each item that are desired to fit in each pickslot
- **Location** – a specific slot in the pickline (of any slot type)

pickline locations. Slotting adds the concept of item sequencing to extended profiling.

Sequencing is key in most picklines. A pickline is slotted down the pick path in velocity sequence to minimize selector travel distance. At the same time, outbound pallets must be stable, with crushables on top. Sequencing rules like velocity, case height and case density are built on top of all the rules applied in the extended profiling exercise. In many environments, sequencing goals and constraints must be accomplished within product groupings.

Slotting capabilities go far beyond those of profiling. While profiling determines the best slot type for each item based on dimensions and movement data, slotting determines the best slot type and the best location for each item. Slotting considers the locations, opening dimensions, weight limitations (by level), product grouping, item slotting unit dimensions and weight, item picking unit dimensions and weights, among other factors, to profile and sequence items down the pick path.

Several warehouse management

systems accomplish basic slotting; however, the development skills required to build slotting software that handles more than basic slotting requirements demands highly mathematical/computational expertise and are very different from skills needed to build WMS software (which is database management and reporting oriented). The proliferation of stand-alone slotting software speaks to industry's need for more advanced slotting capabilities than most WMS solutions provide. The Greenfield layout or re-rack/addition requires not only profiling, but also slotting. Profiling determines how many of each slot type are required; slotting determines where in the pickline each slot type and item goes. Slotting provides the optimal assignment of each item to a location in order to meet the objectives while working within the constraints that have been imposed by the physical layout and/or management.

### Slotting Benefits

The benefits of proper slotting include lower DC operating costs. The customer benefits through

better service levels; selectors and replenishers benefit through a safer environment. All profiling benefits are realized with the opportunity to also reduce selector travel path, reduce bend and reach, build stable loads, and minimize accidents, breakage, and more. The slotting concept of sequencing based on goals and constraints enables additional benefits to be realized. Considering actual pickline slot locations and then sequencing items down the pick path based on goals and constraints is exactly what slotting accomplishes.

### Conclusion

Profiling is:

- an important element when considering how well an existing or future rack configuration will support the selection and replenishment of a set of items, and

- an important first step when evaluating a rack layout.

But profiling only goes so far. Detailed slotting provides:

- the actual assignment of items to pickline locations, and

- pick path sequencing to meet stated goals and constraints.

As with profiling, multi-dimensional slotting prohibits optimal results using a spreadsheet. Basic slotting can be achieved using some WMS packages; however, advanced slotting software using optimization-based mathematical approaches generates optimal slotting results. Slotting software that handles profiling and slotting requirements provides the greatest advantage and supports optimized warehouse results.

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