


viewpoint

Optimum Facility Design

The Do's and Don'ts of Planning

Facility design involves more than just warehouse configuration. It also calls for strategic thinking that identifies long-term goals and sales strategies, and a significant amount of cooperation among all parties involved. This report addresses the right ways – and wrong ways – to proceed.



Before completing a strategic facility design, it is important to define the word “strategic.” Strategic design should evaluate the business trends and growth in your business five to seven years into the future. However, the reality is, most companies can’t accurately predict their annual sales revenue five years into the future. There in lies the first DON’T: do not swag at sales numbers. Take the time to work with your sales and marketing team and understand what the sales trends are.

In addition, consider any potential changes in your sales strategy. For example, is your company planning to use new sales channels (e-commerce or catalogue) or, more importantly, is your product mix in terms of cube (cubic feet per case) and selling unit of measure going to change?

These above mentioned factors can impact your facility layout and space requirements considerably. The first DO in starting a project is to identify the resources that will be involved in the project and identify their specific roles. The team members should be kept informed of the project status at regular intervals. By keeping everyone informed, you will not only ensure that all key strategic decisions are common knowledge, but when it comes to addressing any potential issue on the back-end of the project, you will work as a team to come up with a solution, instead of pointing fingers and blaming one another for the failure.

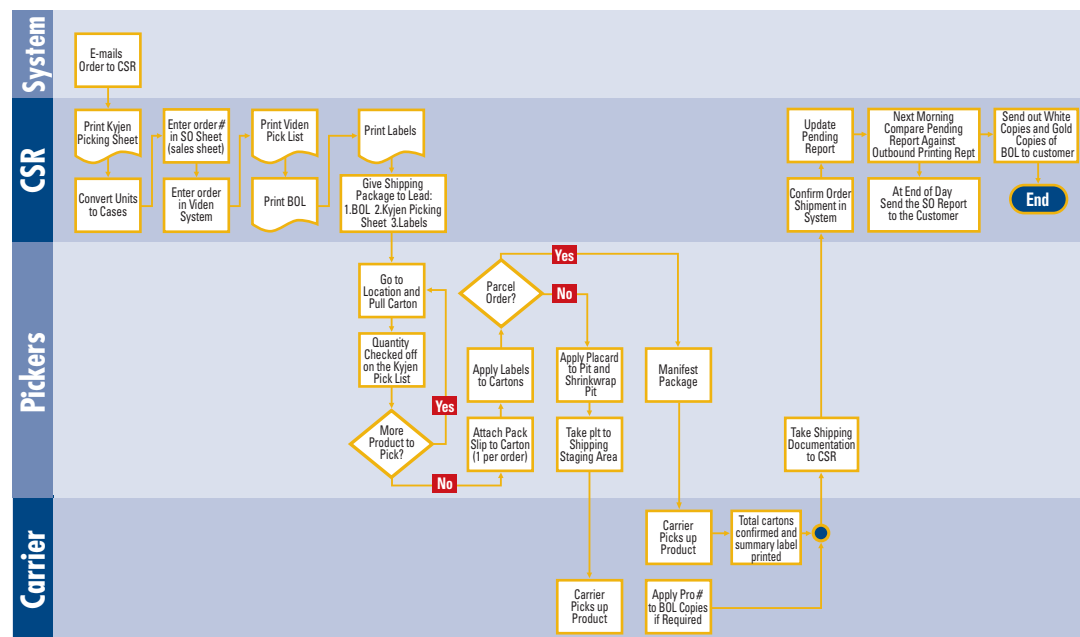
Future sales trends (percentage increase or decrease over the previous year) are typically used as a basis for SKU growth, inventory, purchase order and sales order trends. Our next DO is to document your design

assumptions, who made each assumption and what was the logic behind the assumption.

A DO in designing a facility is to document your current operational functions. You may be thinking that since this is a new facility, you do not have a current process or that you will be operating in the same fashion at the new facility. If this is the case, document the processes that you are using in your current distribution environment. A DO is to use cross-functional process flow techniques that capture the interdependencies among systems, processes and people (Table 1 below).

A major DON'T is to interview only management during this task. You need to complete the three actuals: (1) visit the actual place, (2) watch the actual process and (3) speak to the actual people who perform the task. Use the management team in conjunction with the associates to validate the process flow charts. We are often surprised by the disconnect between how management believes an operation is executed versus the actual process. Also, there are some aspects of the process that the operators might not be aware of, but that the management team is. Therefore, it is important to match both the management's version of the process with the operator's version of the process and fill in the missing gaps. The next DO is to have your management sign off on the flow charts and potentially use them as training documentation.

Current Outbound Process - Table 1



The next DO is to analyze your distribution center mathematically in order to define your future capacity requirements. Unfortunately, the best predictor of the future is the past. A major DON'T is to assume that your facility can be designed at the current capacity. A DO is to evaluate at least one year's worth of data in order to capture inventory level fluctuation, sales volume fluctuations and also the seasonality of the different SKUs. What data should be collected? Our next DO is three major data profiles: (1) Receipt Profile, (2) Inventory Profile and (3) Order Profile.

Let's define the data requirements for the profiles. **For the Receipt Profile** we require the purchase order header and detail by day. If possible, we recommend that you collect the receipt time of day (time stamp of the actual receipt). This allows you to evaluate the workload by time of day in order to evaluate the size of yard, your receiving dock and the number of receiving docks required to support your business.

The major advantage of analyzing inbound receipts is to understand daily, weekly and monthly trends in inbound demand. A receipt profile is like an order profile, but focused on inbound functions (receiving, put-away and cross docking). Knowing the number of receipt lines per purchase order and receipt quantity per line will help determine the variability of the receipt in terms of handling unit of measure (each, case or pallet).

The next profile is your Inventory

Profile. The inventory data required is the on-hand inventory at the end of the month for 12 consecutive months. The data for your inventory profile should include every item by unit of measure and total quantity. A DON'T is to evaluate only one period. The inventory profile will enable you to determine the amount of inventory required to support demand by period. Regardless of whether or not your

current facility has the incorrect storage medium, you need to understand the unit of measure configuration by item and how much cube (cubic feet) of inventory is in your facility by period.

A DO is to ask if the inventory turns are going to change in future years.

- Are your buyers going to change their buying strategy?
- Is there an initiative to reduce inventory in your supply chain?
- Or if you are a wholesale grocer do you make forward buys in order to decrease your cost of good sold.

Another DO is to develop a space standard based on proposed storage mediums for your facility. A space standard is basically a ratio of how much area or volume is required to store each SKU or unit of measure. Using the space standard, along with your inventory profiles, can serve as a check on whether or not the size of the facility you are designing will meet your needs.

We have unfortunately witnessed many companies and design consulting firms that have not considered an inventory profile in their analysis. The result is a lack of space or too much space because inventory movement by item and handling unit of measure was ignored.

The last data profile is your Order Profile.

The data required for this profile is the order header and detail of your outbound demand. A major DO is to confirm what the order date represents. Is it the entry date, download date, release date, pick date, invoice date? A DON'T is to assume that all orders are the same. Evaluate your order profile by sales channel and order type. For example, one-line orders for Internet customers are much different from a multi-line order for a business-to-business customer. A DO is to analyze order profiles by sales channel and evaluate affinities (similar patterns) across the order profile. For example, your business-to-business orders are similar in lines per order and units per lines with your retail sales orders. Hence, similar outbound processes can be used to process different order types across multiple sales channels.

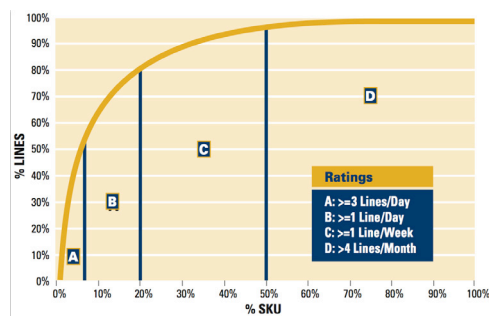
A DO is to evaluate orders and order lines by hour of the day. A DON'T is to use averages to design your facility. Averages lie and do not take into consideration the variability of your order profile: average lines per day, average lines per week and average lines per hour. We recommend that you use 1 or 2 Sigma Standard Deviation above average to ensure that you are considering the variability that exists in your facility. A DO is to decide how you want to handle the spikes in your business. Will you be



using overtime, temp labor, additional shift, or a third-party warehouse?

A major DON'T is to only use Order Profile and slotting to design your facility. Slotting should be used to determine where a discrete item should be located in your facility, but not as the sole analytical tool to design your warehouse. Many slotting tools evaluate only static locations and not dynamic forward pick locations. If utilizing a standard slotting tool, then a DO is to evaluate the life cycle of the SKU over a 12-month period. Reference the figures on this page. Many facility design engineers will evaluate the number of forward pick locations and size the forward pick locations based on traditional Pareto Principles. Figure 1 illustrates which percentages of the lines were fulfilled by which percentage of the SKUs. It also specifies the criteria that was used to assign the average velocity rating for the year.

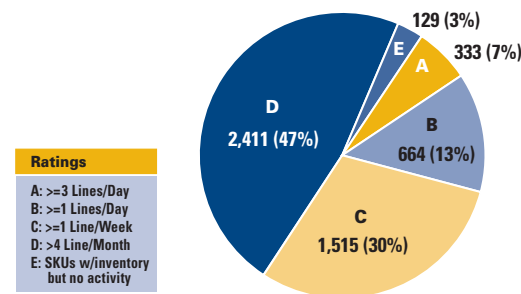
SKU Pareto Chart - Figure 1



By evaluating the life cycle of the SKU over 12 equal periods (reference figure 3), the actual number of SKUs that acted as an "A" over the

SKU Breakdown - Figure 2

Figure 2 illustrates the SKU breakdown by rating. You notice that there are 333 "A" SKUs.



year were only 108. A DO when designing a forward pick area is to consider the number of unique SKUs and their velocity in conjunction with how the SKUs moved over a time interval (recommended interval is a year).

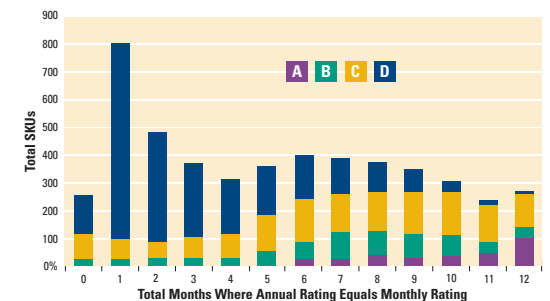
Another DO in designing forward pick locations is to accommodate some dynamic locations to account for any surge in activity for slower-moving items. Table 2 (see next page) shows the activity level for the different SKUs throughout the year. From the previous example, we know that only 108 SKUs acted as "A" movers for the entire 12 months (the A Prime SKUs), but there can also be other "A" movers, "B" movers, and "C" movers that act as fast-moving SKUs in a particular part of the year.

Therefore, we can account for static locations for the A Prime SKUs and some dynamic locations for the other seasonal fast movers.

If you have many SKUs that you want to put in a forward pick area, another DO is to distribute the work. Consider pick rates when slotting the SKUs. You don't want to design a bottleneck by overburdening a pick zone by putting all fast-moving items in a small area. A DO is to create your Golden Zone in order to maximize your picking efficiency with your fast moving items.

The next DO is to define storage strategies and picking strategies. This leads to the next DO, which is to define the future processes. As stated previously, if you will be operating in the same fashion as you are today, then make those your future processes. Bottlenecks in both your conveyor system and other parts of the facility are often caused by not releasing the work efficiently; therefore, consider the way you will be releasing work when you develop future processes.

SKU Rating Annual Trend - Figure 3



Total SKUs Acting as "A" Movers - Table 2

SKU TYPE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
"A PRIME" SKUs	108	108	108	108	108	108	108	108	108	108	108	108
"A" SKUs	145	143	134	144	175	175	180	192	204	167	168	123
"B" SKUs	86	83	86	85	97	135	118	96	138	69	57	52
"C" SKUs	5	20	40	8	5	5	4	4	5	3	6	2
"D" SKUs	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL "A" MOVING SKUs	344	354	368	345	421	421	410	400	455	347	339	285

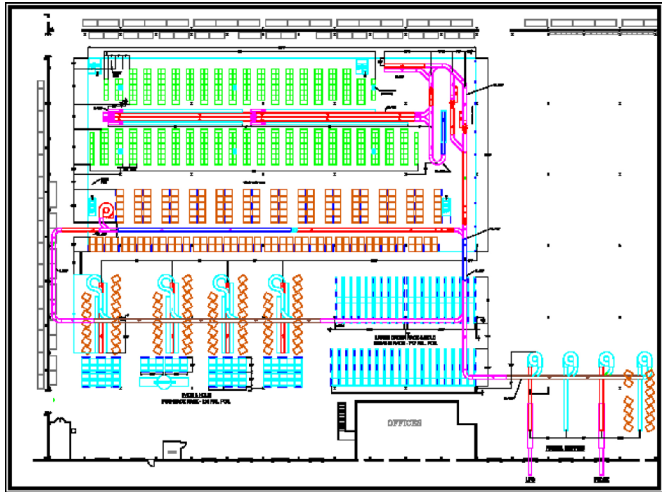
When using material handling equipment like a conveyor system, a DO is to validate the throughput requirements in terms of units, lines, orders, cartons and pallets. A conveyor system will create bottlenecks in your operation if you don't look at the different throughputs for all the processes that are performed along the conveyor; for example, picking, packing, dunnage insert, manifesting, and sortation.

Another DO is to identify the different material handling equipment you will use: stand-up forklift, sit-down forklift, double-deep pallet jack or single-deep pallet jack. This will impact the size of the aisleways in your facility. Also define potential utility requirements: power requirements (electrical, propane), air and water. How much space is required to store the equipment?

Now you are ready to start putting lines on paper! A major DON'T is to assume that there is only one solution for your design. A DO is to come up with at least three design alternatives that will meet your design criteria. Another DON'T is to create these concepts in a vacuum. Coming up with conceptual designs is an iterative process that involves more than the person putting the lines on paper; it involves the whole design team. Once all the concepts have been generated, the next DO is for the design team to select the final option and ask for the appropriate management approval.

Figure 4 illustrates a concept that was selected by a distributor who was trying to improve his company's warehouse efficiency and also improve customer satisfaction.

Warehouse Efficiency - Figure 4



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