EFFICIENT HANDLING STARTS WITH GOOD PLANNING

Efficiency in material handling operations has become one of the most important factors in the success of the manufacturing or distribution company entering the nineties. Customers demand more services and stiff competition means more and more cost cutting. A company's success or failure can depend on its ability to do both of these things simultaneously. Although increasing services while decreasing costs seems contradictory, it can be done, and two planning tools are especially helpful in making it work.

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CAD's principal use in material handling planning is for developing alternative layouts for warehouse and manufacturing operations. CAD has several features which make it more convenient than conventional mathematical calculations and drawing by hand. CAD is accurate enough to produce drawings which can be used for rack installation or parts assembly. It provides visual representation of material flows in a manufacturing or warehouse facility in plan, elevation, isometric or animated views.

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Drawing is faster and neater with CAD than drawing by hand. CAD programs use a layering system which is much like using transparency overlays on a drawing done by hand. Groups of drawing entities are organized together on different layers and can be turned on or off individually or in groups. For example, in a warehouse drawing, one layer may contain the walls, a different layer will have columns, and there will be a third layer for pallet racks in one configuration and a fourth layer to show pallet racks in a different layout. This means that all of the alternatives can be drawn and stored in the same drawing file.

One of the time saving features of CAD is its ability to load the contents of a drawing into a database program. This allows the computer to generate bills of materials or to list the storage capacity of various alternatives. A manufacturer with CAD capabilities can create CAD drawings in exactly the same manner as actual assemblies are made. By drawing a set of uniquely identifiable parts, and giving names or code numbers to each part, a set of symbols is created. These symbols or parts can be used to create higher level drawings consisting of a combination of the parts and each unit within the whole composition can be identified and counted automatically for a bill of materials. With some programming, a CAD program used in this way can be made to provide the component parts information needed for a materials requirement planning (MRP) system.

COMPUTER SIMULATION

Computer simulation makes a mathematical model of an operation. A simulation is created by describing to the simulation

TYPE OF VEHICLE	**MINIMUM** AISLE WIDTH	**VEHICLE** COST	**PALLETS** STORED	**COST PER** PALLET
Counteredbalanced	12'	$22,000	912	$ 46.74
Narrow Aisle Reach Truck	8' 6"	$27,000	914	$ 57.63
Double Reach9' 6"	$33,000	1,103	$ 59.98	
Very Narrow Aisle	5' 6"	$80,000	1,164	$ 71.67

program all of the known or assumed data about the physical characteristics (such as the number of stations or steps, the traveling distance from one part to another, the space in which the action is occurring, etc.), and the times involved (how long it takes to get from one point to another; to load and unload material from a conveyor, lift truck, or shelf) to perform a specific task. After entering all of the information, the simulation is run. It keeps track of how much has been done, the elapsed time, how much material has been used, whether any queues have been formed, how much accumulation of material there is, and where and when crowding may occur. If the simulation program includes animation, you can see a representation of all of this action occurring while the program generates the statistical information you need.

The supermarket checkout operation is one example of a function that might be simulated. Almost everyone has been in a grocery store on some occasion (usually a weekend morning) when there are not enough checkers, and the lines extend from the registers into the food aisles, preventing people from moving from one aisle to another or from reaching items on the shelves or from identifying which line is the shortest, or even from getting to that line if one could see it. Coincidentally, unless the store is open 24 hours a day, this is also typically the busiest stocking time, so cartons and pallets and carts are likely to contribute to the general congestion in the aisles.

If we were designing a new supermarket, and wanted to try to minimize the crowding effects at peak shopping times, we could simulate the proposed activities. We would tell the simulation program information such as how many checkout lanes our design contained, how many customers could be expected to enter the store in a given time period, how long it would take them to get through the store and make their selections, what paths they would be most likely to follow, how many items they might buy, how long it would take to unload an item from a cart onto the register conveyors, how long it would take for the checker to scan and bag each item and total the sale, collect the money and make change.

By changing those variables one at a time which could realistically be changed, we could find the best solution to the problem. For example, we might try adding an extra checkout register, or we might see what would happen if we increased the aisle space, or added baggers to the operation. Simulating these operations under any of the conditions we might consider would tell us which changes would be most effective.

TESTING A DESIGN INEXPENSIVELY

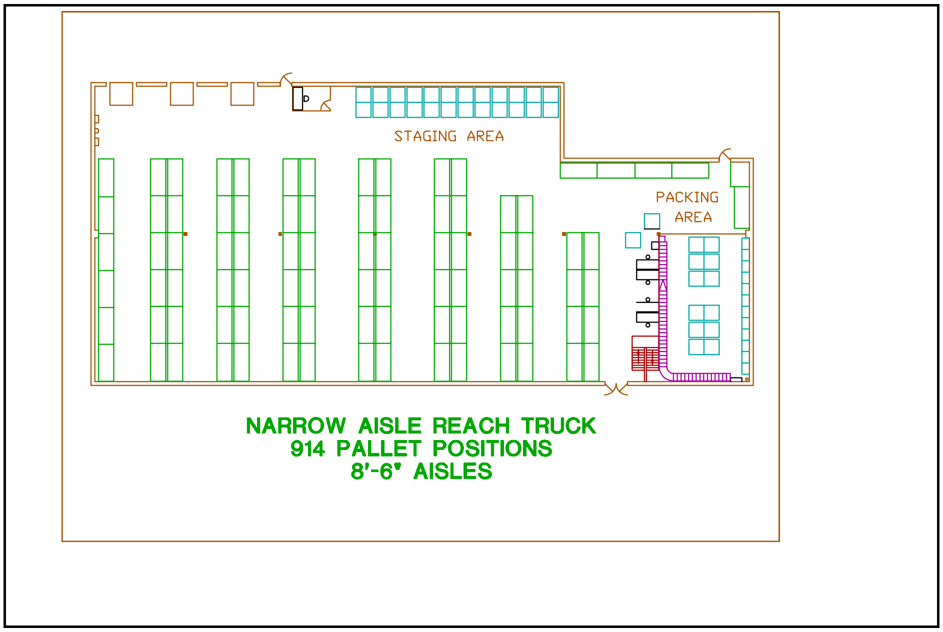
The greatest benefit of simulation is that it allows you to test a design inexpensively before committing time and money to the implementation of new operations. In material handling operations, simulation is especially useful in showing staging space requirements, accumulation conveyor lengths, potential aisle contention - that is, two or more things needing to be in the same place at the same time - the number of vehicles needed to meet a particular quota, the number of cars in an AG system or lanes in an AS/RS. These are areas that can cost an operation in lost efficiency for many years. Once equipment has been bought and installed, and employees have been hired and trained, it is difficult to change.

Of course, any of the information that can be obtained from CAD or computer simulation can be calculated mathematically, but because of the number of calculations and the tremendous amount of time involved in doing these things manually, they are often inaccurate, or simply not done at all.

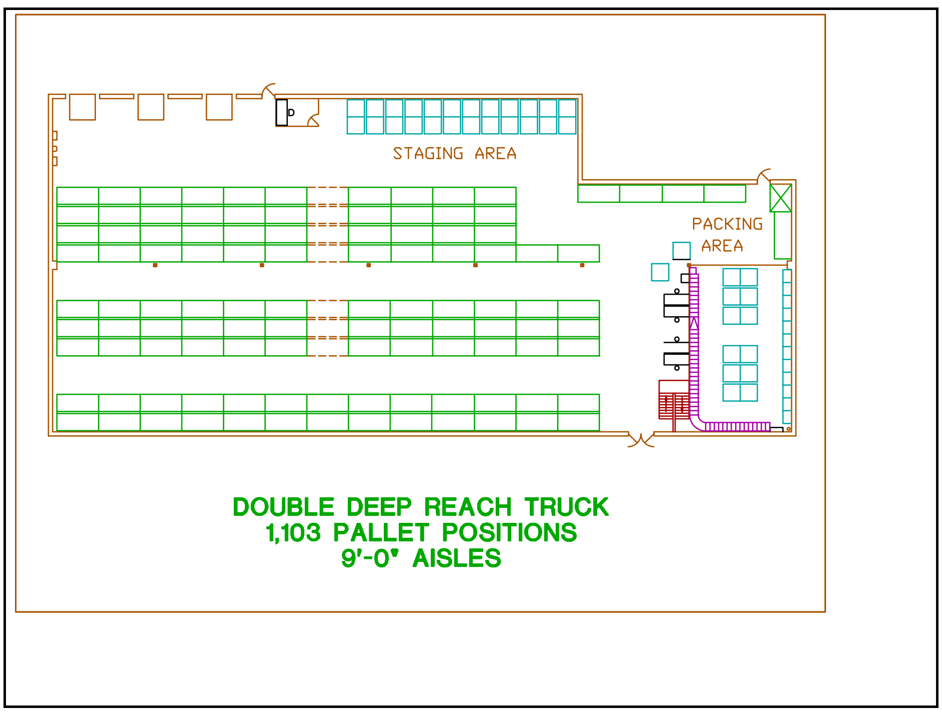
CASE STUDY:
A PROBLEM FOR CAD

A chemical distributor built an 11,000 square foot warehouse, with 25' by 39' 6" bays. In this building they had to store about 1,000 pallets. They wanted the most cost effective layout that would meet their storage requirements.

GROSS & ASSOCIATES laid out 16 alternatives using CAD. There were four different layouts to accommodate each of four different types of lift trucks: counterbalanced, narrow aisle reach, double reach, and very narrow aisle. Then GROSS & ASSOCIATES compared the one best layout for each of the four trucks for capacity and cost per pallet stored. The counterbalanced truck provided the best cost per pallet, but the layout only had a capacity of 912 pallet positions, because of the wide aisles required by this vehicle. The narrow aisle reach truck alternative was more expensive because of the cost of the truck, but it could only store 914 pallets because the minimum aisle width for this vehicle did not work well with the building's column spacing. The very narrow aisle truck had the highest cost per pallet but was able to store the most - 1,164 pallets. However, the double reach truck alternative had a capacity of 1,103 pallets, which was enough to meet the company's requirements, and the cost per pallet was less than the very narrow alternative. The client chose the double reach alternative.



What this shows, particularly in comparing the counterbalanced layout to the reach truck alternative, is that it is not always easy to mathematically calculate how much space various alternatives will require. Because of column spacing or other building characteristics, it is more accurate to draw each layout of the building. CAD makes it feasible to design and view possibilities that would have been too time consuming to draw by hand, permitting more thorough analysis.



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