Distribution Center Bottleneck Analysis and Throughput Improvement

Vertical: Manufacturing | Pharmaceutical | Healthcare | Portfolio | Logistics | Financial | Government | Business

Genre: Case Study | Project Review: | White Paper | Technology Overview

Client

A Leading Manufacturer of Eye Care Products

Situation

The client's distribution center could not meet the demand of all the orders that were coming in on a daily basis. Typically only 70% to 90% of all orders would be filled on straight time. As a result, orders were late and the facility had to run overtime and weekends to meet the demand. Managers tried increasing staff in all the different areas, but were still unable to meet the requirements or affect the system throughput.

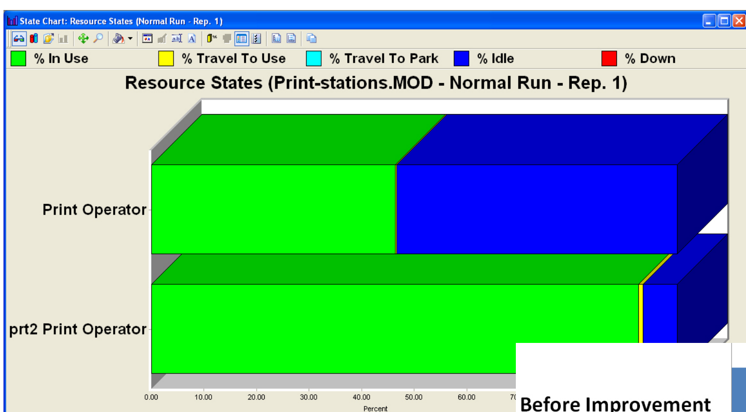
Objectives

ProModel was engaged to develop a simulation solution which would help them determine the root cause of their inability to meet customer demand. Objectives included:

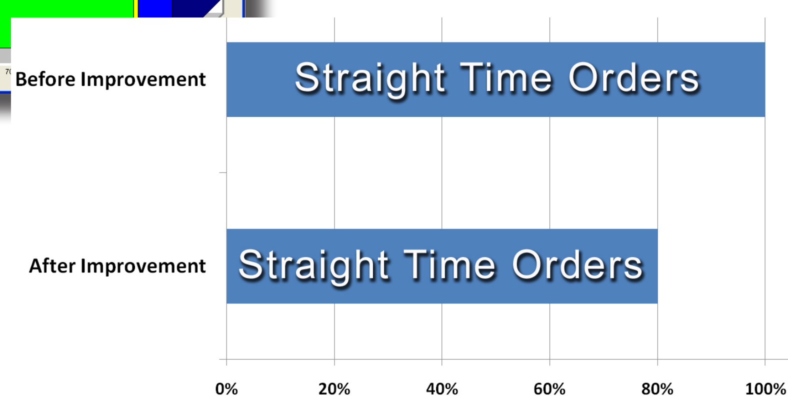
- Develop a simulation model of the facility in order to identify bottlenecks.
- Determine the most effective changes to increase throughput.
- Improve operations such that customer demand could be met on straight time with minimal or no cost increase to implement the solution.

Results

- The new layout was implemented and the actual operation results were within 5% of the model's predictions. The end result is the facility was now able to meet 100% of the current order requirements on straight time, as well as have 30% protective capacity for projected increased future demand.
- Reduced excessive OT labor cost.
- In addition to the original system set up, the model is continuing to be used to help determine the staffing requirements and shift schedules for each area of the DC depending on the order profiles.



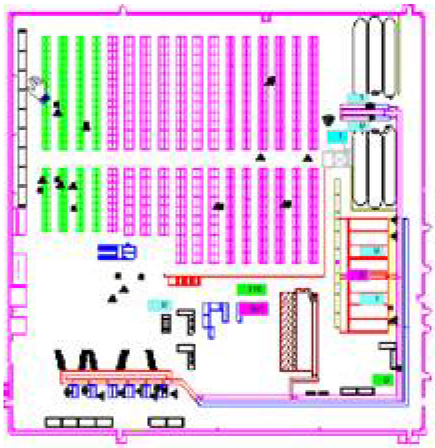
Print station operator utilization doubled with new layout

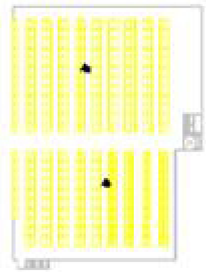


Solution

The solution consisted of three separate but related models. The first model (dist-before) shows the CAD layout of the facility. It has bulk pick areas, carousels, flow racks, and an itematic - automatic dispensing system. The order types were defined by the picking location and the size of the order. Good data was provided from the WMS system that depicted the volume for each order type. Managers decided to look at a typical volume day and a heavy volume day.

Solution



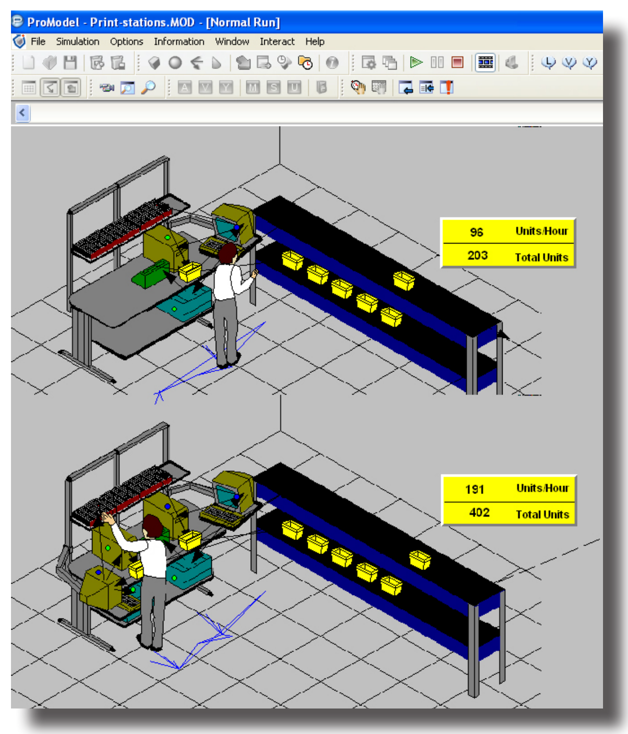


	Total	[illegible]
Vials Itematic	35	0
Blister FlowRack	29	2
Blister Carousel	34	9
Blister Carousel & FlowRack	9	4
Vials <21 Shelves	9	26
Vials 21-1500 Shelves	7	23
Vials <1500 Shelves	7	32
Blister <21 Shelves	11	31
Blister 21-1500 Shelves	14	25
Blister <1500 Shelves	8	15
Shelves & Carousel	3	21
Shelves & Carousel & FlowRack	5	26
Shelves & Carousel & FlowRack & Itematic	6	24
Shelves & FlowRack	4	13
Shelves & FlowRack & Itematic	3	20
Shelves & Itematic	6	19
Carousel & FlowRack & Itematic	11	2
FlowRack & Itematic	26	0
Carousel & Itematic	14	2

With the first runs of the model it was determined that the conveyor system was the bottleneck. As a result, it didn't matter how many operators they added, since it was limiting the total throughput. The shift supervisors validated that this was what was happening in the daily operations.

To resolve the problem a suggestion was made to change the way the totes were introduced to the conveyor system. Instead of introducing all of the totes at the beginning of the line upstream from the carousels, they would introduce the totes just upstream from the first pick area on the conveyor. This resulted in two new tote introduction areas, one at the flow rack area and one upstream of the itematic area. This was tested in the simulation model and the predicted increase in capacity was 10%, but that would not meet the demand of orders. As a result, changes were immediately implemented in the WMS system and system throughput increased on a daily bases from 5% to 14 %; however, orders were still unable to be fulfilled.

Managers then went back to the model to identify the next areas that they could change to increase throughput. The model showed that with the new tote introduction locations, the bottleneck was shifted from the conveyor system to the print pack area. A number of alternatives were reviewed to increase the capacity of the area and it was determined that the best approach, from a quality standpoint, would be to break the area into two separate operations: a printing/order verification area and a packing area. To accomplish this, printing stations would need to be created, but it was not clear what the design of the stations should be and how many would be required.



To help determine the best design and throughput capability of the printing stations, the second model was built. The detailed model of the printing station design (print-stations) showed the trade-offs of different configurations.

The model contains two equipment configurations that could be compared:

1. Single printer station, which would allow for one operator to work on one tote at a time.
2. Double printer station, which would allow for one operator to work on two totes at a time.

The results showed that the difference in throughput would be about two times more with the double printer station and the utilization of the operator would be about 92% versus a maximum of 46% in the single printer station option. The two printer option was selected, because the increase in saved space, throughput, and operator utilization far out weighed the cost of the additional equipment.

The last step was then to redesign the conveyor layout and floor plan to allow space for the new printer stations, and to determine the maximum number of stations that would be required during operation. The third model was developed (dist-after) by modifying the original DC model to design the new facility layout. After running a number of order scheduling scenarios the design was refined to meet future projected demand requirements as well as to have 30% buffer capacity.