Process and Facility Layout Improvements to Meet Projected Growth at M.S. Walker’s Norwood, MA Distribution Center

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Abstract
M.S. Walker is a distributor of wine and spirits that must adjust current warehouse storage procedures at its Norwood distribution facility to accommodate future customer demand. Predicted growth of 5% over the next few years is likely to exacerbate the capacity issues at the warehouse. To address the over-capacity conditions, the team first determined Norwood’s floor capacity and areas of fork lift traffic in order to benchmark improvements. Using tools from statistics, product prioritization methods, facility layout, and material handling the team improved the layout and defined standard operating procedures to minimize movement of product and clear congestion within the receiving and bulk storage areas. A final solution for M.S. Walker documents procedures for determining the product hierarchy, the program needed for implementation, and a restructured facility design for receiving.
The Need for Project

M.S. Walker will soon be over capacity at their Norwood facility and will need to increase their effective capacity without making a large capital investment. M.S. Walker is a distributor of spirits and wine in the New England area. Currently, at the facility in Norwood, Massachusetts, the receiving and bulk storage areas are at or near maximum capacity. With a projected growth of 5%, M.S. Walker would like to increase capacity in these areas without making any capital investments. The layout of the facility, existing standard operating procedures (SOPs), and floor inefficiencies generate congestion in these areas which prevent the facility from reaching its full potential.

The Design Project Objectives and Requirements

The objectives of the project are to minimize congestion in the receiving areas and maximize utilization of the warehouse at the Norwood site. Design Objectives

The objective of this project is to redesign the receiving and bulk areas of the Norwood facility in order to meet the projected growth at M.S. Walker. Heavy congestion due to the movement of people, products and equipment contributes to inefficiency and needs to be removed. To better utilize floor space the team seeks to strategically place high moving products.

Design Requirements

Changes made to the facility must not require any large monetary investment or the hiring of additional workers. Any modifications in operating procedures must be simple and easy to implement, so as to achieve worker buy-in on the warehouse floor. High Jump® is M.S. Walker’s Warehouse Management System (WMS), and must stay in place since it is a valuable management tool. Lastly, as the workers are the most important asset in a family owned company such as M.S. Walker, the project would like to make the proposed changes and resulting benefits clear to the workers and management.

Design Concepts Considered

Several methods for modifying the existing layout and for classifying the products were explored; they include several physical changes as well as changes to computer-based systems. One of the most drastic measures the team considered was to alter the way a worker puts away a product. Presently the workers will place a product away into storage and tell the WMS where they put it, which the team dubbed as a “system-
informed” approach. However, there is limited long term strategy involved in the placement of product. The team considered the scenario in which the WMS instruct the workers exactly where to store the product (a pure “system-directed” approach), but this was ruled out due to infeasibility.

Different facility designs were examined before arriving at the final solution. The idea of adding a staging area directly behind the shipping doors was considered, along with the reorganization of the layout of the bulk aisles was examined. The team also investigated other possible ways to increase the efficiency by changing the order in which product is stored.

As the team reflected on a hybrid of system-directed and system-informed approaches for product put-away, several different methods of choosing the put-away location were evaluated. The approach of utilizing a coefficient of variance, a measure used to evaluate relative volume and variance of a product, fell flat since it did not completely describe the client ordering patterns of the product. TOPSIS was another put-away technique considered; an algorithm that takes numerous factors into account and then strategically ranks different options. TOPSIS was too complex to be implemented in M.S. Walker’s WMS.

### Recommended Design Concept

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Project deliverables include an improved facility layout for the receiving area, as well as software and procedures to prioritize products based on quantity shipped and steadiness of demand.

The team constructed an algorithm to group similar products based on shipment frequency and steadiness of demand and then proposed a layout that arranged those product groups in the most efficient manner. Software and procedures were delivered allowing M.S. Walker to perform the algorithm themselves. Furthermore, a redesigned facility layout configuration was generated.

### Design Description

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Floor space near the receiving door and the bulk storage was restructured to reduce congestion of fork lifts and improve the flow of pallets. Specifically, extra products, defective products, and raw materials were rearranged or moved to another location to reduce clutter in the two areas. Introducing a “palletize zone” and visual aids on the floor supplement this new facility layout in order to maintain structure in the area. A palletize zone is a designated location for
The products are broken down into categories based upon volume shipped and variability of shipment.

Supporting the new facility layout is the optimization section of the project that will change where the product is placed. The team chose to implement a relaxed system-directed (SD) approach, which means that the WMS does not tell the worker an exact location to put a product, rather it recommends an area to put it. After consulting different sources, an ABC type classification system was selected from various alternatives as the best method for this particular SD problem. Under the ABC system, the products are split into groups based on volume of product shipped and a variation factor. Space on the warehouse floor is reserved for each of the different groups. A scripted program will be provided to M.S. Walker so that in the future the ABC categories can be re-evaluated and the products can be re-aligned as necessary.

**Analytical Investigation**

Many different analytical tools were used to develop the final solution. An Activity-Relationship chart helped the team identify which items or areas needed to be next to each other, and which could be relocated, in order to fit the needs of M.S. Walker without compromising service. Perhaps the most useful tool utilized was the collection of time studies. While visiting the M.S. Walker facility, the team was able to follow workers throughout their duties to get a feel for how daily business was conducted at M.S. Walker. It was during these time studies that the true problems in the receiving and put away processes were discovered. On the optimization side, several statistical tools were used to properly categorize the products including Pareto charts and variance analysis.

**Key Advantages of Recommended Concepts**

Aside from fulfilling the project objective of increasing capacity at the Norwood facility, there are other benefits which will result from the implementation of the team’s suggestions. Cycle time of putting away product will be reduced the product will be placed in a better location. Reduction of the heavy congestion in the receiving areas will occur, as the layout will be better suited to accommodate the traffic. It will eliminate all the clutter currently existing at the receiving area. In general, implementing the recommendations that
the team devised will help eliminate some of the confusion observed in the process and overall streamline how things are run at M.S. Walker.

**Financial Issues**

No large capital investments can be made to solve this problem. Only solutions that primarily use the existing equipment and warehouse may be considered. The project had to work within M.S. Walker’s constraint that no large capital investments could be made. The company is willing to make small investments such as buying an additional forklift; but large investments, changes to the building, or the construction of a new building were not options available. Since the changes recommended are mostly procedural, there will only be two types of costs associated with this solution. Man hours and employee training will be the primary investment that M.S. Walker will have to make to implement the recommendations. Since many pallets of product will need to be rearranged based on the new layout, man hours are required to move the products to their new locations. To implement the new storage methods in the warehouse, the workers will have to be trained on the new operating procedures. Finally, painting new lines and numbers on the floor will require a small amount of investment.

**Recommended Improvements**

Future work with the M.S. Walker Company would provide opportunities to improve their supply chain relationships and WMS algorithm in addition to implementing the recommended solutions to the receiving and bulk storage areas. While the layout proposal aims to improve the capacity of the receiving and bulk storage areas of the warehouse by 5%, the team saw further improvement opportunities. A discrete system is a WMS script that breaks down products into more finite groupings and considers other variables such as bin utilization. Workload balance refers to assigning work of unloading a truck in receiving and putting the product away based on the shipment to alleviate bottlenecks. Such a balance would increase receiving capacity and reduce put-away times. Finally, a pull system between M.S. Walker and liquor businesses would permit M.S. Walker to keep fewer inventories, freeing capital and reducing overhead costs.