

Designing an Optimal Facility Layout: A Case of a Plastic Molding Company

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Abstract

A facility layout is setting up the physical assets of a firm to promote the efficient utilization of resources such as workers, materials, machines, and energy. It affects the firm's productivity and profitability. In addition, the layout is related to the safety of plants, warehouses, stores, and other facilities. The facility layout is frequently implemented in conjunction with continuous improvements and lean principles.

We have worked with a small-to-medium enterprise (SME) that produces customized plastic molding products using job-shop processes. This company, which located in the Northwest of the United States of America, has experienced increased demands and decided to expand its production capacity. In addition, the chief executive officer (CEO) of the firm has realized that the current plant layout is inefficient due to the detached shipping and receiving areas, duplicated storage space to accommodate the detached shipping and receiving areas, conveniently installed machines as needed, nearly randomly located rooms. The company is in the process of buying a 45,000 square-foot building and needs the optimized layout of its plant. We utilize three inputs or constraints for designing the layout of the plant such as production volume for each product, an activity relationship chart for machines or workstations, and a from-to chart for product flows. The objective of the layout design is to minimize total weighted distance under the constraints. Although there are numerous configurations available, we consider three basic shapes such as an L shape, a straight line, and a U shape. We have found that the U-shape layout yields the minimum weighted distance among the proposed layouts under given conditions such as production volume, activity relationships that determine how close or far workstations and departments to be located, product routes, and some fixed locations for an overhead crane, the quality department, so on. Our result provides the minimized total distance along with advantages and disadvantages of each layout. In addition, a CAD (computer aided design) drawing has been prepared for facilitating the implementation of the layout. Finally, the CEO and his staff have decided to adopt the U-shape layout as we have recommended.