FORD MOTOR COMPANY
SIMULATION OF MATERIAL HANDLING OPERATIONS FOR LABOR REQUIREMENTS CALCULATION

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Ford Motor Company is the second-largest U.S.-based automaker and the fifth largest in the world. Ford’s Vehicle Operations Industrial Engineering (VOIE) team is responsible for calculating labor requirements to support production and material handling. These calculations are based on time standards applied to different operations. For material handling operations, labor requirements are estimated using packaging, usage information, travel distance and motion studies. However, some aspects of the material distribution strategy (such as travel of Powered Material Handling Vehicles (PMHV) inside the plant, and floor shop dynamics) affect calculation accuracy in three different ways. First, VOIE has difficulty capturing true causes and effects of delays over vehicles that move across the plant. Second, the PMHVs follow fixed routes, and vehicles can carry multiple parts at each delivery route (thus the material flow and replenishment based on a pull system for different production mixes is not captured in conventional time studies). Third, shop floor dynamics affect the calculation of labor requirements, given congestion in the aisles and bottlenecks in the plant, which are typically overlooked. Due to these challenges, Ford Motor Company sought to implement a simulation to improve the head count calculations of material handling for the vehicle assembly operation.

The 2015 Tauber-Ford project team developed a simulation to analyze complicated plans and capture plant floor dynamics in order to accurately calculate labor requirements. The Kansas City Assembly Plant (KCAP) was chosen as the pilot plant for this project due to the complexity of its operation. The current product, Ford Transit, has a wide range of body styles and trim level options that make KCAP one of the most challenging manufacturing and material distribution systems among Ford’s 66 manufacturing plants worldwide. The developed simulation includes both static and dynamic models of the KCAP system, which capture different aspects of material flow. The static model generates an overview of the KCAP operation and calculates the use of the different resources. On the other hand, the dynamic model uses discrete event simulation (DES) to capture the effect of different equipment interaction on material flow, such as congestions and bottlenecks. With the simulation tool, Ford can gain insight on the material flow throughout the facility. This insight can help increase the use of each resource and reduce head count by balancing distribution operations. Moreover, heuristic improvement opportunities in layout and organization can be assessed to reduce the distribution cycle time inside the plant. This simulation supports data-based decision-making for a more efficient material handling operation. The team studied different scenarios and set a road map of feasible improvement that could lead to $1.6 million in potential savings per year at the Kansas City Assembly Plant. Moreover, the team established the groundwork and trained personnel in VOIE so that the simulation methodology could be implemented enterprise-wide. Implementing this approach in the North American operations could result in a savings of $20 million a year for the company.