FORD MOTOR COMPANY

AI-Enabled Allocation Plan Optimization Tool

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Ford Motor Company (Ford) is the second-largest U.S.-based, and fifth-largest global automaker, with revenue of $156 billion in 2017. Ford has a vision for the "Factory of Tomorrow", which involves smart factories using artificial intelligence, augmented reality, and other new technologies. To help achieve this vision, Ford recently invested $45M in support of its Advanced Manufacturing facility to help build out Ford's smart-factory capabilities in these areas.

With the introduction of each new vehicle model, engineers undertake a complex and highly-manual planning process to determine the allocation of ~10,000 worksteps and associated parts and tools to stations in the plant. This complex process involves many vehicle configurations, and the engineers must also consider multiple constraints such as ergonomics, precedence, tooling, floor space, and cycle time. Under current processes, this allocation planning and constraint-checking is done manually by large teams of engineers on a station-by-station basis. This is iterative, time-consuming, and can lead to a sub-optimal plan, as it is difficult to look at a broader set of stations simultaneously.

To improve the allocation plan and reduce the engineering planning hours required, the Tauber team created an analytics tool to recommend a feasible and optimized plan. The team studied the current allocation planning process and interviewed engineers to understand key issues faced, constraints and logic required by the tool, and ensure the tool had a user-centric design. The Tauber team also employed agile methodology, developing and testing new capabilities with key users on a weekly basis.

The solution utilizes machine-learning to analyze historical allocation plans of similar vehicles to predict the order in which worksteps should occur, predicting 80% of the worksteps within 3% of their executed position. The tool then utilizes mixed-integer programming to recommend a feasible plan that optimizes operator utilization. By implementing the tool developed by the Tauber team, Ford will benefit an estimated $3M annually in direct savings through 7% utilization improvement resulting from improved allocation plans, as well as an estimated $1M annually in cost-avoidance through reduction in engineering hours required. There is also additional opportunity to roll the tool out on a global scale.