TAUBER INSTITUTE
FOR GLOBAL OPERATIONS
UNIVERSITY OF MICHIGAN

# Making More Material Flow at Ford

*Photographer: Miguel Saez*

Ford Motor Company, headquartered in the Detroit suburb of Dearborn, is the second-largest U.S.-based automaker and the fifth largest in the world, with 2014 revenue of $144 billion. In order to improve its material handling labor calculation, Ford worked with a team from the Tauber Institute for Global Operations.

At Ford, the 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, as well as shop floor dynamics, have affected calculation accuracy in three different ways.

First, VOIE has found difficulty in capturing the true causes and effects of delays for vehicles that move across the plant. Second, the PMHVs are made to follow fixed routes and can carry multiple parts on each delivery route. Conventional time studies are unable to accurately capture different production mixes in the material flow and replenishment pull system. Third, shop floor dynamics have affected the calculation of labor requirements due to aisle congestion and plant bottlenecks.

To solve these problems, Ford Motor Company brought in a student team from the Tauber Institute for Global Operations at the University of Michigan. This team consisted of Jingyang Du, pursuing a Master of Supply Chain Management degree, and Miguel Saez, an Engineering Graduate Program student in the Global Automotive and Manufacturing Engineering masters program.

The challenge for the Tauber team was to develop and implement a simulation to improve the head count calculations of material handling for the vehicle assembly operation. The simulation would 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. Its current product, the Ford Transit, is made up of 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.


*L to R: Jingyang Du and Miguel Saez. Photographer: Philip Dattilo*

This simulation included both static and dynamic models of the KCAP system and captured different aspects of material flow. The static model generated an overview of the KCAP operation and calculated the use of different resources. This model was based on a probabilistic analysis of the routes and material demands. The dynamic model used discrete event simulation to capture the effect of different equipment interactions on material flow, including congestion and bottlenecks.

With the simulation tool, Ford was able to gain insight on the material flow throughout its facility. This helped increase the use of each resource and reduced head count by balancing distribution


*L to R: George Harlow (Ford), Craig Putnam (Ford), Doug Rickert (Ford), Matt Welch (Ford), Rainer Mindermann (Ford), Jingyang Du (MSCM '15), Larry Seiford, Joel Tauber, Bob Garnham (Ford), Miguel Saez (ME-PhD'15), Al Woodliff (Tauber Industry Co-Director), and Amitabh Sinha (Tauber Business Co-Director) Photographer: Philip Dattilo*

operations. Moreover, on-the-job improvement opportunities in layout and organization were then assessed to reduce the distribution cycle time inside the plant.

The simulation supported data-based decision making for a more efficient material handling operation. The team studied different scenarios and set a road map of feasible improvements with the potential to create $1.6 million in savings per year at the KCAP. They established the groundwork and trained personnel in VOIE in order to support a simulation methodology implementation company-wide. This effort could generate annual savings of $20 million for Ford's North American operations.

On September 18, 2015, the Tauber Institute for Global Operations announced that the Ford Motor Company team of Du and Saez won third place in the 2015 *Spotlight!* Team Project Showcase Scholarship Competition. The 35 Tauber teams, composed of 89 students and supported by 54 faculty advisors at 23 sponsoring companies, worked in sectors including manufacturing and supply chain, health care, energy, retail, technology, and logistics to uncover solutions to operations-related challenges.

## The Challenge

Study the material handling operation inside a final assembly shop at Ford Motor Company to identify block and starve conditions. The use of the simulation would capture the stochastic nature of the manufacturing system supporting an accurate calculation and allocation of labor resources.

## The Team

### Students

Jingyang Du
*Masters of Supply Chain Management*

Miguel Saez
*EGP (MEng in Global Automotive and Manufacturing)*

### Project Sponsors

Bob Garnham
*Supervisor, Vehicle Operations, Industrial Engineering*

Doug Rickert
*Manager, Vehicle Operations, Industrial Engineering*

### Faculty Advisors

Henry Lam
*College of Engineering*

James Price
*Ross School of Business*

## About Tauber Team Projects

Each two to three person Tauber Team consists of graduate Engineering, MBA, and/or MSCM students. Along with receiving high-level corporate support from the sponsoring company, each team is advised by a College of Engineering and a Ross School of Business faculty member and overseen by a Tauber Institute co-director. The projects begin on-site in May and continue for 14 weeks. Students present the results of their projects and compete for over $40,000 in scholarships at the U-M Tauber Institute's annual *Spotlight!* event, held each September in Ann Arbor, Michigan. *Spotlight!* provides outstanding opportunities for students and corporate partners to establish relationships while exploring innovations in operations and manufacturing. The 2015 Tauber Team Projects resulted in $500 million in savings according to sponsoring company calculations, an average of $14.3 million per project over three years.

To learn more about the Tauber Institute for Global Operations, visit tauber.umich.edu or contact us at (734) 647-1333

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