



TAUBER INSTITUTE
FOR GLOBAL OPERATIONS
UNIVERSITY OF MICHIGAN

Optimizing Whirlpool's Foam Filling Process



L to R: Nicholas Walker and John Klocke onsite at Whirlpool Latin America



Whirlpool Corporation is the number one major appliance manufacturer in the world, with approximately \$21 billion in annual sales, 97,000 employees and 70 manufacturing and technology research centers in 2015. The company markets Whirlpool, KitchenAid, Maytag, Consul, Brastemp, Amana, Bauknecht, Jenn-Air, Indesit and other major brand names in nearly every country throughout the world.

Whirlpool Corporation boasts an Advanced Manufacturing (AM) organization that provides research, technical direction, and new technology guidance to its businesses around the world. After discovering latent capacity in the cabinet foaming area of the refrigerator assembly process, AM saw a need to improve the foam filling process for its refrigeration division.

To help solve this problem, Whirlpool brought in a student team from the Tauber Institute. This team consisted of John Klocke, currently working toward a Master of Business Administration (MBA) degree, and Nick Walker, a member of the Engineering Global Leadership Honors (EGL) program pursuing BSE and MSE degrees in Chemical Engineering. The team commenced the project by detecting latent cabinet foam capacity in several of the refrigerator assembly lines. To improve this capacity, they utilized ProModel computer simulation software to develop current state models of two cabinet foam lines in Amana, Iowa and Joinville, Brazil.

By analyzing timing, changeover, and production scheduling data at each line, and receiving input from plant employees, engineers, and facility computer programmers, the Tauber team created several future refrigeration cabinet foam process models for each area. Based on the future state models, they initiated an implementation effort in Amana. The team demonstrated that by adding two additional sensors to each fixture and changing the timing logic, capacity would be able to increase by 23 percent, or 6,000 to 10,000 units per year.

"[The Whirlpool foam project] is a wonderful example of the Tauber Institute's signature action-based program," said faculty advisor Brian Talbot. "John and Nick tackled a set of challenging and important capacity questions for Whirlpool in the summer of 2015. Working

"Working closely with Whirlpool personnel, John and Nick developed sophisticated ProModel simulation models that will ultimately provide multi-million dollar benefits to Whirlpool."
–Brian Talbot, Faculty Advisor

closely with Whirlpool personnel, they developed sophisticated ProModel simulation models that will ultimately provide multi-million dollar benefits to Whirlpool. [They] learned a valuable computer language, how to structure and model complicated problems, how to collect and validate appropriate data, run realistic scenarios, and complete cost benefit analyses of decision alternatives."



*L to R:
Nicholas Walker
and John Klocke at
Whirlpool Headquarters*

In addition, the team's future state models will serve as the baseline for Whirlpool's efforts to standardize the cabinet foaming areas of 50 lines worldwide. With the completion of their Amana implementation, they will generate a five-year net present value for Whirlpool Corporation ranging from \$3.3 to \$8.2 million with 90 percent confidence. What's more, the team's future state models



L to R: Larry Seiford, Mike Hile, Whirlpool Engineer Lead, Nicholas Walker (EGL BSE/MSE-Chem '16), Joel Tauber, John Klocke (MBA '16), Mae Zyjewski, Sr. Director Global Advanced Mfg at Whirlpool, Mike Anthony, Eng, Al Woodliff, and Amitabh Sinha

across all three lines present a five-year net present value opportunity ranging from \$21 to \$30 million with 90 percent confidence.

On September 18, the Tauber Institute announced that the Whirlpool team of Klocke and Walker won first place in the 2015 *Spotlight!* Team Project Showcase Scholarship Competition. The 35 Tauber teams, composed of 89 students at 26 sponsoring companies and supported by 54 faculty advisors, worked at locations around the world in sectors including manufacturing and supply chain, health care, energy, retail, technology, and logistics to uncover solutions to operations-related challenges.

With their demonstrated problem solving skills, Klocke and Walker produced several improved state computer models to maximize overall throughput and boost the refrigeration division's foam filling process. By the end of the project, Whirlpool's Tauber Team created a discrete simulation model used to optimize refrigeration plants and also recommended ways to refine this process. This improvement of Whirlpool's bottom line through operational enhancements in an important business line will directly affect the company's future success.

Whirlpool Project Team

Students

John Klocke
Master of Business Administration

Nick Walker
EGL (BSE/MSE Chemical Engineering)

Project Sponsors

Mike Anthony
Engineering Director, Refrigeration and Dish

Mike Hile
Engineer Lead, Polyurethane Foam

Mae Zyjewski
Senior Director, Advanced Manufacturing

Faculty Advisors

Brian Love
College of Engineering

Brian Talbot
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.

