



TAUBER INSTITUTE
FOR GLOBAL OPERATIONS
UNIVERSITY OF MICHIGAN

How Paying Attention to the Little Things Pays Off



BorgWarner Turbo Systems relied on a team from the Tauber Institute of Global Operations at the University of Michigan to help it improve its small parts inventory management and tracking. The team recommended innovative material and information control solutions to enable the company complete control and traceability of its components.

BorgWarner Inc., a \$10.5 billion company headquartered in Auburn Hills, Michigan, is a global automotive industry components and parts supplier with \$8.3 billion of sales in 2014.

A leading supplier in the transmission and powertrain segment, BorgWarner has an international presence, with more than 20,000 employees at 60 manufacturing facilities in 19 countries.

It is primarily known for its powertrain products, which include manual and automatic transmissions and transmission components, such as electro-hydraulic control components, transmission control units, friction materials, and one-way clutches, along with turbochargers, engine valve timing system components, and four-wheel drive system components. The company is divided into Engine and Drivetrain groups.

BorgWarner Turbo Systems is part of the Engine Group, which is responsible for research and development of the company's internal combustion engine-related components, along with operational efficiency, including fuel consumption, emissions, and performance. Key products are turbochargers and other related engine operation components.

Turbo Systems is a global manufacturer of turbochargers and boost-ing systems, selling components to manufacturers of passenger cars and commercial vehicles. In 2014, the division's 10 manufacturing facilities produced nine million turbochargers and generated 28 percent of BorgWarner sales.

But Turbo Systems struggled with managing and tracking its small components inventory. Similar small parts could get mixed up and

“BorgWarner has many different types of each of the small components that go into their core assembly, but there's no traceability system, so there's no way to tell at the end of the process if the correct parts were used throughout that process.”

— Sarah Klemsz

assembled incorrectly and if the resulting errors went undetected by operators or quality inspectors, they increased quality costs and damaged BorgWarner's reputation.

To solve this problem, BorgWarner Turbo Systems brought in a student team from the Tauber Institute for Global Operations at the University of Michigan, consisting of **Fan Fan** and **Sarah Klemsz**, both pursuing the Master of Supply Chain Management degree, and **Kendall Moyer**, a member of the Engineering Global Leadership Honors (EGL) program, working toward a BSE/MSE in Chemical Engineering.

The Tauber team was charged with designing a global solution to prevent mixing of small parts without increasing production and material costs.

Fan, Klemsz, and Moyer kicked off their project by evaluating four manufacturing facilities and completing 44 interviews to understand Turbo Systems practices.

Above: Presenting at BorgWarner Headquarters, Fan Fan (MSCM) and Kendall Moyer (EGL-BSE/MSE ChE), and Sarah Klemsz (MSCM). Photographer: P. Dattilo



Taken at BorgWarner headquarters, left to right: Stephan Altmeyer, Manager, Global Advanced Quality, Fan Fan (MSCM) Sarah Klemsz (MSCM), and Kendall Moyer (EGL-BSE/MSE ChE) at the BorgWarner Headquarters. Photographer: P. Dattilo

BorgWarner Turbo Systems Team

Student Team

Fan Fan—Master of Supply Chain Management
 Sarah Klemsz—Master of Supply Chain Management
 Kendall Moyer—EGL (BSE/MSE Chemical Engineering)

Project Sponsors

Stephan Altmeyer—Manager, Global Advanced Quality
 Wolfgang Schneider—Vice President, Global Manufacturing and Quality

Faculty Advisors

Lisa Pawlik—Ross School of Business
 Fred Terry—College of Engineering

New Material and Information Control Processes

After comparing their findings to external benchmarking and industry traceability requirements, the Tauber team designed new processes for material and information control of small parts.

To ensure end-to-end traceability, the Tauber team introduced updated automatic identification (auto-ID) technologies for material control and developed a concept for a new part numbering system to information control. The Tauber team published global standards for traceability, simulated the effect of the new processes on small parts, and designed a dynamic model for evaluating auto-ID technologies.

The team shared their recommendations with BorgWarner's global and local leaders. Teams within each of the global functions and local facilities have begun to implement these changes

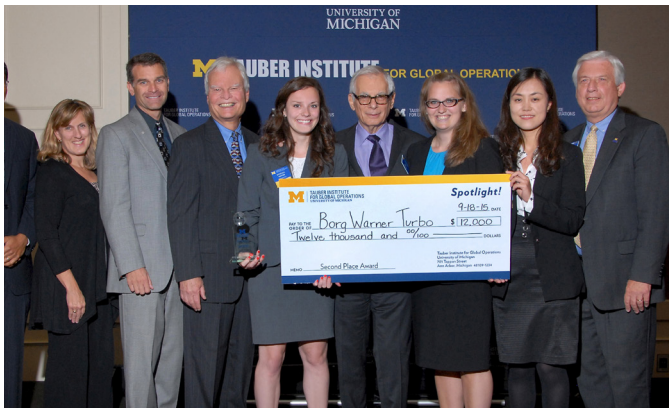
Making an Impact

The Tauber team's recommendations will reduce labor and material identification costs, recall expenses, and the possibility for small parts to be mixed up. By using the team's ideas for material and information control for all components across the division, Turbo Systems will achieve 100 percent control and traceability of components, and save up to \$10.61 million annually.

Project Team Takes Second

On September 18, the Tauber Institute for Global Operations announced that the BorgWarner Turbo Systems team of Fan, Klemsz, and Moyer won second 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 26 sponsor companies with locations around the world, worked in sectors including manufacturing and supply chain, health care, energy, retail, technology, and logistics to uncover solutions to operations-related challenges.

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The 2nd place *Spotlight!* Winner: BorgWarner Turbo Team: Kendall Moyer (EGL-BSE/MSE ChE), Sarah Klemsz (MSCM), and Fan Fan (MSCM) and at the *Spotlight!* Photographer: P. Dattilo

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

