TAUBER INSTITUTE
FOR GLOBAL OPERATIONS
UNIVERSITY OF MICHIGAN

25 YEARS

Optimizing Inventory Management at BorgWarner Morse Systems

BorgWarner Inc., a $10.5 billion company headquartered in Auburn Hills, MI, is a global automotive industry components and parts supplier with sales of $8.3 billion 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 two groups, Engine and Drivetrain.

BorgWarner Morse Systems, also known as Morse TEC, 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.

A global technology leader for more than 130 years, BorgWarner Morse Systems delivers broad expertise and customized solutions for variable camshaft valve timing, chain-driven engine timing systems, and HY-VO drivetrain chains for front-wheel drive transmission and transfer case applications. With best-in-class simulation, testing and manufacturing capabilities, it partners with engine manufacturers and automakers to provide advanced technologies and award-winning innovations to improve fuel economy and reduce emissions, enhance performance and deliver integrated systems solutions.

BorgWarner Morse Systems has more than 2,800 employees globally and operates in 13 locations in seven countries. About 70 percent of the vehicles on the road have a Morse Systems product in them.

But for Morse Systems to keep its competitive advantage, it needs to manage costs effectively while maintaining high service levels to its customers. As a result, inventory management practices have become a key element for management attention.

"When BorgWarner Morse Systems became more successful globally, the products supplier base grew more complex, with a bigger spending volume," said Stella Bi, global commodity manager in Shanghai, China and a project sponsor. "How to help the plants in different regions with different product portfolios and market environments better manage their supply chain model, reduce their inventory, and improve their turns are the key to sustainable success for the company," she continued. "The selected plants for this summer were either below global average, thereby offering a bigger

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Luis Garcia-Guzman
Lecturer of Industrial and Operations Engineering
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Len Middleton
Lecturer of Strategy and Entrepreneurship
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Above, right: L to R: Stella Bi, George Wu, Christina Greaves

improvement opportunity, or a new starter that wants to know all best practices from the very beginning."

To help increase inventory turns,BorgWarner Morse Systems brought in a student team from the Tauber Institute for Global Operations at the University of Michigan, consisting of Christina Greaves, pursuing a Master of Supply Chain Management degree, and George Wu, pursuing a Master of Business Administration degree.

The Tauber team traveled to corporate headquarters and manufacturing plants in the United States, Mexico, India, Poland and China, including two plants that were reporting the lowest inventory turns and a nascent plant. Initial expectations were to increase inventory turns within five years by 25 percent in Plant A and 20 percent in Plant B. For the nascent Plant C, the initial expectation was to propose a supply chain model that would allow it to hit a minimum of 15 inventory turns by 2016.

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The Tauber team studied Morse Systems supply chain models and conducted root cause analysis and benchmarking to identify areas of opportunity, followed by deep dive analysis and simulation to support a set of recommendations that would improve their inventory management performance.

After carefully prioritizing areas of opportunity, the team developed a set of recommendations mostly focused on managing raw materials, which included developing a template to determine policies by using optimized inventory models.

"The team proposed a new material ordering model to the plants to help the planner better understand the real needs and pull their materials," said Bi. "It's a very intelligent tool for the plants to use on routine basis."

The Tauber team's findings not only targeted supply chain operation processes but also other opportunities related to the company's reporting system and each plant's utilization of ERP technologies. For all these opportunities, the team documented some of the principles and best practices applicable in Global Guidelines, a 30-page living document, which will be used in the future to roll out and deploy continuous improvement initiatives across the division's plants.

"Innovative strategies involved creating an optimized model streamlining manual processes through ERP systems" said Wu. "The team also wrote a software program using C++ to run through data to validate the team's analysis and hypothesis to cover the extensive effort of this global project."

The global nature of this three-month project added another level of complexity.

"The team spent their time in five different countries over 14 weeks and had to work through different cultures by adapting to different working styles, foods, jet lag, and sorting through documents in different languages," said Wu. "The greatest challenge was working cross-culturally and working with teams in different time zones. Towards the end of the project, where the team had to coordinate with every region, it was not uncommon to receive calls in the middle of the night."

Through these recommendations, the plants would be able to achieve inventory turns improvements of 66 percent in Plant A and 25 percent in Plant B within five years. For Plant C, projections show it can achieve more than 15 inventory turns by 2016 and 28.83 inventory turns by 2019, an overall result exceeding initial expectations.

The first stage pilot for ERP system implementation of a few selected material numbers occurred from June 22 to August 15, 2015. The second stage pilot to roll out to all raw materials began in August. After implementation of the recommendations, the Tauber team estimated $2.1 million in savings over the next five years.

Tauber Team BorgWarner Morse Systems at Spotlight! competition. Photographer: Philip Dattilo

The Challenge:

The team will create a detailed implementation plan across Mexican, Indian, and Polish plants and global inventory management guidelines for BorgWarner Morse Systems to achieve a target of 15 inventory turns within five years. Details of recommendation will entail full value chain mapping and analysis at above plants, analysis of data from China's pilot plant, and considerations of surrounding culture and business environment.

BorgWarner Project Team

Students
Christina Greaves–Master of Supply Chain Management

George Wu–Master of Business Administration

Project Sponsors
Stella Bi–Global Commodity Manager

Marco Caputo–VP of Global Supply Chain

Robert Strimpel–Director of Global Commodity Management

Faculty Advisors
Luis Garcia-Guzman–Lecturer of Industrial and Operations Engineering, College of Engineering

Len Middleton–Lecturer of Strategy and Entrepreneurship, Ross School of Business

About Tauber Team Projects

The 2016 Tauber Team Projects resulted in $460 million in savings according to sponsoring company calculations, an average of $14.4 million per project over 3 years.

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.

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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