BORGWARNER MORSE SYSTEMS
CAPITAL EFFICIENCY AND HEAT-TREATMENT BENCHMARKING PROJECT

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BorgWarner Inc., a $9B company, is a global leader in clean and efficient technology solutions for combustion, hybrid and electric vehicles. Morse Systems, a business unit within BorgWarner, delivers expertise in customized solutions for variable cam timing, engine timing systems and drivetrain chains. Within chain manufacturing, Morse Systems was eager to benchmark and standardize heat-treatment furnace performance measures and was looking for recommendations on how to most efficiently utilize capital at Morse Systems Korea (MSK).

Heat-treatment is a critical value-add process during the manufacturing of chains that requires capital intensive furnaces that work 24/7. These furnaces, which operate at high temperatures, are difficult to shut down and demand extensive maintenance to operate at ideal conditions. Therefore, it is imperative that MSK is able to determine optimal capacity, utilization, and production schedules to ensure maximum capital efficiency. In addition, it is important that plants are able to internally benchmark furnace performance to identify key areas for improvement. To successfully benchmark performance, plants must use a common set of metrics that rely on identical assumptions, which is currently not the case.

The Tauber team, based at Morse Systems Korea (MSK), was assigned two main tasks: 1) Study the heat-treatment process in MSK to determine optimal utilization and improve capital efficiency and 2) visit Morse "sister" plants in Japan, China, and Italy to understand local performance measurement and bring back best practices to implement in MSK. Additionally, after identifying key differences in the calculation of Overall Equipment Effectiveness (OEE) among plants, design a standardized OEE metric that can be implemented across plants to enable a commensurable comparison of heat-treatment performance.

The team, using linear programming, the Bill of Materials system, capacity analyses, and cost analyses, presented an optimal production schedule and ascertained required production capacity at MSK. By doing so, the team reduced up to 2,600 overtime labor hours per year in addition to recommending a 25% reduction in the number of furnaces while still meeting demand. Together, the recommendations resulted in potential savings of up to $1.37 million over the next five years. Overall, this represents a yearly reduction of up to 9.1% in direct costs related to heat-treatment furnaces at MSK.

After visiting MSK's sister plants, the team conducted a detailed analysis of OEE calculations while noting fundamental differences. Taking into consideration the theoretical approach and current business need, the team standardized the OEE calculation to rely on identical assumptions. This new metric can be easily implemented to uniformly compare furnace performance. The team also recommended a Global Improvement Resource Center—a common platform for plants to share continuous improvement ideas with each other. Finally, as a long-term goal, the team recommended standardization of machinery and product mix across plants, making it easier to manage global inventory and enabling easy sharing of best practices.