Rubber Mixing Logistics and Operations

Overview
Goodyear has been experiencing a significant amount of WIP within their supply chain, both at the mixing facility and throughout the transportation component of their operations. Goodyear Pacific analyzed both the logistics and mixing aspects of Goodyear’s operations to determine an effective approach for reducing this WIP to a reasonable level. The team used Microsoft Excel to conduct multiple spreadsheet simulations, which resulted in the testing of various policies. The team determined that a ‘Two-Batch Policy’ was the best method for reducing WIP within the supply chain. The team also analyzed the possibility of adding additional mixers, through a heuristic approach. Additionally, Arena models were developed to test various policies and add variation into the process.

Objectives
• Develop a transportation model to optimize, which satisfies daily requirements for rubber mixing
• Develop a scheduling model, which minimizes WIP, and also meets the daily requirements for rubber mixing

Approach
• The transportation model was promptly created using an EOQ model and carefully estimated shipping costs established with the sponsors.
• A scheduling model was handled by first using physical materials, such as coins and paper, to simulate the mixing process and its constraints. Through the physical simulation, impacts of each constraint, such as mixer changeovers and rubber cooling time, were carefully taken into consideration.
• Next, a spreadsheet simulation was performed using Microsoft Excel where work-in-process levels and mixing cycle times could be individually monitored.
• Different scheduling policies were brainstormed and evaluated by the cycle times, as well as work-in-process levels. Eventually, the team discovered that each model was a representation of trade-offs between cycle time and work-in-process. The team developed a “Two-batch” scheduling policy, which minimizes work-in-process, yet maximizes the 85% OEE of a mixer, which is another constraint set up by the sponsor.
• Finally, heuristic models and Arena models were utilized to further analyze the behavior of the mixing process.
• The sponsor also traveled to Penn State University to validate the results and progress the team had.

Outcomes
• The sponsor will see a 30% reduction in total work-in-process given the current demand settings.
• The sponsor will benefit from the various mixer-demand and mixer-time relationship models that were created.
• If the sponsor plans to develop a new mixing facility, with similar demand and locational settings, the methodology and approach that were documented will be a very valuable reference.

Figure 1. Illustration of a Two-Batch Policy