Analysis of Abrasion Resistant Coatings Under High Loads

Overview
Manitowoc’s mobile cranes stabilize themselves with an extensible outrigger beam. This beam, when extending, fulcrums about a nylatron puck on the underside of the beam socket and permits shifting and abrading within the socket. Furthermore, the enormous forces and moments generated from the loaded boom drive immense impact forces. To this end, our group researched various coatings that could withstand the large abrasion and impact forces to prevent abrasion of the beam.

Objectives
State your team’s objectives and what it is you all did for the project this semester. This can be one or two sentences, or you can use bullets if there are multiple objectives. For examples of other “Review Recaps”, see: http://www.ie.psu.edu/BusinessIndustry/PreviousProjects.cfm?Type=Previous

Approach
• Began by discussing what the primary factors to protect against are (abrasion, impact)
• Brainstormed testing methods to simulate scenario the outrigger beams were under
• Determined relevant variables for testing methods and found appropriate ASTM standards
• Visited sponsor to understand more about problem and see original damage to outrigger beams
• Built INSTRON rig per ASTM standards G115 and D1894
• Received multiple steel samples from Manitowoc and coated them with 7 different coatings
• Used INSTRON to get coefficient of friction data for each of the coating types
• Performed Vickers micro hardness testing to determine impact resistance of each coating
• Sent best samples out for external Taber testing to determine long-term abrasion/wear resistance
• Ordered coatings to find optimal abrasion resistance, impact resistance, and lowest coefficient of friction
• Compared coatings to theoretical crane application to determine viability of each coating

Outcomes
• Manitowoc will be able to use dry-powder lubricants to increase the aesthetic durability of its outrigger beams
• Manitowoc also has a set of alternate uses for different parts of the crane
• Will save on re-servicing crane outriggers and provide a better product
• Opens up opportunities for further research into different lubricants and applications