

# **Performance analysis of system components for hydraulic bike design in a capstone design project**

Western Michigan University

Edward Brabandt, Alamgir Choudhury and Pavel Ikonomov

## **Abstract**

Product development competitions through capstone design courses pose both, opportunities and challenges for graduating seniors in engineering and engineering technology programs. Sponsor support for the competition provides resources and generates student enthusiasm. However, such competitions may also impose process, materials, fabrication, time, and performance constraints that are not usually encountered in a typical capstone design project. This poster presents a senior design projects based on a national hydraulic bicycle design competition sponsored by Parker Hannifin Corporation. Generally, a design team would encounter a variety of additional challenges in working through the constraints of this type of competitions. Because such competitions typically work from an industry rather than an academic timeline, tasks such as prototyping, design refinement, fabrication, and eventually a performance-based competition may be overwhelming for a two-semester project. Similarly, use of industrial components in lieu of components specified in a design process present additional challenges to be overcome. To circumvent this problem, performance of different industrial components is analyzed in a simulated system in the laboratory and components are selected based on optimal performance of the system. Incorporation of long-term performance criteria of a system and its components at an early stage of the design process is essential for achieving design objectives of such a system. The laboratory system developed utilizes sensors, data acquisition system, and application program to analyze behavior of components of a system under diverse operating conditions. Design of a system based on this analysis resulted in significant improvement in overall performance of the hydraulic bike.