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## CEAS hydraulic bike wins National Chainless Challenge

A WMU engineering team has won the national championship in the 3<sup>rd</sup> Chainless Challenge - a hydraulic bicycle design competition sponsored by Parker Hannifin Corporation and held July 30-31 in Cleveland, OH. The team earned the championship trophy and a \$10,000 cash award.



Winning this year's Chainless Challenge is the WMU bike team: **Phani Chandar Sree** (on bike) and (from left) **Manik Kapoor**, **Dr. Pavel Ikonomov**, **Francis Schlaud**, and **Dr. Alamgir Choudhury**

Parker established the criteria for the annual competition, which challenges students nationwide to be innovative in the design and development of a bicycle that transfers the rider's manual power from the pedal to the driving wheel without using a traditional chain or other direct-drive mechanisms.

**Dr. Alamgir Choudhury**, an associate professor in the Department of Industrial and Manufacturing Engineering (IME) and **Dr. Pavel Ikonomov**, an IME assistant professor, led a student team that included **Manik Kapoor** and **Phani Chandar Sree**, both ME master's students; and **Francis Schlaud**, an industrial education student.

WMU won the overall championship based on its taking first place in the 12-mile endurance race and winning the award for design safety and reliability.

The WMU entry was the lone survivor in the endurance race, completing the hilly 12-mile track in 2 hours and 37 minutes. Choudhury said a rule change that teams could no longer push their bikes during the race led to WMU's victory. "This change emphasized the performance of the bike rather than the physical endurance of the rider," he said.

"Our bike was the only bike that could complete the 12-mile race without pushing."

To maneuver the hills without needing to be pushed, WMU's team reduced the overall weight of the bike and revamped the gear train to handle a variety of road conditions. The new gear train enabled the team to select the right amount of torque - more when climbing hills and less when descending hills. "The most important thing that we did was to redesign the gear shift," Choudhury said. "That was the key to our success."

WMU's competition included teams from California State Polytechnic University, Cleveland State University, Murray State University, Purdue University, University of Akron, University of California-Irvine, University of Cincinnati, University of Illinois - Urbana-Champaign, and University of Wisconsin -Madison.

In addition to the endurance race and a 100-meter sprint circuit, each bicycle design was judged on its design ingenuity and novelty, reliability and safety, and manufacturability and workmanship, and on a design report.

Others who contributed to the project include **Dr. James Kamman**, an associate professor in the Department of Mechanical and Aeronautical Engineering (MAE), **Dr. Stoyan Stoychev**, who earned a Ph.D. in mechanical engineering last spring at WMU, **Ananda Paudel**, an IME graduate student, and IME Lab Coordinator **Glenn Hall**. The entire team developed the winning bike by optimizing the design of a bike prototyped three years ago in IME and MAE senior design projects.

Parker - which sponsors CEAS research in hydraulics, pneumatics, and motion control - has been a generous contributor both to the Parkview Campus Parker Motion and Control Lab, where much of the work on the hydraulic bike is done, and for engineering scholarships. In April, Parker Hannifin representatives **Duane Crockrom**, Hydraulic Group HR Manager, and **Larry Schrader**, Global Motion and Control Training Manager, presented the college with additional funding. For more information, contact Choudhury at [alamgir.choudhury@wmich.edu](mailto:alamgir.choudhury@wmich.edu)