

Full Fairing Fun

Each engineering problem has its solution, but sometimes the best planning, design and execution is met with unforeseen variables.

As a freshman, Joshua Hockel joined Bourns' Human Powered Vehicle (HPV) challenge in 2006, and helped the team to a top 10 finish in 2007. Taking part in his third HPV challenge, Hockel wanted to take the college's team to a new level.



He had noticed that the teams that performed best had encapsulated the rider in a full fiberglass fairing to minimize drag. The previous two years the Bourns' team had wanted to complete a full fairing, but they ran out of time and money.

This year, with Hockel as ASME president, the team raised \$5,000 from sponsors and began designing their entry. Hockel said it was exciting to take the lessons and software tools they learned in class to create, modify and analyze aerodynamic designs for their HPV. "I just took my fluid mechanics course, which was very helpful," he said

For instance, they used Solidworks' 3D computer-aided design to shape the shell. They also used Matlab, a high-level language and interactive environment that makes quick work of complex mathematical analyses. The team also tested scale models in Professor Marko Princevac's large wave tank, using colored dye and water currents to achieve more precise observations of drag than when using a wind tunnel.

The goal was to support the ergonomic stance of the rider while minimizing weight and wind drag. The modeling allowed the team to reduce weight by 5 percent and friction by 2 percent. "It's all about inches," Hockel explained. "Small improvements add up over 40 miles."

The team built the one-of-a-kind fiberglass shell in Bourns Hall and began road testing. In the HPV Challenge, the vehicles are tested in sprints and a 40-mile endurance race. Riding



skill and conditioning are major factors.

At the competition, most of the more than 30 teams representing engineering programs nationwide found that their full fairing designs were difficult to control in high winds at the Reno, Nev., site. With lessons learned, next year's design may include an optional sail.