EcoCAR Challenge Countdown - The Road to the Finals

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The EcoCAR Challenge is an opportunity for university students to apply cutting edge technology and experiment with solutions to the problems of the future. The goal of the three-year student competition is to design practical vehicles that improve efficiency, emissions, and performance while remaining functional.

We began our work with EcoCAR in 2009. The first year of the EcoCAR Challenge focused on design and simulation, and Ohio State took 1st place overall as well as awards for top performance in many judged events [1 [1]]. In the May 2010 competition, the Ohio State vehicle placed 5th out of 16 competing university teams competing with an all-electric vehicle driven by only a 138 hp (103 kW) GM electric machine. The final competition will take place in May 2011. Since year 2, Ohio State's complete EREV architecture has been implemented and tested to tune the following powertrain components:

Ohio State University EcoCAR Promo [2] from Harry Locke IV [3] on Vimeo [4].

• 138 hp (103 kW) GM electric machine
• 110 hp (82 kW) Remy electric machine
• 138 hp (103 kW) 1.8L Honda CNG engine running E85 fuel
• Custom dual clutch transmission allowing mode switching:
o Series operation (Engine and Remy charge battery)
o Parallel operation (Engine and 2 electric machines drive the wheels)

The video above introduces the Ohio State vehicle and some of the components that make it run. Several sponsors including GM, the Department of Energy, MathWorks, dSPACE, and Woodward work closely with engineering students from the 16 participating University teams to make complex designs possible throughout the competition.

The EcoCAR teams met at MathWorks headquarters in Natick, MA in September 2010 to discuss the final competition rules and receive training on new tools to help with the final year of development. Since then, the Ohio State team has made some significant progress to continue vehicle calibration and tuning. The team had broken a shaft that connected the clutch system to the engine during the summer, and that had left the vehicle once again all electric with no range extending mode. The vehicle's entire front powertrain had to be removed for repair, so the system was given a full inspection and underwent additional improvements including adjustments to the clutch system and actuators, better alignment of the belt system for the electric motor and cleaner routing of cooling and oil lines. After completing these improvements, the team once again has the vehicle functioning in all operation modes. The current focus is tuning for smoother mode transitions, higher

efficiency, and drivability to help demonstrate the benefits and functionality of this architecture.

Check back each month through June for updates from the team on our progress leading up to the final competition. For more information, please email us at osuecocar@gmail.com [5] or visit www.ecocar.osu.edu [6].

John Kruckenberg is a graduate student at Ohio State dedicated to the EcoCAR project. Mr. Kruckenberg is the leader of the Controls / Hardware in the Loop development team for Ohio State's EcoCAR project. He is currently pursuing a masters degree in Electrical Engineering and writing a thesis on fault diagnostic topics for the EcoCAR vehicle. Interests include rapid control development and embedded control systems.

Find out more about John and the team at www.ecocar.osu.edu [6].

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Links:
[1] http://http://www.ecocarchallenge.org/docs/2009_year1_finals.pdf
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