EcoCAR Challenge Countdown: The Road to the Finals - February

Beth Bezaire

The Ohio State University EcoCAR team is one of 16 teams using cutting-edge technology to develop fuel-efficient, low-emissions vehicles for EcoCAR: The Next Challenge. Teams are in the third and final year of the competition, which culminates in June.

Over the past month, the Ohio State team has been testing powertrain functionality by driving the vehicle in all four operation modes:

1. Charge Depleting 2WD and 4WD (all-electric)
2. Charge Sustaining Series (engine on, city driving)
3. Charge Sustaining Parallel (engine on, highway driving)
4. Regenerative Braking

Dynamic testing of our vehicle has focused on top-priority tuning categories where improvements offer large gains in fuel economy and drivability. Therefore, we have been doing most vehicle testing in all-electric operation, parallel operation, and transitions between operating modes. This dynamic testing has enabled the team to improve vehicle calibrations and control algorithms for a more seamless and fuel-efficient ride.

In conjunction with dynamic vehicle testing, the team has also continued to work on sub-system control refinement. Through improved throttle control and torque control, the engine now realizes transients more quickly and operates much more smoothly. The transmission actuation and sensor feedback, which was originally done with an H-bridge and a large number of digital inputs and outputs, has been consolidated to a local DC-motor control module using simple CAN communications for improved robustness, simplicity, and efficiency. The rear electric machine was

calibrated for better torque mapping, and the software on the inverter for the front electric machine was upgraded to provide a significant update in tuning, fault tolerance, and fault detection.

Currently, the team is preparing for the Spring Workshop being held at the U.S. Environmental Protection Agency at the beginning of March. All 16 vehicles will undergo a rigorous inspection to ensure each vehicle meets safety and technical requirements. Then, teams will be given the opportunity to conduct emissions and energy consumption testing as a benchmark assessment before the final competition. Ohio State's preparation for the inspection has included hardware refinements such as sanding and painting exposed metal on underbody parts, tidying up coolant lines and electrical wiring, and adding custom interior panels to improve vehicle aesthetics and cover added powertrain components, as well as continued engine testing to improve start-up and transient emissions.

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 [1]or visit ecocar.osu.edu [2].

About the Author
Beth Bezaire is a graduate student at Ohio State University pursuing a Master's degree in Mechanical Engineering. Beth's work focuses on the emissions control of Ohio State's EcoCAR project, with specific interest in the implementation of an electrically-heated catalyst into the team's plug-in hybrid electric vehicle.

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