

## IPRO 310: CONVERSION OF A RIDING LAWNMOWER TO HYDROGEN FUEL

### OBJECTIVE

The Chicago Park District, which is responsible for maintaining over 7300 acres of trim grass, charged the group with finding a method for converting a conventional riding lawnmower to one that uses a cleaner burning alternative fuel that will reduce emissions, yet still provide a similar level performance, ease of use, and cost of operation.

### TASKS, BARRIERS, and ACCOMPLISHMENTS

Each of the three teams had a mission and corresponding successes and obstacles:

- **LAB-SAFETY TEAM:** The lab safety team was charged with investigating general hydrogen safety, educating the entire team about safety, making sure that a safe testing environment was maintained, and ensuring that the prototype lawnmower met all safety requirements. Their greatest obstacle was the huge amounts of technical material they found regarding hydrogen safety. They were successful in reading, summarizing, and presenting all pertinent safety codes including those from NASA, OSHA, and the International Code Council.
- **TESTING TEAM:** The testing team's main objectives were to benchmark test the gasoline-powered engine and compare the results from the same test on the hydrogen-powered engine. The team's greatest barrier was that the engine testing facilities and main testing apparatus had been neglected for years and no one knew how to operate it. They, however, persevered and, as a result, the semester's greatest accomplishment was learning the testing system's hardware and software systems, repairing all but one of the modules without outside assistance, and preparing a detailed testing procedure for next semester's IPRO team. As the semester ended, the team was waiting for a refurbished part to come back from the system's manufacturer. It is the last part needed to perform testing. Next semester's team must only follow the laid out procedure.
- **CONVERSION TEAM:** The conversion team was given the task of creating a thermodynamic model of the engine, developing a detailed conversion procedure, ordering the necessary conversion equipment, and converting the engine. The greatest barriers encountered during the semester were finding the necessary high performance parts for such a small and obscure engine as well as finding equipment that would satisfy the stringent safety requirements imposed by the lab-safety team. Though, the greatest barrier to the actual conversion turned out to be time. The team had not anticipated that the purchase order and delivery process would take as long as it has. The team is still waiting for parts. The team's greatest accomplishment was identifying and ordering the required equipment and writing the conversion methodology so next semester's IPRO team must only follow the procedure.

### FURTHER PHASES

This semester's team completely set up the project. Next semester's team needs only to run tests on the gasoline engine, convert the engine, test the converted engine, and convert the lawnmower.

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**Conversion Team:** Dan Taulbee (Leader), Preeti Abraham, Steffany Evanoff, Yewon Gim