



## Engine Test Facility for ATU Biodiesel Fuel

**Prepared By:**

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### Problem Investigated:

Through the university faculty research grant program, an award was made to the PI, Dr. Gill Richards, Co-PI, and with support for two students to investigate and establish a means for testing biodiesel fuel produced by the ATU Chemistry department. This grant was funded by the Arkansas Center for Energy, Natural Resources and Environmental Studies. This report summarizes the activities undertaken during this research project, the results produced and presentations made by grant participants.

### Grant Activities:

The grant period ran from October, 2004 to June, 2005. During the grant period, two senior mechanical engineering students received \$801 each of support from the grant and a total of \$1016.20 was expended for supplies and equipment. Registration for the Arkansas Undergraduate Research Conference in Arkadelphia in the amount of \$26.00 was also paid from the grant with additional travel costs (mileage, mentor registration) being paid from the Mechanical Engineering budget.

The initial aim of the project was to procure a test engine for use in the biodiesel testing program. As possibilities were investigated, it became clear that the funds available from the ACENRES grant and an associated ATU sponsored grant would not be sufficient to obtain a typical engine/dynamometer set-up. Attention turned to a diesel powered electrical generator, but this idea was eliminated due to problems with regulating the speed of the engine and in providing a suitable load for the engine. Finally, the team settled on a plan of on-road testing using a diesel powered vehicle. After investigation, a suitable vehicle was located and obtained for temporary use at no cost to the project other than maintenance, fuel, etc.

Due to the time involved in arriving at the above testing arrangement and the nature of the equipment selected, the scope of tests to be performed was scaled back from the original research plan. The tests performed with the diesel vehicle included measured fuel usage, engine power, and engine emissions. Testing was done with 0%, 20% and 100% biodiesel fuel. A complete report of the findings of this research is available in the Senior Design Project report completed as part of the requirements for MCEG4493 by the two student researchers.

### Summary and Conclusions:

In summary, the biodiesel fuel performed well with only a slightly lower measured fuel mileage than petroleum diesel, slightly lower engine power output at a given engine speed, and noticeably lower emissions than standard diesel. From the results of this investigation, it appears clear that standard diesel engines can perform adequately running on any combination of petroleum and biodiesel fuel.

**Publications and Further Activities:**

The undergraduate student researchers presented their findings of activities carried out under this grant at the Arkansas Tech Honors and Undergraduate Research Symposium and the Arkansas Undergraduate Research Conference held at Henderson State University in April, 2005. A final report, on which the above presentations were based, was filed as part of the students' capstone design project and a copy of this document is attached to this report.

This initial activity investigating biodiesel fuel has led to three further senior design projects and one additional research grant. Though none of these later activities were direct follow ups to this original investigation, this first work in the biodiesel field has proven very productive for the department and its students.