



U.S. Department of
Transportation



Project Title: *Advanced Technologies for Biodiesel Production using a Microwave Extraction System*

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Project Goal

Current fossil fuel prices make biodiesel produced from vegetable oil a viable renewable energy source. Notwithstanding feedstock prices, a major component of the biodiesel price is its production costs, higher than petroleum diesel. This project addresses the critical need to develop cost-saving processing technologies to assist biodiesel producers in reducing energy consumption and increasing yields. The overall objectives for the project were: a) To optimize the oil extraction process from rice bran and soybean flour using a batch microwave process; b) To design, develop and optimize a continuous microwave system for oil extraction using the optimization results obtained from the batch microwave process for soybean and rice bran flour; c) To use the batch and continuous microwave oil extraction optimization results obtained for soybean and rice bran flour and extend it to study the oil extraction from Chinese tallow tree (CTT) seeds; and d) To achieve microwave-assisted trans-esterification of these lipids into biodiesel.

Project Outcomes

The use of microwaves as energy source (batch and continuous) for oil extraction from various oil containing agricultural feedstocks (soybean flour, rice bran and Chinese tallow tree seeds [CTT]) and as a heating source for transesterification of the extracted oils into biodiesel was investigated. The microwave assisted oil extraction (MAE) was compared with conventional (CE) and Soxhlet extraction (SE) methods. Results indicate that the MAE process was faster than CE and oil yields comparable to SE were obtained. The quality of the oil extracted also adhered to biodiesel specifications and oil conversion into biodiesel rates of > 99% were obtained indicating the feasibility of using microwaves for oil extraction and transesterification. Future research will focus on scaleup of the continuous microwave process and a detailed study on the cost economics involved for introducing the process on an industrial scale. Use of other alternative energy efficient technologies in conjunction with microwave process to further reduce the operating costs involved and produce competitively priced biodiesel will also be investigated.



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