ETHANOL PRODUCTION IN OKLAHOMA

By: *Andrew Abatiell, Jason Ireland, Joseph Odusina, Daniel Silva Rajoo, Zafar Zaidi*

Capstone Design Project- University of Oklahoma - Spring 2003

Executive Summary

The objective of this study was to determine the feasibility of ethanol production in Oklahoma by using a mathematical model. The study was divided into 5 major sections and was addressed in the following order: market demand, feedstock selection, plant and feedstock location, processing technology, and the mathematical model. To begin the study, a market analysis was performed to determine the future demand of ethanol. The study indicated that if MTBE is banned, the future of ethanol production is promising due to an increased demand. In the second section of the study, potential feedstocks for ethanol production were chosen based on crop availability, crop composition, byproduct formation, and ethanol yield. The potential feedstocks selected were switchgrass, grain sorghum, and wheat. For each crop, transportation, storage, and harvesting costs were collected. In the third section of the study, potential plant and feed locations were chosen. Oklahoma was divided into 9 districts, placing a potential plant in each district and one feedstock supply point in each county. Distance data between each plant and supply point was collected. Potential processing technologies were then analyzed for all three crops; FCI and operating cost estimations were made. The three processing technologies considered were: 1) fermentation, 2) dilute acid hydrolysis, and 3) gasification. A mathematical model was constructed to compile all the data collected to determine the optimum processing type, plant capacity, plant location, feedstock(s), NPW, FCI, and operating cost. The processing technology chosen was traditional fermentation with the four plants located in 1) Broken Bow, 2) Clinton, 3) Hobart, and 4) Garber. The model found that in order for ethanol production to be profitable in Oklahoma, it is required that: 1) the price of ethanol does not fall below $.60/gallon, 2) the transport cost does not go above $.2/ton of feed-mile, 3) the storage cost does not go above $2.0/ton of feed, and 4) the operating cost is less than 3.2 times the original operating cost. A preliminary stochastic model was constructed to access the risk involved, but a thorough model was unable to compile any results due to a lack of resources at the University of Oklahoma.