NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Liquid-Liquid Separation Process

Cooperative Research and Development Final Report

CRADA Number: CRD-09-362

NREL Technical Contact: Dan Schell

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Cooperative Research and Development Final Report

In accordance with Requirements set forth in Article XI.A(3) of the CRADA document, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

CRADA Number: CRD-09-362

CRADA Title: Liquid-Liquid Separation Process

Parties to the Agreement: 3M Company

Joint Work Statement Funding Table Showing DOE Commitment:

Estimated Costs	NREL Shared Resources
Year 1	$ 75,000.00
Year 2	$ 105,000.00
Year 3	$ -30,000.00
TOTALS	$ 150,000.00

Abstract of CRADA Work:

The 3M Company, in collaboration with the National Renewable Energy Laboratory (NREL) and others, will develop the concept of the membrane solvent-extraction (MSE) technology for water removal and verify the technology at a pilot scale for bio-ethanol production to increase energy and water savings.

Summary of Research Results:

An initial AspenPlus model of the membrane extraction distillation process was originally developed by 3M to perform techno-economic analysis. NREL expanded the original AspenPlus model to include pilot-scale fermentation and MSE technology. Where possible, experimental data collected from the pilot plant was included in this AspenPlus model.

The U.S. Department of Agriculture (USDA) previously developed a technoeconomic model of a corn dry-grind ethanol production process. The model is not intended to replicate a specific existing fuel ethanol plant, but rather to model the processing steps and unit operations typical of most corn-based dry mill ethanol facilities. In this project, the USDA model was also modified to assess the impact of replacing the beer column with MSE technology.

The NREL and 3M team found that MSE technology reduced energy requirements for ethanol recovery compared to the conventional distillation. The most significant reduction was attributed to eliminating the beer column, which is the most energy-intensive unit operation in the process. MSE technology was also found to reduce cooling demands compared to conventional distillation.

Subject Inventions Listing: None

Report Date: March 11, 2014

Responsible Technical Contact at Alliance/NREL: Dan Schell

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