

Contract No. R005-0011

“Corn Oil Extraction”

Submitted by Headwaters Incorporated and Great River Energy

Blue Flint Ethanol will be managing this project

Principal Investigator: Jeff Zueger

PARTICIPANTS

Sponsor	Cost Share
Headwaters Energy Services Corp./ Great River Energy	\$1,500,000
North Dakota Industrial Commission	<u>\$ 500,000</u>
Total Project Cost	\$2,000,000

Project Schedule – 5 months

Contract Date – May 28, 2009

Start Date – June 1, 2009

Completion Date – August 31, 2010

Project Deliverables:

Status Report: June 30, 2009 v

Status Report: 30 days after first report v

Status Report: 60 days after first report v

Status Report: 90 days after first report v

Final Report: No later than August 31, 2010 v

OBJECTIVE/STATEMENT OF WORK:

The objectives of the project are three-fold: to protect ND renewable energy jobs through diversification of revenue streams to the existing Blue Flint Ethanol production facility, utilize an ethanol process co-product to produce biodiesel, and to create a renewable energy market for corn oil, a product not currently harnessed in North Dakota. While corn oil extraction technology has been utilized in ethanol plants outside of the state, this project would deploy two unique enhancements to the oil removal process: temperature optimization and wax separation. Temperature optimization increases the amount of oil production. It also enhances the quality of the oil. Wax separation avoids sending unwanted wax to biodiesel processing facilities that would have to dispose of it, thereby increasing the value of the corn oil. In addition, the wax removed from the corn oil is put back onto the feed, adding nutritional value to the feed.

STATUS

Contract executed. First two status reports have been received. A contract has been executed with a technology provider for the purchase and installation of a corn oil extraction system. The general system specifications are complete. The centrifuge has been purchased. Delivery of the completed skid is scheduled for October, 2009.

The third status report has been received. There has been a slight delay in the delivery of the completed skid. Contracts and purchase orders have been executed for all labor and pipes, valves, fittings, etc. required for the installation of the completed skid. Appropriate permits have been filed. The system specifications and final 3D design layout unique to Blue Flint are complete. Skid

base design has been completed, reviewed and certified by a structural P.E. and approved. Tank specifications have also been approved and fabrication is scheduled.

The fourth status report has been received. The date of the completed skid has been delayed by approximately 1 week (anticipated to be delivered late in October). All mechanical, civil, and electrical vendors have been selected for the installation of the skid. Tie-ins that could be done prior to the arrival of the skid were completed during the scheduled plant maintenance shutdown in September. Installation of major equipment onto the completed skid base was completed in September followed by piping and instrumentation installation.

A no-cost extension has been requested and approved extending the date for the filing of the final report to May 31, 2010.

A no-cost extension has been requested and approved extending the date for the filing of the final report to August 31, 2010.

The Final Report has been received and is posted on the Industrial Commission/Renewable Energy Program website.

The Final Report includes the following information:

The SMAART Oil system is designed to recover the maximum amount of oil available from the stillage stream being processed. It accomplishes this by first processing the stillage stream with a centrifuge to extract a modified stillage stream, also known as a light phase mixture, which consist of any unbound oil and any high lipid content emulsion material. The system is equipped with the Westfalia RS-220 centrifuge, specifically designed and modified for oil recovery from an ethanol plants stillage stream. The operation of the centrifuge is adjusted to achieve this recovery of the light phase mixture. The system then treats this light phase material to break the emulsion layer and release a large fraction of the oil as free oil which is then recovered and provided as product oil.

In summary, the SMAART Oil system has been operating at the Blue Flint facility consistently since the beginning of 2010. The system has achieved its performance guarantee in the contract as shown by delivery 3-4 times the amount of free oil in the feed stillage. This also indicates that the additional features of the system provide improved performance over standard installation designed to only achieve recovery of free oil content. Experience with the system over the first half of 2010 has resulted in the operators being able to achieve a continuous steady improvement in oil recovery by adjustments to both the system and characteristics of the stillage feed. Analysis of the feed stillage and the de-oiled stillage indicates that additional improvements are feasible.

This project is now complete.

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