

Contract No. R005-0012

“Phase I: Biomass Enhanced Refined Lignite Demonstration Project”

Submitted by ComPAKco and Great American Energy

Principal Investigators: Jim Flaherty/Michael Flaherty

PARTICIPANTS

Sponsor	Cost Share	Actual
ComPAKco	\$169,500	\$138,050
Federal Machine	\$ 35,000	\$ 74,301
Great American Energy	\$ 90,500	\$ 66,233
North Dakota Industrial Commission	<u>\$275,000</u>	<u>\$249,938</u>
Total Project Cost	\$570,000	\$528,522

Project Schedule – 7 months
Contract Date – May 28, 2009
Start Date – June 1, 2009
Completion Date – July 31, 2010

Project Deliverables:
Status Report: June 30, 2009 ✓
Status Report: August 31, 2009 ✓
Status Report: March 1, 2010 ✓
Final Report: July 31, 2010 ✓

OBJECTIVE/STATEMENT OF WORK:

The project’s objective is to optimize the design and operation of compacting technology to blend lignite with biomass to produce a high value solid fuel for home and commercial furnaces. A ComPAKer will be engineered to produce product at an optimum rate. The ComPAKer is a machine that has been designed to make biomass pellets. The proposal seeks to combine beneficiated coal, biomass, and additives into pellets. Because it is plentiful in North Dakota, grasses will be the first choice for biomass. The density of the material will increase the energy value. This will be beneficial for transportation. The biomass enhanced fuel product(s) will be tested in home and small commercial furnaces. Testing and analysis will be performed to characterize the fuel and determine the product firing characteristics and emissions. A fuel specification will be developed to aid in establishing markets for the product. Emissions testing will be conducted to demonstrate the environmental performance of the product.

STATUS

Contract executed. First two status reports have been received. Engineering design work is substantially complete; equipment design is complete; equipment construction is in progress; marketing assessment complete, research testing complete, and product testing on-going.

The contractor has experienced construction delays associated with the testing building. Therefore a no-cost extension request has been made and granted to extend the filing of the last status report (change from November 30, 2009 to March 1, 2010) and the final report (change from January 31, 2010 to April 30, 2010).

The March 1, 2010 report has been received. Significant progress has been made on the design, fabrication and testing of the compaction equipment. PAKs have been successfully produced from blends of biomass/lignite and from pure biomass. Alfalfa straw has been used as the primary biomass product at this time. The compaction machine is fabricated at full scale. The material handling portion of the project is occurring at pilot scale. The equipment is scheduled to be moved into the project building in the near future. Pilot scale testing has demonstrated the ability of the ComPACco compaction equipment to produce a uniform product with far lower energy input than conventional designs. Product throughput has exceeded expectations. Physical and chemical properties of the PAKs are currently being tested.

The contractor has requested additional time to complete more testing of both the production and burning of the PAKs. Therefore a no-cost extension has been granted to extend the filing of the final report (change from April 30, 2010 to July 31, 2010).

The final report has been submitted and is posted on this website. The Project Summary indicates the following:

Objectives of Phase I of the Biomass Enhanced Refined Lignite Demonstration Project were to: development of a compacting machine, produce a blended fuel from lignite and biomass, characterize the fuel through laboratory analysis and emissions testing and perform test burns on the fuel blends. All project goals were met.

Production of the blended fuel required the designing and engineering of a compaction machine and integration of the material handling systems with the compaction machine. Engineers from ComPAKco designed, manufactured and assembled the compaction machine (ComPAKer). Most of the materials handling equipment was purchased and Federal Machine performed integration design and engineering.

The ComPAKer has successfully processed a complete range of blended fuels from 20-100% biomass percentage blends. Energy inputs for the equipment are significantly less than competing compaction equipment. The equipment is mobile and compaction rates for the product can be varied to meet the desired production applications. Production rates were less than targeted; however, the design can be scaled up to produce compacted material at higher rates.

Test burns were conducted at the Federal Machine site. Emission(s) testing was conducted in April. A second test burn, of 30/70 lignite/biomass blend was produced and burned in July. Production runs demonstrated that blends containing higher proportions of biomass formed Paks with better integrity. These dense paks meant a more porous charge in the furnace enabling a larger load to burn with more consistent heat output and less smoke. PAKs with higher biomass blends also had lower BTU content.

The biomass blends have been tested and characterized in the laboratory. Short Proximate, physical characteristic analysis (Pellet Durability Index), Ultimate testing and mercury analysis were performed on the fuel. Ash minerals were performed on PAKs produced in July.

The targeted market for the lignite/biomass Paks is rural institutions and homes that use propane, oil, and natural gas for heating. ComPAKco's machine can provide a low cost, high value solid fuel as an alternative that should be especially attractive to farmers that can grow much of their own fuel for home heating and for drying crops.

9/15/10