

Iowa Power Fund Board Project Report Update

Project: Amana Farms, Inc. Contract Number: 09-IPF-05

Power Fund Award: \$1,082,575

Payments Issued to Date: \$918,000 (1 payment issued)

Cost Share Invested to Date:

Project Award Date: November 12, 2008

Project Description:

Amana Farms is using an anaerobic digestion, which is a two-stage digester that converts manure and other organic wastes into three valuable by-products: 1) Biogas – to fuel an engine/generator set to create electricity; 2) Biosolids - used as a livestock bedding material or as a soil amendment; 3) Liquid stream - will be applied as a low-odor fertilizer to growing crops. (see Business Plan appendix H) The methane biogas will be collected from the two stages of the anaerobic digestion vessel and used for fuel in the combined heat and power engine/generator sets. The engine/generator sets are natural gas-fueled reciprocating engines modified to burn biogas. The electricity produced by the engine/generator sets will be used to offset on-farm power consumption and the excess power will be sold directly to Amana Society Service Company as a source of green power.

The waste heat, in the form of hot water, will be collected from both the engine jacket liquid cooling system and from the engine exhaust (air) system. Approximately 30 to 60% of this waste heat will be used to heat the digester. The remaining waste heat will be used to heat other farm buildings and may provide heat for future use for drying corn or biosolids. The digester effluent will be pumped from the effluent pit at the end of the anaerobic digestion vessel to a manure solids separator. The mechanical manure separator will separate the effluent digested waste stream into solid and liquid fractions. The solids will be dewatered to approximately a 35% solid material. Some of the separated solids will be used by the farm for a livestock bedding replacement. The remaining separated solids may be sold to other farms for livestock bedding purposes or sold to after-markets, such as nurseries and composters for soil amendment material.

The liquid from the manure separator, now with the majority of the large solids removed, will be pumped into the farm's storage lagoon. A significant advantage of the effluent from the anaerobic digestion treatment process is that the viscosity of the effluent is such that the liquid effluent can now be pumped through an irrigation nozzle for field spreading.

Project Update:

► **To produce renewable energy in a practical and profitable way**

As of June 30, 2009, 2,145,000 kWh have been sold to the Amana Society Service Company.

We are striving to find the input formula that maximizes energy output. The digestion cycle takes 21 days so any changes to the input formula take approximately one month before we know the positive or negative effects of the change. The project is not operating at its full potential. We have experienced pump failure and the original three pumps have been replaced with six new pumps with a more robust design. We continue to learn more about the daily operations regarding mixtures and inputs.

► **To reduce greenhouse gas emissions from beef production and from industrial waste stream disposal**

As of June 30, 2009, Amana Farms has digested the following:

1. 2,882,848 gallons of by-products of enzyme growth medium from a Cedar Rapids based company. The by-product was previously transported to a sewer plant in Des Moines.
2. 1,170,000 pounds of cardboard material from a Cedar Rapids based company. The cardboard was previously disposed of by land application.
3. 19,716,990 pounds of manure from Amana Farms.
4. 905,899 gallons of lagoon effluent from Amana Farms.
5. 404,140 pounds of starch from a Cedar Rapids based company that could not be used for food production.
6. 5,000 pounds of sugar from a Cedar Rapids based company that could not be used for food production.

► **To produce fertilizer that is more readily available to crops**

As of June 30, 2009, 1,494,060 pounds of dry matter have been produced and 7,627,667 gallons of effluent have been produced through the digestion process. Amana Farms has utilized 100% of the product by applying on Amana Farms' crop ground.

► **Education**

The educational facility construction is completed. The date and time of the 2009 annual seminar has not yet been determined. As of June 30, 2009, a total of 254 visitors have toured the facility.

► **Employment**

The project has created 3 full time jobs with Amana Farms.

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Project Expenditures:

Expenditures for the educational facility from the award date to June 30, 2009 are \$114,429.91. The itemization for said expenditures is as follows:

Howard R. Green	\$61,852.40
Eastern Iowa Building	\$14,868.00
Iowa State University	\$ 1,500.00
Dell	\$ 4,752.24
Kinzenbaw Earthmoving	\$ 4,925.00
York Construction	\$20,645.00
Welter Storage Equipment	\$ 5,365.74
ProVantage	\$ 271.78
South Slope	\$ 249.75

There were no invoices over \$50,000. Source and use of funds for the entire project as of June 30, 2009 are in the amount of \$5,211,075. Per Article 6.3 Cost Variation, the total cost of the completed project now exceeds \$5,155,613.

Operation Performance:

Amana Farms anaerobic digester is operating and achieving the goals originally set, just not on the scale our system was built for. In order to reach maximum output levels, we are working with engineers from GHD, Inc., Howard R. Green and Iowa State University. We will be funding a graduate student from Iowa State University who will study our project and help us increase production.