Diamond K Feeds, LLP
19666 County Road 28
Altura, MN 55910
507-689-2058

Project Title: Diamond K Feeds Methane Digester Project
Milestone Number 3

RDF Contract Number: EP-51 Report Date: Aug 15, 2013

Congressional District: Minnesota 1st

Project funding provided by customers of Xcel Energy through a grant from the Renewable Development Fund.

Executive Summary:

Photo 1: Groundbreaking for the digester project was held in June of 2011

Work on the digester project has moved along well. We are looking forward to completion of the construction and startup of the equipment. This project is going to be a huge value to our dairy in a number of ways. First of all, the digestion process will collect the methane gas that has been identified as an environmental concern for air quality and will utilize it to run a generator to produce electricity. In other words, we will be taking a negative and turning it into a positive. Secondly, the digester will run on a continuous basis to provide a steady supply of electricity sent out to the grid for public consumption as opposed to other renewable sources, such as wind and solar, that is not continually available. This will provide our dairy with an additional revenue source. Thirdly, we see the use of livestock waste to produce electricity as an extremely valuable resource in the search for ways to lessen our country's dependence on foreign oil, to reduce the use of coal which is a pollution problem and to lower the amount of nuclear waste that must be stored. In

addition, there is no land taken out of food production to grow the feedstock for the digester and once the manure has been through the digestion process it is a much more valuable fertilizer source than in its raw state. The digested manure has virtually no pathogens or weed seeds remaining in it and it is ready for immediate plant uptake. This will lessen the need for the use of commercial herbicides to kill weeds. It will also be a safer product for spreading on the land since there are no pathogens remaining and the plants will utilize the fertilizer immediately meaning that the manure won't have to remain in the ground while it composts leaving it susceptible to runoff. Lastly, there will be little if any odor remaining, leaving our dairy much more public friendly.

Technical Progress:

Work on our digester project has been moving along successfully. Our three existing cattle free stall barns are being remodeled at one end for the collection of the manure for the new system. An additional 16 feet is being added on with a new below ground 24" pipe that runs from the building to a 30'x30'x12' concrete reception pit. The manure will be scraped down the alley of the barn with a skid steer loader and pushed into the collection gutter. From there it gravity flows to the central collection pit that holds the manure from all three buildings. The manure is agitated and then pumped to the digester vessel through an underground pipe.

Photo 2: Workers preparing one of the manure drops

Photo 3: The collection area at the end of one cattle barn

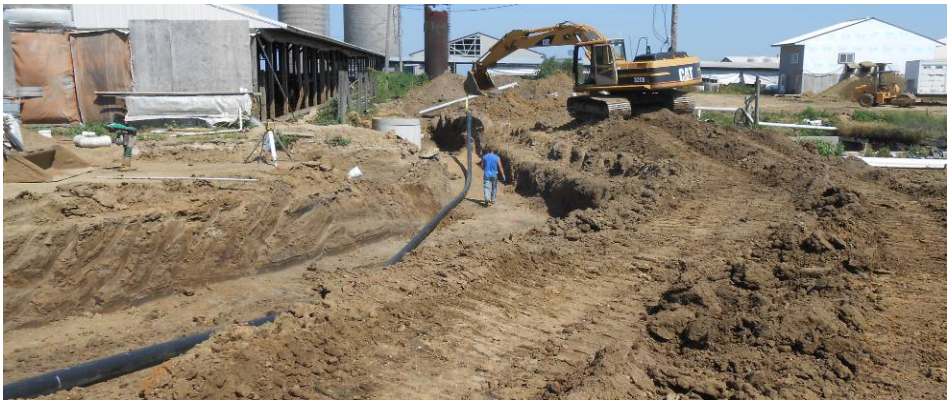

Photo 4: Laying in the pipe that brings the manure to the digester

The walls of the digester are 10 inch thick reinforced concrete 18 feet high. The digester vessel will hold 1,137,892 gallons of manure. The floor of the digester is a 6 inch thick concrete slab. It is sitting on a footing of 2 feet of compacted class 3 soils, an HDPE liner, 4 inches of sand and then 6 inches of screened rock.

Photo 5: Pouring the floor of the digester

Photo 6: Construction of the digester walls

Photo 7: The digester vessel walls completed

The manure will be stirred with 4 agitators set to run automatically on a predetermined time frame. The manure needs to be kept at a 100 degree temperature. This is accomplished with water tubes that surround the inside of the digester.

Photo 8: Agitators to stir the manure in the digesters

Photo 9: Hot water from cooling the engine flows through these tubes to heat the manure

The agitators keep the manure moving around the hot water pipes to keep the feedstock at a constant temperature. This maintains the aerobic activity that produces the methane gas. The hot water is in a closed loop system that comes from the engine building. Water is used to keep the engine cool and is approximately 180 degrees as it comes off the generator. The water is cooled to 100 degrees then piped to the digester to keep the manure heated. The water is continuously flowing back and forth in the loop through underground pipes and reused over and over again. We will also add piping to also utilize this hot water to heat the buildings on the farm and lower heating expense.

Photo 10: The layer of insulation between the layers of plastic forming the digester cover

The digester is covered with a sheet of HDPE plastic, then a layer of insulation and then an additional sheet of HDPE plastic. The methane gas forms under this cover and is sucked to the engine building by a pump which compresses the gas for the engine. If there is any excess gas than the engine can utilize, it is flared off. There is no storage area for the methane gas.

Photo 11: Gas flaring off the digester when the generator is not in use.

The hydraulic retention time for optimal gas collection off the manure is 22 to 25 days. After the manure leaves the digester it flows to a 30'x30'x12' concrete reception pit. From there it is pumped into a 14'x40' insulated pole building where the solids are separated from the liquid with a screw press separator. The liquid flows out to the existing storage ponds where it is held until the appropriate time to spread it on the crop land for fertilizer. This reduces the amount of commercial fertilizer that must be purchased for the crops. The solids are stockpiled in a connected 40'x60' non-insulated pole building and used as bedding in the free stalls for the cattle. This eliminates the expense of bedding products that must be hauled in from outside sources. Excess solids can be sold as bedding products to other dairies or for other uses such as mulch for plants, garden fertilizer, biodegradable plant pots, etc. This will provide additional revenue source for the dairy.

Photo 12: The building that houses the electrical generation equipment

The methane gas is delivered to a 40'x50' insulated pole building by an 8 inch underground pipe where it is compressed and delivered to an 8-cylinder engine specially designed to burn biogas or to a hot water boiler configured to burn biogas. The hot water boiler is there to provide extra heat if needed for the digester or to keep the digester heated if the generator is being serviced. That will also keep the building environment heated as well. The compressed gas fires the engine that spins the generator to produce the electricity.

When fully operational we will be producing 300kW of electricity per hour. The dairy will use approximately 35% of the production. The remaining 65% will be sold to Xcel Energy for the grid.

Photo 13: The engine that will produce the electricity

Additional Milestones:

Work is in progress on the engine building and the installation of the equipment for electrical generation.

Project Status:

The project is on schedule for completion of construction within the next month. Start up of the electrical generation is dependent on the upgrade of the power line, by the power company, to our dairy. We don't have a firm time line on that yet.

Legal Notice