

AN ENERGY INTEGRATED FARM

Evan Leefers

Carlinville, Illinois

m) We farm about 1,800 acres near Carlinville which is about midway between St. Louis and Springfield, Illinois. In addition to the tillable land we have some pasture land which supports a 350 head, cross bred cow herd.

Our primary crops are corn and soybeans. We also cut about 200 acres of corn silage which is stored in a concrete trench silo and a 24 x 70 upright concrete stave silo.

We feed about 2,000 head of beef animals for slaughter each year. Most of our beef feeding is done in an open-front, slotted floor, confinement building. The building is 56 feet by 500 feet with 13 - 40 feet by 40 feet pens. Each pen sets over a separate 8 foot deep liquid manure pit and each pit is covered by reinforced concrete beams and slats. The building, which faces east, has a 4 foot drive alley on the east, a feeding alley inside the building on the west and cattle working equipment on the north. Doors along the west side are open during summer and closed during winter.

Several years ago we began looking for ways to reduce our energy bills. Producing our own energy seemed like a good idea. After a great deal of investigation we decided to go ahead with the ideas shown in the diagram. We decided to build both a methane plant and an alcohol plant. The methane could be used to dry corn, heat our home and farm buildings and fire the alcohol plant. We could sell the alcohol to an anhydrous plant for use in gasohol. We could also burn alcohol in our tractors or trucks or we could generate our own electricity. The by-products of both plants could be recycled back to the feedlot as feed and to the land as fertilizer. The alcohol thin stillage could also be a very good feed stock for the methane plant.

We began operating the methane plant in August, 1980. The plant was built by Bio Gas of Colorado, Inc.

As the liquid manure pits in the beef building fill we pump the manure into a holding pond. From this pond, we pump the manure into the digester. This pump operates a few minutes several times a day, adding manure to the digester.

The digester is a 150,000 gallon Harvestore covered on the outside with sprayed-on urethane insulation. A boiler produces hot water which is pumped through a heat exchanger in the digester as needed to maintain a 90-100° F temperature. A recirculating pump keeps the digester stirred.

As the liquid level in the digester rises, it overflows into a one day holding tank. From this tank we can either go to solid

separation to recycle the solids or to a lagoon. The lagoon is pumped to our land through a traveling gun irrigator.

We originally stored methane in a 10,000 gallon gas storage bag. At a certain pressure, our compressor would pull the gas through a scrubber to remove hydrogen sulfide and compress the gas into a 30,000 gallon high pressure tank. We no longer use the low pressure bag because we had trouble holding it in place.

We have not had much trouble with methane plant. At one time, the overflow line in the digester became blocked and pressure built up in the digester causing some damage to the roof.

The alcohol plant is designed to produce 25 gal/hr. of 190 proof alcohol. We produced our first alcohol about a year ago.

There have been a number of problems with the alcohol plant and we are still working toward the solutions. We have not been able to obtain the necessary yields of alcohol and are not able to say why at the moment. We also have not been able to maintain continuous production due to agitation problems in fermentation and plugging of heat exchanger tubes.

Our experience with feeding both the distiller's grains and the thin stillage has been good. Due to the limit on the amount of water we can put in the cattle feed, we are able to use only about half the thin stillage in this way. The rest of the thin stillage is a very good feed stock for the methane plant. When we add this stillage to the digester we get large increases in methane production.

In spite of the difficulties we have had, we still like the idea of producing our own energy and the idea of integrating energy production into the other farming operations. We are going to make it work for us.

Our energy integrated farm has brought us a benefit we didn't expect. We have met many interesting and enjoyable people from all over the United States and from several foreign countries.

