ALTERNATIVE ENERGY SOURCES - WHAT WE LEARNED FROM EUROPEAN TECHNOLOGY AND A PRACTICAL LOOK AT POSSIBLE ONTARIO ON-FARM APPLICATIONS

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Van Raay Farms Ltd. is a 500 sow farrow to finish operation which crops 600 acres of land, mainly corn, soybeans and wheat. We grow half of corn needed for feed and purchase the remaining as high moisture corn. The set up is two locations. On one site we have our 500 sow farrow & 8 week weaner operation. The second site, which is within 2 kms., is a 3500 head "motel style" finishing barn. This is the site of the proposed methane digester. We produce about 3,000,000 gallons of manure annually.

Why are we Investigating a Methane Digester for our Farm?

We are a relatively small hog farming operation and want to be self sufficient. Lowering or stabilizing our cost of production is key. Heat and hydro costs run between 5 & 7% of our expenses annually. There is no indication that this cost will be getting lower.

During investigation, it became apparent that self-sufficiency alone wouldn't make the project viable. Size being a major consideration, work to maintain a 100, 250 or 500 kW system would all be the same. Also, in my travels I have learned there could be several income streams from a digester.

1. Electricity
2. Heat
3. Tipping fees
4. Digestate

Electricity

Ontario 11.2 cents and 3.5 cents for demand.

Heat

60% of Methane energy comes off as heat. A 500 kW generator is about $450,000.00 gross income in electricity in Ontario.

- Therefore, is there more than $500,000 of heat value that can be used for something else?
- What other project could use low temp heat, 70 degrees Celsius and for what purpose?

Tipping Fees

Manure alone doesn't produce great volumes of methane. There are a number of products that can be added to manure to bring volumes up. These come in two categories.

- Nutrients that create lots of methane that have marginal or no costs.
- Nutrients that produce very little methane but some one is willing to pay large tipping fees to dispose of.

Examples:

Corn Silage - or corn in Germany. Corn silage alone with manure could bring a digester's methane volume up 2 – 3 times. The cost of corn silage in Ontario last year was about $25.00/tonne to grow. The future value of corn silage from 2007 to 2010 is unknown. At these costs and with 11.2 cents for electricity this is not a great return on investment.

At the other end certain abattoir waste streams costs $90/tonne to be removed from the plant. The amount of methane that this would generate could be off set by the tipping fee.

During the early years of the methane digester industry in Germany, (before competition for the by-products was a problem) earlier innovators received 50% of their income from tipping fees.

Digestate

The volume of digestate should be nutritionally unchanged. The manure portion of the digestate will be nutritionally unchanged and actually enriched by whatever organic matter was added. The digestate would result in an organic, less odorous material. The nitrogen content of the digestate would be more readily available and therefore it is more important to apply closer to plant needs. Can we sell the digestate for more then it costs to transport or at least for transport costs as it is an environmentally more friendly product?

These 4 Factors on the Income Side also have an Expense Side

Electricity costs 11.4 cents/kW to deliver hydro to our farm.

Questions remain:

- Will Ontario Hydro allow us to use our own generator use pre-meter or do I have to buy electricity for more then I am paid?
- Does the inflation factor make the 20 year contract (which is the duration of the Standard Offer Contract) not economically sustainable for the farm in 5, 10, 15 or 20 years?
- Is the cost of Central Metering economically viable today or is that a tomorrow project? (combining our two sites together)
- Can I get 8000 hours of generation time out of the system annually?

- As an anaerobic digester is alive with sensitivities to temperatures and diet, minor Changes in the diet could affect the methane output. Digesters need daily monitoring and maintenance and a "farmers" hand to get the maximum output.

Heat recovery has its own challenges.

- If we bring in material from a slaughter house, as organics (non feed ingredient types) they will need to be pasteurized. The standard in Europe would normally be 1 cm size at 70 degrees Celsius or 24 hours at 55 degrees Celsius to pasteurize material. Does this consume most of the excess heat from the methane? On a 500 kW plant 5% of the heat could be used to heat the hog barn.
- Do we need a secondary business located on site to utilize the heat? Is there some drying process or greenhouse growing operation that could make use of this heat? Again the challenge of starting 2 new businesses at once and the time and energy to monitor them could be overwhelming. What is the right size of business to be viable? How big of a greenhouse do you need to be viable? Can we dry a product year round, 24/7 because heat is low volume and continually produced?

Tipping Fees

Digesters are custom built depending mainly on what you are feeding them.

- Do we need a 2 stage digester to get the maximum methane output? Consideration needs to be given to what we feed the digester.
- Do we need 20 days retention time (corn silage) or 65 days (wheat straw) to get the methane out of the feedstock? With our daily manure production of 35 tonne/day, digester size may vary from 180,000 to 500,000 gallons for the manure portion alone. If we add a bulky organic material, these may make the project not viable. Some organic materials may need to be pasteurized which would require extra equipment; a) to pasteurize b) to pump, c) to store.
- Equipment to add corn silage doesn't work to add grease trap waste. Licenses to accept non feed organics on site need to be applied for. Rules to apply digestate, made from non traditional organics may need neighbourhood and Ministry of Environment approvals. At what point do we change from farm to industrial and will be regulated by industrial rules?
- Availability and supply balancing becomes a new challenge. Are we large enough to get a good supply or too small to take the entire output from a factory? Will large companies work with a small entrepreneur or will they depend on large disposal companies intent on maintaining their margins and leaving us with no margins?

Again the challenge of working with an unknown industry (organic waste) and achieving economic viability at the same time.

Digestate storage costs money.

- Where and what type of storage do we build? VRFL is nutritionally balanced to the rich side at this point. The 2006 season was the first year where manure was exported off the farm.
- If we add more organic material to the mix will we be able to sell digestate as a nutritionally known bacterially stable (no *E. coli*) product to our neighbours and at what % of commercial fertilizer prices? Is this an opportunity or a liability? Does the nitrogen become more leachable as digestate vs. manure and does that require us to apply all the digestate in the spring, requiring more storage and more application requirements?

Those are some of the opportunities and challenges of anaerobic digesters for my situation as I understand them from my travels and research. The challenge in general is to develop a plan to meet many different needs from many different organizations which in the end will be a very specific specialized project capable of doing only one thing.

Good luck on your project.