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From: Jan Allen, P.E. CM Q/OE
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RE: SMALL SCALE ANAEROBIC DIGESTION FAQS FROM E GIBSON

- *Is the filtration technology on this system really able to nullify the odor associated with methane production from controlled spoilage? (sewer gas)*

The system has five odor control elements: full enclosure with no exposed liquids or waste materials (no storing of unprocess waste materials either) + an organic media biofilter + a charcoal media carbon filter + an atomizing counteractant misting system + an exhaust dispersion stack. Odor control is designed to be much more complete than composting or farm systems as most of our applications are in tight urban locations. This is a primary and fundamental element in our technology.

- *The material indicates that a charcoal filtration system is employed. What is the operating cost to maintain filters, and how much filter waste is generated?*

The charcoal filtration uses biochar or coarse charcoal, which is more economical and porous than activated carbon. The service life for both the biofilter and charcoal filter is expected to be 12 – 36 months depending upon the specific application. Changing the media is about \$300 (9.5 CY) and \$500 (5 CY) in material cost for the biofilter and charcoal filter respectively. Spend media will be 80% of these volumes and can be used in the landscape – especially good for tree and shrub plantings in the root zone.

- *The 1000T/yr. unit can generate up to 500T/yr. of depleted solid waste. Where would we intend to dispose of that waste, and do we anticipate the ability to sell that waste locally as an agricultural product? Are there any local farmers who have an interest in this type of organic waste product? What is it worth?*

We don't consider it waste as it is an organic fertilizer. Existing organic farmers, composters, nurseries, etc. are likely customers. It should be viewed as a commercial resource with a beneficial use. Composting or drying the digestate makes it much more commercially attractive (in texture and weight) and commands a higher market value. This is a good question and a good plan should be in place before proceeding. Wet organics are typically considered zero value (give away) and composted organics are typically listed at \$20/CY value retail, \$12/CY wholesale.

- *What are the manpower requirements associated with maintenance and operation of the system? Cost of labor to deal with disposal of depleted solid waste?*

The system is designed to be a 2 hour per day labor expense. Having the digestate flow by gravity directly into a tank trailer is ideal and requires little or no labor. Hauling is a consideration as someone will have to move the digestate to the beneficial use location.

- ***Do we have access to any client data from the manufacturer to indicate what maintenance costs we can expect for the replacement and upkeep up parts and equipment?***

The odor control are the only consumable parts. Grinders and pumps will have rotating equipment that may last several years without service in normal applications. Gas conditioning for the boiler and engines may have some minor consumable parts (e.g. sulfide removal using an iron based media). The three engine generators are the elements needing the most upkeep and service. There are three Honda GX620 20 HP V Twin Engines that will need oil change, air filter, etc. just like any vehicle engine.

- ***Do our local utilities have the technology in place to accommodate the absorption of off-grid energy into their systems? How is it metered?***

It would be ideal if you can avoid net metering, power producer agreements, etc. if you are generating 11.7 KW continuously or 35 KW 8 hours a day you may never have a net metering situation. You can ask your utility how they support onsite power production. You can also ask if they have a net metering policy or program.

This sounds like a potentially viable technology for us, and the payback would be a reasonable return if it is as advertised. We would need to understand what hidden expenses there are relative to operation, and if our local area is equipped to provide us with at market for the waste products.

The main unknowns are permitting, power utility red tape, and beneficial use of the organic output materials. If you can firm up these unknowns that will minimize risk and unanticipated events.

We also need to understand how our local energy vendors are reacting to this type of technology. I have seen energy providers in other market resist this type of move to recycled energy since it negatively impacts their earning potential. If they don't support our efforts here, what if any challenges will that present?

This is really site specific and local in nature. We are happy to advise and coach you through the local issues.

Lastly, can we convince corporate

Corporate review may or may not consider triple bottom line or quadruple bottom line evaluation (economic, sustainability, social, cultural or people, profit, planet, and progress). At any rate the economic will have to be positive ROI.

