**MEC 3040 Module 9 Lab Exercise: Creating a systems diagram of VTCAD**

Vermont Tech’s Community Anaerobic Digester (VTCAD) is a sophisticated complete-mix, two-phase, mixed substrate anaerobic digester. It’s a complex system of tanks, pipes, values, pumps, mixers, blowers, water traps, a generating engine and other components. To deepen your understanding of the process of anaerobic digestion and to allow you to integrate that understanding with digester operations this assignment asks you to create a systems diagram of VTCAD and to identify equipment whose operation can be controlled via the facility’s PLC screen along with critical manual valves.

**Assignment:**

*You are welcome to work in groups. I’ve modified this assignment in response to your comments. If you’ve already begun your diagram there is no need to make these changes. Please email me if you have questions.*

Create a working **diagram** of VTCAD process that shows its major elements and how they are connected. The diagram should follow the follow of movement of feedstock through the AD system and the production of biogas, electricity, heat & co-products. More specifically:

* Show the major elements and the plumbing that connects them.
* Show the flow of feedstock, products, co-products & by-products through the system.
* *I’ve posted an example under this assignment (ppt file).*

Then, **list** each piece of major equipment shown on the diagram & add accessory equipment that serves that major equipment: monitors, sensors, mixers, pumps, controllers, valves, etc.,. For each of these accessories:

* Describe its function; and
* Record it’s current display or setting
* *I suggest using an Excel table and I’ve posted an example.*

Connections that also form part of the VTCAD system

Consider how VTCAD connects with the larger system it is the central component of. What other parts of the campus or what other organizations does it interact with?

* Show these connections on your systems diagram.
* How many trips are made to and from the farm(s) each day & what is transported?
* How many trucks deliver feedstock to VTCAD each day?
* How far is the feedstock transported? Where does it come from?

Feedback from the operator

Ask an operator for some feedback about the system.

* Which parts or components of the system cause the most problems for the operator?
* If the operator had the time and money, how would he or she change the system design and construction and why?
* What part(s) of the system are the most functional and least problematic?
* How much time does the operator spend operating the digester vs. communicating with the farm and feedstock suppliers and other organizations.
* What is his or her favorite part of the operator’s job and what’s the worst aspect?

**Some great resources:**

* Technical drawings and diagrams of VTCAD created by Bio-Methatech, the company that built the facility. You can find these diagrams in Appendix A on the AD Apprenticeship page of my website, http://richmond-hall.weebly.com/a-vtcad-technical-info.html
* The touchscreen control panel (PLC) for VTCAD that is located behind the feedstock reception pit in the central bay of the facility.
	+ The touchscreen has a series of displays that show various parts of the system.
	+ Each display shows a part of the system, available data and current settings for equipment within that part of the system.
	+ Images of each PLC screen are posted with Module 2.