



Bioenergy in practice

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Waste Biogas Production From Stackable Long Stem Materials

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In September, Glen Cauffman and I spent five days in Germany with a representative from the Viessmann Group, a German energy company, visiting and learning more about high solids wet and dry fermenter type biogas production systems. Of particular interest were their Bioferm dry fermenters. “Dry” might better be considered “stackable” – moist organic materials that are not oozing or slumping and can be stacked to depth of 5-7’ without producing high amounts of leachate (called percolate with these systems). The ideal materials for these systems are those that can be handled with a front end loader and stored in piles, wet bales or bunker type storages.

How it Works:

A mixture of the desired material is loosely piled in an air tight concrete vessel with a front end loader. The vessel has a liquid recirculation system that will collect any liquid that leaches (percolate) out of the pile, direct it to a storage tank and then pump it back over the pile with a sprinkling system on the ceiling of the concrete vessel. It is important to keep everything moist but not flush a lot of liquid through the material. The stack needs to remain porous enough throughout the 28 day batch process to allow liquid to drain to the bottom and biogas to escape to the top of the pile. The biogas is stored in a large flexible bag located on top of the vessel, and is dried and cleaned before being used to fuel a CHP (combined heat and power) unit. At the end of 28 days the sealed doors are opened, the material is removed and then about half of the removed material is mixed with fresh feedstock and the process starts all over.

We visited digesters (fermenters) that were owned and/or operated by individual farmers, groups of farmers, manufacturing companies, outside investors, a leaf and yard waste facility and the Munich Zoo. The systems we saw had from 3 to 6 vessels that allowed for regular addition of new material and also assured that biogas production was reasonably consistent. Germany’s decision to guarantee a buyback price for green energy has encouraged development of a private based infrastructure for design, supply, construction and management of biogas production.

An Example Facility:

Following are pictures from an on-farm unit visited in the town of Reichenbach. The unit has been operating since 2007 and was being loaded with a variety of plant material. The owner would like to add manure to the mix but his permit does not allow him to use poultry manure and all the nearby dairy farms produce liquid manure. A typical mixture for this system consisted of 22 t whole plant silage; 12 t grass silage; 63 t corn silage, 6.9 t cracked corn and 4 t straw.

This dry fermenter is located on what was a dairy /crop farm but no longer has cows. It has three vessels approximately 100 ft long and 23' wide by 16' high. The gas storage bag, CHP units, control room and office are all located on top of the concrete vessels.



The percolate tank is to the left of the building. PV panels located on the large roof provide an additional source of renewable energy. Access doors to the three vessels face a covered mixing area. Newer units have replaced the single hinged access doors with smaller double doors that open in both directions.

A gas storage bag occupies approximately one half of the attic space over the concrete vessels. A bottom drain allows condensed water to drain from the system.



Two 178 kW CHP units are located over the back of the first vessel. The system was producing at 360 kW during our visits but earlier in the year production was as low as 190 kW due to problems with the biology of the system.

A self loading wagon unloads fresh grass silage on top of previously harvested corn silage.



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