Anaerobic Digestion

The second way - and the most fun - is to build a 'Heath Robinson' system. Again get the EA involved, and speak to as many suppliers as possible including your Water Company. Most suppliers are enthusiasts, and will offer advice.

The process is broken down into five separate areas, input, in-vessel, gas control, engine and disposal.

Input

This depends on the type of waste going in. Raw meat needs to be steam sterilised. This effectively reduces cell walls and speeds up the digestion. See 'pathogens' in the next article. Green waste is not best suited to AD, but kitchen waste is perfect. The trick for all wastes is to get the particle size as small as possible.

In-Vessel

There are two aspects of this section, how to design a cell and how to operate it. The operation of a system depends on what temperature you want to run it at; Thermophilic at 55C (tricky but fast) and Mesophilic at 35C (dependable but slow). So your design will have to have a heat exchanger, and some way of preventing heat loss. The whole process is a bit like cooking, and you need to keep an eye on temperature, pH and gas output, so you need at least three thermometers, one pH tester in the vessel, and a way of assessing the CO2 using a Draeger Tube (more about this later). You will also need outlets at the top for gas take off, and a pressure valve. If you are going for Mesophilic, then, depending on size, the vessel will need some type of stirring/agitation. Most self-build designs work on a manual system that is considerably less efficient than an automated design, but a lot cheaper.

Disposal

When the waste in the batch has completed its in-vessel stay (more on this in a later article) the waste should be pumped to a holding vessel (preferably with some heat recovery process), and then disposed of in one (or all) of five ways. The Digestate may need aeration to reduce the biological oxygen demand (BOD), and then the Digestate can be bottled or used in non-animal land spread. The Digestate then can be de-watered and the solids extracted. The solids depending on the compost required can be stored elsewhere. The liquid can go through a reverse osmosis unit to clean it up prior to mains discharge. (Talk to your water company - there is a cost attached). Remember that this water will be warm and chemical nutrient rich. Don't forget that the legislation calls for delivery vehicles to be disinfected or steam cleaned - prime source of water. Some groups have experimented with poly' tunnels to absorb the water. The fifth way is to use reed bed technology to clean up the water prior to watercourse discharge - and again talk to your water company; there is the inevitable charge to consider.

The variation with the earlier comparison of wine making starts with the two following sections.

Gas Control

Depending on the amount of gas to be produced, the gas in the vessel starts out at 100% non-methane, and gradually builds to 66% methane. The major component of the gas in full production is carbon dioxide (33%). It is considerable less expensive to dribble a small quantity of gas into a Draeger Tube to assess the CO2 than put an inline gas sampler to test for methane. The gas should go into a storage vessel - preferably rubber that will cause the gas pressure to stabilise prior to the engine. If you need to use a turbine, then you will need to put in a scrubber to remove the Hydrogen Disulphide. Otherwise after sizing your engine (a complete article on its own) you must then include a flare.

When the methane content is below the engine lower operating percentage of methane, the gas must be burnt off in a flare.

Engine

There are several engines on the market, and it is possible to modify a diesel engine to do the job. The generator on the engine provides the electricity, and the radiator provides the heat. However, I would recommend that you look at an off the shelf engine. There is the grid connection to consider.

Having built your system, the DEFRA / EA view is that you have to demonstrate a technical competence, and the overall manager has to attain certification within 2 years.

This article has skimmed over most of the technicalities, and is designed to shrink the task ahead. The best way forward is to talk to suppliers and consultants and get a way from them.

Neville is the Operations Manager for the Sileby Village Trust Ltd. The central aim of the Trust is the development of renewable energy initiatives, leading to increased deployment and revenues within the village community. Please note, no responsibility can be accepted for any actions based upon this article by any reader!

Illustration by Bob Gale