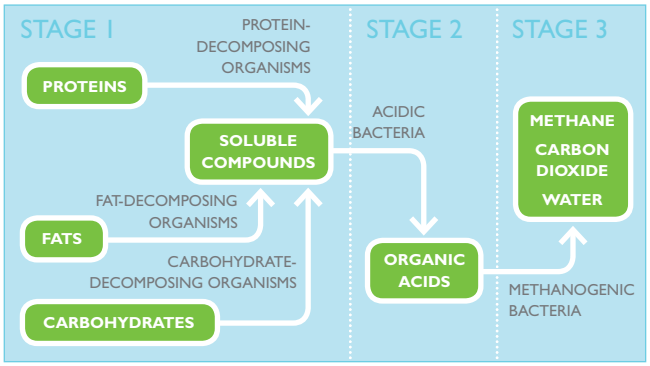
Malaby Biogas

THE AD PROCESS

Introduction

Malaby Biogas has been established to use the process of anaerobic digestion (AD) as an environmental waste solution as well as providing renewable energy by using the biogas generated from the process in the most advantageous way possible. The precise technological solution to ensure this will depend on the specific requirements of each site however the basic process is the same.

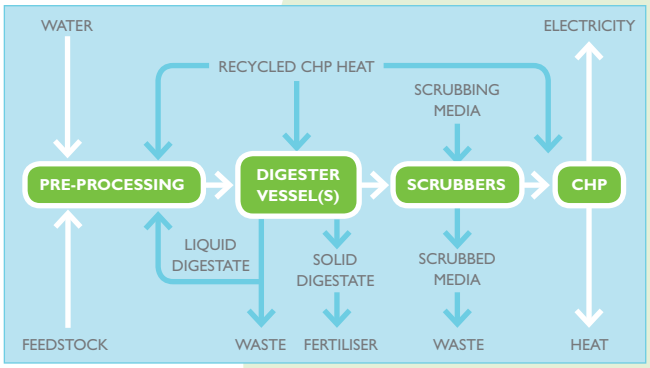
Chemical process



Organic waste from the most readily available sources will be combined to provide a consistent feedstock for digestion by naturally occurring bacteria. The feedstock will be digested in three stages: hydrolysis, acidogenesis and methanogenesis. Hydrolysis reduces the feedstock into soluble compounds so that bacteria can digest them into Long Chain Fatty Acids under mesophilic conditions (30°C) during the acidogenesis stage. During this stage some biogas is produced. During the methanogenesis stage bacteria digest the Long Chain Fatty Acids under thermophilic conditions (50–70°C) to produce biogas and digestate (waste by product).

Physical process

The feedstock is received in an enclosed building, macerated and pumped to a predigester vessel. Differing feedstocks can be blended to allow consistency for bacterial digestion. Some waste will require pasteurisation upstream of the predigester tank. The feedstock will be passed into one or more digestion tanks where the temperature will be controlled to allow mesophilic and thermophilic digestion to occur. The retention time will be controlled to ensure optimal biogas production. As biogas is generated it is passed through several scrubber units which remove polluting compounds such as hydrogen sulphide and excess carbon dioxide. From here the biogas is used directly in a Combined Heat and Power (CHP) unit to generate electricity and heat for process use or export. Once digestion is complete the remaining digestate is removed and (optionally) processed to separate the nitrogen rich water from the phosphorous rich solid where is is stored for removal for spreading on fields.



Inputs

The main input into the system is the feedstock to be used. Other inputs include water, energy, bacteria and scrubbing media however the necessity and importance of each of these depends upon the nature of the feedstock. Thus the design of an AD plant depends upon the type of feedstock available.

In centralised facilities energy dense feedstocks such as hazardous waste, abattoir waste, organic industrial waste and commercial food waste will be imported for processing. In such cases blending and liquefying become important factors and therefore there is a higher requirement for water and energy for pasteurisation and mixing.

A farm based system will be using animal slurries or energy crops generated on site and so there will be larger volumes of feedstock to consider in the sizing of tanks for a successful digestion facility.

Outputs

The main output of an AD plant is energy in the form of biogas. How this is utilised will depend on the requirements of the site and the surroundings. With additional cleaning biogas can be upgraded for use as a 'green' road fuel or for direct export into the national gas grid. However, it is more generally used in engines to generate electricity and heat. Heat energy is difficult to move over long distances so it is often better to pump the gas to the point of use before using it. If the energy is to be used locally then it is best to use it as it is produced to reduce the need for compression and storage both of which are hazardous activities.

Some of the energy generated in the digestion process will be used in running the AD process itself both by heating the tanks and pasteurisers and powering the equipment and buildings. Excess energy will then be used on site for secondary demands such as other farm activities, use in commercial buildings for process or administration purposes or for residential use as heat or electricity. Finally, excess electricity can be exported.

Liquid and solid digestate is the by product of the AD process. It is a nutrient rich medium useful as an agricultural soil conditioner and fertiliser with the nutrients being more readily available for plant uptake than raw manure slurry.