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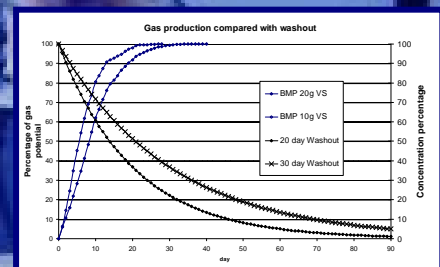
Renewable energy from crops and agro-wastes.

EPSRC

Efficiency gains within the anaerobic digestion process fed with energy crops, utilising plug flow.

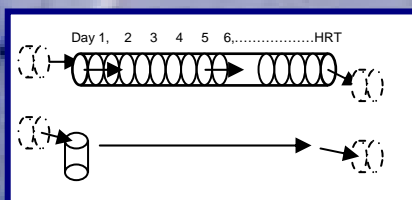
The microbial mediated breakdown of organic materials in the absence of oxygen results in the production of methane and CO₂, this series of interlinked process is known as Anaerobic Digestion. This process is natural and spontaneous but uncontrolled leads to an increased GHG load on the atmosphere but properly harnessed AD can produce energy and the digestate used on the land.

Anaerobic digestion can be used for energy recovery from wastes or energy production from crops not usually considered as biofuels. The efficiency of the transformation is of greater importance and throughput is less relevant when the feedstock has a positive value and energy production is the goal.



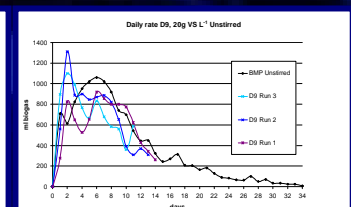
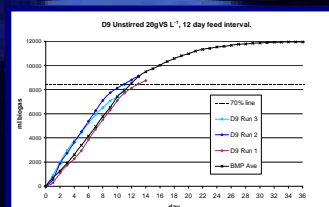
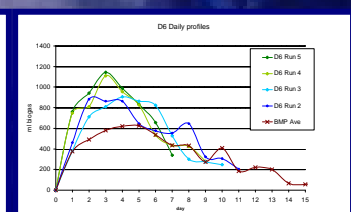
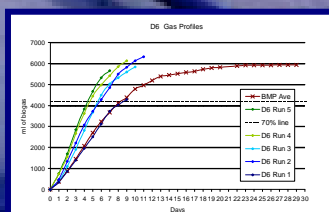
The Biochemical Methane Potential of two loadings of rye grass show that most of the gas is obtained in the first 10 days.

The washout curves show the amount of feedstock that remains over the Hydraulic Retention Time. The greatest loss is in the first part of the HRT. The loss is greater with shorter retention times and slower transforming feedstocks.



Plug flow is the way to enable continuous feeding while not washing out the feed, digesters have to behave more like pipes avoiding any of the material leaving early or remaining late.

This was modelled by batch feeding to obtain 70% of the gas yield and then the reactor was re-fed, this was repeated under at two loading rates, low and high.



The gas results show an improvement with each cycle as the microbes acclimate to the feed. At lower loads more gas potential is unlocked as some gas is liberated from the solids in the inoculum, but not at higher loads. The daily gas production points to a sag at higher loads that is absent at lower loading, this may explain the over all better performance of the lower loading. Less faster is better than more slower.

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