Generating Energy from Brewery Wastes

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Presentation Objectives

- Motivation for study
- Explanation of biogas
- Project Overview
- Results
- Future Implications

Current Problems

- Climate change – greenhouse gas emissions
- Peak oil – Becoming harder to find and more expensive to extract
- Population growth – about 6.7 billion and counting (in 1850 about 1.2 billion)

Biofuels

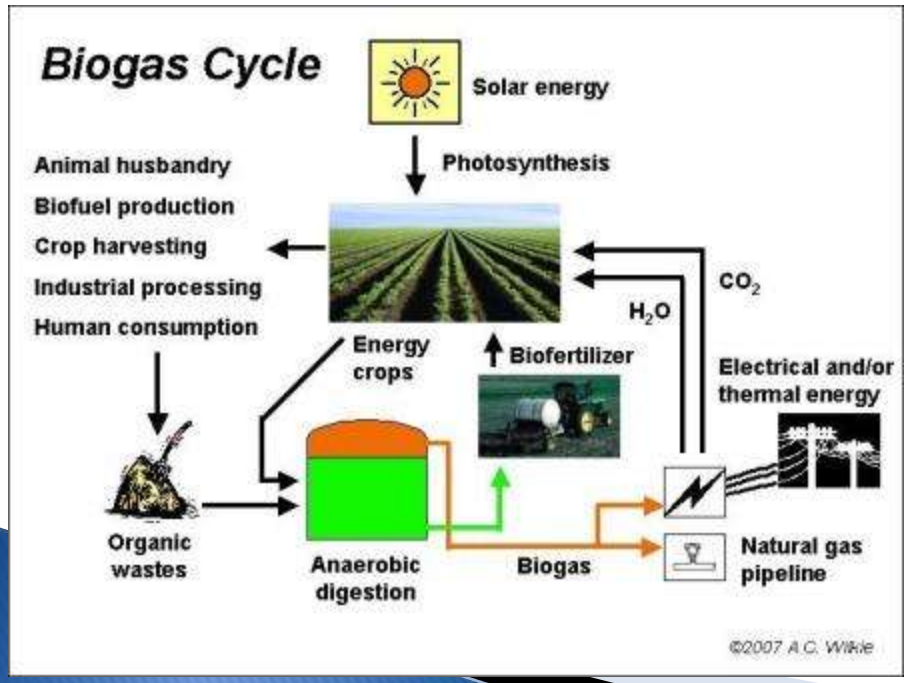
- Fuels that come from biomass
- This energy ultimately comes from the Sun and harnessed by plants via photosynthesis

Anaerobic digestion

- Natural process in which microorganisms break down organic material in the absence of oxygen
- Results in biogas production
- Occurs in wetlands and cows

Biogas

- Def – Gas produced during the biological decomposition of organic material in an anaerobic environment
- The organic sludge byproduct can be used as a fertilizer
- Composed of about 65% CH_4, 30% CO_2, <5% H_2 and H_2S



Motivation for Brewery project

- Breweries are sources of organic waste
- Organic material can be anaerobically digested then biogas can be used as an energy source in brewing
- Reduces the use of fossil fuels and reduces cost for business

Overview of Project

- Collect organic wastes from local brewery
- Determine the amount of biogas that could be produced under optimal conditions
- Calculate the amount of energy this biogas could produce
- Determine the cost that could be offset with using biogas as energy

Swamp Head Brewery

- Began brewing in April 2009
- Brewing about 2 batches per week
- Currently spent grains go to a cattle farmer and liquid wastes go into the drain

COD and VS

- Chemical oxygen demand – indirectly measures organic content in water
- It measures the ability of water to consume oxygen during the decomposition of organic matter
- Volatile solids (VS) – Wet material is dried, then combusted; the difference=VS

Research Methods

- Use samples of grain and trub and determine potential biogas production
- Total weight of grains per batch assumed to be five 55 gallon barrels (~588kg wet)
- Estimates used: 350L CH_4/kg COD
  318L CH_4/kg VS

Results

Weight of wasted grains per brew: 588 kg

Table1. Potential methane and power generation of spent grains using estimations based on chemical oxygen demand and volatile solids.

	g / kg Grains	L CH4/ Brew	Potential Power (kWh/ Month)	Potential Power (Btu/ Month)
COD	258	53,125	4,132	14,102,372
Volatile Solids	217	40,517	3,151	10,755,476

Table 2. Potential methane and power generation of trub.

g VS/ L Sample	g COD/ L Sample	L CH4/ L Sample	kWh/ L Sample	Btu/ L Sample
97.75	196.08	68.14	0.66	2260.95

Implications

- The organic wastes at the brewery have a potential to produce a significant amount of energy for onsite use
- Anaerobic digestion could be used in other industries that produces organic wastes
- Biogas would be used as an alternative to fossil fuels
- Helps to mitigate climate change by reducing carbon emissions and reducing the use of synthetic fertilizers

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