# Renewable Resources

Biogas

The All Natural

Gas

## Where is biogas used:

- biogas is used all over the world.
- It is primarily used by farmers and in rural areas to reduce costs of cities powering stations
- becoming more popular in higher populated areas.

Map from:
http://go.hrw.com/atlas/norm_htm/world.htm


# What are the technological limitations of the resource:

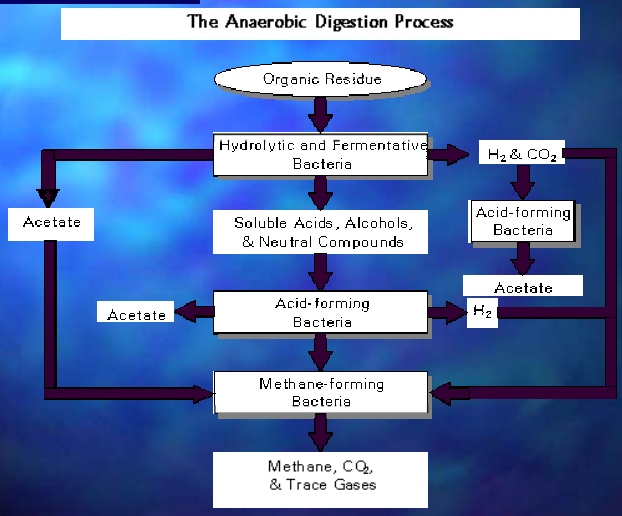
- Gas turbine required to convert the methane into a usable form of energy, on average only 70% of the material can be made into biogas
- water and steam the conversion factor can be greater than 80%.
- biogas can be used for many purposes it best to used for direct use such as heating and cooling.

Pictures from:
http://www.biogasworks.com/Index/AD%20Short%20History.htm

# How is the raw resource converted to energy:

- the raw organic residue (raw sewage, manure and other such resources) that is required in this process is converted to it usable energy state by bacteria breaking down complex substances and releasing the methane, which is the energy source sought after in this conversion.
- happens though a series of chemical breakdown (see chart on next slide)
- required bacteria in this process, the raw material must be in a temperature range between 40°F and 212°F. This helps the material to be broken down
- process is also naturally occurring without knowing of as well.

(chart from http://www.biogasworks.com)




## How do the production, transportation and use of biogas affect the environment:

- cleanest and least toxic in the world. machinery required to heat the raw materials is non-polluting, and it is a completely natural process
- Also through manufacturing biogas landfills and sewage systems become smaller and the process creates an odourless gas, and a high nutrient fertilizer
- in a way the production of this form of gas is better for the environment than not producing it.
- transportation of biogas is done through trucks similar to those that transport any other gas.
- clean burning and completely natural so it has no adverse effects on the environment. It also reduces the amount of methane and carbon dioxide released into the environment.

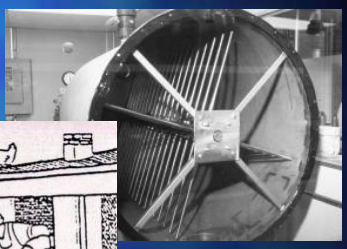
Pictures from:
http://www.ees.adelaide.edu.au/pharris/biogas/PictGal.html

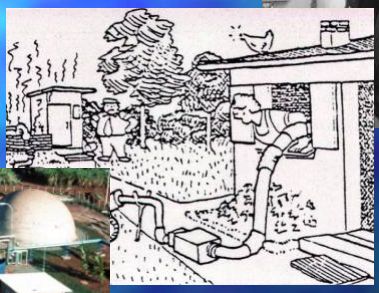
## How has biogas been used in the past:

- it is believed that a form of this gas was used to heat water from the 10th to 16th century.

1. By 1850 the concept of biogas was starting to become better understood and in sewage processing plant was built to create biogas, and this energy was used to illuminate streetlights.

Pictures from:http://www.biogasworks.com/Index/AD%20Short%20History.htm





## What is biogas used for:

- used primarily for direct uses such as heating and cooling.
- this resource can be adapted for many different uses that benefit the environment and the economy. With some modifications to the engine biogas can be used to run vehicle, as a clean burning and quiet source of fuel.

## How do you feel biogas will make it in the future:

- biogas is a safe, cheap and reliable source of energy with endless uses.
- nutrient rich fertilizer is produced and is safe in the environment.
- answer to the problem of pollution and the diminishing oil supplies.
- way of the future, at least until a working cold fusion generator is created.

## Pros and Cons

- Pros
  - Renewable
  - High nutrient fertilizer produced in excess.
  - Environment friendly.
  - Reduces methane and carbon dioxide release into the air.
  - Cheap to produce.
  - Many different uses.
  - Reduces landfill sites, sewage drainage, and farm manure.
  - Clean/ quiet fuel for cars and trucks.
- Cons
  - Reduced power from vehicles.
  - Extra time required to produce in comparison to other energy resources.

## Bibliography


- Mr Paul Harris University of Adelaide, Roseworthy Campus Australia. Paul.harris@adeleaide.edu.au
- http://www.ees.edelaide.edu.au/pharris/biogas/beginners.htl
- http://www.biogasworks.com/
- http://www.cement.ca/cement.nsf/internetE/21CB949B6026443585256C31007B665D?opendocument
- Chemistry text book


## The End