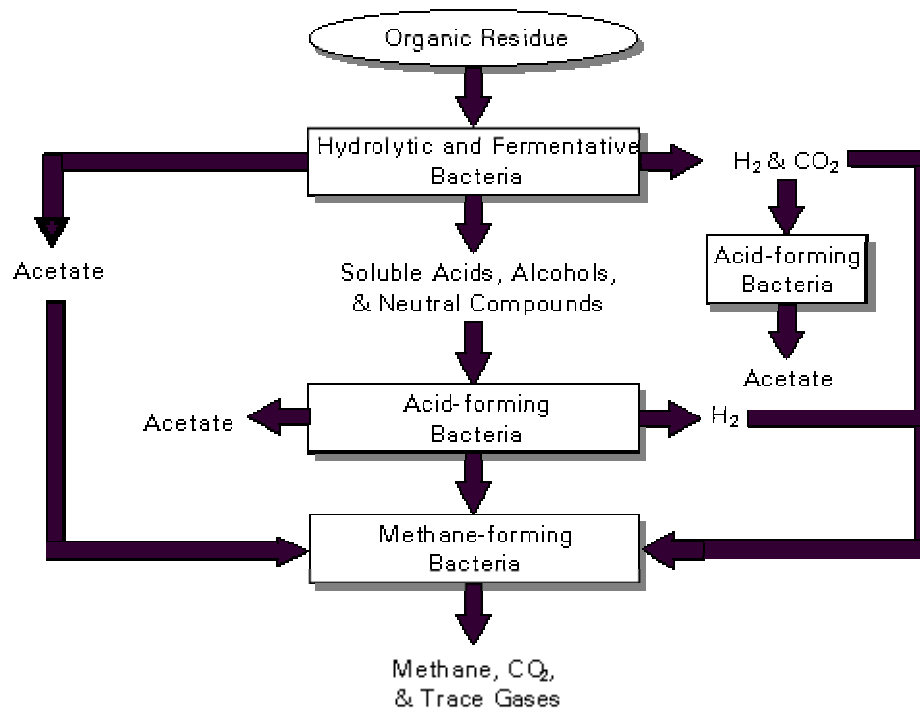


1. **Where is biogas used:** biogas is used all over the world. It is an international energy source that is not bound to any certain area. It is primarily used by farmers and in rural areas to reduce costs of cities powering stations. But is becoming more popular in higher populated areas.
2. **What are the technological limitations of the resource:** the limitations to using biogas are very few. One limitation though would be that in the 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 while when mixed with water and steam the conversion factor can be greater than 80%. Another limitation would be that though biogas can be used for many purposes it best to used for direct use such as heating and cooling.
3. **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. But this happens though a series of chemical breakdown as shown in the following chart. (chart from <http://www.biogasworks.com>)

The Anaerobic Digestion Process



For the 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. The higher the temperature the higher percent of biogas produced. This process is also naturally occurring without knowing of as well. In our sewers and septic tanks this breakdown of wastes by the hydrolytic and fermentative bacteria just occurs, so this process has be

happening for longer than we have known about it, and discovered how to utilize the energy produced.

4. **How do the production, transportation and use of biogas affect the environment:** The production of biogas is amongst the cleanest and least toxic in the world. The machinery required to heat the raw materials is non-polluting, and it is a completely natural process done inside since it is simple bacteria doing all the work to convert the waste to a usable energy. Also through manufacturing biogas landfills and sewage systems become smaller and the process creates an odourless gas, and a high nutrient fertilizer that is used on the farms in which most or the raw material came from, so in a way the production of this form of gas is better for the environment than not producing it. The transportation of biogas is done through trucks similar to those that transport any other gas. This energy form is 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.
5. **How has biogas been used in the past:** In a bit of history, it is believed that a form of this gas was used to heat water from the 10th to 16th century. 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.
6. **What is biogas used for:** Biogas is used primarily for direct uses such as heating and cooling. But that is not all it is limited to, 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. It can also be used to run electrical appliances and virtually any application.
7. **How do you feel biogas will make it in the future:** I feel that biogas is a safe, cheap and reliable source of energy with endless uses. Through the process of producing the resource a nutrient rich fertilizer is produced and is safe in the environment. So I feel that this energy source has a bright future ahead of it. This is the answer to the problem of pollution and the diminishing oil supplies. So this is the way of the future, at least until a working cold fusion generator is created.

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:

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- **Chemistry text book**