Biogas

Energy Sense in Today's World

By Hannes Muntingh

What is biogas?

Biogas is a natural gas that is produced when organic material is broken down (consumed) by a variety of micro-organisms in the absence of oxygen. This process of anaerobic digestion occurs naturally in our environment in places where conditions are favourable, like, for example, at the bottom of some lakes and in the stomach of a cow

This presents us with an opportunity for meeting our own energy demands

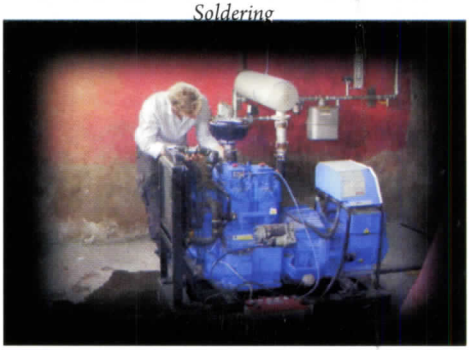
Biogas consists mainly of methane (CH_4) and carbon dioxide (CO_2) plus a few trace amounts of other gases. The methane content is what enables us to utilize biogas as a source of renewable energy. The percentage of methane present depends on the type of material digested and relates directly to the calorific value of the biogas. On average, biogas has a methane content of around 60% and a calorific value of 6kWh/m^3.

As a source of energy, biogas can be used for

- √ Cooking
- √ Water heating
- √ Gas lighting
- √ Chick/Piglet warming
- √ Various other gas appliances
- √ Cogeneration of electricity and heat as fuel for a biogas generator

Cooking

Soldering



Congeneration of Electricity & Heat (Akut motor conversion project)

Another value adding product of the anaerobic process comes in the form of a bio-fertilizer. The digested slurry is a nitrogen rich, instant fertilizer that can be an environmentally and economically sound substitute for the use of chemical fertilizers.

The idea then, is to create an environment for the anaerobic digestion of organic waste material and a system for capturing, storing and distributing the consequently produced biogas to the various user points. Organic material should never be a waste, when it can be a resource!

Biogas cont.

The utilization of this energy from waste can be achieved by the construction of a biogas plant.

The Biogas Plant

The three main factors to be considered in regards to the feasibility, sizing and design of a biogas plant are:

1) Material to be digested
2) Energy Demand
3) Economic and environmental benefits.

Digester feeding material

Most organic material will anaerobically digest given enough time under the right conditions, but some break down faster than others and some will produce more methane, and thus a higher quality biogas. In some cases mechanical chopping/stirring, heating of the digester or further treatment of the slurry may be required.

The type and amount of readily, reliably available feeding material will therefore play a determining role in the design and sizing of the system.

Typical organic waste materials suitable for digestion include:

- Cattle slurry
- Pig slurry
- Poultry manure
- Vegetable wastes
- Food processing wastes
- Sewage

Energy Demand

For any renewable energy system to be sustainable, a balance has to be struck between the means and the needs of the users.

Obviously, a bigger system would produce more biogas, but will also require more feeding material and will cost more to construct. In many parts of the world, where tariffs are fixed, farmers and industries are generating electricity from biogas and selling this to the national grid. In Kenya, however, this still proves difficult to implement, in which case it is better to size a system according to the energy demand of the site.

System Economics

Another key factor in the design of any particular biogas plant is the financial payback time of the investment. This is mainly determined by the initial cost of construction and the savings in energy costs over time. Generally, the payback time for biogas plants in Kenya, makes good financial sense.

Biogas cont.

Biogas plants come in various shapes and sizes and some perform better than others, but they all share the same concept: turning waste into energy.

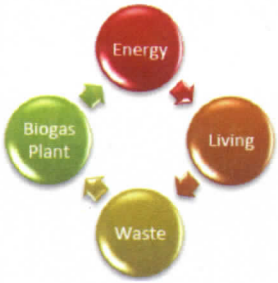
The benefits are the same at various ends of the scale, from small holding farmers with 4 cows producing enough gas for the cooking needs of a family to industrial biogas plants adding value, economical as well as environmental, to large scale operations.

Livestock & Biogas

The livestock industry is particularly well suited to the production and use of biogas. Very little change to the daily proceedings is required and livestock wastes form a very good and very easily digestible feeding material for biogas production. As long as the construction is of good quality, these systems can be much lower cost and low maintenance with very good performance.

Every morning, when the shed is being cleaned, the manure, urine ad wash water is collected or directed to feed the anaerobic digester. The biogas produced is stored and piped to the user points. The digested slurry is used as a bio-fertilizer.

As farming has always been about how best to utilize all possible resources on your patch, biogas certainly fits the bill and helps complete the cycle.



Benefits - a summary The first, obvious, benefit to us as energy users is the savings in energy costs by generating our own energy from a renewable source of available organic waste material.

• The digested material (slurry) also adds value as it provides us with a nitrogen rich bio-fertilizer for use in agriculture. This can provide an environmentally sound substitute to other harmful and expensive chemical fertilizers. This slurry is also virtually odourless and does not attract flies, which holds obvious benefits to human health in terms of the prevention of fly borne diseases.

• Through the use of biogas, we can reduce the deforestation caused by the use of conventional sources of fuel like firewood and charcoal. This in turn will aid the water holding capacity of the land as well as prevent erosion and the loss of nutrient rich top soils. The trees, of course, also have the vital role of absorbing carbon dioxide and producing oxygen.

•Another environmentally positive aspect is the reduction of methane released into the atmosphere by burning it as a source of energy. The methane normally released, for example, by cow manure and organic wastes in landfill contribute massively to the effect of global warming as methane is 23 times more active as a greenhouse gas than carbon dioxide.

All in all this technology can form part of the solution to many problems faced by all of us in these times.

For more information, you are welcome to come and see me at the show, cubicle no 4 in the business centre, or contact me at any time:

Biogas Energy Solutions Limited
Mob: 0738 560026
Email: hannes@biogasafrica.com