biogas

Context

Biogas - an energy source of growing importance

Soon there will be 8 billion people living on our globe. This is an incredible number thinking that only one hundred years ago there were not even 2 billions!. Mankind has grown tremendously and so have some problems. By producing biogas we could fight two major problems of mankind.

Two problems of a growing mankind. The first is the growing amount of waste we produce – including also **organic waste**. When organic waste rots, it sets free **CO_2** and **methane**. Both gases are known to be greenhouse gases, which means, they make our earth warmer. And second, our modern society depends on the energy of fossil fuels such as oil, gas or coal. These fuels are limited and might be used up soon. Using them always means burning them, which again leads to a higher amount of CO_2 in the atmosphere.

Biogas as a solution. Biogas is made of organic waste or agricultural crops especially grown for that purpose. Thus it reduces the amount of waste in our **landfills**. Biogas is also a powerful fuel, which can help to satisfy our energy needs in a **sustainable** and **CO_2 neutral** way.

Production of biogas- If you produce biogas, you let biomass rot in the **absence of oxygen**. Under these "**anearobic**" conditions organic matter rots with the help of **microorganisms** to produce biogas. It is a mixture of **methane** CH_4 (75-50%) and **carbon dioxide** CO_2 (25-50%) and can be burned to carbon dioxide and thereby energy is produced.

Raw material for biogas production. Biogas can be made of almost any kind of organic material.
- organic wastes of cities, **sewage sludge**
- industrial waste water
- waste water of cities
- organic wastes of farming (straw, leaves , manure…)

Production of biogas from agricultural organic wastes. Biogas from organic farming wastes is usually produced in **fermenters** (also called **digesters**). Those are big containers in which the wastes are decomposed by bacteria in an atmosphere without oxygen. In Germany there are about 3000 such "mini plants", in Austria there are about 120. Almost all of them use the biogas to produce **heat and electricity**. The biogas is used to run a motor that produces electricity in the first place and heat as a by-product.

Tasks

1. Watch the following movies and then improve your knowledge with a short quiz:

! Pay particular attention to the following terms:

- **Components of biogas**
- **Raw materials for biogas**
- **Fermenter**
- **Biogas from pig manure**
- **Co-generator unit**
- **fertilizer**

Introduction:
fundamental facts about biogas

Input and waste materials:
raw material for the production of biogas - utilisation of waste materials

Production of biogas:
The process of producing biogas

Electricity and heat from biogas:
this movie shows the cogeneration unit

Improve your knowledge with a short quiz: ?

2. Use this calculator  for the following calculations:

a) How much electric energy can be generated from 1 t maize silage or 1 t manure?
(The density of manure is nearly: ρ = 1 050 kg/m^3)

b) In an area of 1 ha 50 t maize can be produced for silage.
How many households can be supplied with the energy from this maize silage.
One household (2-3 persons) needs energy about 3,2 MWh per year.

c) How many liter heating oel can you replace with maize silage from 1 ha?
1 m^3 biogas has the same energy as 0,6 l heating oil.

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