PORTABLE BIOGAS DIGESTERS

EnD-I TDI
What is the **ITDI BIOGAS DIGESTER**?

The ITDI Biogas Digester is a physical structure whose main function is to provide anaerobic condition (without the presence of air) within it. This structure when loaded by biodegradable materials especially manure will produce biogas. It is also known as bioreactor or anaerobic reactor.

What are the uses of **BIOGAS**?

The common uses of biogas are for cooking, lighting, running an internal combustion engine, propagation of algae for tilapia culture and the effluent can be used as fertilizer in vegetable propagation.
Guide values for **BIOGAS** consumption

- **Cooking:** 0.45 cubic meters (8 cu. ft.) per person per day
- **Lighting:** 0.12-0.15 cubic meters (4.5 cu. ft.) per hour per lamp
- **Driving Engines:** 0.45 cubic meters (15 cu. ft.) per HP per hour

Value equivalent of **BIOGAS** with other energy sources

- 1 kilogram **LPG** = 0.45 cubic meter biogas
- 1 liter **gasoline** = 0.54 cubic meter biogas
- 1 liter **diesel fuel** = 0.52 cubic meter biogas
- 1 kilowatt hr. **electricity** = 1.0 cubic meter biogas
Substrates for BIOGAS Production

Substrates are biodegradable materials, which can be used for biogas production. The substrates, which can be loaded to the biogas digester, are the following:

- **Animal Wastes**: chicken dung, hog, cattle, goat and carabao manure.
- **Household Wastes**: night soil and kitchen refuse
- **Crop Residues**: corn stalks, rice straws, banana leaves, corncobs, peanut hulls, cogon and bagasse, water lily and grass cuttings.
- **Industrial Wastes**: distillery slops, coconut water, filter pressed cake, banana and pineapple peelings, Bottling wastes, bihon wastes, fish wastes and meat processing wastes.
Composition of Biogas

Biogas is composed of the following:

<table>
<thead>
<tr>
<th>SUBSTANCES</th>
<th>SYMBOLS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane</td>
<td>CH4</td>
<td>50 – 70%</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>CO2</td>
<td>30 – 40%</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H2</td>
<td>5 – 10%</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>N2</td>
<td>1 – 2%</td>
</tr>
<tr>
<td>Water Vapor</td>
<td>H2O</td>
<td>0.3%</td>
</tr>
<tr>
<td>Hydrogen Sulphide</td>
<td>H2D</td>
<td>Traces</td>
</tr>
</tbody>
</table>

Heating value of Biogas

The heating value of Biogas is 950 – 1050 BTU/ft³ or 20 Mega joules per cubic meter. It has an ignition temperature in the range of 650 degrees to 750 degrees Celsius.
BIOGAS DIGESTER DESIGN
Three types of portable Biogas Digesters

- **TYPE:** PORTA BIO-DIGESTER I
- **MATERIALS:** Plastic Digester with plastic gas holder
- **CAPACITY:** 0.211 m$^3$ (211 liters)
- **START-UP OPERATION/LOADING RATE:**
  - 100 L inoculum/
    2kg kitchen waste
  - 8kg animal manure/
    2kg animal manure
  - 16 L water/8 L water
- **DAILY BIOGAS PRODUCTION:** 350-400 liter
- **ESTIMATED COST:** PhP 9,000.00
Three types of portable Biogas Digesters

- **TYPE:** PORTA BIO-DIGESTER II
- **MATERIALS:** Plastic Digester with metal gas holder
- **CAPACITY:** 0.211 m³ (211 liters)
- **START-UP OPERATION/LOADING RATE:**
  - 100 L inoculum/
    2kg kitchen waste
  - 8kg animal manure/
    2kg animal manure
  - 16 L water/8 L water
- **DAILY BIOGAS PRODUCTION:** 350-400 (liter)
- **ESTIMATED COST:** PhP 17,000.00
Three types of portable Biogas Digesters

- **TYPE:** PORTA BIO-DIGESTER III
- **MATERIALS:** Metal Digester with floating gas holder
- **CAPACITY:** 0.55 m³ (550 liters)
- **START-UP OPERATION/LOADING RATE:**
  - 185 L inoculum/
    2kg kitchen waste
  - 16kg animal manure/
    4kg animal manure
  - 32 L water/12 L water
- **DAILY BIOGAS PRODUCTION:** 500-550 (liter)
- **ESTIMATED COST:** PhP 25,000.00
Value equivalent of **Biogas** with other energy sources

1 kilogram **LPG**
= 0.45 cubic meter biogas

1 liter **gasoline**
= 0.54 cubic meter biogas

1 liter **diesel fuel**
= 0.52 cubic meter biogas

1 kilowatt hr. **electricity**
= 1.0 cubic meter biogas
Maintenance of the **Biogas** Digester

Cleaning of the digester usually takes 8 months-1 year. For a carelessly operated digester, cleaning will be done every (3) months while a well run digester may take 8 months-1 year of operation before it will be opened and cleaned.
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