Banas Bio-Gas Plant

13.10.2020
• About Banas Dairy
• Introduction to Bio-Gas Plant
• Key Favorable Factor to the Bio-Gas Project
• Advantage of Bio-Gas Plant
• About Dama Bio-Gas Project
• Bio-Gas Project Costing and Payback Period
About Banas Dairy

- Established in 1969
- Operations - Bansakantha District of Gujarat, Rajasthan and Uttar Pradesh
- Asia’s largest Co-operative Dairy
About Banas Dairy

• As part of our Hon. Prime Ministers’ vision of doubling farmers income by 2022 Banas Dairy has taken initiatives for further value addition in milk, milk products and started value addition of other agri products like Potato, Honey, Edible Oil, Take Home Ration etc. which shall greatly augment the farmers income.
  – Banas Dairy was paying Rs.9 Cr per day to farmers for milk in 2014 and currently paying Rs.24 Cr Per day- More than double in five years.
  – Started production of value added Potato products, investing more than Rs.100 Cr. to set up own potato based value added products. Farmers shall get better and consistent prices of their potato production.
  – Started Honey bee rearing, Honey collection, processing and packing; collected 80 tons of Honey in year 2019-20 from farmers.
  – Started 200 tons per day of edible Oil packing facility and started marketing in Gujarat, Madya Pradesh, Rajasthan and Maharastra.
  – Started Take Home Ration plant of capacity 200 MT/day- ready to cook with essential nutrients for malnourished children, pregnant women, adolescent girls and lactating mothers.
  – Started Banas Medical College and Research Institute at Palanpur- shall provide quality healthcare to farmers and huge boost to medical education.
  – Ambitious plan of fodder development through Hydroponic technology.
  – Target to plant 10 Cr. Tress in 10 years in district. Plan to harvest rain water throughout district by people participation.
Introduction of Biogas Plant

- As a part of our Prime Ministers’ vision to increase farmers' income to double by the year 2022, Banas Dairy have taken many initiatives as described above including multi beneficial Biogas project.

  - Banas Dairy have set up a pilot project Biogas generation plant at its Dama Semen station and presently production of a gas has been started.

  - In future Banas Dairy has ambitious plan to set up at least 50 such bio gas plants in the district.
Project Objective

- Additional income to Farmers
- Waste to wealth
- Hygiene & Environment
- Nutrient rich fertilizer
- Clean Energy
- Employment
Key Favorable Factor to the Project

- Availability of raw material – Cow dung and Potato
- The requirement to increase farmer income
- Replacement of fossil fuels
- To Improve rural hygiene
- Promote organic farming
- Site location - Highway and vehicles operating on CNG
- A requirement of nutrient rich fertilizer
Advantage of Bio Gas Plant

• The farmers shall get a good price of their cow dung which shall be an additional income to them along with milk income.

Considering :- 5 Cows
15 Kg Dung/Cow/day
1 Kg cow dung = Rs 1

<table>
<thead>
<tr>
<th>Cow dung</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 kg/day</td>
<td>75 Rs/day</td>
</tr>
<tr>
<td>2,250 kg/month</td>
<td>2,250 Rs/month</td>
</tr>
<tr>
<td>27,375 kg/year</td>
<td><strong>27,375 Rs/year</strong></td>
</tr>
</tbody>
</table>
Advantage of Bio Gas Plant

- Shall reduce the labour requirements for handling of the dung, as the dung is directly collected from the farms only on daily basis.

- Shall save the land utilization else it would occupy space to store dung in their farms.

- Shall improve the hygiene and sanitation of the farms and villages as there shall not be dung stored nearby. This shall improve the health of Animals and also the Farmers /Villagers.

- The environment shall be protected as it will Significantly lower the greenhouse effect

- Farmers shall get very nutrient and micro mineral rich manure

- Shall reduce the use of fossil fuels as it provide renewable and clean energy source.
Advantage of Bio Gas Plant

• Biogas reduces two critical important greenhouse gases
  
  – Carbon dioxide (CO\textsubscript{2}) (Its emission shall get reduced when biogas shall replace fossil fuel use (i.e coal, petrol, natural gas))
  – Methane (CH\textsubscript{4})

• Reduction of greenhouse gases:
  
  – 800 kg/day of CH\textsubscript{4} equivalent to 20 tons of CO\textsubscript{2}/day.
  – Additionally there shall be reduction of 2.87 tons of CO\textsubscript{2}/day when 800 Kg CBG replaces the petrol as fuel.
About Dama Biogas Plant

• Daily 40 ton of cow dung is required for the plant, which is collected from 254 farmers of 12 numbers of villages.

• Daily Cow dung is collected from the farm of the farmer and then transferred it to the plant through tractor trolley.

• From the plant about 2000 CUM/day Raw Biogas is generated which shall be purified and to around 800kg/day Bio Gas.

Components of Biogas Plant:

• Cow Dung Collection
• Weigh Bridge
• Unloading tank
• Mixing Tank
• Digester

• Gas Balloon
• Purification System
• Compression Process
• Cascade System
• Dispenser

• Solid Liquid Separator
• Vermi-compost
• Liquid Fertilizer Tank
Cow Dung Collection in the Village

• A system is developed through which cow dung is collected from the villages

• The tractors with trolleys move from farm to farm and collect the dung from the farmers.

• The dung is weighed at farmers place.

• The farmers are paid Rs.1 per kg of cow dung. The payment of cow dung is paid to farmer with the milk payment on every 15 days.
• Collected dung from the farmers is transferred to the Biogas plant at Dama.

• The tractor trolley with dung is weighed at the plant and quality is checked.
Cow Dung Unloading

- After weight measurement, dung is unloaded in the Cow Dung unloading Tank.
- No man-power is required during unloading process.
Mixing of Cow dung

• After unloading of dung in the tank, water is added in 1:1 ratio.

• After water addition, homogenous mixture (Slurry) is prepared through agitator

• The slurry is transferred to the Anaerobic Digestor
In digester, dung degrades in presence of anaerobic bacteria to produce Biogas.

Capacity of digester: 3000 m³
Products from Biogas Plant

- Anaerobic Digester
  - Slurry
  - Gas
  - Bio Gas
    - Purified Gas
      - Vehicle Fuel
    - Liquid Fertilizer
      - Solid Fertilizer
    - Solid Liquid Separator
• The generated raw biogas is collected in the Double membrane Balloons.

• Double membrane Balloons capacities are
  1. Digester top mounted balloon : 500 CUM
  2. Raw gas storage balloon : 1000 CUM
• The Raw Biogas contain Methane, Carbon dioxide, Hydrogen sulfide, moisture etc.

• The raw Biogas is purified for methane enrichment by removal of other gases and purified gas have methane content of more than 93%. 
Compression

- The purified gas is then compressed to high pressure of about 200 Bar.
Purified Gas Storage

• Compressed purified gas is stored in the Cylinder Cascade system.

• Storage Pressure : 200 Bar

• Storage Capacity : 1600 kg of gas (approx 2 days of storage)
Banas BioCNG Station

- The purified gas is filled in the vehicle through dispensing system.
- Quantity: 800 Kg of BioCNG per day
- 100 vehicle can be filled through the gas station (8kg per vehicle)
Solid Liquid Separator

Over Flow of digester is passed through the Solid Liquid separator machine

The machine separates the solid part and liquid part which shall be used as solid fertilizer after enrichment and liquid fertilizer.

Quantity of fertilizer:

- Solid: Around 8 ton of solid fertilizer per day
- Liquid: Around 70,000 L per day
Solid Fertilizer

• Solid Fertilizer is further processed through vermicomposting.
• Solid fertilizer shall be added with required micro nutrients which shall be very useful in organic farming and a replacement of chemical fertilizers.
• Fertilizer bags of 25/50 Kg shall be packed for farmers.
Liquid fertilizer is collected in the tank and sold to the farmers through tankers.

This fertilizer shall also serve the purpose of manure and help retain the moisture content of the soil.
## Project Costing

### CapEx

<table>
<thead>
<tr>
<th>Work</th>
<th>Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Work</td>
<td>Rs. 45,650,000</td>
</tr>
<tr>
<td>Mechanical work</td>
<td>Rs. 34,750,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Rs. 80,400,000</strong></td>
</tr>
</tbody>
</table>

### OpEx

<table>
<thead>
<tr>
<th></th>
<th>Quantity</th>
<th>Unit Rate</th>
<th>Daily</th>
<th>Month (30 days)</th>
<th>Yearly (365 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow-dung (Raw material)</td>
<td>40,000</td>
<td>1</td>
<td>Rs 40,000</td>
<td>Rs 1,200,000</td>
<td>Rs 14,600,000</td>
</tr>
<tr>
<td>Transportation</td>
<td>14 trips</td>
<td>1250</td>
<td>Rs 17500</td>
<td>Rs 5,25,000</td>
<td>Rs 63,87,500</td>
</tr>
<tr>
<td>Electricity</td>
<td>2000 units</td>
<td>7.3</td>
<td>Rs 14600</td>
<td>Rs 438,000</td>
<td>Rs 53,29,000</td>
</tr>
<tr>
<td>Man-Power</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest and depreciation</td>
<td></td>
<td></td>
<td>Rs 39,649</td>
<td>Rs 1,189,479</td>
<td>Rs 14,472,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>Rs 128,249</td>
<td>Rs 3,847,479</td>
<td>Rs 46,811,000</td>
</tr>
</tbody>
</table>

- Land Cost Extra
## Project Costing

### Revenue

<table>
<thead>
<tr>
<th></th>
<th>Per unit price</th>
<th>Daily Revenue</th>
<th>Yearly (365 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BioCNG</td>
<td>800 Kg</td>
<td>Rs 50</td>
<td>Rs 40,000</td>
</tr>
<tr>
<td>Solid fertilizer</td>
<td>8,000 Kg</td>
<td>Rs 10</td>
<td>Rs 80,000</td>
</tr>
<tr>
<td>Liquid fertilizer</td>
<td>70,000 L</td>
<td>Rs 0.5</td>
<td>Rs 35,000</td>
</tr>
<tr>
<td>Vermiwash</td>
<td>150 L</td>
<td>Rs 70</td>
<td>Rs 10,500</td>
</tr>
<tr>
<td><strong>Total (Rs)</strong></td>
<td></td>
<td></td>
<td><strong>Rs 60,407,500</strong></td>
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</tbody>
</table>

### Subsidy

| For 2000 m3/day | 66 lakhs |
## Payback Period

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Revenue/Yr</td>
<td>Rs 60,407,500</td>
</tr>
<tr>
<td>Operating Cost/Yr</td>
<td>Rs 46,811,000</td>
</tr>
<tr>
<td>Net Profit/Yr</td>
<td>Rs 13,596,500</td>
</tr>
<tr>
<td>Payback</td>
<td>5.4 Years</td>
</tr>
</tbody>
</table>
### Biogas Plant Capacities

Payback period improves with increasing the plant capacity

<table>
<thead>
<tr>
<th>Installed Capacity</th>
<th>2000 CUM</th>
<th>3500 CUM</th>
<th>5000 CUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Material (Cow Dung)</td>
<td>40,000</td>
<td>70,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Subsidy</td>
<td>Rs. 67 Lakhs</td>
<td>Rs. 116 Lakhs</td>
<td>Rs. 166 Lakhs</td>
</tr>
<tr>
<td>Bio CNG in Kg/day</td>
<td>800</td>
<td>1400</td>
<td>2000</td>
</tr>
<tr>
<td>Payback Period</td>
<td>5.4 Years</td>
<td>4.2 Years</td>
<td>3.5 Years</td>
</tr>
</tbody>
</table>
Thank You