“Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India”

With an aim to develop and promote a market environment for introducing energy efficiency and enhanced use of renewable energy technologies in process applications in the selected energy-intensive MSME clusters, United Nations Industrial Development Organization (UNIDO), in collaboration with Bureau of Energy Efficiency (BEE), is implementing a project titled “Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India” funded by Global Environment Facility (GEF) and co-financed by Ministry of Micro, Small and Medium Enterprises (MoMSME) and Ministry of New and Renewable Energy (MNRE). The project supports MSME units in implementing various energy conservation measures and thus result in reduced energy consumption and Green House Gas (GHG).

A GEF-UNIDO-BEE Project

Methane Capture from Dairy Effluents and Used as a Fuel

**Company Profile**

**Mother Dairy (AmulFed Dairy)** - A unit of Gujarat Cooperative Milk Marketing Federation Limited) having its plant at Bhat, Gandhinagar, Gujarat offers wide spectrum of dairy products to the entire nation including cultured products, ice creams, paneer and ghee under the 'Mother Dairy' brand. The Company also has a diversified portfolio with products in edible oils, fruits & vegetables, frozen vegetables, pulses, processed food like fruit juices, jams, etc. to meet the daily requirements of every household.

**Objective**

To capture methane from effluents, & utilize it as a fuel.

**Intervention**

Biogas generation using anaerobic digester and utilize the same as fuel for boilers, canteen and staff quarters of the plant.

**Outcomes**

- Biogas generated: 4000 m³/day
- Calorific value of biogas: 6000 kcal/m³
- Savings from biogas generation: ₹ 72000/day

**Principle**

- Conventional methods of aerobic effluent treatment consume high levels of energy (owing to the nature of the mechanical equipment) and simultaneously release large quantities of methane into the atmosphere.

- Dairy effluents contain high Chemical Oxygen Demand (COD) & Biochemical Oxygen Demand (BOD), and are therefore suitable for anaerobic methane capture.

- Capturing methane from effluents provides an alternative source of energy and simultaneously protects the environment by reducing the emission of greenhouse gas. The biogas so generated is utilized as a fuel for boilers, canteen and staff quarters of the plant.

**Implementation**

- The plant collects around 1700 kL liquid effluents per day from the different processes into a common anaerobic digester. This organic matter is decomposed in an anaerobic environment to produce a mixture of methane and carbon dioxide gas, referred to as biogas.
Cost-Economics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>COD load per day</td>
<td>13600 kg/day</td>
</tr>
<tr>
<td>COD reduction percentage consideration</td>
<td>80%</td>
</tr>
<tr>
<td>Actual reduced COD load</td>
<td>10880 kg/day</td>
</tr>
<tr>
<td>Biogas generated (of reduced COD load)</td>
<td>0.4 m³/kg</td>
</tr>
<tr>
<td>Actual biogas generated (Avg. of monthly production)</td>
<td>4000 m³/day</td>
</tr>
<tr>
<td>Calorific value of biogas</td>
<td>6000 kcal/m³</td>
</tr>
<tr>
<td>Total heat that can be generated from biogas</td>
<td>2400000 kcal/day</td>
</tr>
<tr>
<td>Calorific value of natural gas</td>
<td>8350 kcal/m³</td>
</tr>
<tr>
<td>Natural gas equivalent biogas generation</td>
<td>2874 m³/day</td>
</tr>
<tr>
<td>Cost of natural gas (variable)</td>
<td>₹ 28/m³</td>
</tr>
<tr>
<td>Savings from biogas generation</td>
<td>₹ 80000/day</td>
</tr>
<tr>
<td>Nos. of working days per annum*</td>
<td>360 days</td>
</tr>
<tr>
<td>Total expected savings per annum</td>
<td>₹ 28800000</td>
</tr>
<tr>
<td>Expected energy savings per annum</td>
<td>864 TOE</td>
</tr>
<tr>
<td>Investment of this project includes mechanical and electrical equipment and civil work</td>
<td>₹ 2,50,00,000</td>
</tr>
</tbody>
</table>

* Assumption

RESULTS

Proper disposal of dairy effluent leads to arresting release of methane into atmosphere

Around 4000 m³/day bio-gas is generated from the system, equivalent to 2874 m³/day natural gas

With the help of anaerobic methane capture system, about 864 TOE savings is possible per annum and reduction of 459 tonnes of CO₂ emission per annum

Biogas Generation Through Methane Capture

RESULTS

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Replication Potential

- This type of measure can be implemented in all the dairy units where sufficient effluent is available to generate methane gas
- Anaerobic methane capture technology is very well proven and there is no risk involved in implementation of this measure

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