

Biogas Plant integrated with ETP for a 10 Lakh Litres Per Day (LLPD) milk processing unit (Waste to Energy Solution)



Venue: Dugdh Swarn Mahotsav & Dairy Expo-2026
Indira Gandhi Pratishthan, Gomti Nagar, Lucknow.

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April: 17-18, 2026

Industry Overview:

- Dairy processing capacity: 10 lakh litres/day
- Generates large volumes of wastewater
- High organic load → suitable for biogas generation
- Need for sustainable waste management
- Meet the CPCB standards of Zero-Liquid-Discharge

Wastewater Generation:

- Effluent generation: 2–3 litres per litre of milk
- Total wastewater: 20–30 lakh litres/day
- Major sources:
 - Milk spillage
 - Equipment washing
 - CIP cleaning systems

Effluent Characteristics:

- BOD: 1500–3000 mg/L
- COD: 3000–6000 mg/L
- Oil & Grease: 100–300 mg/L
- Lactose, proteins, suspended solids
- High biodegradable organic content

Need for Biogas-ETP Integration:

- Reduce pollution load (Compliance with pollution control norms)
- Meet environmental norms
- Recover energy from waste
- Reduce operating cost of plant

System Overview:

- Pre-treatment → Anaerobic Digestion → Aerobic Treatment
- Biogas production integrated into ETP
- Energy recovery + wastewater treatment

Process Flow:

- Screening
- Equalization Tank
- Oil & Grease Trap
- Anaerobic Reactor (UASB/CSTR)
- Gas Holder
- Aeration Tank
- Secondary Clarifier
- Sludge Handling

Anaerobic Digestion:

- Oxygen-free biological process
- Converts organic matter into:
 - Methane-rich biogas
 - Stabilized sludge
- COD reduction: 70–85%

Biogas Generation Potential:

- COD load (approx.): 60–120 tons/day
- Biogas yield:
 - 0.35–0.5 m³/kg COD removed
- Estimated biogas production:
 - 8000–15000 m³/day (Aprox. 3400 Kg- 6375 Kg Bio-CNG)

Energy Utilization:

- Equivalent energy:
 - 1 m³ biogas \approx 0.6–0.7 litre diesel
- Daily replacement:
 - 5,000–8,000 litres diesel equivalent
- Applications:
 - Boiler fuel
 - Power generation (CHP system)

Key Components & Sizes:

- Equalization Tank: 2,000–3,000 m³
- Anaerobic Reactor: 4,000–6,000 m³
- Gas Holder: 1,500–2,500 m³
- Aeration System: Based on residual load

Indicative Cost Breakdown (For 10 LLPD Dairy Plant):

Components	Estimated Cost (Cr Rs.)
Civil Works	4.50 to 5.50
Anaerobic Reactor	4.00 to 5.00
Gas Holder & Piping	2.50 to 3.00
Mechanical & Electrical	3.50 to 3.50
Aerobic System	3.50 to 4.00
Total Estimated Cost	18.00 to 21.00

Operating Cost & Savings :

- O&M Cost: Rs. 30–50 lakh/year
- Energy savings:
 - Rs. 5–10 crore/year (fuel + electricity)
- Payback period:
 - 4-5 years

Benefits:

- Environmental:

- Reduced BOD/COD discharge
- Lower greenhouse gas emissions

- Economic:

- Reduced fuel cost
- Revenue from power generation

- Operational:

- Reduced load on aerobic treatment
- Sludge usable as manure

Challenges & Conclusion:

- Challenges:

- High initial investment
- Skilled operation required
- Sensitivity to pH and chemicals

- Conclusion:

- Highly viable for large dairy plants
- Converts waste into energy
- Ensures sustainability & compliance

On going schemes to support the Biogas/CBG project

- Agriculture Infrastructure Fund Scheme
- MNRE support
- GOBARDHAN Yojna
- Any other on-going scheme of the State Govt to support the purchase of compost/ bio-slurry for horticulture/ agriculture programme in the State.

Thank You
Jai Hind
Jai Bharat