Experience With Biogas Technology For Advanced Waste Management In Thai Palm Oil Industry

Facilitation Workshop under the T@W project

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Matchmaking between CDM project owners and EU stakeholders and other forms for business cooperation in the field of sustainable energy

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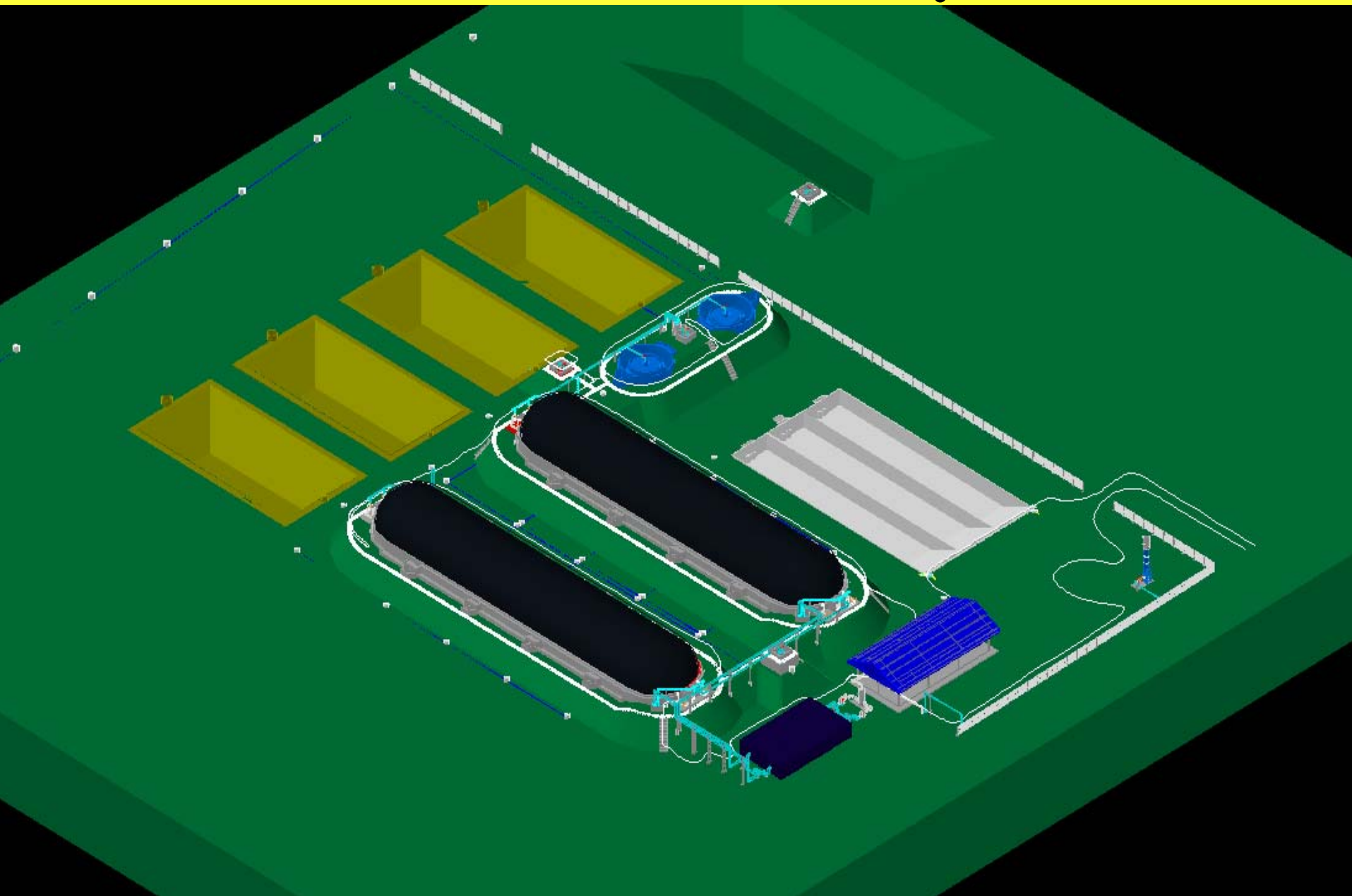
Waste Water Composite Sample Collection of Chumporn Palm Oil Ind., (Public) Co., Ltd.

Parameter	Unit	Value
FFB Capacity	tons/d	1,500
POME Flow Rate from CPO Mill	m3/day	750
pH		4.4-5.0
COD_t	kg/m^3	100
COD_{BD}	kg/m^3	70
TSS	kg/m^3	64.5
VSS	kg/m^3	55.1
Temp.	Degree C	70
Waste Water from Refinery	m^3/day	400
pH		8.5-9.0
COD_t	kg/m^3	5
COD_{BD}	kg/m^3	3.5
TSS	kg/m^3	1.8
VSS	kg/m^3	1.26
Temp.	Degree C	65

Physical Characteristics of Biogas:

- Heating Value 21 MJ/m^3
- Flame Speed 25 cm/s
- Theoretical Air/Fuel Ratio 6.19 m^3a/m^3g
- Combustion Temperature 650 ^oC
- Flash Point of CH_4 600 ^oC
- Heat Capacity (C_p) 1.6 KJ/m^3-0^oC
- Density (P) 1.15 kg/m^3

CPI BIOGAS PLANT Lay Out



Overall View of CPI BIOGAS PLANT

Cooling Pond

Appropriate + Complete Stirred Tank, Thailand (A+CSTRTh) Reactor

Sludge Storage Ponds

Flare

Control building

Appropriate + Up Flow Anaerobic Sludge Blanket, Thailand (A+UASBTh) Reactor

Fuel/ Energy Equivalent From 1 m^3 of Biogas (60 % CH_4)

Fuel/Energy Equivalent	Approximate / 1 m^3 (60 % CH_4)
Electricity Energy	1.25 kwh
LPG	0.46 Kg
Bunker Oil Grade A	0.55 L
Diesel	0.40 Kg
Gasoline	0.60 Kg
Wood	1.60 Kg
Coal	0.8 Kg
Charcoal	1.6 Kg

Experience With Biogas Technology

Key Criteria In Each Phase:

Design Criteria:

- Design to cope up with both high and low capacity during peak and off peak season respectively.

- Design at the correct conditions (pH, temperature) of waste water fed to the digester.

- Design to have the least H_2S content in biogas (appropriate digester and filter system, etc.)

- Design with "safety minded" concern (avoid O_2 in the biogas stream, low head loss in the biogas piping system, rack and chain to lift up the pump for maintenance purpose, etc.)

- Design to have the least maintenance (least moving part equipment possible, simple water level control, etc.)

- Control panel building must be designed in such a way that biogas leakage can be flown freely (shade with control room).

•Appropriate auto water drain valve at the suitable interval.

Operation & Maintenance Criteria:

•Keep biogas pressure not too high and not too low, specially, the one with plastic blanket cover type digester.

•When changing from off peak season to peak season, gradually increase waste water fed to the digester.

•During off peak season, digested waste water need to be recycled to keep an even waste water fed to the digester.

•Pay attention to investigate the sludge drain funnel periodically to prevent blockage of drained sludge.

•Every equipment with moving part must be designed for easy dismantle to do maintenance at the workshop and use a stand by unit during the maintenance period.