
GREEN
ENERGY
NETWORK
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GREEN ENERGY NETWORK

Product & Service

Our Expertise and Fields of Services

- Renewable Energy Projects Development
- Biogas Technologies & Biogas Power Plants
- Biomass Power Plants
- Solar PV Power Plants
- Wastewater Treatment Plants (Organic & Chemical Wastewater) for Domestic & Industries
- Potable / Service Water Plants / RO-Demineralized Water Plants
- Utilities Structural Works, e.g. Substation, Warehouses, Etc.

Our Services

- Turnkey EPC (Engineering, procurement and construction) Projects
- Design, Engineering & Consultancy Services
- Owner Engineering Service, Lender Engineering/ Independent Engineering Services
- O & M Services
  Project Development, BOT or BOOT (Build, Own, Operate, Transfer)

Biogas Energy

Biogas Energy

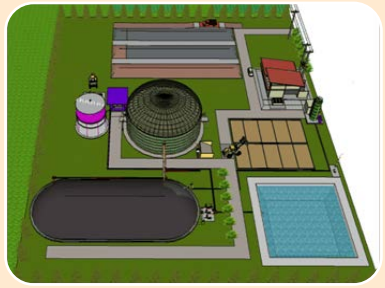
Biogas Plant Technologies

CSTR

(Completely Stirred-Tank Reactor)

MCL

(Modified Covered Lagoon)



Two Stages Reactor

(CSTR and MCL)

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Completely Stirred-Tank Reactor (CSTR)

CSTR is the stirring digester to mix and digest organic substances with high solid content at high efficiency. According to its stirring system, it can increase opportunity to completely mix organic substances with microorganism. In addition, it can break floating scum layer, reduce sediments, and dilute effect of toxicity substances inside digester.

CSTR : Bolted Tank

Tank Construction Technique

Bolted Glass-Fused-To-Steel Tank

- **Durable glass coating provides tank lifetime:**
  - No recoating/ minimal maintenance
  - High performance, hard wearing & abrasion resistant
- **UV Stable long term coating**
- **Easier and faster installation.**
- **100% inspection & qc of costing quality from factory (Holiday Test, Etc.)**
- **Zero leak after completion of installation, commissioning and Hydro test**

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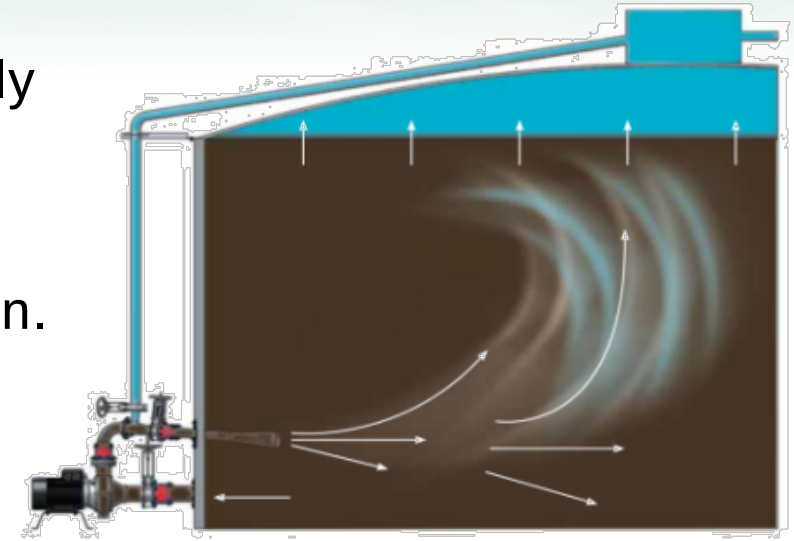
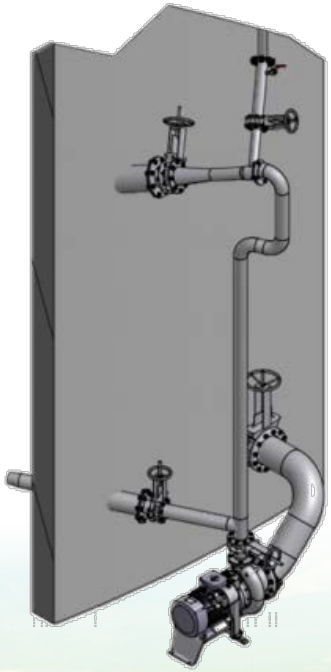
CSTR : Bolted Tank

CSTR : Landia GasMix

Pump GasMix

Pump GasMix is used to completely circulate substrates inside reactor to reach highest gas production less sludge sedimentation and no scum accumulation.





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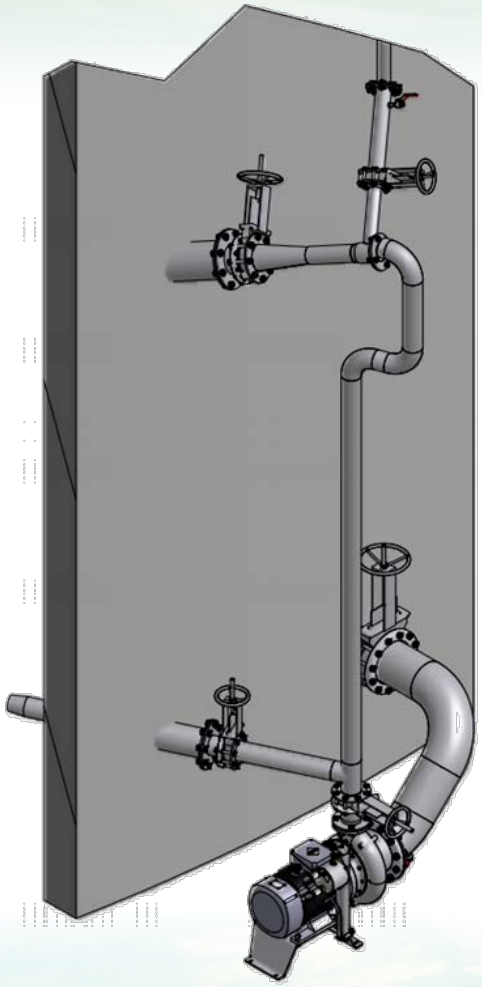
CSTR : Landia GasMix



Typical GasMix Installation

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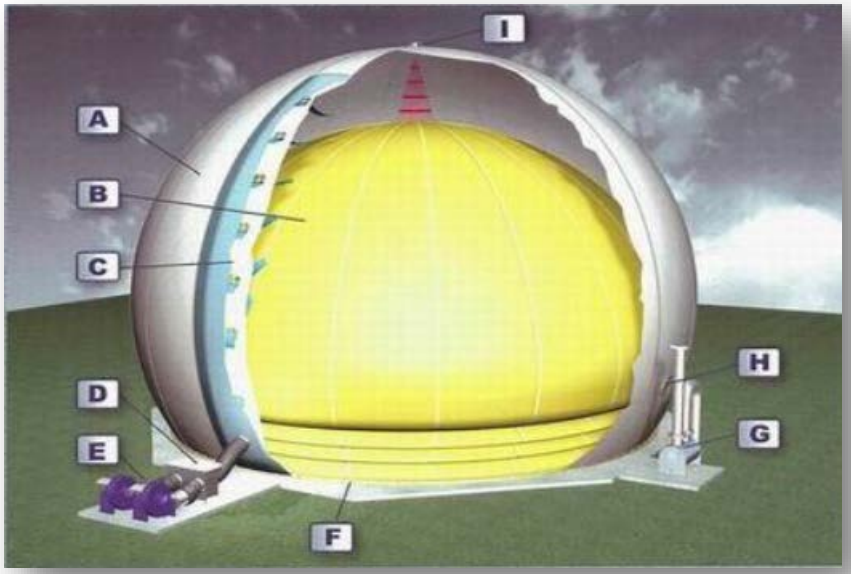
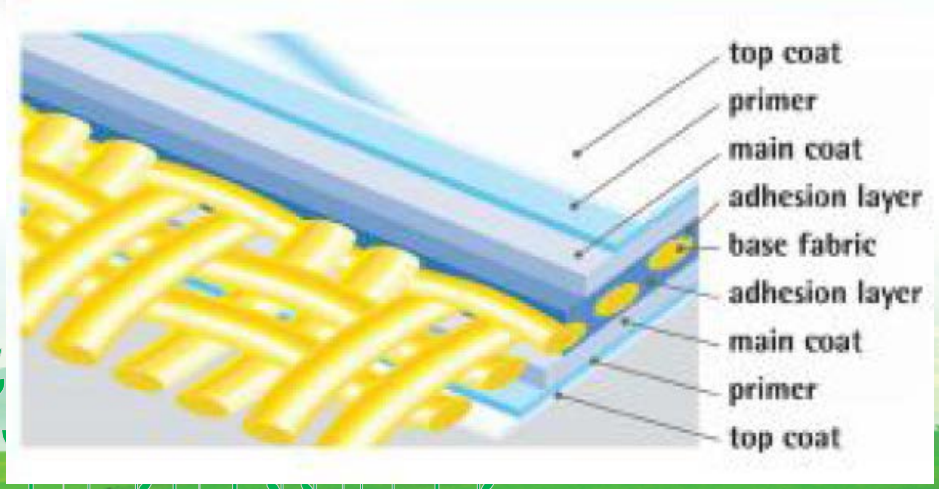
Double Membrane Gas Storage

Type and Feature of gas holder –Roof top gas holder



A Outer membrane
B Inner membrane
C Air flow system
D Non return valve
E Radial ventilator
F Anchor ring
G Safety valve
H Inspection window
I Ultrasonic sensor



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Double Membrane Gas Storage

MANUFACTURING

- The membrane form is achieved by precisely cutting the textile roll to accurate design patterns. These patterns are based on over 20 years experience of the behavior of the textile under pressurized conditions, to ensure even stress distribution throughout the structure.

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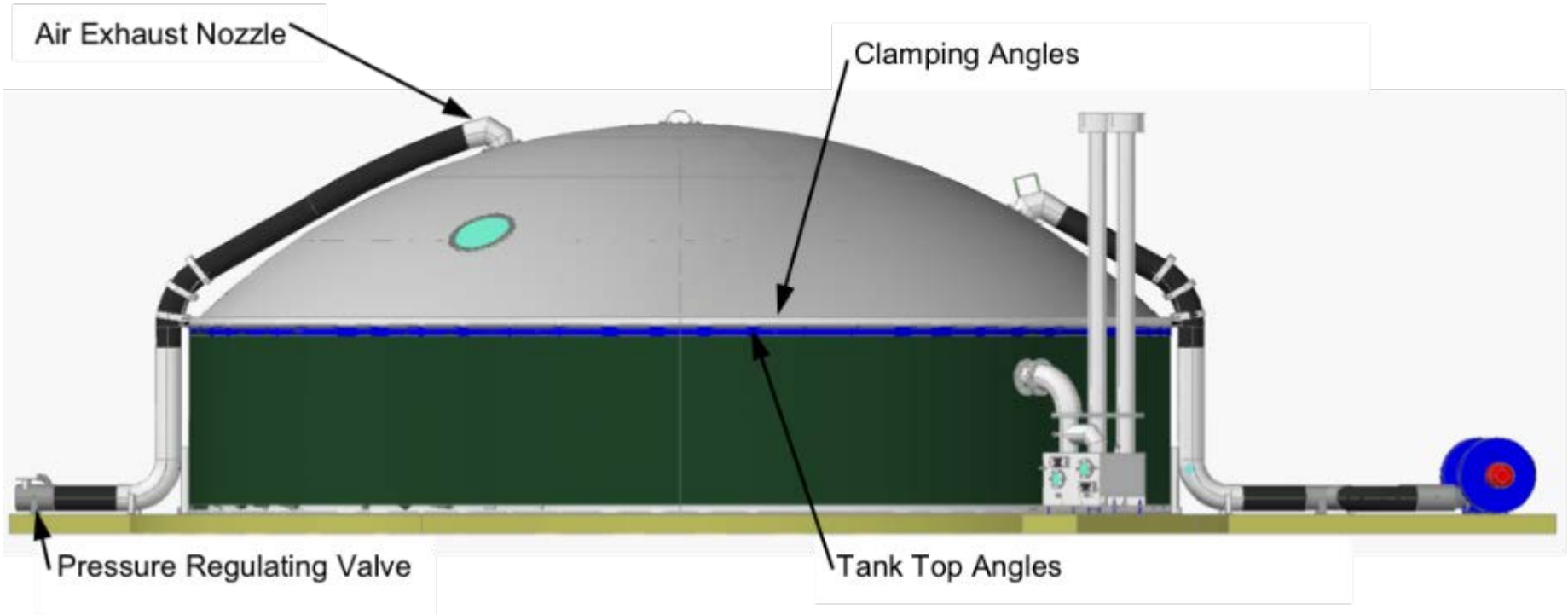
Double Membrane Gas Storage

BIODOME® ENGINEERING OVERVIEW



The blowers ensure that the membrane remains fully inflated under all conditions of biogas production and consumption.

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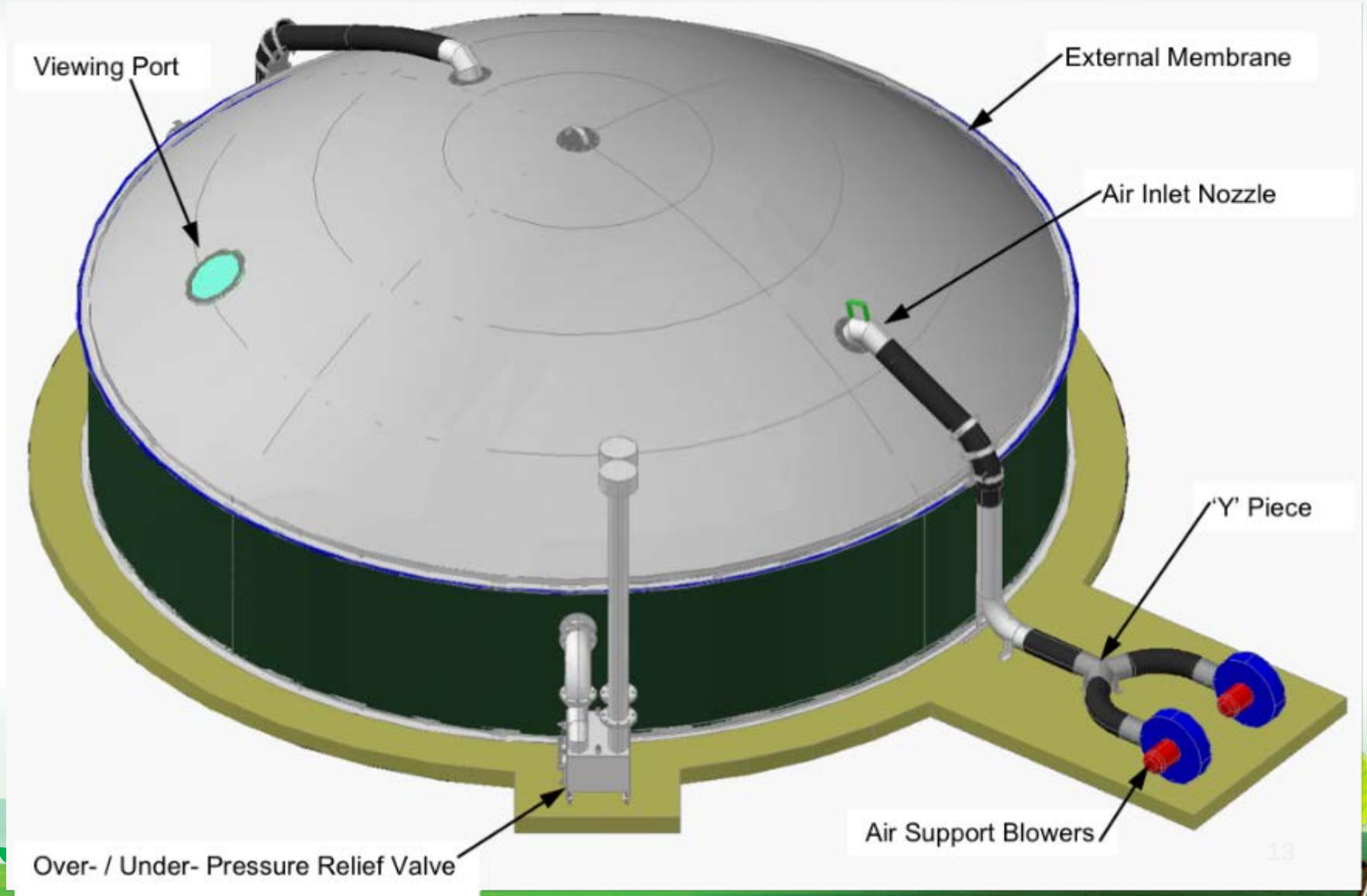
Double Membrane Gas Storage

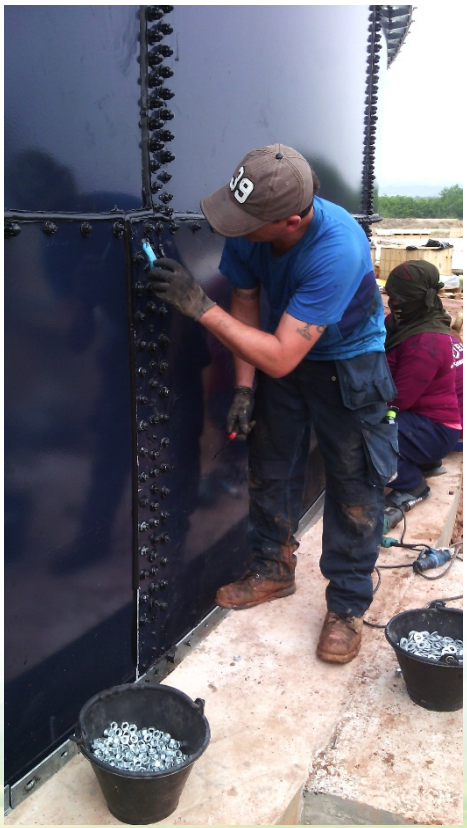
BIODOME® ENGINEERING OVERVIEW

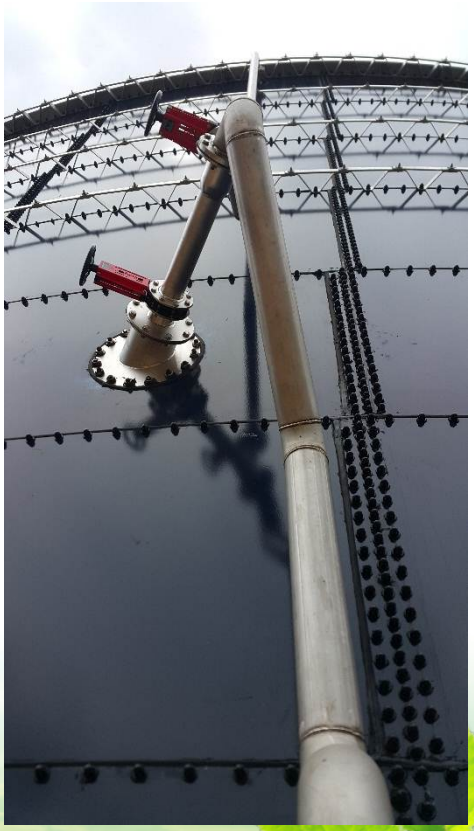


CSTR : Bolted Tank

Example of Tank Installation

Tank Diameter 28.15 m. **Tank Height 11.08 m.**
Tank Capacity 6,584 m^3 **Quantity 3 Tanks**
Gas Mixing System 18.5 kW 3 Units/Tank





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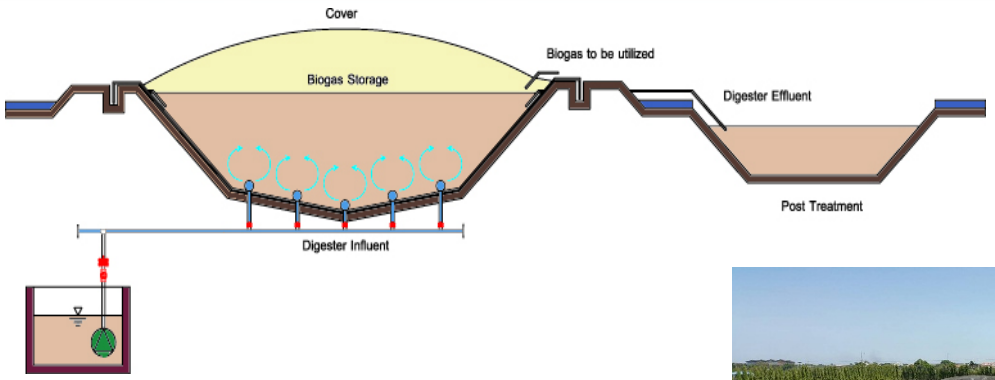
Modified Covered Lagoon (MCL)



MCL technology is developed from conventional anaerobic lagoon that can overcome problems of sludge sediment at lagoon problem. The process starts by entering wastewater from the bottom level of MCL to mix with microorganism (anaerobic sludge). The substrates inside digester will be automatically circulated through networks of solenoid actuator valves and piping, and sediment sludge will be collected at the end of the lagoon.

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Modified Covered Lagoon (MCL)

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Modified Covered Lagoon (MCL)

Biogas Collecting Pipes, HDPE Lining Sheet

Effluent Pipe (Overflow Wier Pipe)

Covered Membrane HDPE Sheet

Two Stages Reactor

Two Stages Reactor for Biogas Production from Palm Oil Mill Effluent (POME)

Two Stages Reactor is the most flexible and efficient combined biogas technologies, which we have proposed to use both CSTR and MCL, as the 1st stage and 2nd stage digester respectively. The advantages of this design are its higher digestion efficiency & better gas production, better treated wastewater qualities and more operational flexibility of biogas storage and utilization.

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Biogas Project References

Thasae Landsetlement Cooperatives, Chumphon Province

- **Type of Factory:** Palm Oil Mill
- **Technology:** Two Stages Reactor
- **Capacity of wastewater:** 225 m^3/day
- **COD:** 100,235 mg/l
- **CSTR Digester Volume:** 5,000 m^3/tank x 2 tanks
- **MCL Volume:** 12,800 m^3

Biogas Project References

Thong Mongkol Palm Oil, Prachuap Kirikhan Province

Technology: Two Stages Reactor

- POME Biogas Plant
- Capacity of wastewater: 600 m^3/day
- COD: 60,000 mg/l
- CSTR Digester Volume: 6,700 m^3/tank x 2 tanks

- Palm Decanter Cake Biogas Plant
- Capacity of Decanter Cake: 36 tons/day
- COD: 480,000 mg/l
- Digester Volume: 6,700 m^3/tank x 1 tank

- MCL (POME + Decanter Cake) Volume: 14,000 m^3

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Biogas Project References

Prachongkit Palm Oil Co., Ltd., Ranong Province

- **Type of Factory:** Palm Oil Mill
- **Technology:** Two Stages Reactor
- **Capacity of wastewater:** 225 m^3/day
- **COD:** 100,235 mg/l
- **CSTR Digester Volume:** 5,000 m^3/tank x 2 tanks
- **MCL Volume:** 12,800 m^3

Biogas Project References

Thana Palm (Palm Harvest Co., Ltd.), Surat Thani Province

- **Type of Factory:** Palm Oil Mill
- **Technology:** Two Stages Reactor
- **Capacity of wastewater:** 600 m^3/day
- **COD:** 60,000 mg/l
- **CSTR Digester Volume:** 6,700 m^3/tank x 3 tanks
- **MCL Volume:** 14,000 m^3

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Biogas Project References

Napier Grass Biogas Power Plant 500 kW, Prachuap Khiri Khan Province

- **Type of Factory:** Napier Grass Biogas Power Plant
- **Technology:** Two Stages Reactor
- **Capacity of Napier Grass:** 50 tons/day
- **CSTR Digester Volume:** 5,000 m^3 + MCL Volume 6,500 m^3
- **MCL Volume:** 5,000 m^3

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Biogas Project References

Ampol Food Processing Co., Ltd., Nakhon Pathom Province

- **Type of Factory:** Food Processing Factory
- **Technology:** Modified Covered Lagoon (MCL)
- **Capacity of wastewater:** 2,000 m^3/day
- **COD:** 6,500 mg/l
- **MCL Digester Volume:** 20,000 m^3 x 2 lagoons

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Biogas Project References

EES Renewable Co., Ltd. Ubon Ratchathani Province

- **Type of Factory:** Tapioca Factory
- **Technology:** Modified Covered Lagoon (MCL)
- **Capacity of wastewater:** 16,500 m^3/day
- **COD:** 12,000 mg/l
- **MCL Digester Volume:** 200,000 m^3

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Biogas Project References

EES Renewable Co., Ltd. Ubon Ratchathani Province

Biogas Upgrading (H_2S Bio-Scrubber) and Biogas Utilization System

Biogas Utilization System and H_2S Bio-Scrubber Unit

Biogas Upgrading (H_2S Bio-Scrubber) and Biogas Utilization System

Raw Biogas

H_2S Bio-Scrubber

1

Gas Dryer

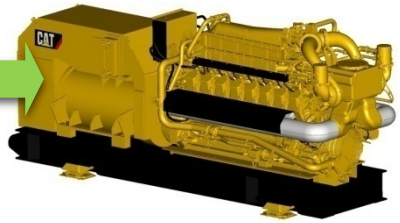
(1) Knockout Drum
(2) Cyclone
(3) Bag Filter

1

Gas Blower

Treated Biogas

2 3

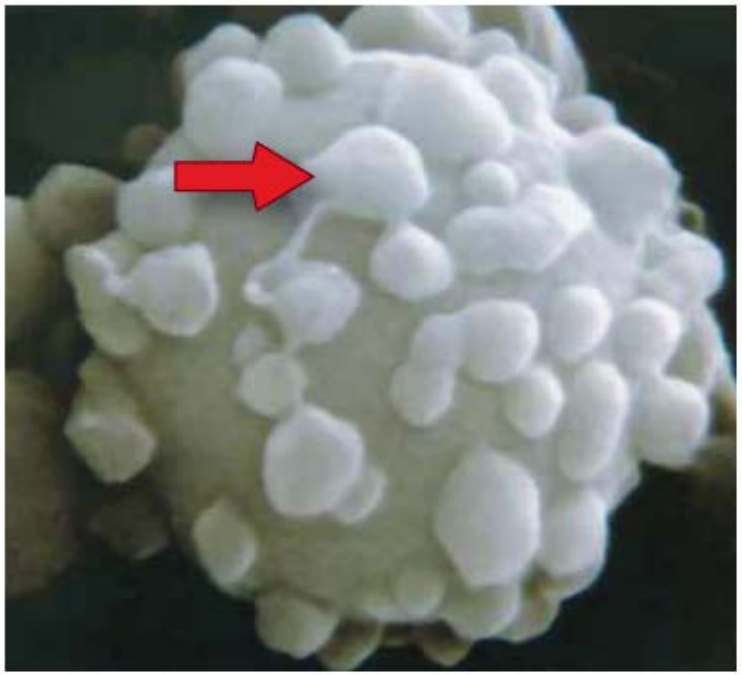


Gas Engine-Generator

H_2S Scrubber Unit (Biological Process)

Thiobacillus Bacteria is an absorber/media converts the H_2S to elemental sulfur (S8). Treated outlet gas can readily meet a less than 100 ppm H_2S specification (typical requirement for biogas) or as low as 5 ppm.

The biological sulfur slurry produced may be used for agricultural purposes or purified to a high quality (99%+) sulfur cake.



Theobacillus bacteria and sulfur nodules (nodules indicated by arrow)

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Advantage from using H_2S Bio-scrubber

- Reduce corrosiveness of gases and condensates
- Low operating cost, compared with chemical process and ferrous adsorbent process
- Extend lifetime of engine parts, valves and other gas contacting parts
- Provide biogas qualities to be complied with engine warranty terms and conditions
- Extend service/operating hours of engine's lubed oil, spark plug, etc.
- Provide low SO_x emission from combustion of biogas, lower than the stack emission standard of DIW (SO_x < 60 ppm)
- Provide safety, low risk of gas valve leakage and explosion (from cases of biogas boiler explosions)

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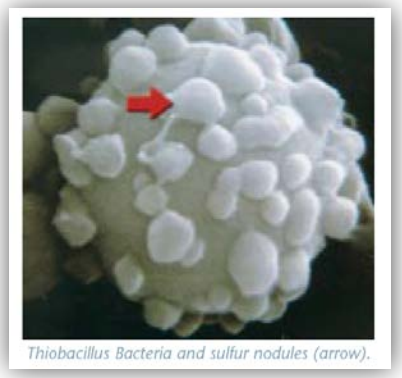
H_2S Bio-Scrubber System

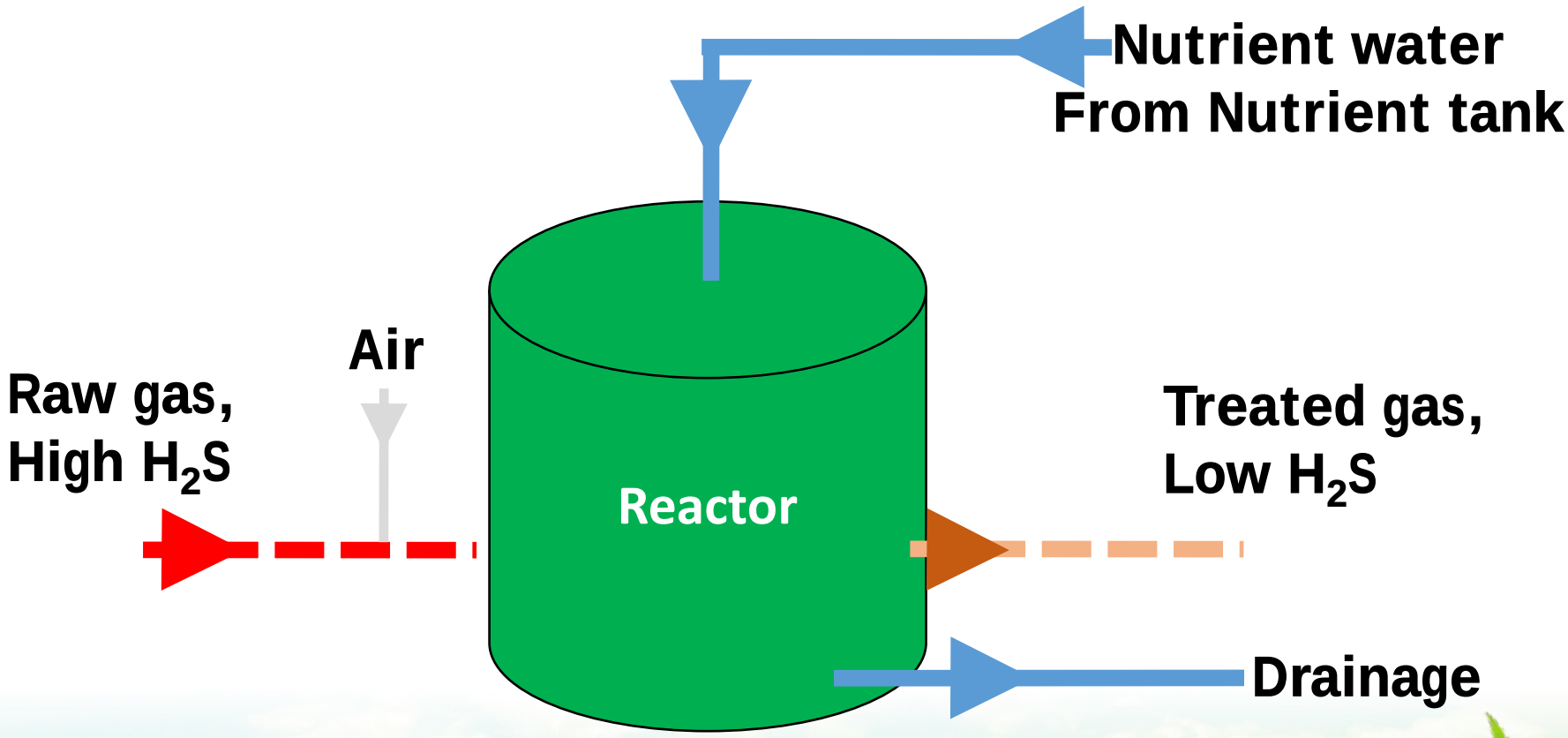
- Use bacteria to reduced H_2S in biogas
- Flow range 50 – 3,000 m^3/hour
- H_2S inlet 3,000-30,000 ppm
- H_2S outlet less than 100-150 ppm



Thiobacillus Bacteria and sulfur nodules (arrow).

H_2S Bio-Scrubber System

H_2S Bio-Scrubber Unit Schematic



Process flow of H_2S bio-removal unit

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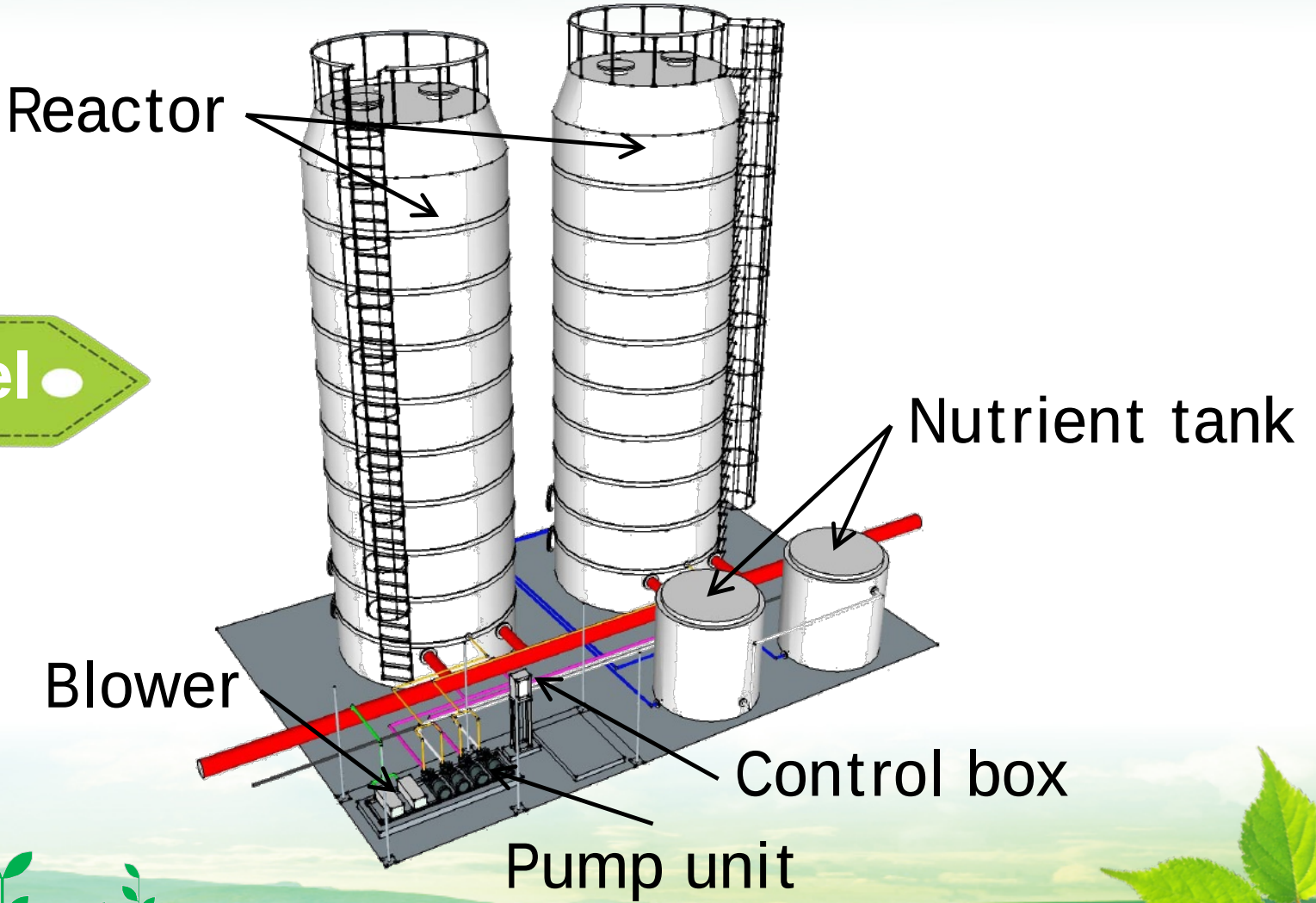
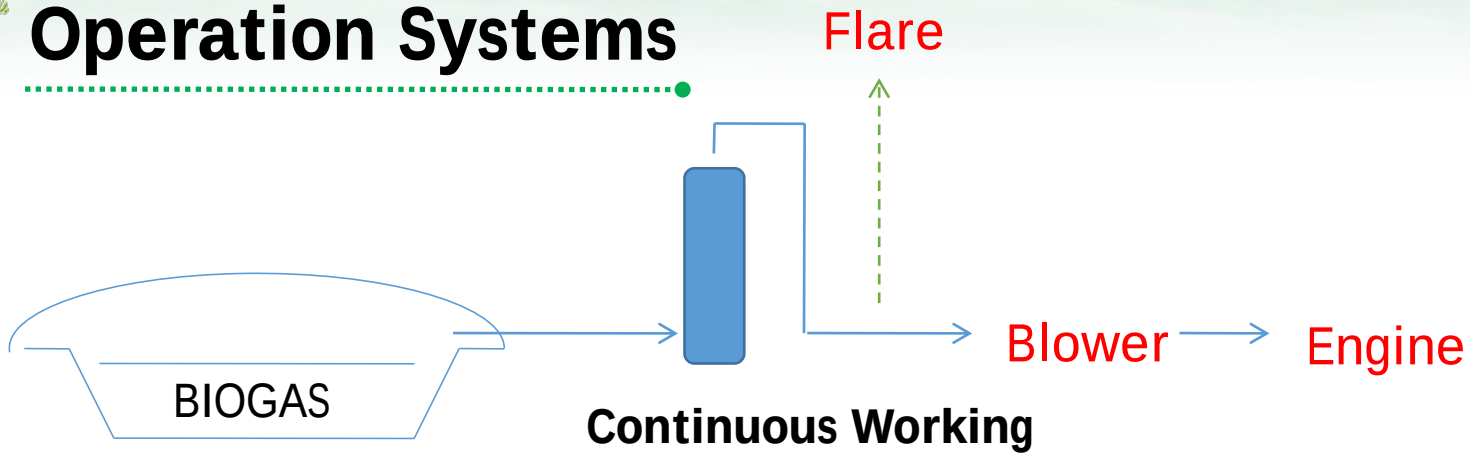
H_2S Bio-Scrubber System

3D Model

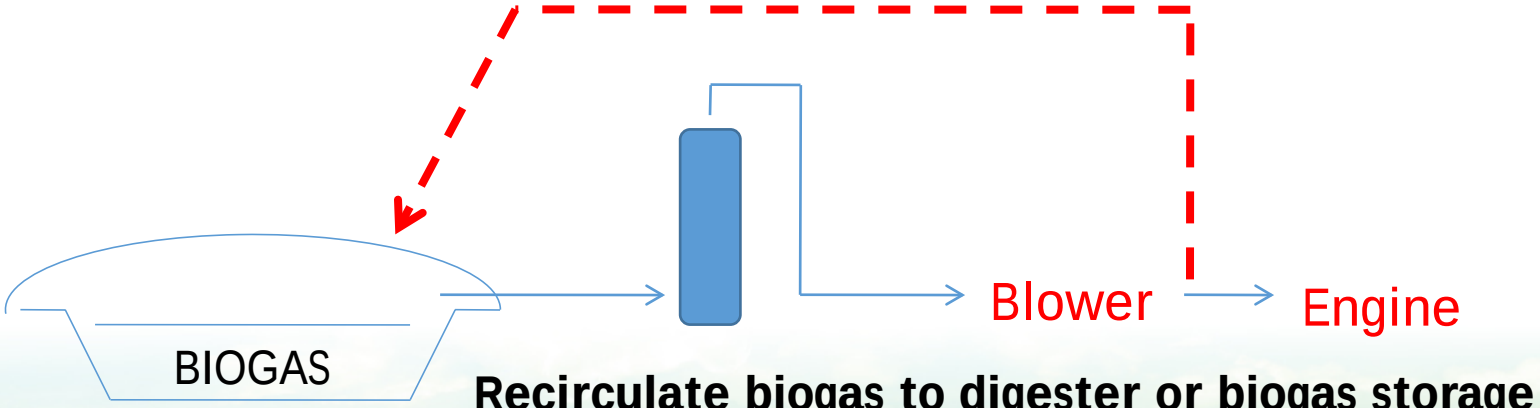


H_2S Bio-Scrubber System

Operation Systems



Continuous Working System



Recirculate biogas to digester or biogas storage (non-continuous)

Project References

Thasae Landsetlement Cooperatives, Chumphon Province

- **Type of Factory:** Palm Oil Mill
- **Biogas Flow rate:** 1,100 Nm^3/hr
- **H_2S Inlet:** 2,000 - 3,000 ppm
- **H_2S Outlet:** < 100 ppm
- **Biogas Utilization:** Gas Engine Generator 2 MW

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Project References

Prachongkit Palm Oil Co.,Ltd. Ranong Province

- **Type of Factory:** Palm Oil Mill
- **Biogas Flow:** 500 Nm^3/hr
- **H_2S Inlet:** 2,000 - 3,000 ppm
- **H_2S Outlet:** < 100 ppm
- **Biogas Utilization:** Gas Engine Generator 1 MW

Project References

Ampol Food Processing Co., Ltd. Nakhon Pathom Province

- **Type of Factory:** Food Processing Factory
- **Biogas Flow:** 150 Nm^3/hr
- **H_2S Inlet:** 3,000 ppm
- **H_2S Outlet:** < 100 ppm
- **Biogas Utilization:** Gas Engine Generator 600 kW

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Project References

Tepkincho Food Co., Ltd. — Samut Sakhon Province

- **Type of Factory:** Food Processing Factory
- **Biogas Flow:** 50 Nm^3/hr
- **H_2S Inlet:** 2,000 - 3,000 ppm
- **H_2S Outlet:** < 100 ppm
- **Biogas Utilization:** Thermal process in Burner

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Project References

Thai Agro Energy Co.,Ltd. Supanburi Province

- **Type of Factory:** Ethanol Factory
- **Biogas Flow:** 1,800 Nm^3/hr
- **H_2S Inlet :** 10,000 - 20,000 ppm
- **H_2S Outlet:** < 200 ppm
- **Biogas Utilization:** Gas Engine Generator 3.6 MW

Project References

EES Renewable Co., Ltd. Ubon Ratchathani Province

- **Type of Factory:** Tapioca Factory
- **Biogas Flow rate:** 2,000 Nm^3/hr
- **H_2S Inlet:** 3,000 ppm
- **H_2S Outlet:** < 100 ppm
- **Biogas Utilization:** Gas Engine Generator 4 MW

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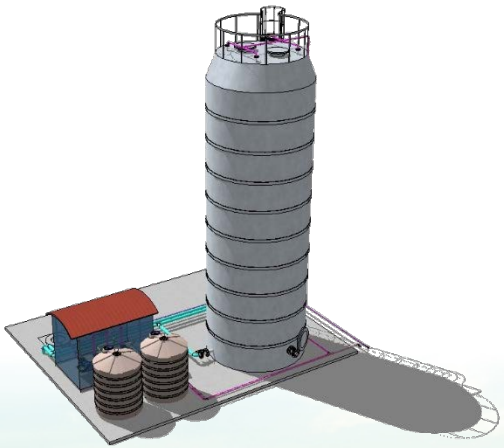
Project References

Somdej Starch Co., Ltd.

Kalasin Province

(Under Commissioning)

- **Type of Factory:** Tapioca Factory
- **Biogas Flow rate:** 1,000 Nm^3/hr
- **H_2S Inlet:** 3,500 ppm
- **H_2S Outlet:** < 100 ppm
- **Biogas Utilization:** Gas Engine Generator 1 MW and Thermal Process in Burner



Project References

Napier Grass Biogas Power Plant, Prachuap Khiri Khan Province

- **Type of Factory:** Napier Grass Biogas Power Plant
- **Biogas Flow rate:** 350 Nm^3/hr (Under Commissioning)
- **H_2S Inlet:** 3,000 ppm
- **H_2S Outlet:** < 100 ppm
- **Biogas Utilization:** Gas Engine Generator 500 kW

Biomass Power Plant Projects Consultant

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Biomass Power Plant Projects Consultant

1) Owner Engineering Services

2) Lender Engineer or Independent Engineering Services

Clients:

Lenders (Banks or Financial Institutes), Investors, Funders, and/or Project Developers

Owner Engineer & Consultancy Services for Biomass Power Plants

Scope of Services

Phase I **Studying and Project Development Phase :**

- Preliminary Design, Conceptual Design
- Project's Feasibility Study
- Site Survey, Site Selection

Phase II **EPC & Suppliers Selection & Contracting Phase :**

- Tendering
- Contractor / Equipments / Vendors Evaluation
- Contracting

Phase III **Implementation Phase :**

- Engineering Approval
- Monitoring and Supervision on Construction
- Commissioning, Performance Testing, Handover

Project References

Owner Engineer Services

Project References

Surat Thani Province

- 6.5 MW EFB/Palm Fiber Fired
- Cogeneration Plant, Palm Oil Mill 60 T-FFB/hour

Project References

Surat Thani Province

- Boiler Plant
- Capacity 50 ton/hour

Project References

Surat Thani Province

Fluegas Cleaning System (ESP)

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EFB Shred and Press for Fuel Preparation., Size and Moisture Reduction

Project References

Surat Thani Province

- 2.5 MW EFB/Palm Fiber Fired
- Cogeneration Plant, Palm Oil Mill 90 T-FFB/hour

Project References

Surat Thani Province

- 2.5 MW EFB/Palm Fiber Fired
- Cogeneration Plant, Palm Oil Mill 90 T-FFB/hour

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Lender Engineer or Independent Engineering Services Services for Biomass Power Plants

Scope of Services

Phase I **Studying and Project Development Phase :**

- Site survey & Site selection
- Raw material survey, Data and information gathering
- Technology review and selection

Phase II **Suppliers Selection & Contracting Phase :**

- Provide services for power plant's permits and licenses
- Review and recommend for EPC contracts and consult owner for contract negotiation

Phase III **Implementation Phase :**

- Site Visit, Monthly Meeting between EPC Contractor, Owner Site Engineer, Independent Engineer (Bank Engineer, etc.)
- Review milestones, deliverables, approval on supported document for loan payment, L/C issuance

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Lender Engineer or Independent Engineering Services

Clients:

Lenders (Banks or Financial Institutes), Investors, Funders, and/or Project Developers

- CIMB Thai Bank Public Company Limited
- Export-Import Bank of Thailand
- TMB Bank Public Company Limited
- Maybank Kim Eng (Thailand) (MBKET)
- Buriram Sugar Public Company Limited

Project References

Lender Engineer Services

Project References

Surin Province

- 17 MW Rice Husk Fired Power Plant

Project References

Nakhon Ratchasima Province

9.9 MW Rice Husk Fried Power Plant

Project References

Nakhon Ratchasima Province

- 9.9 MW Rice Husk Fried Power Plant

Project References

Nakhon Ratchasima Province

- **Boiler Fluegas Cleaning and Stack**

Project References

Nakhon Ratchasima Province

Water Treatment Plant

Project References

Nakhon Ratchasima Province

- **9.9 MW Steam Turbine Generator**

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Project References

Chachoengsao Province

- 200,000 LPD Ethanol Distillation Plant

Buriram Province

- 9.9 MW Wood Bark Fired Power Plant

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Project References

Phrae Province

4.9 MW Woodchip Fired Power Plant

63

Project References

Phitsanulok Province

4.9 MW Woodchip Fired Power Plant

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Project References

Buriram Province

- Technical Independent Engineer, Infrastructure Fund Setup
- 2 x 9.9 MW Bagasse Fired Power Plant

Project References

Buriram Province

- Technical Independent Engineer, Infrastructure Fund Setup
- 2 x 9.9 MW Bagasse Fired Power Plant

Project References

Buriram Province

- Technical Independent Engineer, Infrastructure Fund Setup
- 2 x 9.9 MW Bagasse Fired Power Plant

Project References

Buriram Province

- Technical Independent Engineer, Infrastructure Fund Setup
- 2 x 9.9 MW Bagasse Fired Power Plant

Project References

Nakhon Ratchasima Province

2 MW Cassava Pulp Cake Biogas Power Plant

Project References

Nakhon Ratchasima Province

2 MW Cassava Pulp Cake Biogas Power Plant

Project References

Nakhon Ratchasima Province

2 MW Cassava Pulp Cake Biogas Power Plant

Contact Us

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