Organic waste biogas & organic fertilizer production business proposal

(Facility capacity 1,000 tons/day)

DHM Global Inc

Ver2025

1. Business Overview

1.1 Resource circulation system.

Organic waste.

- Livestock manure/ Animal carcass
- Food waste
- Agricultural by-products.
- Forest waste.
- Sewage sludge.
- Household waste.

Anaerobic digestion system.

animal carcass

Energy production.

- Biogas. [CH4]
- Electricity / CNG / Hydrogen
- Waste heat / Heating

Fertilizer production.

- Organic liquid fertilizer.
- Organic compost.

CDM/Sales

Organic crop cultivation.

sales

Eco-friendly / resource circulation.

1. 1,000 ton/day biogas plant Business Overview

1.2 Business Goals

Business name	Organic Waste Renewable Biogas & Organic Fertilizer Production Business
Processing capacity	1,000 tons / day
Facility scale	Waste Energy and Resources Facility
Budgetary	

- Separator for Recycling
- Biogas facility
- Liquid Fertilizer facility
- Composting facility

Area	Total area	Energy facilities	Recycling facilities	Construction period
	120,000m^2	Decision at design time	Decision at design time	36 months (based on permission License& Certificate)

※ It can be changed in basic and detailed design (KOREA BUSAN FOB)

※ The business site is provided by SPC Corporation in the United States.

1. Business overview

1.3 Business Purpose

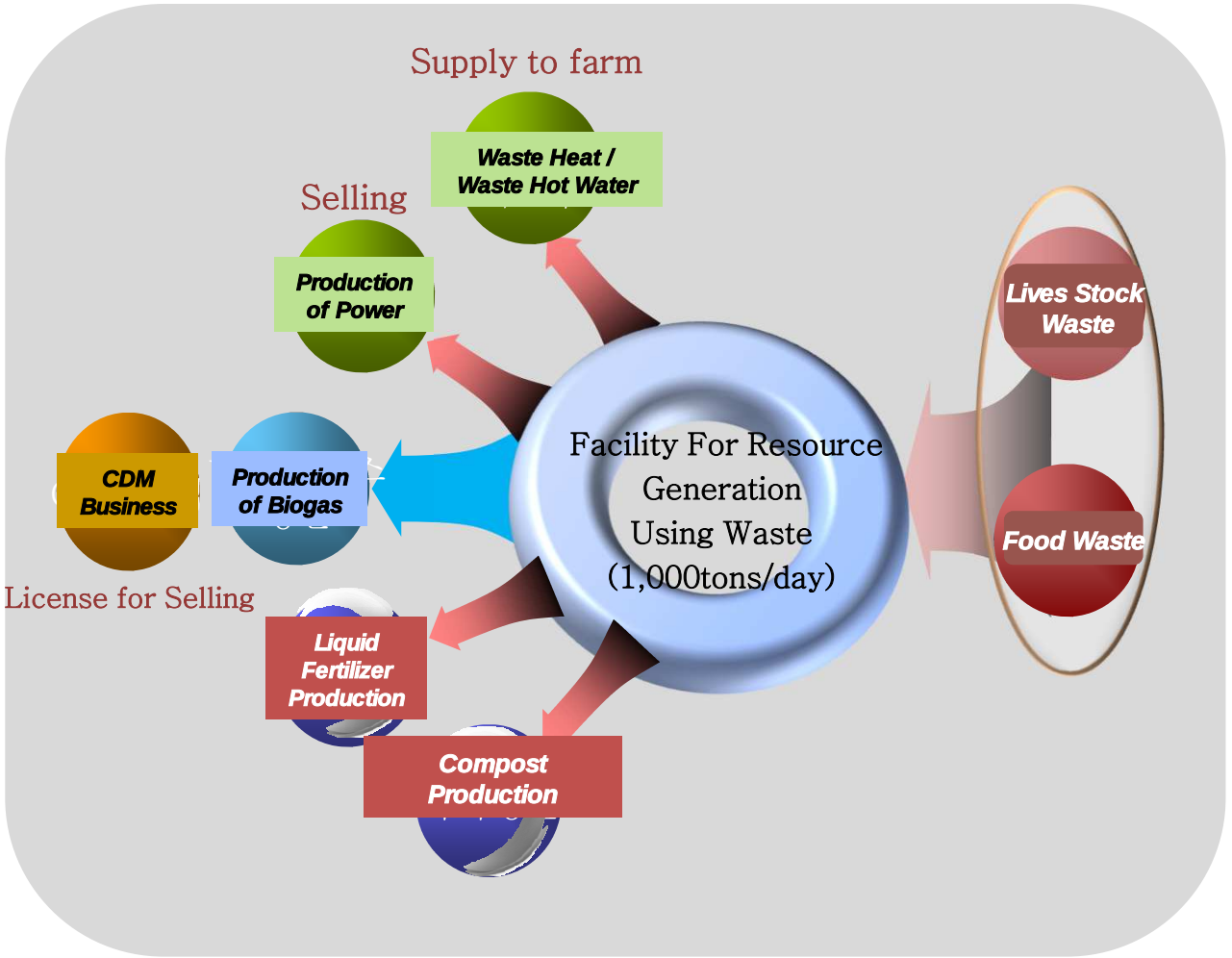
- Realizing Eco-Friendly Clean City
- Solving local waste disposal problems - Rationalized integrated management
- Increase job creation for local residents
- Promoting rural vitality and fostering low carbon green industry - Creating high profit
- Adapt to climate change and strengthen international policy cooperation
- Improvement of water quality for keeping the regulation of living and livestock wastewater wastewater discharge standards

1. Business overview

1.4 Industrial Performance

Expectations

- Improvement of living environment and establishment of energy independent town
- Increasing farming income, creating jobs for the local residents
- Growing resource circulating green industry



➢ Replacement Of Chemical Fertilizer By Recycling Of Organic Waste
→ Higher Income Expectation Of Farmers By Producing Organic Compost And Liquid Fertilizer

1. Business overview

1.5 Economic performance

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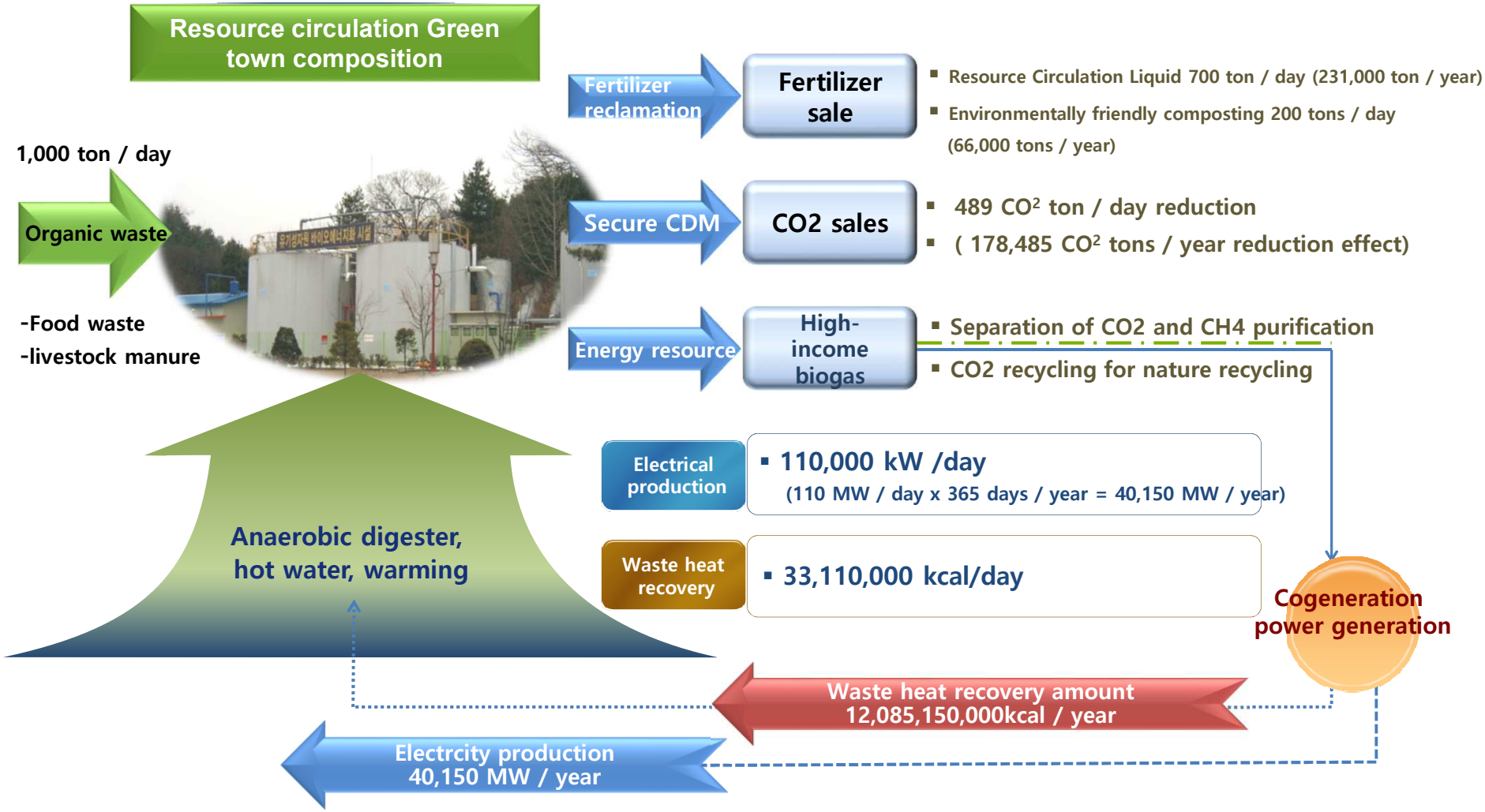
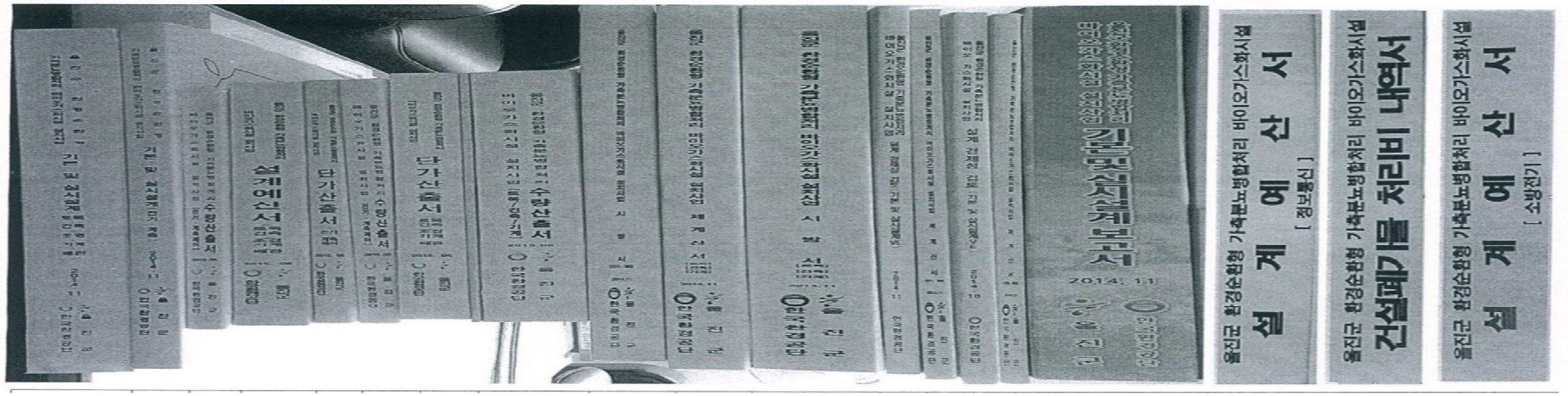


2. Reliability of source technology for biogas plant

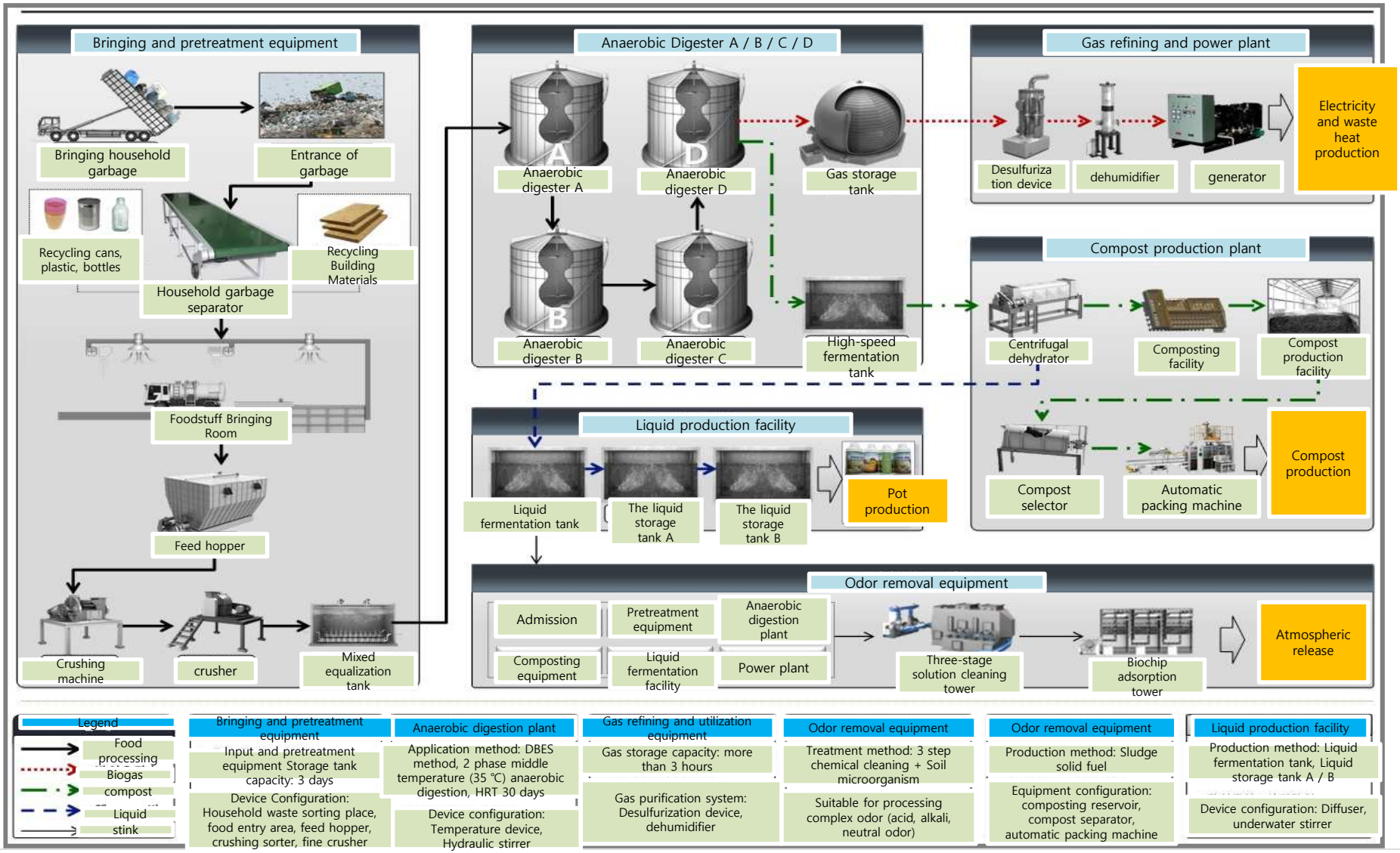
◎ Biogas plant DBES construction method comprehensive design book

- ❖ The anaerobic digestion DBES method is supported by the Ministry of Agriculture and Forestry for the localization and development of biogas plant R&D (NO1: completed in April 2005 ~ March 2007)
- ❖ NO2: May 2007 ~ April 2010), secured source technology & received national DBES certification for new technology.
- ❖ DHM source technology was established through R&D (NO3: 5 years from 2011) for high-efficiency commercialization development of biogas plants supported by the Ministry of Environment.
- ❖ It is a waste new and renewable biogas plant technology that has been proven reliable by DHM's experience in field installation, operation and management of 9 demonstration plants.
- ❖ 100% of the plant's core equipment has been commercialized locally, and it is possible to shorten the delivery period for new plants, simplify maintenance and respond quickly.
- ❖ The biogas plant design factor is a biogas plant optimization design system that applies the operating factors established by DHM in various installation site environmental conditions for 16 years.
- ❖ Gimje Green Village (completed in 2011) supported by the Ministry of Agriculture, Food and Rural Affairs/Rural Development Administration, and Hongcheon Eco-friendly Energy Town (completed in 2015) supported by the Ministry of Environment were designed, manufactured, and installed biogas plants as a construction company. , DBES method.



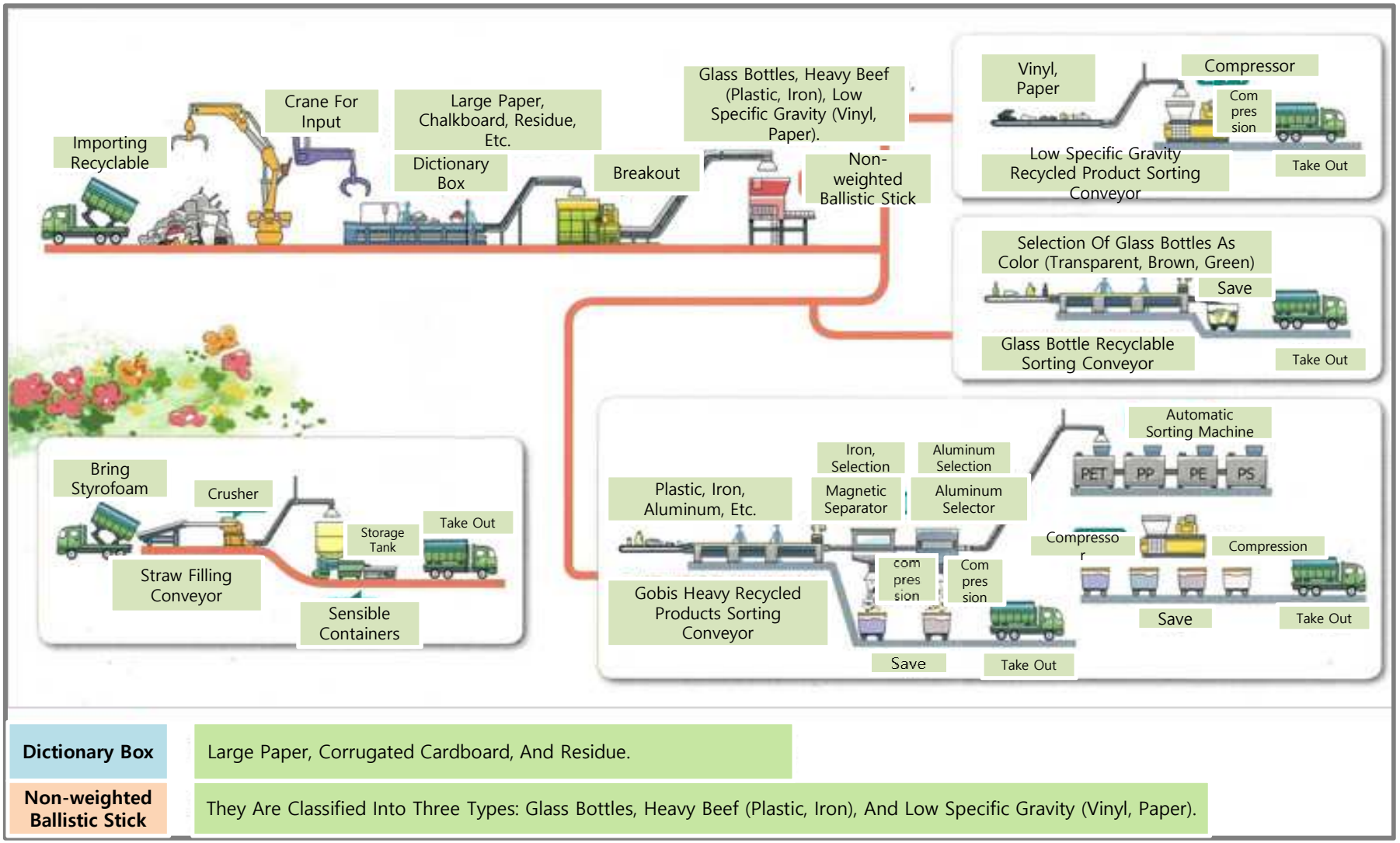
2. Biogas Plant Production Process Chart

◎ Anaerobic digestion method (DBES) process using life garbage



3. Major Equipment

3.1 Life Garbage Recycling Screening Process

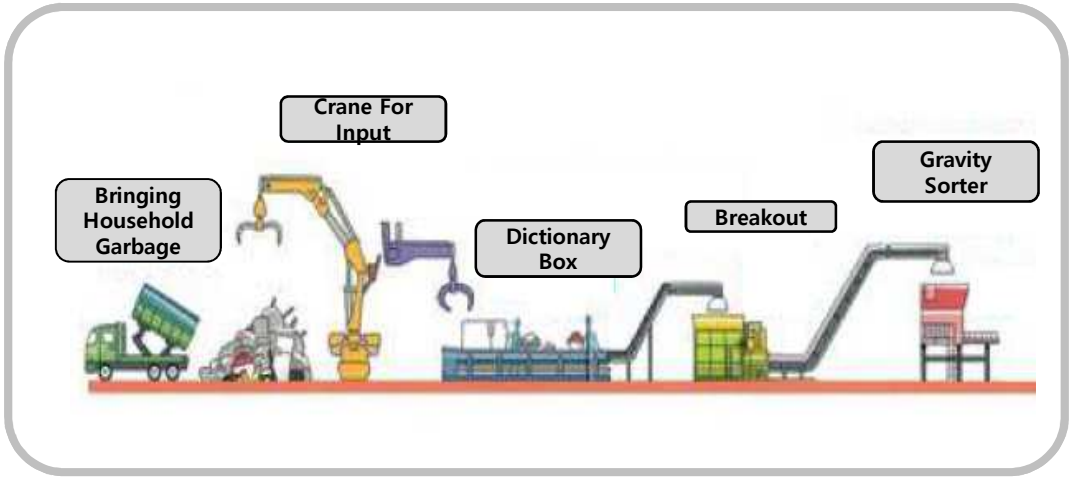


Dictionary Box	Large Paper, Corrugated Cardboard, And Residue.
Non-weighted Ballistic Stick	They Are Classified Into Three Types: Glass Bottles, Heavy Beef (Plastic, Iron), And Low Specific Gravity (Vinyl, Paper).

3. Major Equipment

3.2 Pretreatment Equipment

- Classification Of Life Garbage Sorting Facility



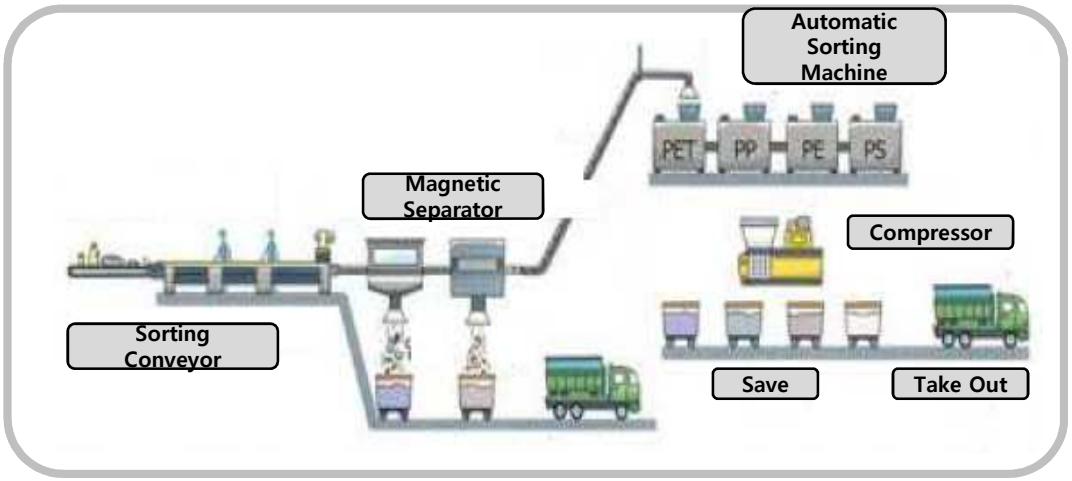
Entrance Of Life Garbage

-Usage: Picking Collected Life Garbage And Selecting
-Type: RFID System, Sealed Structure
-Capacity: 1,000 Tons / Day

Crane For Input

-Usage: Crane Putting Life Garbage Into A Sorting Hall
-Type: Articulated Tongue Crane
-Capacity: 100 Tons / Hour

- Recyclable Goods Sorting Facility



Magnetic Separator

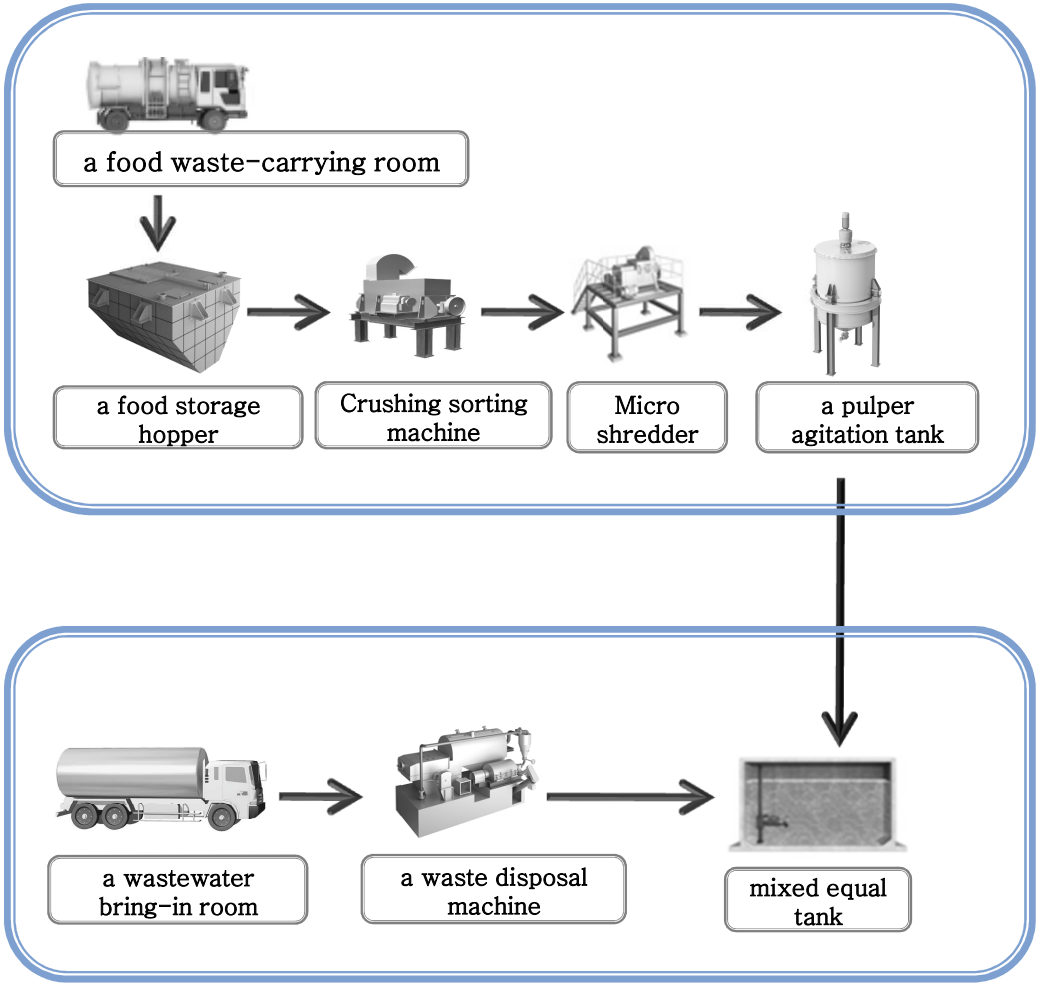
-Uses: Automatic Sorting Of Iron Cans By Electromagnets
-Type: Electromagnet Selection
-Capacity: 100 Tons / Hour

Semi-automatic Compressor

-Uses: Equipment For Compressing And Binding Vinyl, Paper, And Cans
-Type: Semi-automatic Hydraulic Type
-Capacity: 100 Tons / Hour

3. Major Equipment

3.3 Food waste pretreatment facility



a storage hopper

-Use: Food storage function
-Type: Closed hopper + skew conveyor
-Capacity: 3-day storage capacity

crushing separator

-Use: First wash food in a certain size (vinyl, foreign substances)
-Type : Rotor Sorting Crucher
-Capacity: 50㎥/h

micro shredder

- Use: Second fine grinding of food
- Type: Double hammer mill
- Capacity: 50㎥/h

a pulper agitation tank

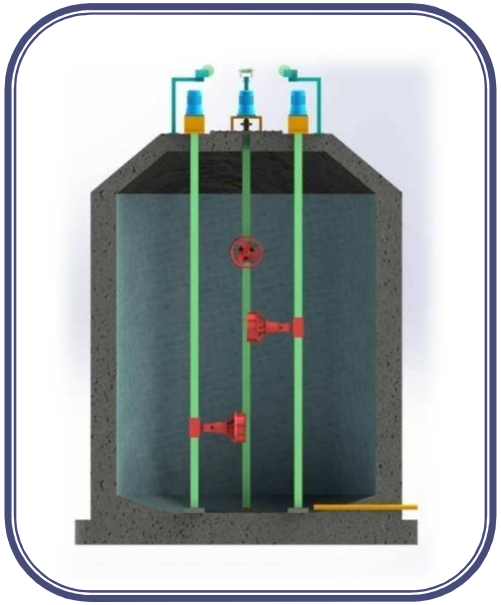
-Use: Specific gravity separator (shells, metals, bones)
-Type: Cylindrical self-standing type (ribbon type stirrer)
- Capacity: 50㎥/h

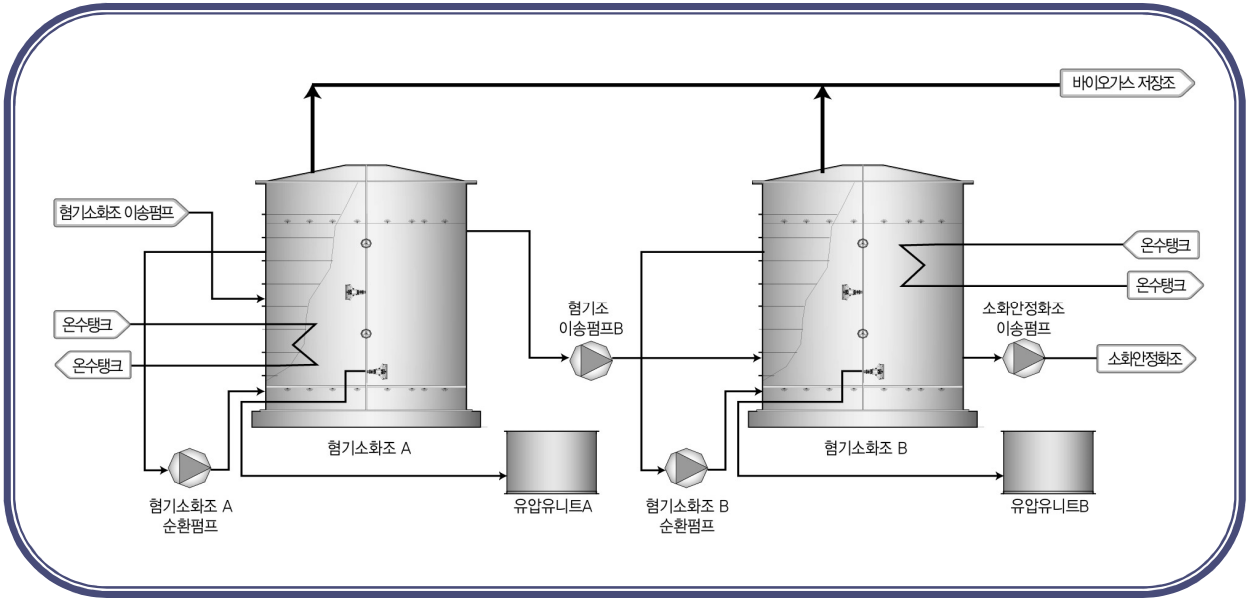
a waste disposal machine

-Use: To remove foreign substances from livestock excrement
-Type: Closed drum screen
- Capacity: 50㎥/h

3. Major Equipment

3.4 Characteristics of DBES Anaerobic Digestion Method





Pure domestic anaerobic digestion technology (DBES method) completed with high efficiency hydraulic agitator

- Biogasification facilities installed in Korea lack residence time due to the deposition of solids in the fire extinguishing tank, deterioration of fire extinguishing efficiency, There are many difficulties in managing the operation and management of anaerobic digester at the biogas plant site, such as a decrease in biogas production.

High efficiency hydraulic stirring fermentation technology, which is a key factor in determining digestion efficiency!!!

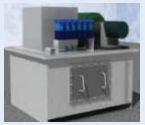
- The DBES biogasification facility prevents deposition by inorganic solids by applying a high-efficiency hydraulic drive stirrer in the digester By improving problems such as suppressing scum generation and maximizing gas volume, the operational stability of eight demonstration facilities is improved even at TS10% or higher
  It is a proven domestic commercialization new technology system that has received NEP certification for new national technology products through strict on-site facility screening by the National Institute of Technology and Standards.

3. Major Equipment

3.5 Efficiency Of DBES Method

Specification Of DBES

Hydraulic Drive Unit



-Hydraulic Power Generating
-Supply Hyd. Oil To Agitator Motor
-Free From Explosion/Firing Acc.

Hydraulic & Submersed Agitator

-Up, Down, Left And Right Rotation Of Agitator
-No Agitation Dead Zone Occurs
-Agitation Of Highly Concentrated Sludge Is Available

Heating Pipes

-Indirect Heating
-Install Heaters
-Using Of Wasted Heat

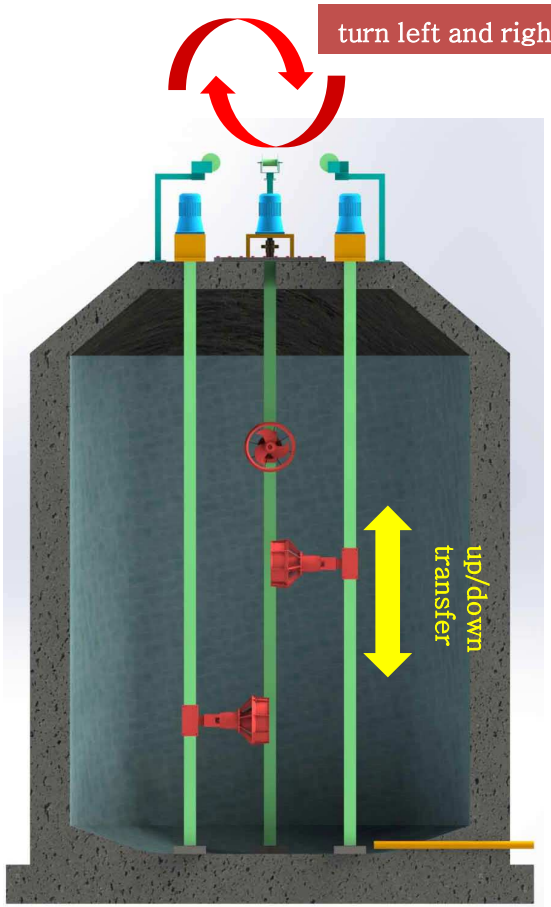
1-phase Anaerobic Digestion

-Preventing Total Damage Of The Plant Due To Sludge Blocking
-Parallel Operation Of Six Agitators

Category	Operating Factors	Characteristics
Digestion Type	• 1-phase Wet Type Anaerobic Digestion	• Favorable To The Appearance Features Of Domestic Waste
Digestion Duration (HRT)	• Acid Fermentation : 15 Days, Methane Fermentation : 15 Days	• Incoming Organisms– Applying Microorganisms– Excellent Microorganism And Driving Condition Stability
Heating Type	• Indirect Heating (Using Recovered Waste Heat From Co-generator)	• Reduce And Prevent Microorganism Impact And Extinction Respectively
Agitation Type	• Hydraulic Driven Submersible Agitator	• High Efficient Agitation Of High Concentrated Sludge, And No Malfunction
Operation Temperature, Ph	• Middle Temperature Digestion (38℃), Ph6.8~ 8,0	• Storing Temperature Of Food Garbage Is Similar To Middle-temperature Digestion Condition; Applying Of Middle-temperature Digestion To Microorganism Is Effective And Stable For Biogas Production

3. Major Equipment

Propeller Agitator Installation Diagram



summary

• A method of stirring by installing a movable hydraulically driven propeller inside the anaerobic digestion tank.

• The stirring position can be controlled by automatically driving the agitator up, down, left and right.

•Main components: hydraulically driven propeller agitator, hydraulic unit, hydraulic hose, left and right vertical movement device

Features

• Realization of complete stirring (NO DEAD SPACE)

• Enhancing digestion efficiency by inducing sufficient contact and homogeneous reaction between influent water and microorganisms.

• Maintain a uniform fire extinguishing temperature (38℃ upper/lower temperature difference less than ±0.5℃).

• There is no sedimentation or sedimentation phenomenon at the bottom of the bottom.

• Prevention of precipitation of inorganic solids (FS recovery rate of 95% or more).

• Possible to remove scum (no need for a separate scum removal device)

• energy cost savings

• Power cost savings through intermittent operation with strong stirring force. (15-minute operation➜45-minute stop, 24 times/day operation)

• Agitation intensity can be adjusted according to the inlet substrate (agitator 50~1,000 RPM).

• Securing durability and safety

• Non-motor type, short circuit and explosion hazard protection.

•There is no power part in the digester, so maintenance is easy.

NEP 신제품인증 NEW EXCELLENT PRODUCT

The propeller hydraulic driven agitation method is an anaerobic digester-exclusive stirrer and is the only product in Korea that has received NEP (New Product Certification) certification..

3. Major Equipment

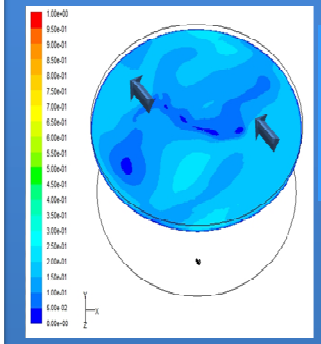
3.7 Hydraulic Stirring System Flow Analysis

(On The Basis Of 1,500ton Stored Digestion Tank)

Flow Pattern At Top Side Plane

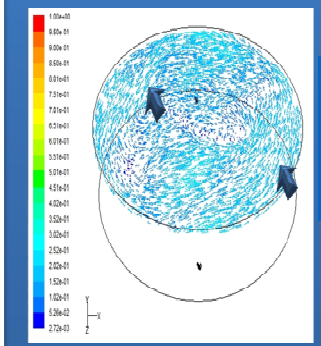
Hydraulic Agitator

Mean flow rate > 0.3 m/s



Mean Flow Rate : 0.1~0.3 m/sec

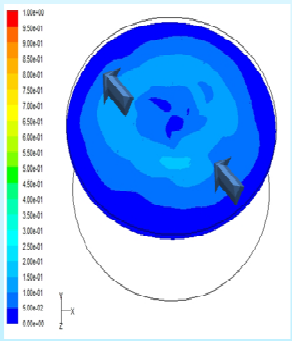
Decision point : Existence of horizontal flow and mixed flow



No Horizontal flow Existence

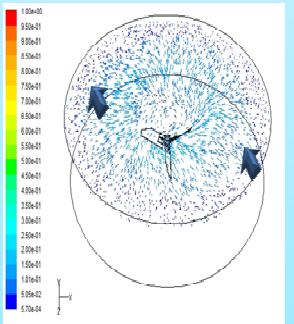
Conventional Agitator Driven By Electric Motor

Mean flow rate > 0.3 m/s



Surface Flow Rate : 0~0.1 m/s

Decision point : Existence of horizontal flow and mixed flow

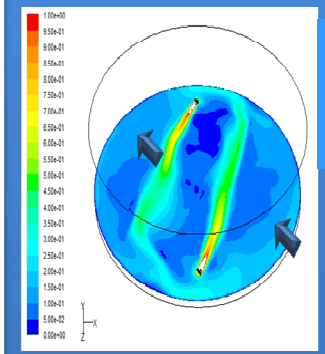


Proper flow exist but not enough cir-cumfer-ential flow

Flow Pattern At Bottom Side Plane

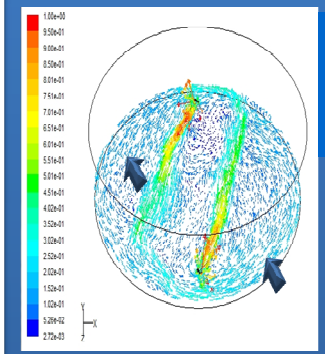
Hydraulic Agitator

Mean flow rate > 0.1 m/s



Mean Flow Rate > 0.1m/sec

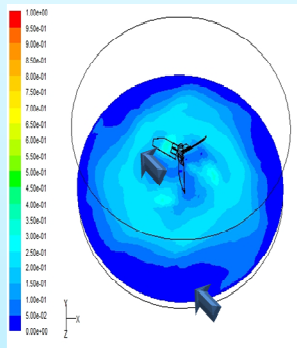
Decision point : Existence of horizontal flow and mixed flow



No Proper Flow for Agitaing

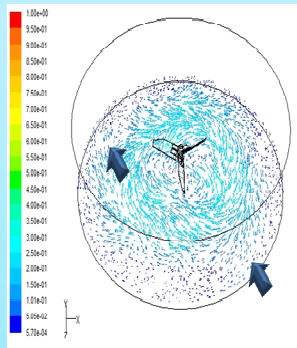
Conventional Agitator Driven By Electric Motor

Mean flow rate > 0.1 m/s



Steady flow exist in central bottom but lower than 0.05m/s

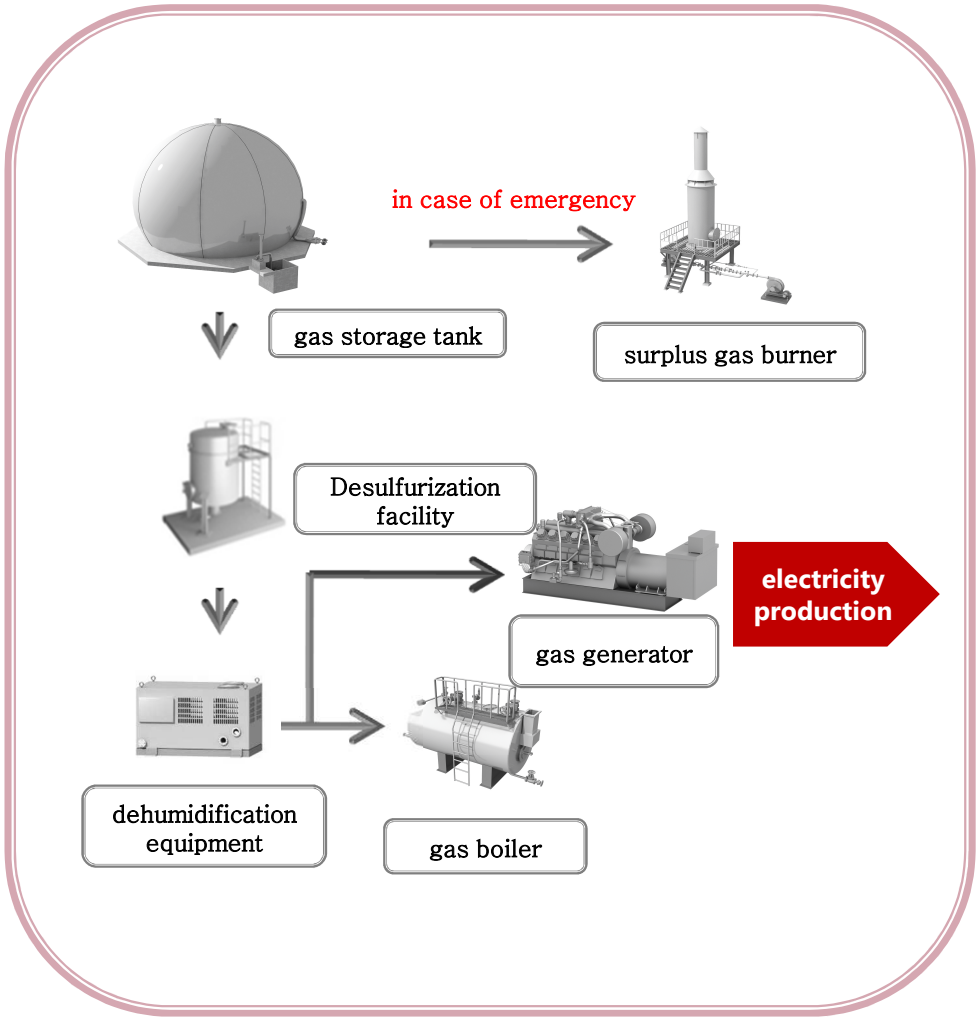
Decision point : Existence of horizontal flow and mixed flow



Proper flow exist but settling around cir-cumfer-ence suspect-ed

3. Major Equipment

3.8 Biogas Storage and Refining Plant



gas storage tank

-Use: Biogas storage function
-Type: double membrane
-Capacity: 6,000㎥ (3 hours storage capacity)

Desulfurization facility

-Use: H2S (hydrogen sulfide) removal
-Type: dry type, free-standing cylindrical type
-Capacity : 2,000㎥/h

dehumidification equipment

−Use: Biogas water removal function
-Format: Air-cooled
-Capacity : 2,000㎥/h

gas boiler

-Use: for heating the digester
-Format: Notong related expression
-Capacity: 1,500,000Kcal/h

surplus gas burner

-Use: Incineration of surplus biogas
-Format: Cylindrical free-standing
-Capacity : 4,000㎥/h

3. Major Equipment

3.9 Cogeneration biogas generation system

- A Heat- exchange Device Will Collect Waste Heat Produced In The Generator, Engine Coolant And Exhaust Gas To Utilize Them To Heat Anaerobe Digester, Barns, Dormitory, And Greenhouses.
- Design & Manufacture To Use The Bioenergy For Continuous Operation.

- ***Electricity Efficiency: 33 % (24 Hour Operation)***
- ***50% Of Waste Heat Will Be Used To Heat Water***
- ***Type : Bioenergy- dedicated Domestic Cogeneration***
- ***Capacity Of The Generator 3,000kw: 2 EA***
- ***Heat- exchange Collection Ratio: More Than 50%***

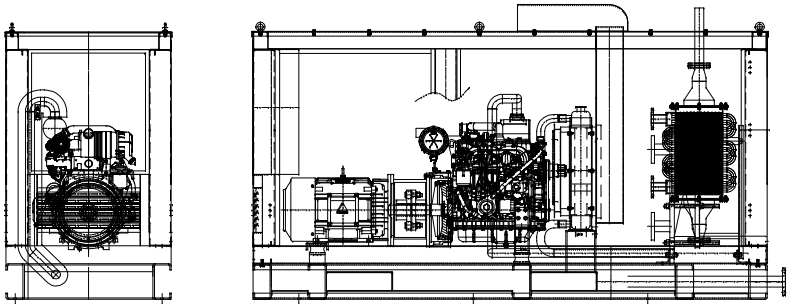
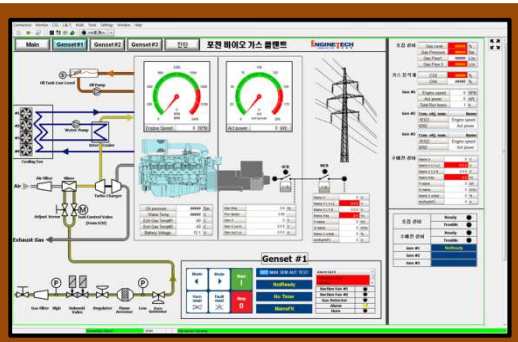
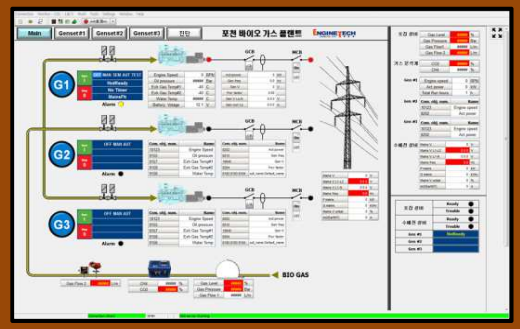


Diagram For Cogeneration

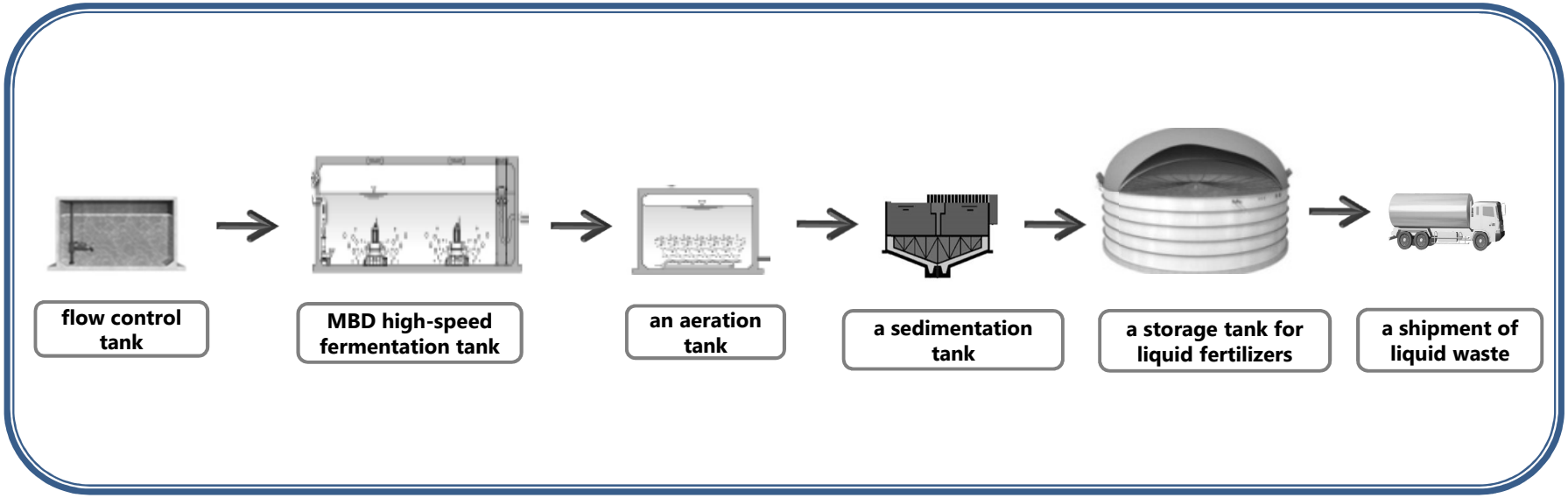
Generator control system main screen





3. Major Equipment

3.10 Liquid Fertilizer Facility



flow control tank

-Capacity: 2,100 ㎥
-Type: Concrete Reinforced Concrete Structure
-HRT: 3 Days
-Construction: Underwater Discharge Pump + Underwater Agitation Device + Diffuser

MBD high-speed fermentation tank

-Capacity: 5,000 ㎥
-Type: Concrete Reinforced Concrete Structure
-HRT: 7 Days
-Configuration: MBD Unit + MBD Circulation Pump + Blower + Sludge Circulation Pump.
-Features: High-speed Fermentation Process Using Mbd.

an aeration tank

-Capacity: 7,000 ㎥
-Type: Concrete Reinforced Concrete Structure
-HRT: 10 Days
-Construction: Sludge Flotation Device + Blower + Diffuser + Feed Pump + Agitator.

Liquid Storage Tank

-Capacity: 21,000 ㎥
-Type: Concrete Reinforced Concrete Structure
-HRT: 30 Days
-Composition: Diffusion Device + Turbo Blower + Liquid Transfer Pump + Stirrer + Microorganism Supply System.

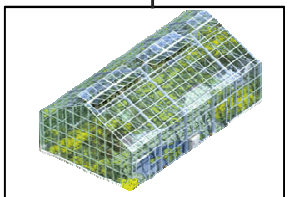
3. Major Equipment

Conventional treatment of liquid fertilizer

liquid fertilizer	Ammonia produced when air contacts to LF
Liquid fertilizer stored in aerobic digest tank	Removing ammonia in the aeration tank
Liquid fertilizer stored in aerobic digest tank	By aerobic digestion process Handles odorous substances
High-speed fermenter	Liquid fertilizer treatment process
MBR filtering system	Commercialize LF
Liquid fertilizer commercialization	Business profit

Glass greenhouse, vinyl house, golf course
Rice farming spraying Substitution of chemical fertilizer into corn, sugarcane crops

Alkaline liquid fertilizer PH 8 ~ 8.5


Glass greenhouse


plastic house


golf course

Sales revenue

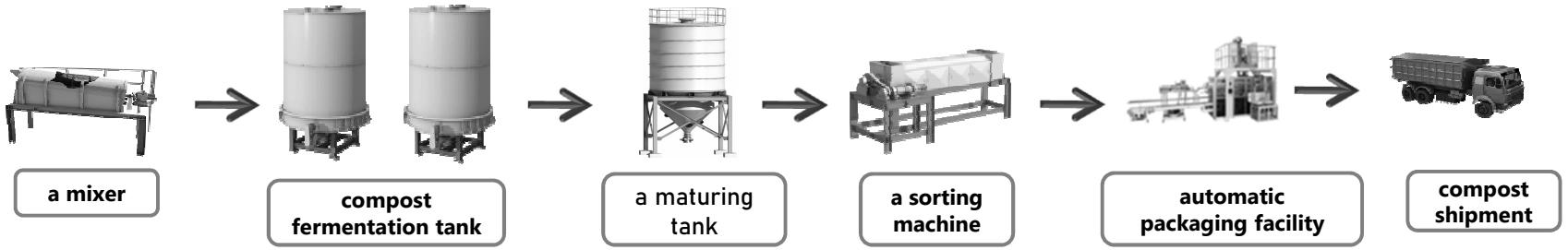
Substitution of chemical fertilizer ➡ Organic liquid fertilizer and compost production

Organic fertilizer supply contributes greatly to health by producing vegetables, fruits and rice.

➢ ***Sterilization and heat treatment at 80°C or higher for about 30 minutes to treat the germs remaining in the digestive juice.***

3. Major Equipment

3.12 Composting facility



an carry mixing tank

- Capacity: 3,000 ㎥
- Form: Concrete steel structure
- HRT: 10 days
- Composition: Skidloader + blower + Floor Ventilation Facility

a fermentation tank

- Capacity: 3,000 ㎥
- Form: Concrete steel structure
- HRT: 15th
- Composition: Escalator Stirrer + Sea ventilation system + blower+ leachate discharge facility

a maturing tank

- Capacity: 6,000 ㎥
- Form: Concrete steel structure
- HRT: 30 days
- Composition: Leach water discharge pump + sea water Ventilation system + blower + deodorizer

automatic packaging facility

- Capacity: 200 tons/day
- Form: Concrete steel structure
- Composition: Hopper+ Buncher + Selectors+ Weighing System + Automatic Packaging Machine

3. Major Equipment

3.13 Compost production process

Blending tank

Deodorization absorption tower (cleansing type)

Compost shipment

Automatic packaging line

A post-storage reservoir

Escalator stirrer

Fermentation tank

3. Major Equipment

3.14 Odor Removal Equipment

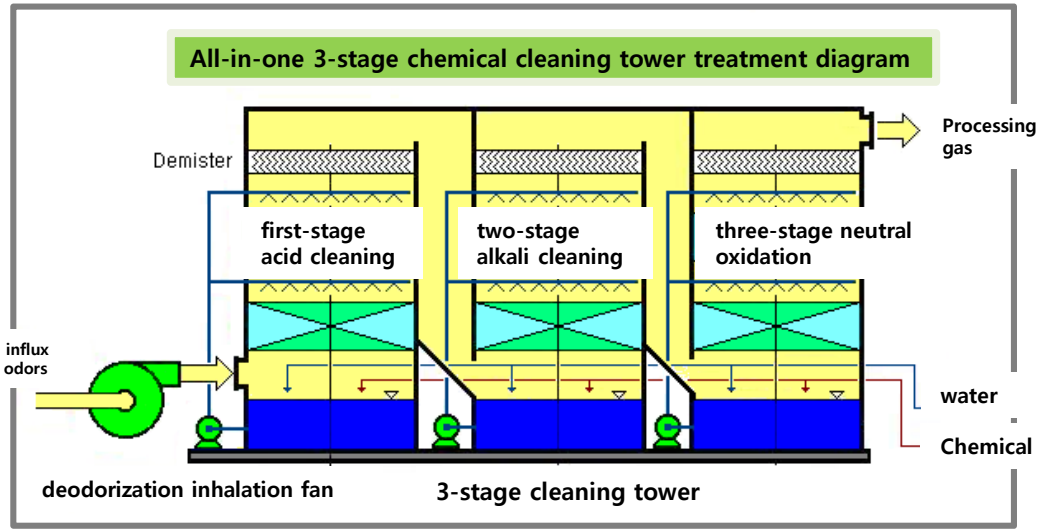
division	High, low odor removal equipment	Characteristic
summary	■ It is a facility to remove the odor of the entire facility. It consists of odor collecting duct low odor odor washing tower, high concentration odor odor washing sorter, deodorizing fan, and chemical feeding device.	■ High odor can be treated at low concentration. ■ Dust and dust can be removed at the same time. ■ High deodorization efficiency and suitable for high concentration treatment. ■ Effective for complex odor. ■ The concentration of the pH in the scrubber is changed according to the concentration of the chemicals to effectively remove the odor. ■ Excellent facility and operation management, low operating cost.
Configuration	■ Type: Wet chemical liquid cleaning system. ■ Structure: Three-stage scrubber for removal of odor of high concentration and low concentration. ■ Material: FRP + SUS304	

3. Major Equipment

3.15 Three-stage chemical cleaning process

In addition to acidic and alkaline odors, complex odors of various types and properties occur during the treatment process, so dust and dust are simultaneously removed by a three-stage chemical cleaning method (alkali gas treatment, acid gas treatment, neutral gas treatment, etc.

an alkaline odor Remove (Stage 1) → an acid odor Remove (2nd Stage) → a neutral odor Remove (3rd Stage)



❑ Reaction principle of three-stage chemical cleaning method

Single-stage treatment (elimination of alkaline odors)

-Substances to be removed: alkaline odors such as ammonia, trimethylamine, etc
-Chemicals used: sulfuric acid (H2SO4)
-Reaction formula: $NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$
$(CH_3)_3N + H_2SO_4 \rightarrow (CH_3)_3NH_2SO_4$
-Characteristic: Neutralizing alkaline gas with a chemical solution

Two-stage treatment (acid odor removal)

-Substances to be removed: Acid odor such as hydrogen sulfide, methyl mercaptan, etc
-Chemicals used: caustic soda (NaOH)
- Reaction formula : $H_2S + NaOH \rightarrow Na_2S + H_2O$
$CH_3SH + NaOH \rightarrow CH_3SNa$
-Characteristic: Removal of acidic odorous substances

Three-stage treatment (removing neutral odors)

-Substances to be removed: neutral odors such as acetaldehyde, styrene, etc
-Chemicals used: Soda Hypochlorite
- Reaction formula: 2NH3 + 3NaOCl → N2 + 3NaOCl + 3HO
-Characteristic: Neutral odorous substances are removed

3. Major Equipment

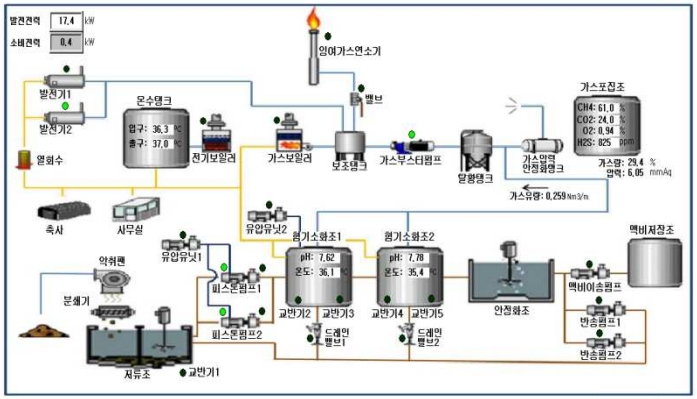
3.16 Plant operation status monitoring

- Monitoring and control/measurement technology according to process On/offline remote control system

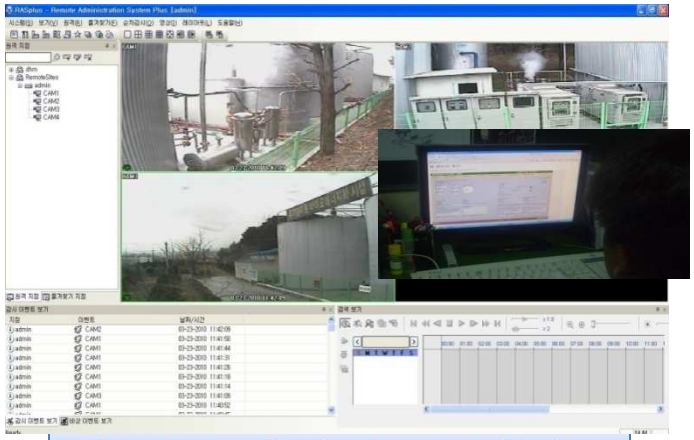
Unmanned monitoring → management of internal situations and external operation parameters

- Control and measurement items

Raw material storage / flux / digester fluid / digester temp./ digestive fluid pH / gas volume / digestive fluid specific discharge pH / storage flux, pH / gas storage volume / pressure / methane / hydrogen sulfide concentration / generation volume/ heating water temp./ emergency ejector/ automatic collector/ desulfurization ventilator of digester/ hydraulic pump/ residual gas incinerator/ gas leakage warning system / monitoring camera



Monitoring screen of comprehensive plant generation and control

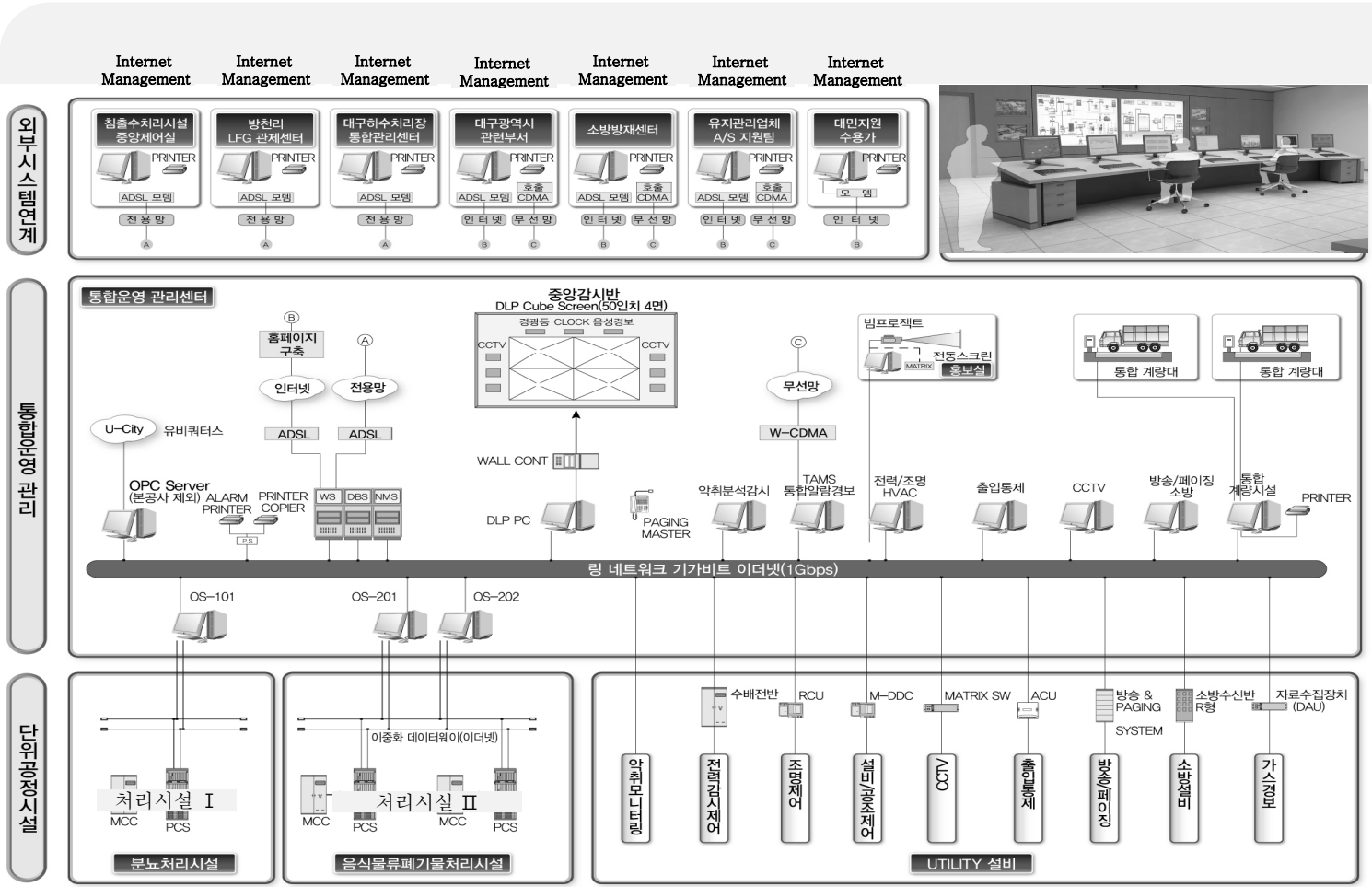


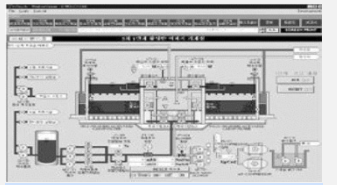
On-site monitoring through CCTVs

3. Major Equipment

3.17 Additional facilities: Monitoring and control system

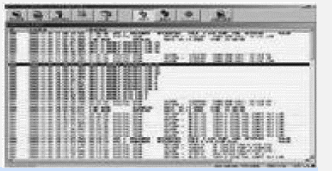
It can be changed in basic and detailed design



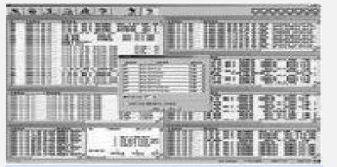


Monitor monitoring function

Control function



Operation management function



Operations Management

- Centralized monitoring + distributed control method, PLC + PC control, DB Web Internet server method

4. 1,000 ton/dey Planning your installation

● Plant Placement: Site Planning

■It can be changed in basic and detailed design

Harmony with the surroundings

Step-1 Required site planning

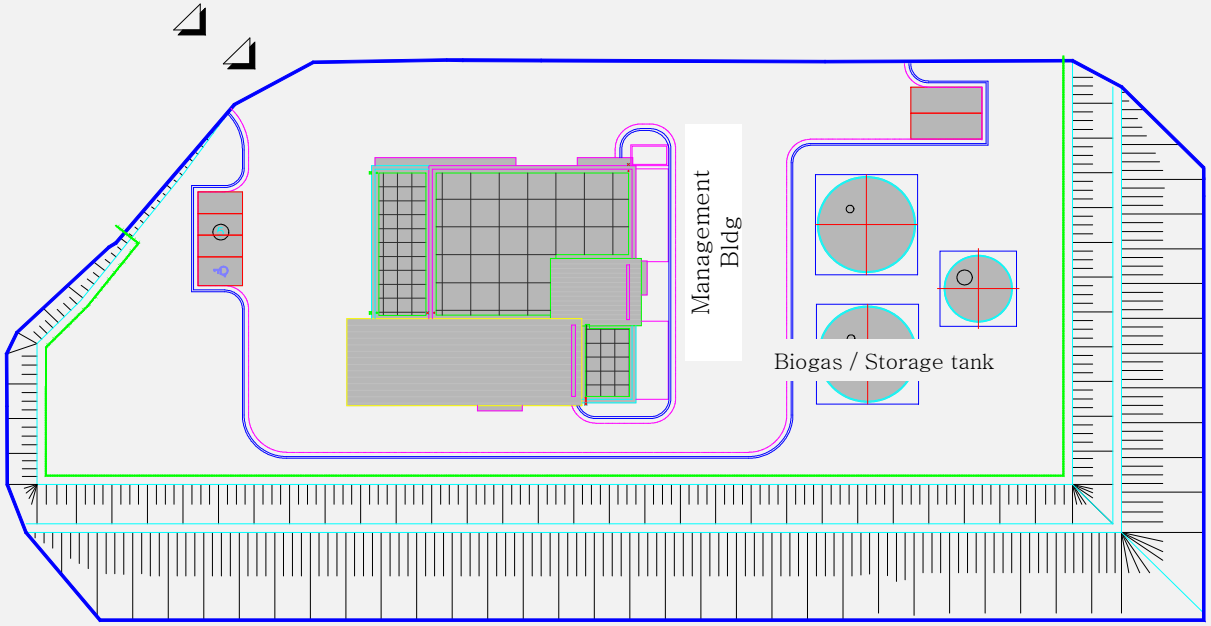
Area: 120,000㎡

- -Bio copper
- -Gas storage / refining copper
- -Liquor and composting / management
- -Recycling Separator

Step-2 녹자공간의 연계

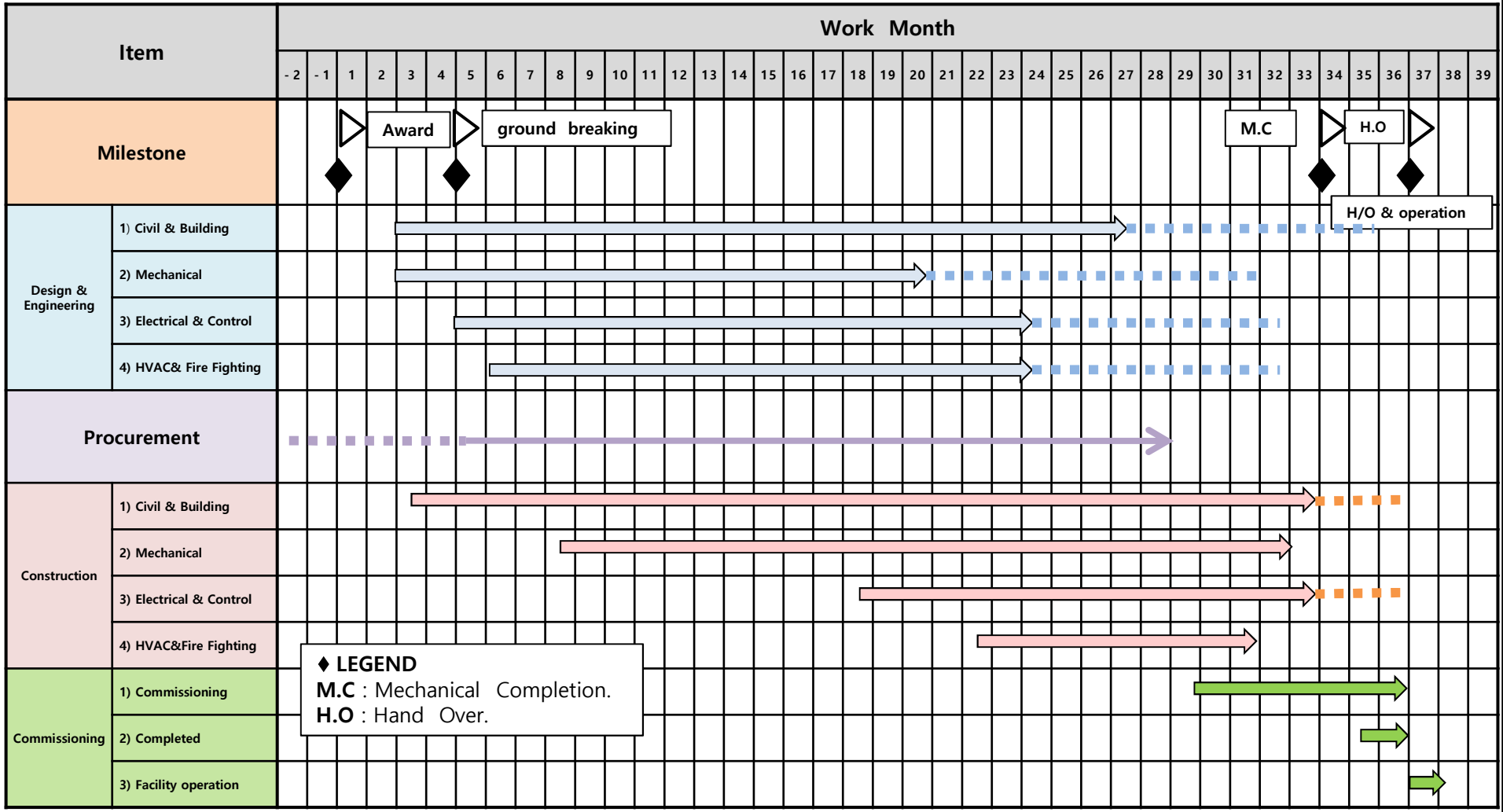
Step-3 SUNKEN 형식의 지하 반출영역

Layout plan



5. Project Plan

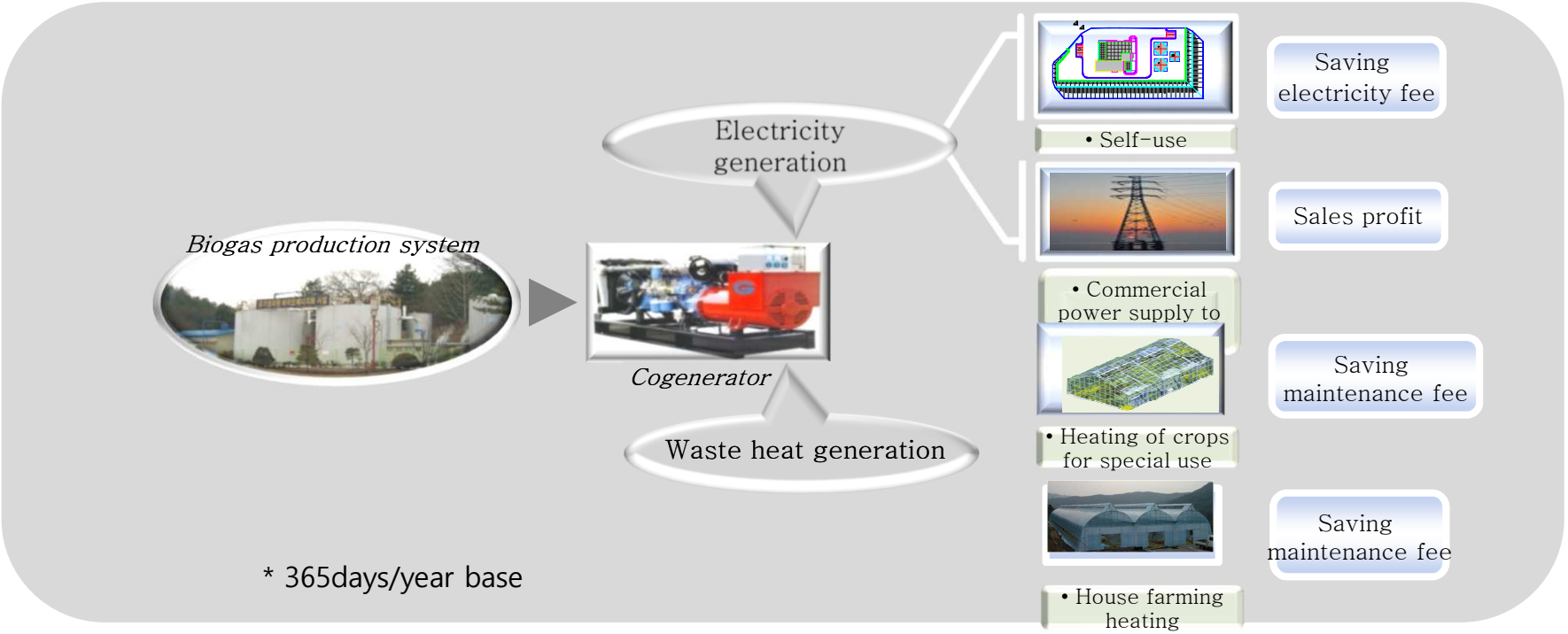
❑ Construction Period: 36 Months Scheduled



▶ The Above Schedule Is Subject To Change During Basic And Final Design.

6. 1,000 Tons/Day Biogas Plant Energy Production & CDM

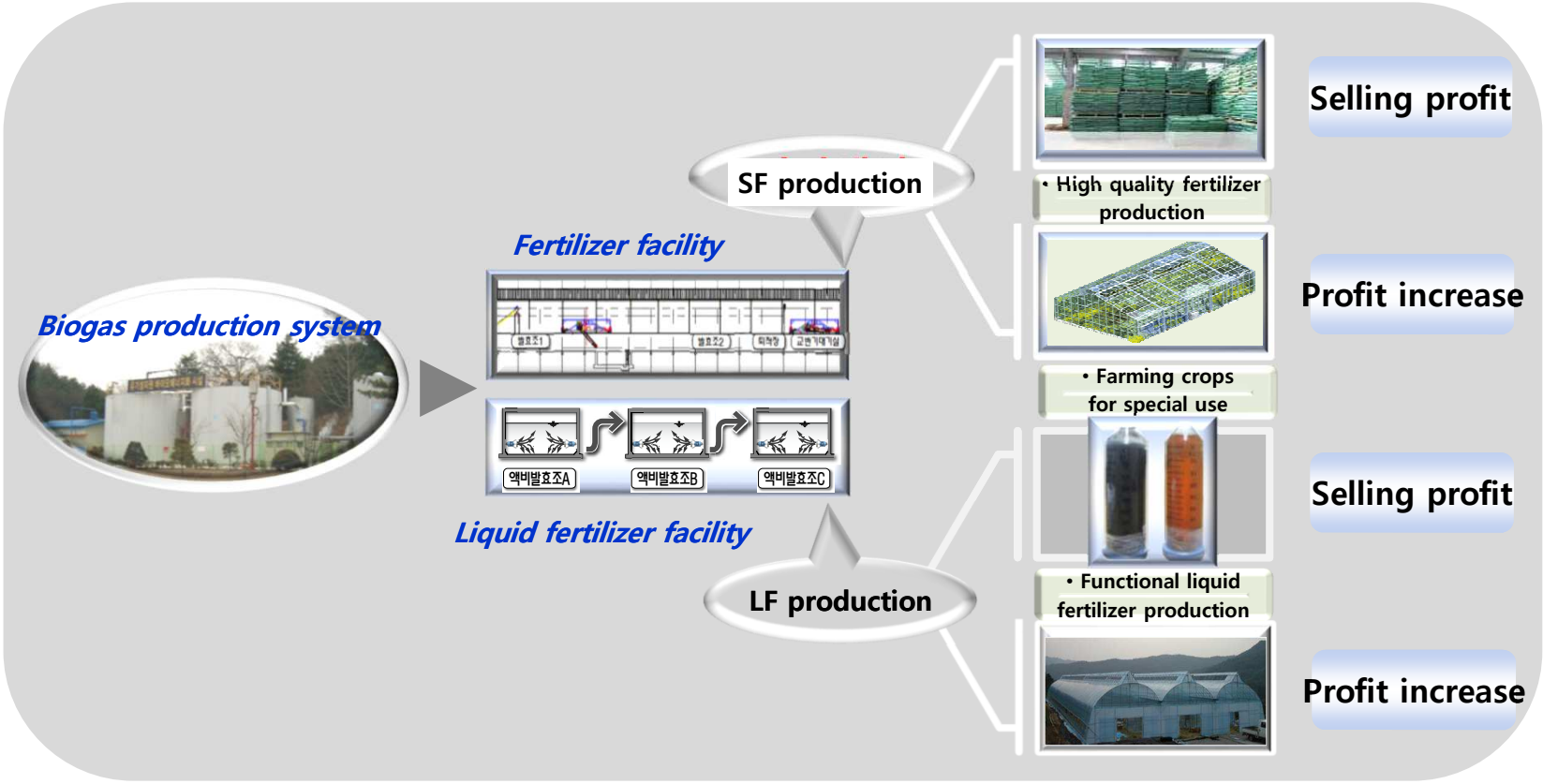
The following calculation can be changed according to the installation site material balance and the design conditions.



Electricity generation	Biogas production 50㎥/MT x 1,000 ton/day = 50,000㎥/day gas(methane 65%) 50,000㎥ x 2.2kw/㎥ = 110,000kw/day electricity production (generating efficiency 33%) X365 = 40,150 Mw/year
Heat recovery	Heat recovery of waste heat of cogeneration unit is about After using about 30% in heating and heating of anaerobic digester, surplus calories: 33,110,000kcal / day X 365 days = 12,085,150,000kcal / year
CDM project	CO^2 reduction effect: 489 ton CO^2 ton / day X 365 = 178,485 CO^2 ton / year)

6. 1,000 Tons/Day Biogas Plant Organic Compost & Liquid Fertilizer Production

The following calculations can be changed depending on the conditions of installation design and material balance.



Compost product	• Compost 200 tons / day x 330 days / year = 66,000 tons / year Production
LF product	• 700 ton/day x 330day= 231,000 ton/year

Supplementary data

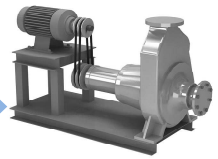
(Introduction to related businesses and introduction to DHM companies in the future)

DHM Global Inc

1). Biogas to CNG & Hydrogen Gas Production Process Chart

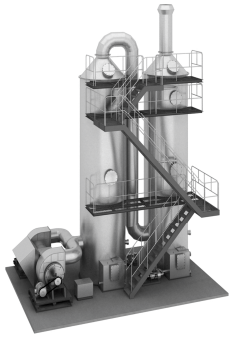
◎ Biogas purification system: CNG / hydrogen gas

Biogas



1 pressurized blower

2 dehumidifier

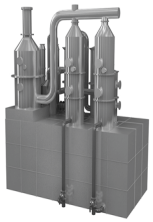


3 CO_2 / CH_4 separation and purification

4 Foreign matter removal filter

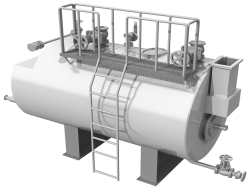
5 pressure regulator

6 cooler



7 dryer

8 gas compressor

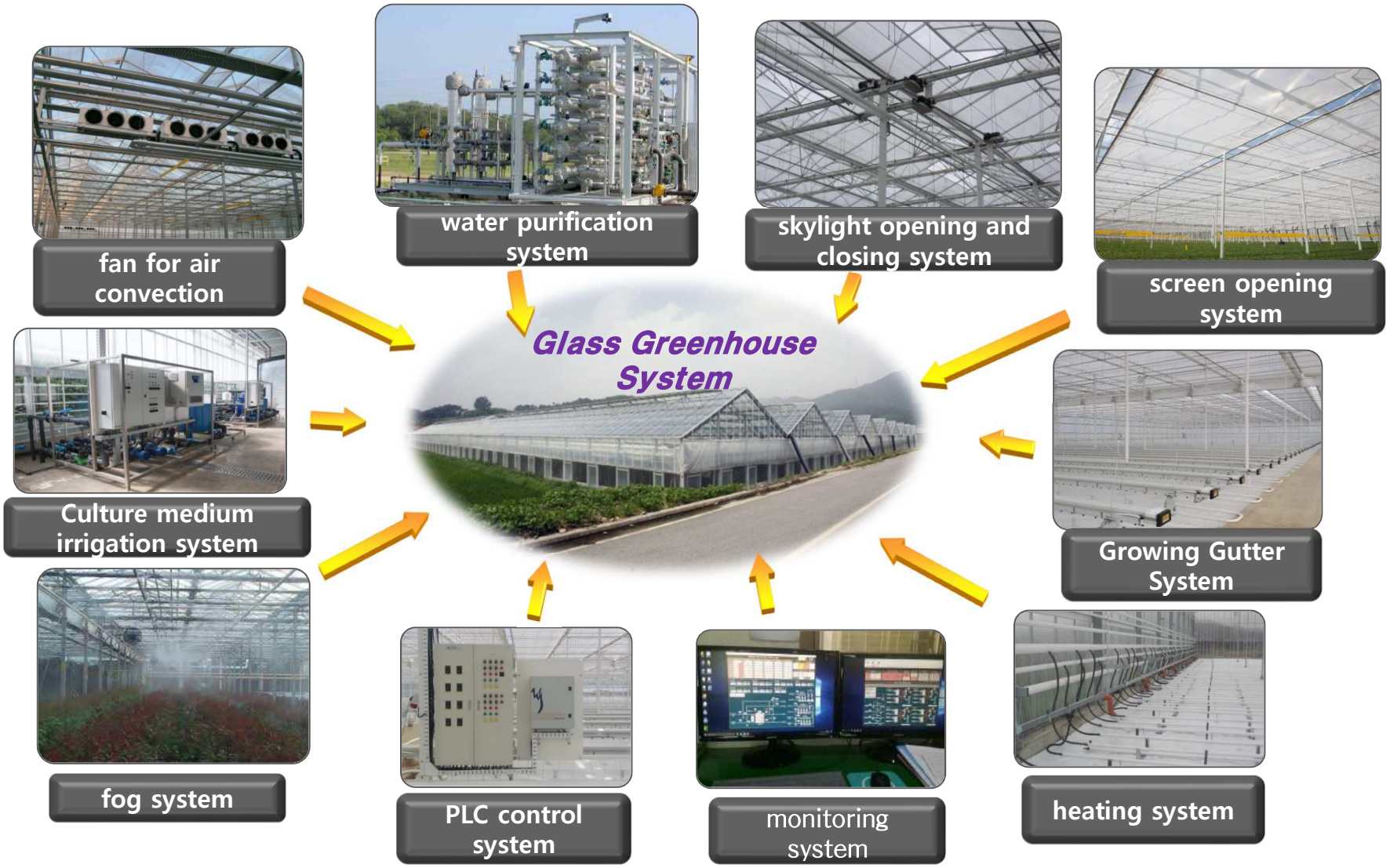


9 gas storage tank

10 gas transport

2). Secondary business introduction using energy & organic fertilizer

◎ *Smart Farm- Glass Greenhouse Agricultural System (High- income advanced agriculture using organic liquid fertilizer)*



3). Production process diagram for recycling business after separating household waste

◎ Household Waste Recycling Business Process Chart

Raw material input

Raw material selection work

Primary crushing & crushing

washing operation

Secondary crushing & crushing

drying operation

1st melting operation

Second melting operation

compression molding work

product shipment

4). Track Record Table 1/2

1

- Project : LIVESTOCK MANURE RESOURCEIZATION PROJECT.
  Hongseong County - South Korea.
- Capacity : 13 tons/day
- Construction Period : January 2005 To March 2007
- Material : Livestock Manure
- Electric Production Sales, Liquid Production, Compost Production

2

- Project : ORGANIC WASTE ENERGY PROJECT.
  Ansung City - South Korea.
- Capacity : 25 tons/day
- Construction Period : November2007 To February 2009
- Material : Food Waste, Livestock Manure
- Electric Production Sales, Liquid Production, Compost Production

3

- Project : ENERGY SELF-SUFFICIENT ENERGY VILLAGE DEVELOPMENT PROJECT.
  Kimje City - South Korea.
- Capacity : 30 tons/day
- Construction Period : January2009 To December2011
- Material : Food Waste, Livestock Manure, Human Feces
- Electric Production Sales, Liquid Production, Compost Production

4

- Project : LOW CARBON GREEN VILLAGE DEVELOPMENT PROJECT.
  Kwangsan District - South Korea.
- Capacity : 30 tons/day
- Construction Period : December2012 To March 2014
- Material : Food Waste, Livestock Manure
- Electric Production Sales, Liquid Production, Compost Production

5). Track Record Table 2/2

5

- Project : ENERGYIZATION PROJECT FOR MERGING ORGANIC WASTES.
  Uljin County - South Korea.
- Capacity : 60 tons/day
- Construction Period : February2015 To October2017
- Material : Food Waste, Livestock Manure, Human Feces
- Electric Production Sales, Liquid Production, Compost Production

6

- Project : ECO-FRIENDLY ENERGY TOWN CONSTRUCTION PROJECT.
  Hongcheon County - South Korea.
- Capacity : 100 tons/day
- Construction Period : April2013 To December 2015
- Material : Food Waste, Livestock Manure
- Urban Gas Production Sales, Liquid Production, Compost Production

7

- Project : ORGANIC WASTE ENERGY PROJECT.
  Nonsan City - South Korea.
- Capacity : 150 tons/day
- Construction Period : October2014 To October2016
- Material : Food Waste, Livestock Manure, Human Feces
- Electric Production Sales, Liquid Production, Compost Production

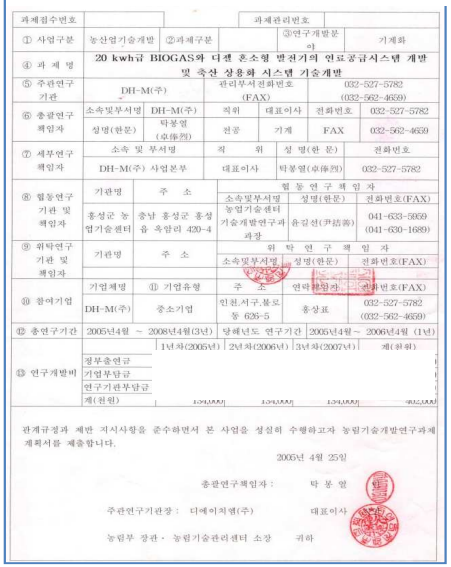
8

- Project : SEWAGE SLUDGE BIOGA SIFICATION PROJECT.
  Jinju City - South Korea.
- Capacity : 600 tons/day
- Construction Period : October2015 To December2017
- Material : Food Waste, Livestock Manure, Organic Sewage Sludge
- Electric Production Sales, Liquid Production,

6). *Gongbeopsa 13 tons/day Biogas Plant Business Performance*

6.1 Business Performance: 13 ton / day HongSung Plant

R&D Certification of IPET



- **Excrement treatment : 13 tons/day**
- Power generation : 25kW/h
- Refining : 15 tons/day
- Digestion type : High temperature anaerobic digestion
- Treatment period : within 10 days
- Cogeneration heating system
- Monitoring management system using the internet
- Area : total 77 pyeong (44 pyeong for refining included)

Top view of the biogas plant

6). *Gongbeopsa 25 tons/day Biogas Plant Business Performance*

6.2 Business performance: 25 ton / day Ansan plant

R&D Certification of IPET

신청인	소속기관	디에이치엠 주식회사	신 청 자	탁 봉 열
	소 재 지	인천 서구 금곡동 658-1	부 서	
	전화번호	032-527-5782	직 위	대표이사
	사용용도	관공서 제출용		
연구과제수행실적내용	사 업 명	생명산업기술개발사업		
	과 제 명	바이오가스 생산 공정 연계 농가형 가축분뇨 통합자원화 공정 시스템 개발 및 실증화		
	연구내용	(1) 기술개발의 최종목표 • 기존 농가 설치시설과 연계호환이 가능한 바이오가스 생산 시설 및 통합자원화 공정 개발 및 실증화 (2) 단계별 연구내용 • 1단계 : 바이오가스 생산시설 검토 및 평가 • 2단계 : 바이오가스 생산 시설 연계 농가형 통합자원화공정 모델 도출 • 3단계 : 농가형 바이오가스 생산 실규모 pilot plant 설치 – 경기도 안성 플랜트 설치 완료 및 운영 중 • 4단계 : 실규모 plant 시운전을 통한 경제성 및 소화액의 자원화 타당성 평가 • 5단계 : 기존 농가 설치시설과 연계호환이 가능한 바이오가스 생산 시설 및 통합자원화 공정 개발		
	과제번호	계약일자	연구수행기간	총 정부출연금	과제상태	과제총평
	307007-3	2007.05.30	3	1,000,000천원	완료	보통
증명서발급기관	기 관 명 : 농림수산식품기술기획평가원					
	주 소 : 경기도 안양시 동안구 관양동 1117-5 우양타운					
	발급부서 : R&D관리본부 사업관리실		담당자 : 정가교 (전화번호 : 031-420-6768)			
	위 사실을 증명합니다. 2011년 09월 29일 농림수산식품기술기획평가원장					

- Daily treatment : Pig manure 25 tons/day
- Cogeneration system (firing)
- Producing liquid fertilizer using digestion liquid fertilizer
- Digestion : Mild temperature anaerobic digestion system
- Desulfurizing facility, moisture removing, gas leak alarm system
- Heating for livestock cages using cogeneration system
- Remote monitoring management system using the internet
- New renewal of livestock excrement, agricultural byproduct, food waste and sewage sludge
- Effective odor-reducing system applied

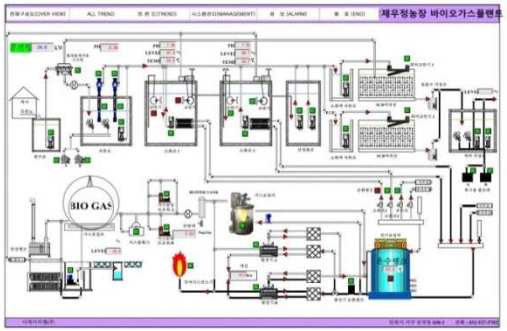
Site monitoring through CCTV

6). *Gongbeopsa 30 tons/day Biogas Plant Business Performance*

6.3 Business Performance: 30 ton / day Gimhae Plant

RDA verified biogas plant to produce gas & LF

- 30 tons/day Biogas plant & glasshouse for green farming
- Cogeneration system (full firing) – Commercial power supply to KEPCO
- Generating natural circulating bioenergy, plant for producing liquid fertilizer
- Digestion : Mild temperature anaerobic digestion
- Generating energy for livestock cages and glass greenhouse using cogeneration system
- Remote monitoring management system using the internet
- Establishing 100% localized commercialization system



Site monitoring through CCTV

High efficiency desulfurizing system

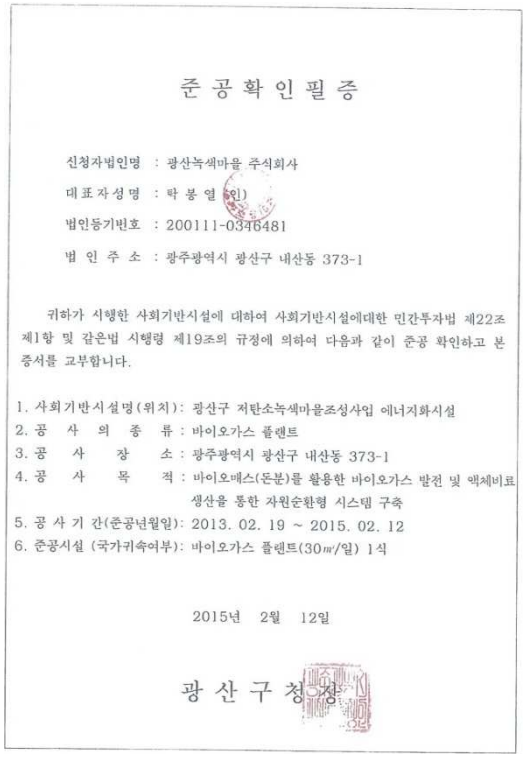
Cogeneration system

Gas collecting tank

Manual/auto control /commercial power supply

6). *Gongbeopsa 30 tons/day Biogas Plant Business Performance*

6.4 Business Performance: 30 ton / day Own DHM plant



준 공 확 인 필 증

신청자법인명 : 광산녹색마을 주식회사
대표자성명 : 박 봉 열 (인)
법인등기번호 : 200111-0346481
법 인 주 소 : 광주광역시 광산구 내산동 373-1

귀하가 시행한 사회기반시설에 대하여 사회기반시설에대한 민간투자법 제22조 제1항 및 같은법 시행령 제19조의 규정에 의하여 다음과 같이 준공 확인하고 본 증서를 교부합니다.

1. 사회기반시설명(위치): 광산구 저탄소녹색마을조성사업 에너지화시설
2. 공 사 의 종 류 : 바이오가스 플랜트
3. 공 사 장 소 : 광주광역시 광산구 내산동 373-1
4. 공 사 목 적 : 바이오매스(돈분)를 활용한 바이오가스 발전 및 액체비료 생산을 통한 자원순환형 시스템 구축
5. 공 사 기 간(준공년월일): 2013. 02. 19 ~ 2015. 02. 12
6. 준공시설 (국가귀속여부): 바이오가스 플랜트(30㎥/일) 1식

2015년 2월 12일

광 산 구 청 장

➢ Biogas plant basic specifications

Category		Detail
Project		▪ Low-carbon Green Village project in Gwangsan-gu, Gwangju
Energy generation facilities	Location	▪ Gwangsan-gu, Naesan-dong 373-1-2, Gwangju
	Throughput	▪ 30 tons/day (Livestock excretion 30 tons/day)
	Main facilities	▪ Carrying/storing facilities, pre-process facilities (when needed), anaerobic digestion facilities, biogas-applied facilities, biogas solidification refining facilities, cogeneration facilities, digestion fluid-applied facilities, odor-removing facilities
Improving village environment		▪ Building 3 town halls in Mangwoel, Ssangnae and Woochi and creating better environment

6). *Gongbeopsa 100 tons/day biogas plant business performance*

6.5 Business Performance: 100 ton / day Hongcheon Plant

성 능 보 증 서

(혐기성소화시설)

홍천군 환경순환형 가축분뇨공공처리시설 설치사업을 시행함에 있어 아래의 혐기성 소화시설 성능을 보증하며, 성능보증 미준수에 따른 모든 책임을 부담할것을 확약합니다.

메탄가스 생성율

구분	체류 시간	바이오가스발생량 (Nm³/일)	메탄가스 생성율(Nm^3CH_4/kg VSin)		
			도축폐기물	가축분뇨	음폐수
설계기준	35일 이상	3020.3	0.35	0.10	0.35
성능보증	설계기준 이상	설계기준 이상	설계기준 이상	설계기준 이상	설계기준 이상

-.주) VSin 은 혐기소화조 유입 VS임
-. 물질수지 설계유입기준이상(VS부하량/5.172kg/일)일 때.
-. 첨부자료 : 물질수지도

2015 년 02 월 10 일

주 소 : 인천광역시 서구 신동안길 15-1(금곡동)
상 호 : 디에이치엠(주)
대 표 자 : 탁 봉 열 (인)
전화번호 : 032-527-5782

현대엔지니어링(주) 귀하

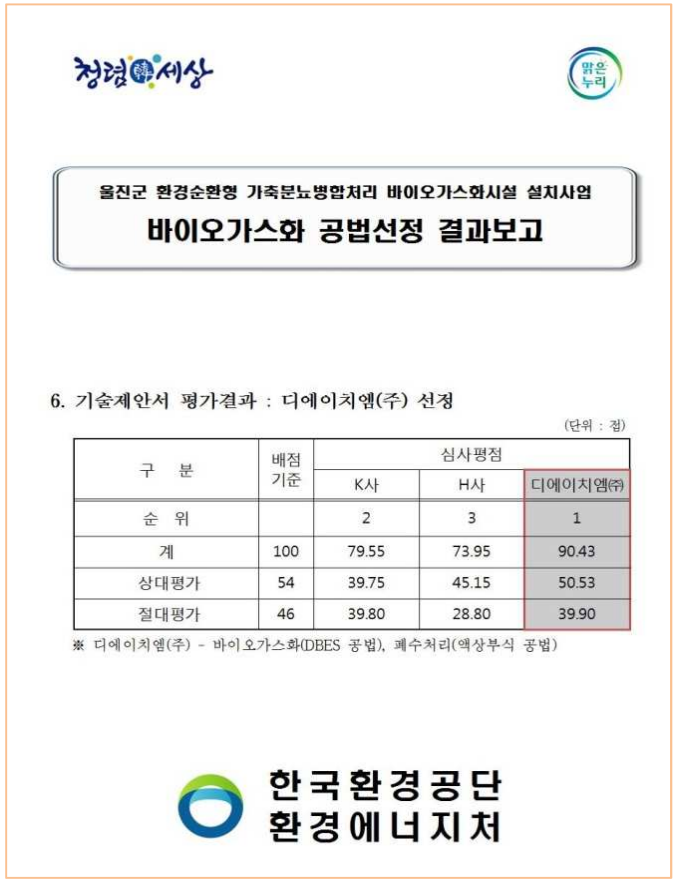
- During normal operation after December 11, 2015 Completed
- Processing capacity: 100 tons / day (80 tons manure + organic waste 20 tons)

6). *Gongbeopsa 60 tons/day biogas plant business performance*

6.6 Business Performance: 60 ton / day Uljin Plant

- Facilities Capacity: Livestock manure 30, Food waste 25 tons / day, Manure 5 ton/day
- Organized by: Korea Environment Corporation

Ul-jin county environment recirculating livestock manure processing installation project construction



청렴세상

울진군 환경순환형 가축분뇨병합처리 바이오가스화시설 설치사업

바이오가스화 공법선정 결과보고

6. 기술제안서 평가결과 : 디에이치엠(주) 선정

(단위 : 점)

구 분	배점 기준	심사평점		
		K사	H사	디에이치엠㈜
순 위		2	3	1
계	100	79.55	73.95	90.43
상대평가	54	39.75	45.15	50.53
절대평가	46	39.80	28.80	39.90

※ 디에이치엠(주) - 바이오가스화(DBES 공법), 폐수처리(액상부식 공법)

한국환경공단 환경에너지처

DBES technology was applied on Ul-jin plant for converting livestock manure to renewable energy and fertilizer. This technology was certified by KECO.

6). *Gongbeopsa 150 tons/day Biogas Plant Business Performance*

6.7 Business Performance: 150 ton / day anaerobic digestion system construction

6). *Gongbeopsa 600 tons/day Biogas Plant Business Performance*

6.8 Business performance: 600 ton / day pearl plant installed Hydraulic stirrer

6). *Construction method selection results for overseas biogas plants*

6.9 Business performance: DBES applied to Yamaga plant in Japan

山農振Ｌ２－ ３９４ 号
平成２７年１１月２７日

ＬＥシステム株式会社
代表取締役　佐藤　純一　様

山鹿市長　中嶋　憲正

山鹿市バイオマスセンター事業提案プレゼンテーションの結果について（通知）

晩秋の候　益々ご清祥のこととお喜び申し上げます。
さて、先般開催しましたプレゼンテーションにご参加いただき、誠にありがとうございました。
審査員による厳正なる選考の結果、貴社提案を採用し、今後協議調整を進めて行きたいと思いますので、よろしくお願いいたします。

山鹿市役所　経済部　農業振興課
担　当：茨　木（いばらき）
電　話：０９６８－４３－１５５６（直通）
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メール：ibaraki.takashi@city.yamaga.lg.jp

H27.11.16実施　山鹿市バイオマスセンター事業提案比較書

会社名	株式会社 リナジェン	LEシステム株式会社	三友機器株式会社	株式会社福山
代表取締役	代表取締役　三嶋　大介	代表取締役　佐藤　純一	代表取締役会長　河内　旭	代表取締役　鄭　陽
本社住所	東京都千代田区神田神保町3丁目2番3号	福岡県久留米市東合川2丁目3番39号	福岡県福岡市中央区大手門1丁目1番3号	東京都渋谷区東3丁目15番7号
事業内容	■バイオマス利活用に関するコンサルティング ■バイオガス発電施設の設計・設置・運転支援・保守管理 ■バイオガス発電所の自社運営及び施設への投資 ■その他バイオガス利活用事業の研究開発及び事業活動の実施	■発電技術、及び蓄電技術の開発 ■レドックスフロー電池（RFB：安全、長寿命、自由設計、低維持費が特徴である電池） ■バイオマスを中心とした環境施設の初期計画の策定、生活環境影響調査等のコンサルティング	■食品製造・産業・科学・建設・環境機械等の設計製作据付、修理、並びに販売 ■受配電盤・制御盤・操作盤・発電機・充電器の製作修理及び販売 ■建築物、工作物の調査企画、設計、施工、監理及びコンサルティング	■再生可能エネルギー事業の企画開発 ■再生可能エネルギー普及のための人材育成及び国際交流 ■再生可能エネルギー発電機器、付属機器の販売及び輸出入
提案の特徴	●高固定物濃度に対応できる発酵槽に改修 ●発酵槽への投入固形物量を増加させ、FIT制度を活用し売電収入を大幅に増加し収入増を図る。	●㈱JIAが中心的な事業主体となり発電事業 ・テント破損側タンクをメタン発酵槽へ（解体ではなく用途変更の手続き） ●メタン発酵槽の段階的利用計画 ●攪拌装置による発酵を促進 ●液肥の利用促進 ・クローラ・クレーン、バキューム車を購入。 ・散布人員を雇用、農家と直接散布交渉。 ・できるだけ安価な価格設定。	●資源作物の栽培・収集 遊休地で多収量の草本作物である「エリアンサス」（多年生イネ科植物）を栽培、メタン発酵原料として収集、投入。	●極限まで簡略化したシステムで建設工事期間を短縮 ●建設設備エリアの縮小化 ●長年の蓄積した技術により高いコストパフォーマンスを実現 ●高い発電稼働率で高い事業集積性を確保 ●単純な維持管理の実現により地域雇用を促進 ●施設の買収を希望
投資内容 投資額	【設備費】 メタン発酵・発電関連設備 230,000千円 液肥散布インフラ追加整備 90,000千円 ※現状設備の撤去費用は含まず	資本的支出 【設備費】 消化槽溶接構造物　32,500千円 消化槽保温材　18,000千円 加温配管　7,000千円 消化槽攪拌機　6,500千円 合計額　263,000千円 運営費 合計額　29,242千円	【設備費】 新設メタン発酵設備　400,000千円 新設発電機　105,000千円 新設堆肥化設備　90,000千円 系統連携設備　15,000千円 【工事費】 既設改造、新設工事　60,500千円 【導　入】 合計額　670,500千円 ※全額市による負担	総額　300,000千円 【連系負担金】50,000千円 【設備費用】250,000千円 ※2年目以降… 総額　59,689千円 【光熱費、人件費、連系負担金、設備費用等】 ＊以降は別添参照
審査点数	898点／1,400点	1,068点／1,400点	660点／1,400点	688点／1,400点

The American people are all environmentally conscious
I will become a company specializing in environmental energy.

Thank you

DHM Global Inc