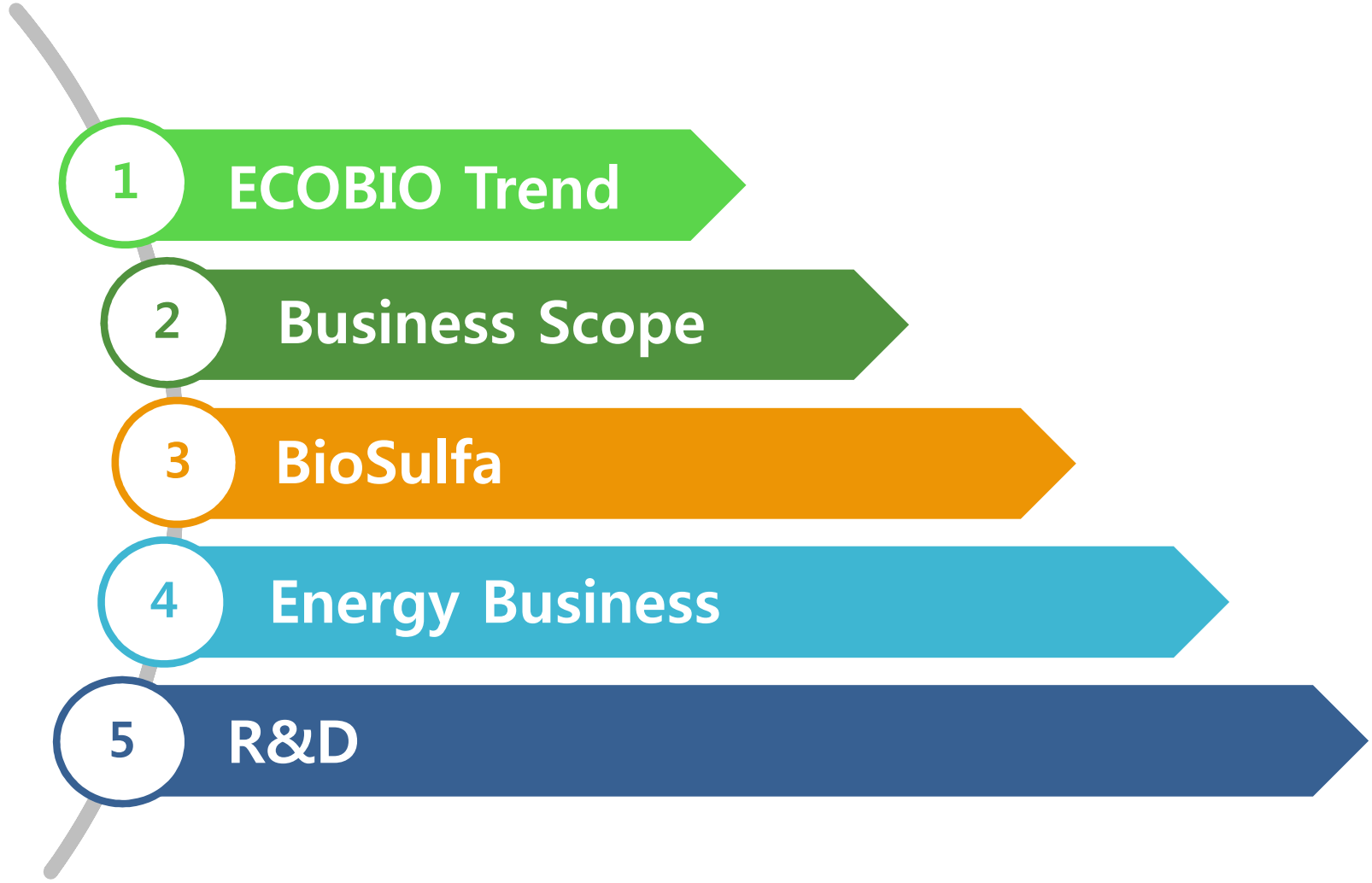
ECOBIO HOLDINGS CO.,LTD. 2018 IR

REF. 180906

www.ecobio.co.kr
www.biosulfa.co.kr

Contents



Business Vision –Establishing an Up-Cycling business structure via the Eco-Chain

www.ecobio.co.kr
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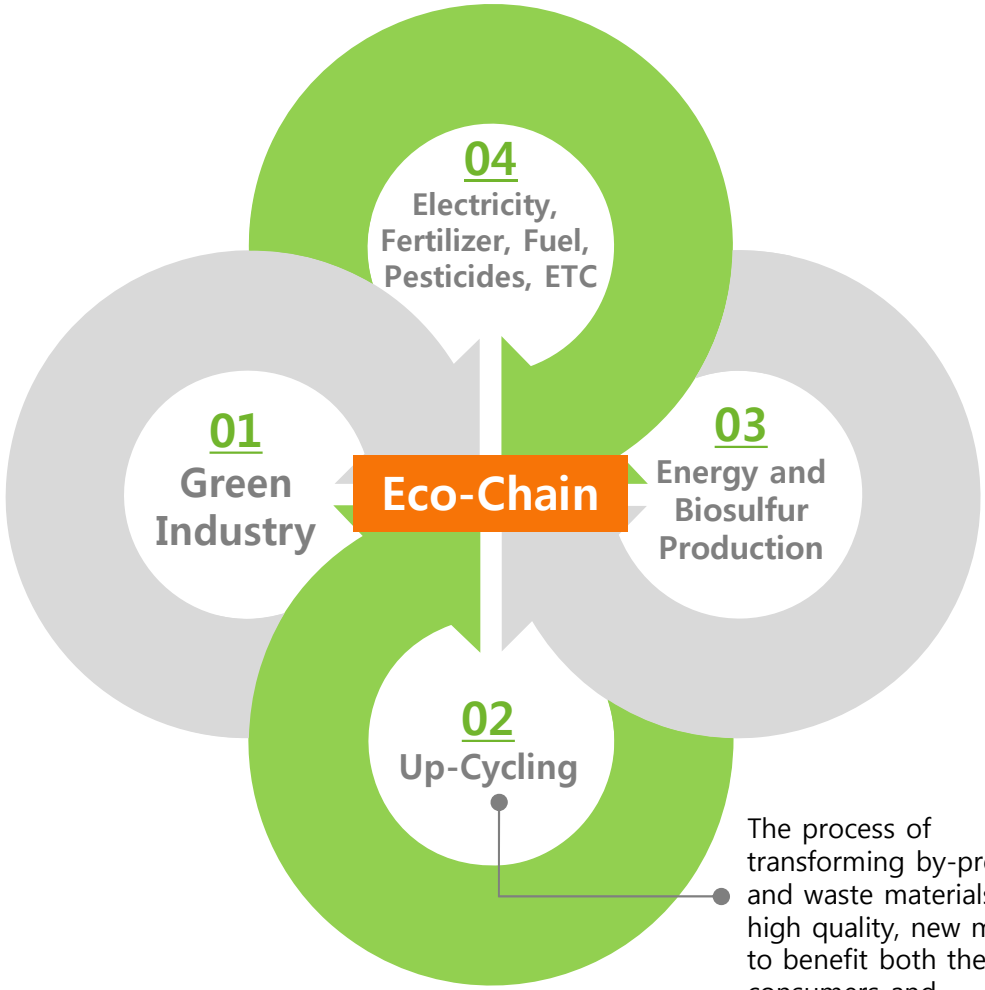
The Past is the Strength of Today
The Future starts Today.

To transform the existing
To create the nonexisting
Forge sustainability!

- *ECOBIO HOLDINGS*
CEO Hyo-Soon Song



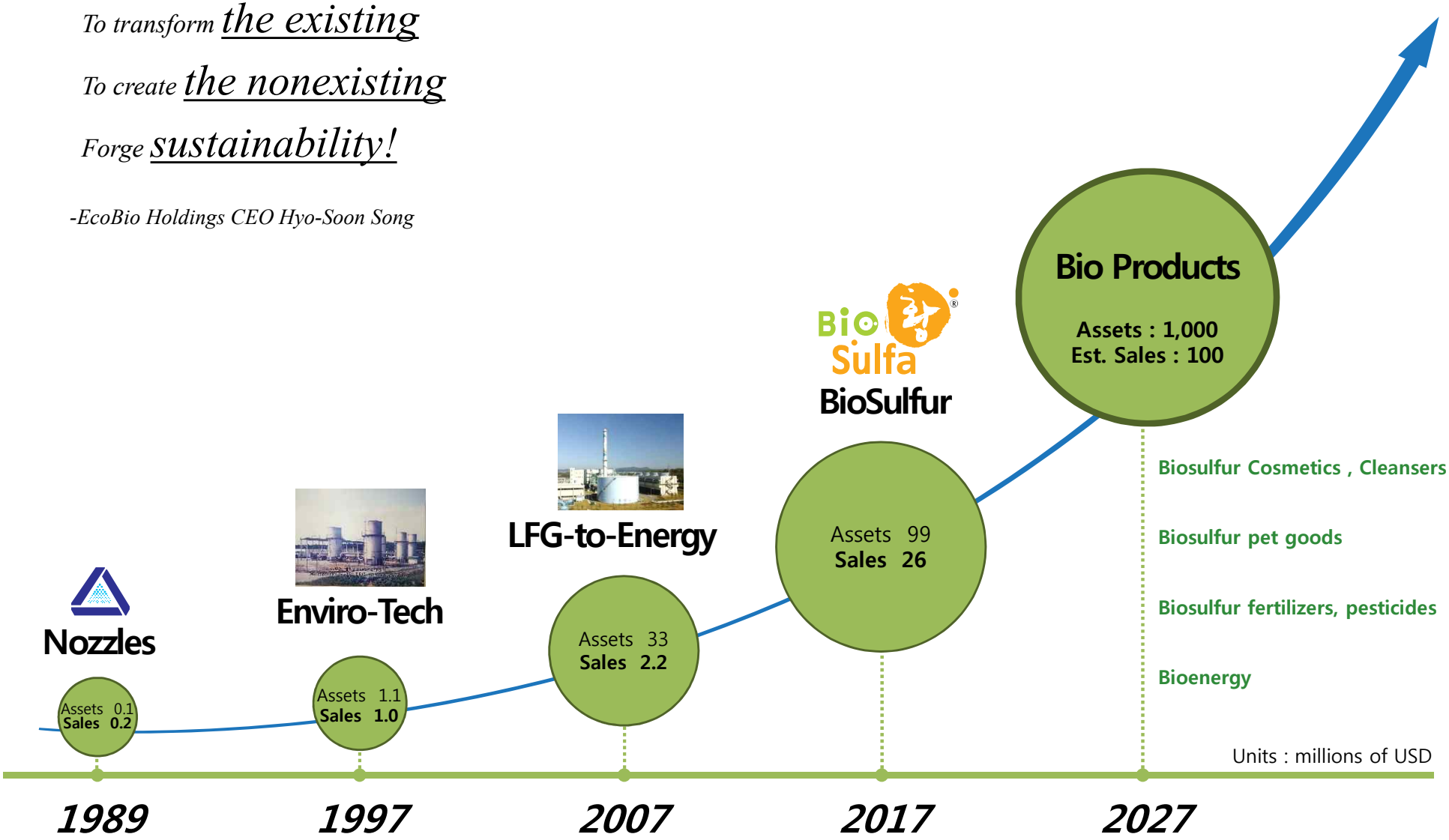
1. ECOBIO Trend

To transform ***the existing***

To create ***the nonexisting***

Forge ***sustainability!***

-EcoBio Holdings CEO Hyo-Soon Song



1. ECOBIO Trend

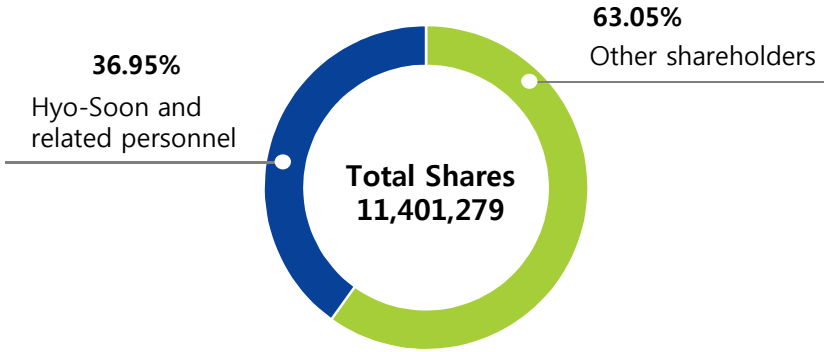
[Company Overview]

Company Name	EcoBio Holdings Co., Ltd. (KOSDAQ 038870)
CEO	Hyo-Soon Song
Founding Date	1989. 4. 1.
Capital	5.7 billion KRW (Approx. 5.36 million USD)
Market Value	118.5 billion KRW (Approx. 111.39 million USD) (as of closing price on Feb. 28th 2018 : ₩10,400)
Employee	120 people
Business Scope	Biosulfur, Biofuel, Bioenergy, Environmental Technology Development
Company Location	Head office : Total Eco Bldg. 5, Seoun-ro 26-gil, Seocho-gu, Seoul Eco-energy Power Station : 58, Baekseok-dong, Seo-gu, Incheon Daejeon Business Center : 186, Bulmu-ro, Yuseong-gu, Daejeon

[CEO Introduction]

Name	Hyo-Soon Song
Academic	Ph.D. Keimyung University, Environmentology
1989	Founding of EcoBio Holdings Co., Ltd.
2005	Chairman of Bio-division of New & Renewable Energy Association
2013	Received Presidential Prize for Renewable Energy Award
2015	Present Auditor of New Renewable Energy Association
2016	Current EcoBio Holdings CEO

[Shareholders] (as of 2018. 02. 28.)



[Company History]

2016	EcoBio Holdings Co., Ltd.
2013	Presidential Award for Excellence
2012	Awarded the highest prize by for company specializing in the recycling of waste-energy resources - Minister of Environment
2008	Goldman Sachs U.K attracts $28 million in foreign capital
2007	KOSDAQ Listed
2002	Joined Korea Renewable Energy Association
1989	Founding of EcoBio Holdings (previous TotalENS)

2. Business Scope

BIO Based (Sulfur/Electricity/Gas/Hydrogen), Enviro-Tech

World's Largest LFG to Electricity Generator
- **LOCATION :** 58, Baeksuk-dong, Seo-gu, Incheon
- **DETAILS** : Steam generated electricity through LFG
- **TOTAL INVESTMENT** : 1,000 million KRW
- **SCALE** : 50MW Steam Turbine (World's largest scale)

Korea's First Bio-Gas to Vehicle Fuel Facility
- **LOCATION :** Seonam, Magok-dong, Kangseo-gu, Seoul
- **DETAILS** : Use of Biogas (from digestor) for use in vehicle fuel
- **SCALE** : 7,000Nm³/day(4,290Nm³ of vehicle fuel produced per day)

(Sangam Hydrogen Station)
- **LOCATION :** Seoul Nanji Landfill Site
- **DETAILS** : LFG to Hydrogen Fuel production
- **SCALE** : 1,080Nm³/d
- **ROLE** : Simplex 50

Daejeon Boiler Fuel
- **LOCATION :** Daejeon Geumgo-dong Landfill Site
- **DETAILS** : Boiler fuel supply (40㎥/min)
- **ROLE** : Investor, Engineering, Construction and Operation, CER sales

Gumi LFG-to-Energy
- **LOCATION :** Mishigupo-dong Municipal waste Landfill Site
- **DETAILS** : Gas Engine(0.3MW)
- **ROLE** : Investor, Engineering, Construction and Energy sales, CER sales

Daegu Boiler Fuel
- **LOCATION :** Daegu Bangcheon-ri Landfill Site
- **DETAILS** : Supply regional heating fuel (130㎥/min)
- **ROLE** : Engineering and Construction

BioSulfa Inc.
- **LOCATION :** 161, Samhwa-ri, Misan-myeon, Yeoncheon-gun
- **DETAILS** : Biosulfur product production

Pyeongchang Bio-Gas plant
- **LOCATION :** Pyeongchang-gun, Jinbu-myeon sewage treatment site
- **DETAILS** : Organic waste to energy
- **SCALE** : 7,200Nm³/d
- **METHOD** : Simplex 300

Gangneung Bioenergy
- **LOCATION :** Gangneung-shi, Byeongsan-dong sewage treatment site
- **DETAILS** : (digester) Gas to vehicle fuel
- **SCALE** : 1,200Nm³/d
- **METHOD** : Simplex 50

Gangwon Bio-Gas Plant
- **LOCATION :** 561-2, Gahyeon-dong, Wonju-shi
- **DETAILS** : Organic waste to vehicle fuel
- **SCALE** : 14,400Nm³/d
- **METHOD** : Simplex 600

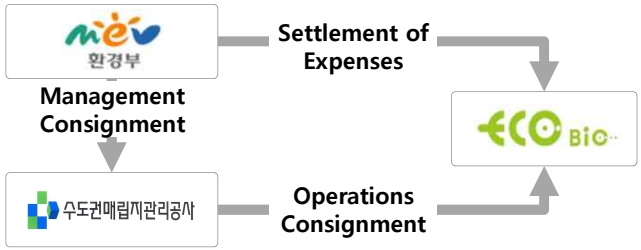
Changwon Bioenergy
- **LOCATION :** Changwon-shi Dukdong Sewage Treatment Site
- **DETAILS** : (digestor) Gas to vehicle fuel
- **SCALE** : 14,400Nm³/d
- **METHOD** : Simplex 600

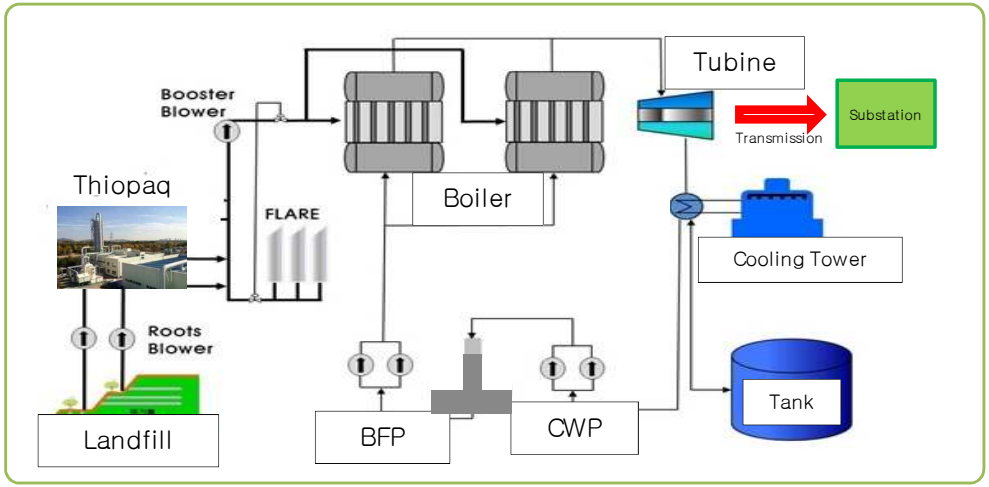
Busan Bioenergy
- **LOCATION :** Busan-shi Donglae-gu Suyoung Plant
- **DETAILS** : (digestor) Gas to vehicle fuel
- **SCALE** : 14,400Nm³/d
- **METHOD** : Simplex 600

2. Business Scope

LFG Utilization – Biosulfur production and power generation through continuous operations of LFG business

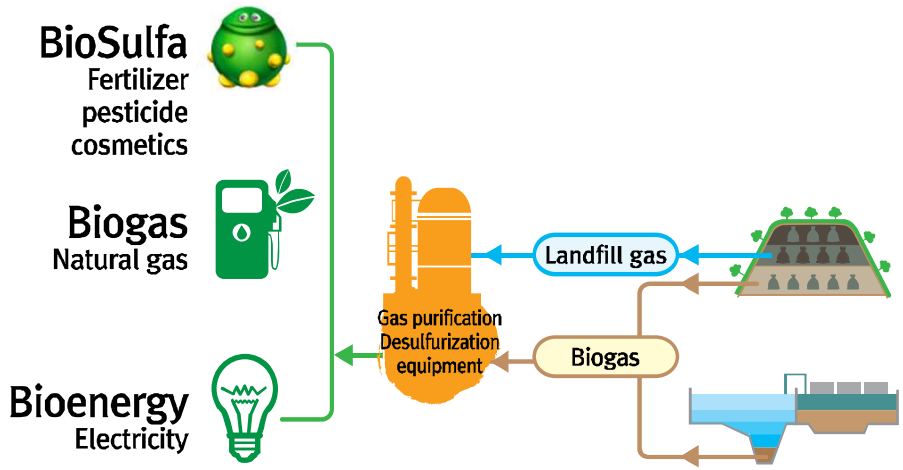
Operational Profit Model





Process Diagram

OPERATIONS	LOCATION	FACILITY SCALE
ECOENERGY (100% SUBSIDARY)	58, Baekseok-dong, Seo-gu, Incheon	2 Biosulfur production systems. 1 Steam turbine generator.



2. Business Scope

Energy Sales – Organic Waste-to-Energy Plants, Biogas Upgrading System(Simplex), Hydrogen Station

Wonju Organic Waste Biogas Plant

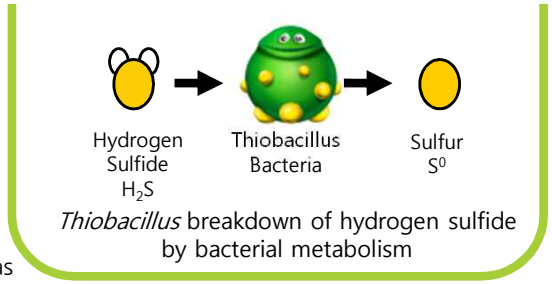
Biogas-to-Vehicle Fuel Project at Sewage Treatment Plant in Busan

Sangam LFG-to-Hydrogen Station

Location		561-2, Gahyeon-dong, Wonju	Suyeong Plant in Donglae-gu, Busan	Sangam-dong, Mapo-gu, Seoul
Purpose (Treatment volume)		Organic Waste-to-Car Fuel (14,400Nm³/day)	Sewage Treatment Gas-to-Car Fuel (14,400Nm³/day)	Hydrogen production and vehicle fueling station from treated landfillgas, and surplus gas fuel cell charging (1,080Nm³/day)
Operation		In operation	In operation	In operation
Role & Contribution of Ecobio Holdings	Equity Participation	18%	30%	-
	Construction (EPC)	◎	◎	◎
	Operations (O&M)	◎	-	◎

Producing BioSulfur Using Microorganisms

※Biosulfur production process within the Bioreactor



Organic

pH 8.5

1~4μm

Aqua

Certified Organic Material (Post No. 1-6-014) (Certification No. 1-6-002)

VS

Category	Biosulfur (suspended concentrate)	Petrochemical Sulfur (solid)
Definition	Biosulfur produced from microbial metabolism	Chemical sulfur derived from chemical reactions
pH	Slightly Alkaline (pH 8.5) suspension	Strong Akaline (pH 12~14) powder
Sulfur Conc.	40% ± 3% (suspension)	100% solid powder
Density	1.35 g/cm3	1.95 ~ 2.26 g/cm3
Particle Size	1~10 μm particles (high fungicidal effect)	400~600μm (low fungicidal effect)
Hydro-philicity	Pharmacological cocktail effect (Hydrophilic-like, can be mixed with other substances)	Does not suspend well in water, may cause unwanted effects (Highly hydrophobic, can not be mixed with other substances)
Characteristics	Naturally suspended state, easily suspended in water	Not soluble in water, needs caustic soda and surfactant for suspension
	Alkalizes the soil when used as fertilizer	Acidifies the soil when used as fertilizer
	User in organic fertilizers, pesticides, cosmetics and pharmaceuticals	Used in chemical fertilizer
	Harmless to insects	Can cause metal corrosion, generates toxic gas and can reduce the lifespan of plastic materials

- Operates the World's Largest Biosulfur Production Facility
- Builds and Operates Biosulfur Production Facilities
- Operates the World's Largest Biosulfur R&D Center

ECO Bio www.ecobio.co.kr

- World's No.1 Anaerobic Water & Gas Treatment Corporation
- Own the Technology for Producing Biosulfur by Using Thiobacillus Bacteria

PAQUES

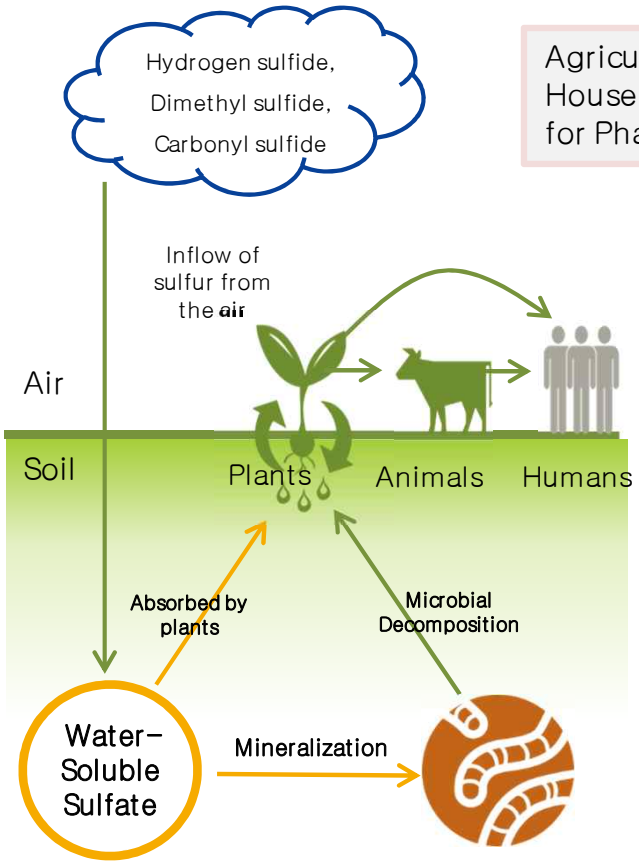
Joint Project for Raw Bio Material / Product Sales, Production Facility

Domestic Markets

BioSulfa

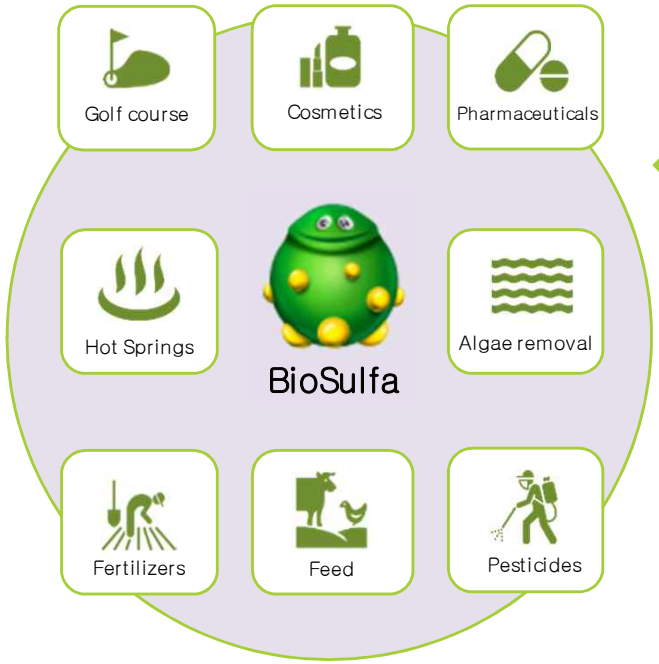
International Markets

Producing and Using BioSulfa Establishes a New Sulfur Cycle



Sulfur Circulation in Nature

Agriculture BioSulfa (Fungicide) → Raw Material for Household Items → Ingredient for Cosmetics → Ingredient for Pharmaceuticals



Used for Various Purposes

BioSulfa Production

Organic Material Listed
National Notice (BioSulfa 25%)

공시번호 : 제 공시-1-6-030호

유기농업자재 공시서

1. 업체명 : 에코바이오홀딩스(주)　　2. 대표자 성명 : 송효순
3. 주소(사업장) : 서울특별시 서초구 서운로 26길 5
4. 자재의 명칭 : 황
5. 자재의 구분 : 병해충관리용
6. 상표명 : 바이오황25
7. 주성분(원료)의 종류 및 함량(%)
   - 주성분 : 황
   - 원료의 종류 및 함량 : 황 25, 보조제 75
8. 유효기간 : 2018.08.23.~2021.08.22.
9. 제조장주소 : 인천광역시 서구 백석동 58(수도권 매립지내)
10. 최초 공고일 : 2018.08.23.
11. 최초 공시기관 : 농업기술실용화재단

「친환경농어업 육성 및 유기식품 등의 관리·지원에 관한 법률」 제38조제2항 및 「농림축산식품부 소관 친환경농어업 육성 및 유기식품 등의 관리·지원에 관한 법률 시행규칙」 제49조제2항에 따라 위와 같이 유기농업자재 공시임을 증명합니다.

2018년 8월 23일

농업기술실용화재단 이사장

Organic Material Listed
National Notice (BioSulfa 50%)

공시번호 : 제 공시-1-6-014호

유기농업자재 공시서

1. 업체명 : 에코바이오홀딩스(주)　　2. 대표자 성명 : 송효순

Issue number : 16-16

Environment-friendly Agricultural & Organic Inputs Product	공시서 (National Notice)		
Notice Number	National Notice-1-6-014		
Company Name	EcoBio Holding Co., Ltd	Chief Executive Officer	Hyo-soon Song
Company Address	5, Seoun-ro 26-gil, Seocho-gu, Seoul, Rep. of KOREA		
Factory Location	61, Gelwol-ro, Seo-gu, Incheon, Rep. of KOREA		
Organic Inputs Type	An organic agricultural material to control diseases and pests.		
Brand name	Eco Bio Sulfur		
Applied Crop	Red pepper, Lettuce, Chinese cabbage, Soybean, Cucumber, Strawberry		
Applied Pest	-		
Expiration Date	Oct. 10. 2015. ~ Oct. 09. 2018.		

In accordance with Article 37 of 「ENVIRONMENT-FRIENDLY AGRICULTURE PROMOTION ACT」, I hereby certify that the product above is listed on the National Notice List of Environment-friendly Agricultural & Organic Inputs in the Republic of Korea.

Date of Issue : Oct. 28. 2016.

농 업 기 술 실 용 화 재 단 이 사 장

Foundation of Agri. Tech. Commercialization & Transfer

Organic Material Listed
Quality Certification (BioSulfa 50%)

공시(품질인증)번호 : 제 품질인증-1-6-002호

유기농업자재 [ ] 공시서 [○] 품질인증서

Issue number : 16-15

Environment-friendly Agricultural & Organic Inputs Product	품질인증서 (Quality Certification)		
Notice Number	Quality Certification-1-6-002		
Company Name	EcoBio Holding Co., Ltd	Chief Executive Officer	Hyo-soon Song
Company Address	5, Seoun-ro 26-gil, Seocho-gu, Seoul, Rep. of KOREA		
Factory Location	61, Gelwol-ro, Seo-gu, Incheon, Rep. of KOREA		
Organic Inputs Type	An organic agricultural material to control diseases and pests.		
Brand name	Eco Bio Sulfur		
Applied Crop	Red pepper, Lettuce, Chinese cabbage, Soybean, Cucumber, Strawberry		
Applied Pest	Powdery mildew(Cucumber), Two Spotted spider mite(Strawberry)		
Expiration Date	Jun. 30. 2016. ~ Jun. 29. 2019.		

In accordance with Article 37 of 「ENVIRONMENT-FRIENDLY AGRICULTURE PROMOTION ACT」, I hereby certify that the product above is listed on the National Notice List of Environment-friendly Agricultural & Organic Inputs in the Republic of Korea.

Date of Issue : Oct. 28. 2016.

농 업 기 술 실 용 화 재 단 이 사 장

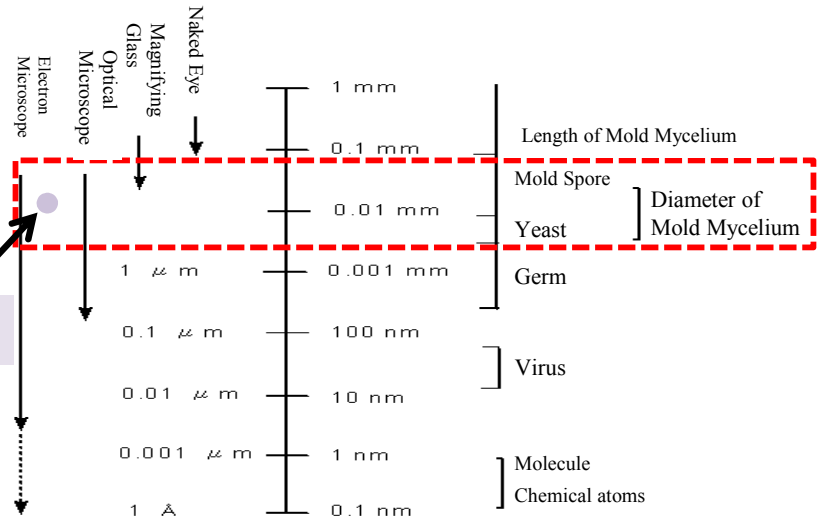
Foundation of Agri. Tech. Commercialization & Transfer

Fungicidal Effect of BioSulfa

● Why So Effective?

1) Optimal Particle Size: 1~10 ㎛
2) Particle Size Optimal for Sterilizing Mold Spores
3) Germs and viruses are smaller than BioSulfa particles

Prerequisite for Maximizing the Benefits of BioSulfa → 1~10 ㎛

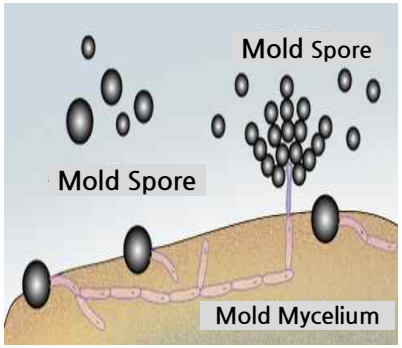


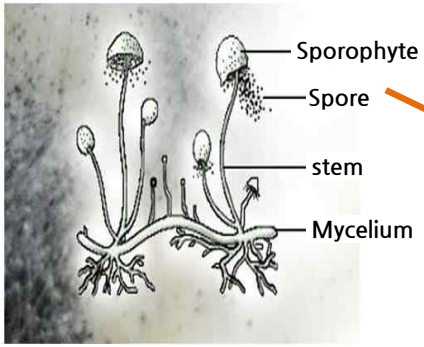
● Fungicidal Effect of BioSulfa

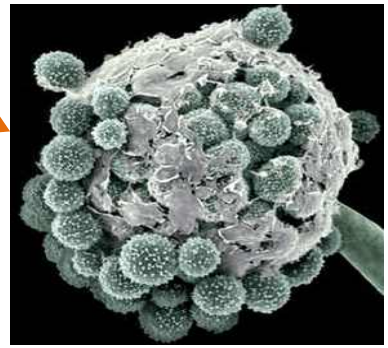
1) reproduce through spores ➔ can maintain spores even in the worst conditions

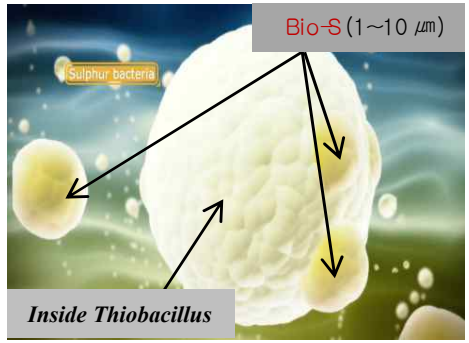
2) are bigger than other germs ➔ Makes it difficult to prevent reproduction

- Existing Pesticides ➔ increases pesticide resistance
- BioSulfa ➔ Highly Effective ➔ no fungicide resistance









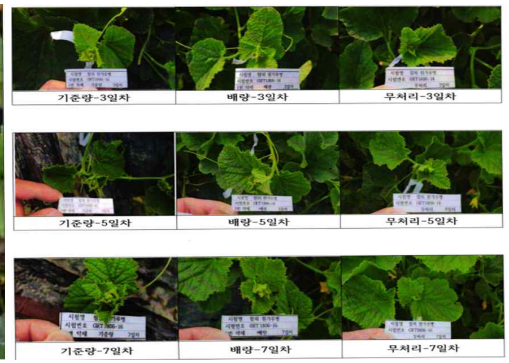
Certified Institute Test of BioSulfa on Powdery Mildew and Mites(1/4)

Performed by the Korea Bio-Safety Institute / Cucumber 2016.04.08~05.08 (Ipjang), 2016.04.29~05.29 (Namseon)

Crop	Targets	Results	Treatment Images
Cucumber	• Phytotoxicity • Powdery Mildew *(Sphaerotheaca fusca)*	• Standard dilution(x1,000) and double dosage dilution(x500) were applied • 3 times Foliar Spraying after breakout in every 10 days • **85% efficacy** on powdery mildew at Ipjang farm • **83.6% efficacy** on powdery mildew at Namseon farm • Greenhouse conditions • Test was carried out at 3 different region at same time during 30 days • **No phytotoxicity** in standard dose and double dosage.	 〈 test photo 1 〉  〈 Test photo 2 〉  〈 test photo 3 〉  〈 Phytotoxicity test result 〉 (3, 5, 7 days after treatment)

Certified Institute Test of BioSulfa on Powdery Mildew and Mites(2/4)

Performed by the Korea Bio-Safety Institute / 2018.06.12-2018.07.12 (Namseon, Saengguk)

Crop	Targets	Results	Treatment Images
Oriental melon	• Phytotoxicity • Powdery Mildew *(Sphaerotheaca fusca)*	• Standard dilution(x1,000) and double dosage dilution(x500) were applied • 3 times Foliar Spraying after breakout in every 10 days • **78.4% efficacy** on powdery mildew at Namseon farm • **82.7% efficacy** on powdery mildew at Saengguk farm • Greenhouse conditions • Test was carried out at 3 different region at same time during 30 days • **No phytotoxicity** in standard dose and double dosage.	 〈 test photo 1 〉  〈 Test photo 2 〉  〈 test photo 3 〉  〈 Phytotoxicity test result 〉 (3, 5, 7 days after treatment)

Certified Institute Test of BioSulfa on Powdery Mildew and Mites(3/4)

Performed by the Korea Bio-Safety Institute / 2016.04.26~2016.05.10 (Gamgok)

Crop	Targets	Results	Treatment Images
Strawberry	• Phytotoxicity • Mite *(Tetranychus urticae)*	• Standard dilution(x1,000) and double dosage dilution(x500) were applied • 1 time Foliar Spraying after breakout • **65.9% efficacy** on strawberry mite at Gamgok farm • Test was carried out at 3 different region at same time during 14 days • **No phytotoxicity** in standard dose and double dosage	 〈 test photo 1 〉  〈 Test photo 2 〉  〈 test photo 3 〉  〈 Phytotoxicity test result 〉 (3, 5, 7 days after treatment)

Certified Institute Test of BioSulfa on Powdery Mildew and Mites(4/4)

Performed by the Korea Bio-Safety Institute / 2018.06.12-2018.06.26 (Yecheon), 2018.06.20-2018.07.04 (Gamgok)

Crop	Targets	Results	Treatment Images
Apple	• Phytotoxicity • Mite *(Panonychus ulmi)*	• Standard dilution(x1,000) and double dosage dilution(x500) were applied • 1 time Foliar Spraying after breakout • **57.8% efficacy** on apple mite at Yecheon farm • **62.1% efficacy** on apple mite at Gamgok farm • Test was carried out at 3 different region at same time during 14 days • **No phytotoxicity** in standard dose and double dosage.	 〈 test photo 1 〉  〈 Test photo 2 〉  〈 test photo 3 〉  〈 Phytotoxicity test result 〉 (3, 5, 7 days after treatment)

2018 CAC China – BioSulfa product launching and development of business relations

BioSulfa
products launched in 2018

Agricultural | Soy Beans | Vegetables | Grass/Lawn

- Development of business relations in China, South America India, Europe, etc.
- Applications in combination with fertilizers, agrochemicals and plant extracts
- Identification of market value
- Differentiation of biosulfur from chemically produced sulfur
- Investigation of necessary product registration

Wonju BGP(Bio Gas Plant)– Organic Waste Anaerobic Digestion and Energy Production


Anaerobic Digester

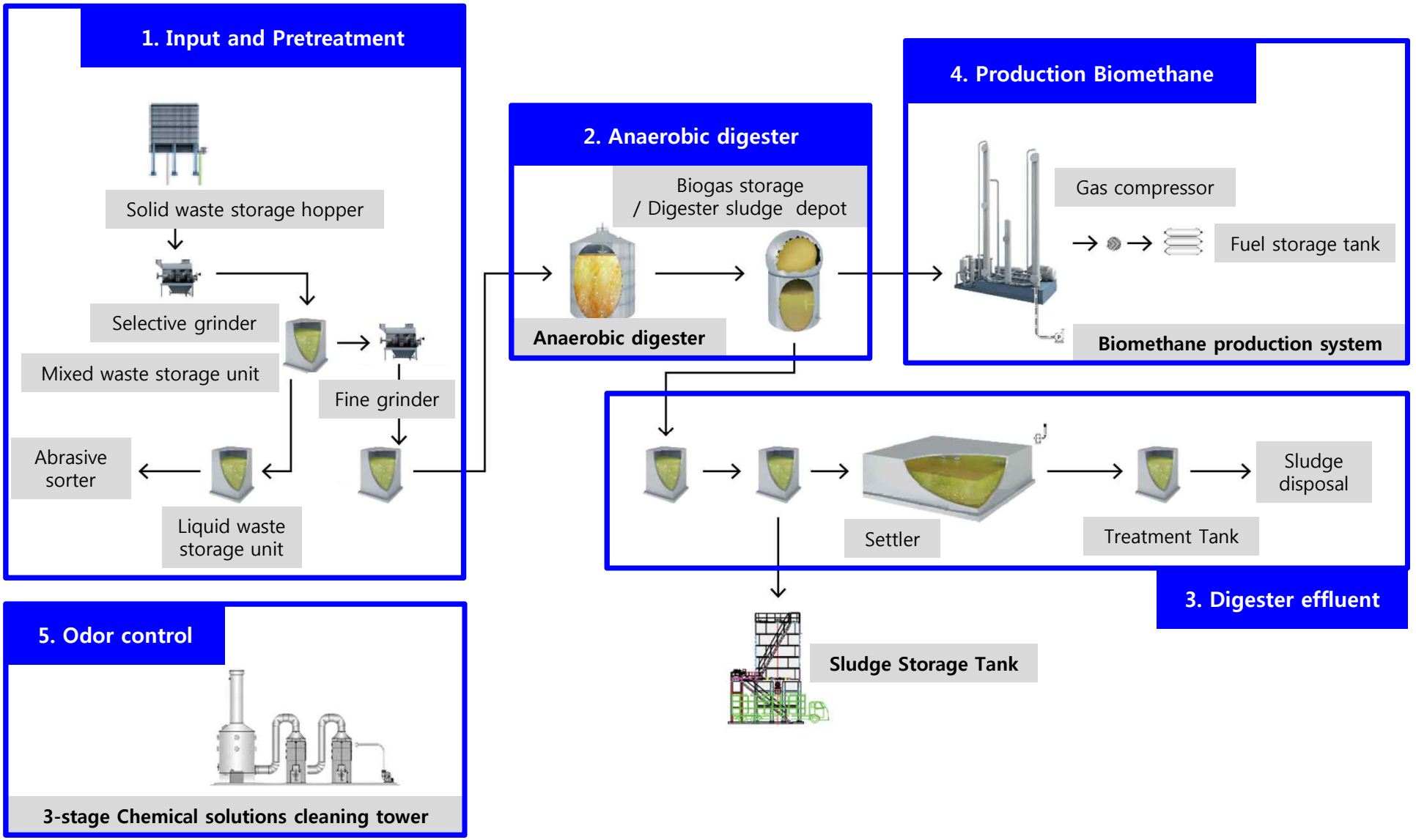

Biomethane Production


Odor Control


Input and Pretreatment


Wastewater treatment


Recycling Center


1. Input and Pretreatment
Solid waste storage hopper
Selective grinder
Mixed waste storage unit
Fine grinder
Abrasive sorter
Liquid waste storage unit
2. Anaerobic digester
Biogas storage / Digester sludge depot
Anaerobic digester
4. Production Biomethane
Gas compressor
Fuel storage tank
Biomethane production system
3. Digester effluent
Settler
Treatment Tank
Sludge disposal
Sludge Storage Tank
5. Odor control
3-stage Chemical solutions cleaning tower

Biomethane Gas Distribution

Biogas production facility
(capacity : 600N㎥/h)

Fueling station
(capacity : 250N㎥/h)

Vehicle Refueling
(Approx. 100 cars/d)

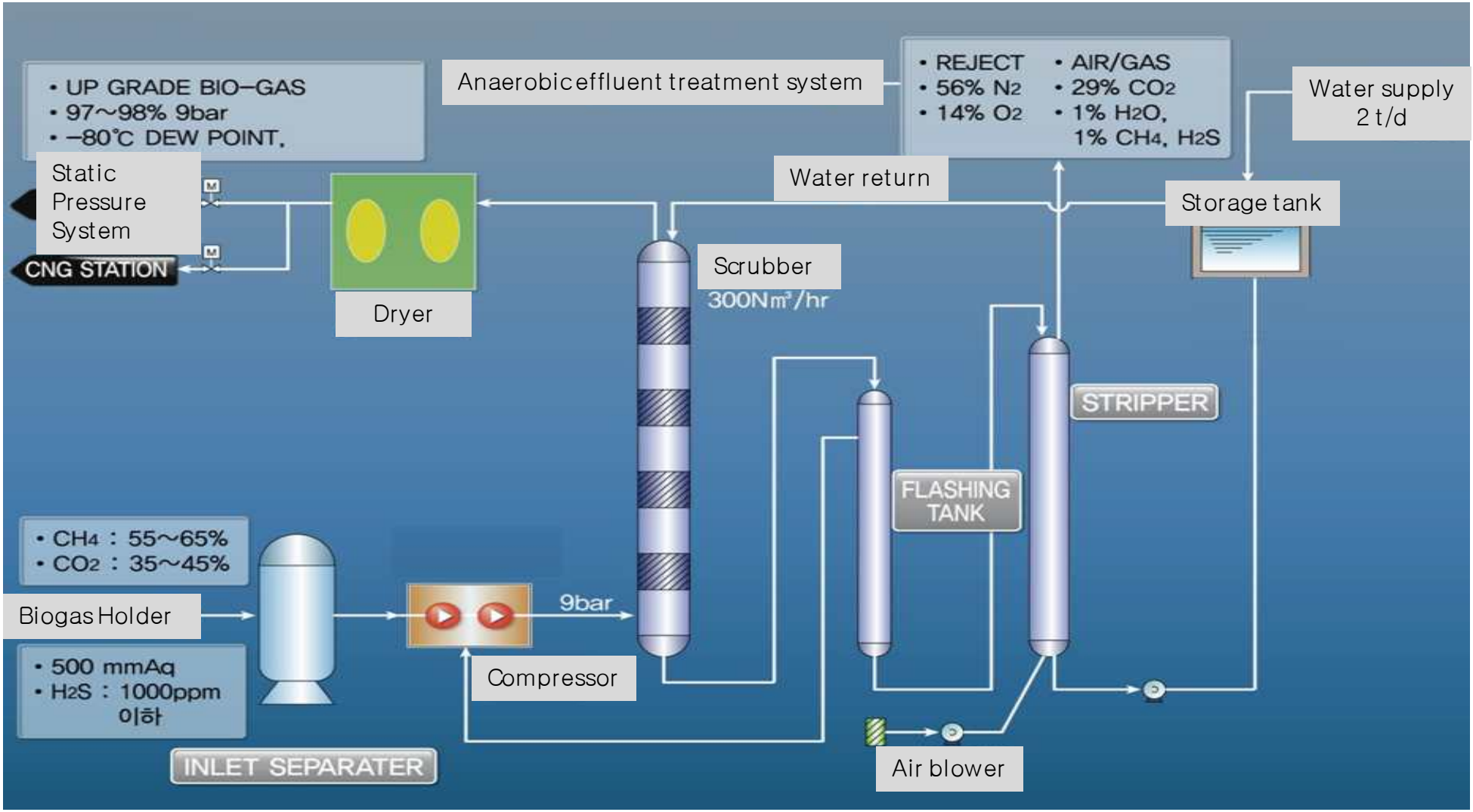
Buffer Tank
(15㎥, 4~5bar)

Sewage treatment plant fuel supply
(Approx. 1,500 Nm^3 /d)

- Biomethane production : 4,100N㎥/d
- Treatment method : Water Scrubbing fuel quality
- Fueling station : Automobile fuel quality standard
- Sewage treatment plant : CH_4 >95%
- Fuel quality test : Once per month

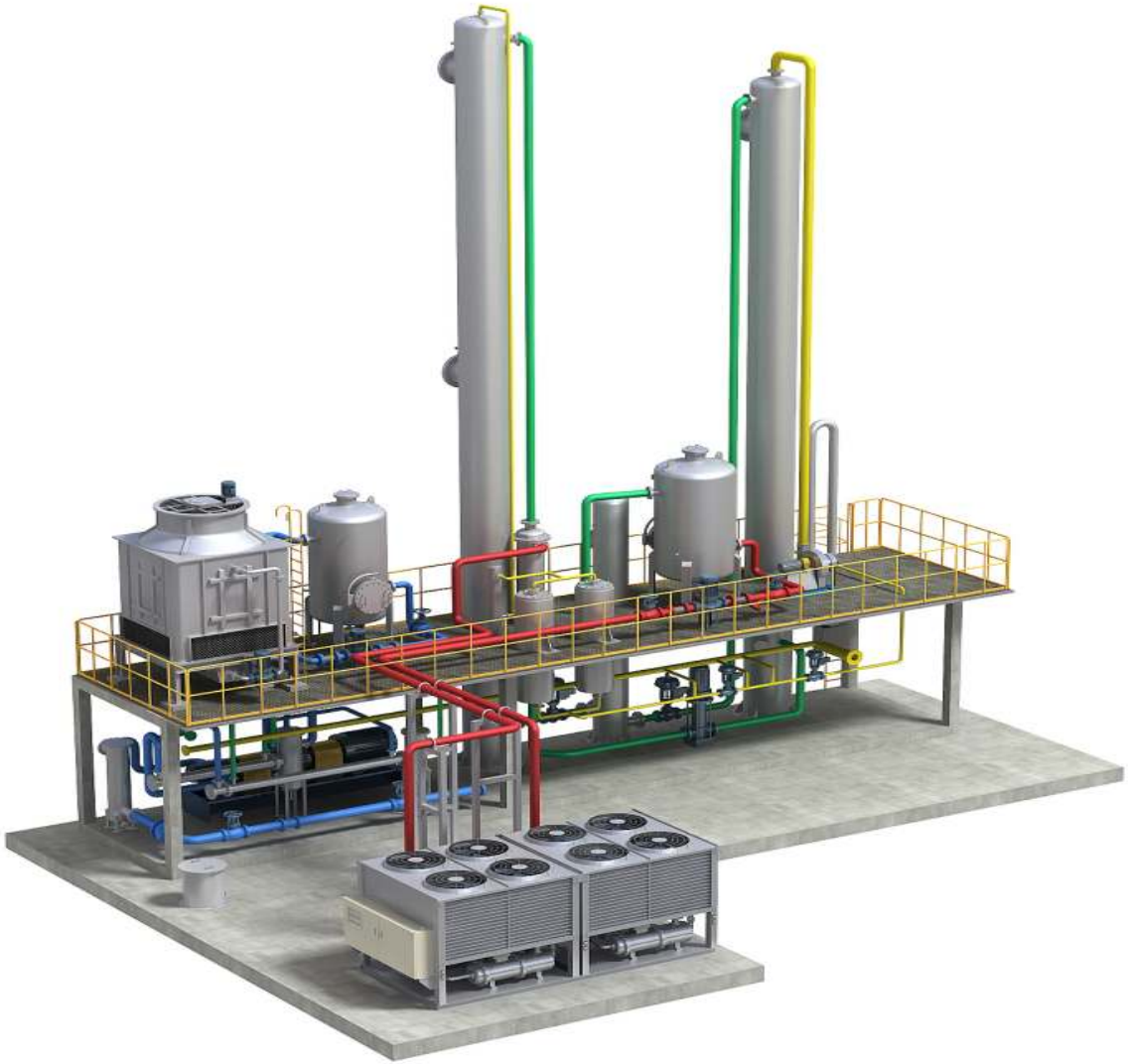
(Patent No. 10-1207532)

Simplex – Bio Gas Upgrading Plant (Water Scrubbing Process)



(Patent No. 10-1207532)

Simplex – Bio Gas Upgrading Plant (Water Scrubbing Process)



Sangam Hydrogen Station – Hydrogen production and use from methane in LFG

- **Name** : Sangam Hydrogen Station
- **Location** : Sangam-dong, Mapo-gu, Seoul
- **Capacity** : 30 Nm³/h (30 vehicles)
- **Fuel Cells** : 2 x 10 kW
- **Production Method** : LFG refining
- **Completed in 2011.05.**
- **Operator** : EcoBio Holdings Co., Ltd.

Pretreatment System	Hydrogen Production System (Fuel Processer)			Hydrogen gas compressor storage tank	Hydrogen injector
	Reformer	Shift Reactor	PSA (pressure swing adsorption)		
Separation of Methane (CH_4) and other gases	$CH_4 + H_2O \rightarrow 3H_2 + CO$ (800°C Steam)	$CO + H_2O \rightarrow H_2 + CO_2$	Separation of H_2 from other substances to increase purity (at least 99.995%)	Pressure store H_2 at 41.5MPa	Refuel vehicles 35MPa hydrogen

Hydrogen fuel source through the use of landfill gas

Securing proprietary technology through continuous R&D and national research projects

Biosulfur Product Development

Organic agricultural material, plant promoter, pet products, cosmetics etc.

Biosulfur Characteristic Research

Research on plant and crop application.
Insect, pest efficacy study.

National Research Projects

Development of biosulfur conversion Technology.
Development of eco-friendly alternative materials for golf courses.
Biogas process improvement study etc.

Magok R&D Centre

R&D

Business

High Value Addition of Biosulfur

Commercialization as organic agricultural material, plant promoter, pet products, cosmetics, etc.

Biogas Diversification

Biogas Hydrogen & Fuel Cell
Biogas city gasification project.

Waste to Energy (Upcycling)

Biogas resource development business
Organic Waste Energy Project.
Environmental Plant Manufacturing Business. Expansion of green industries.

Expansion of R&D Capabilities – Construction of Magok R&D center,
continued development of market leading technology –expansion of national research projects

Location	Magok Industrial Complex D10-1	
Area	1,196.7m²	
Construction Area	716.9m²	coverage ratio 59.9%
Total Floor Area	5,932.7m²	floor area ratio 349.5%
Research Complex	2,139.5m²	
Add. Facilities	1,734.2m²	
Commercialization Facility	308.4m²	
Parking space and underground area	1,750.6m²	

Stage 1

- Bioenergy


Stage 2

- Biosulfur-containing organic agricultural material
- Biosulfur-containing pesticides


Stage 3

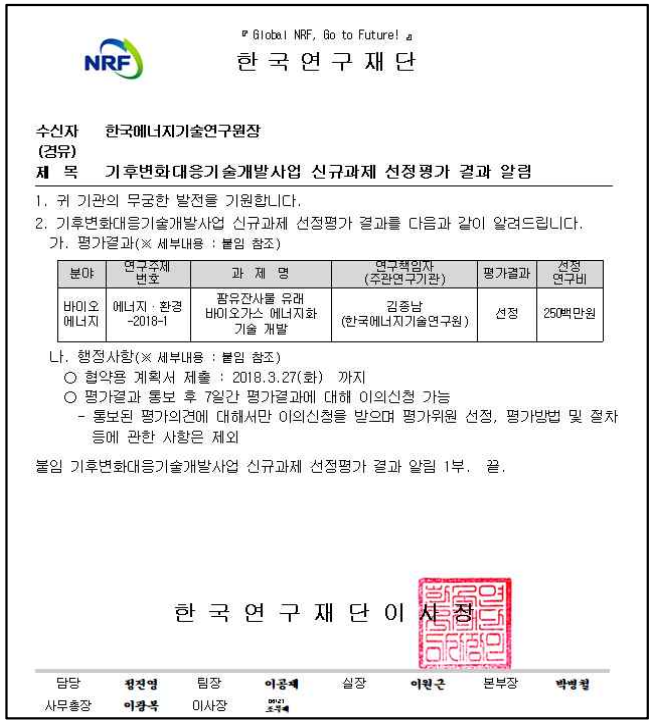
- Biosulfur-containing pet goods
- Biosulfur-containing bath good , cleansers, etc.


Stage 4

- Biosulfur-containing mask pack
- Biosulfur-containing skin care cream


National Research Foundation of Korea : New Project

1. Project Name : **Development of pre-treatment for POME biogas**
2. Research Institute : EcoBio Holdings Co., Ltd.
3. Head Institute : Korea Institute of Energy Research
4. Total Research Period : 2018. 3. 29. ~ 2021. 12. 31.(45 months)
5. Research Grant : 1.7 Million USD



Project Overview

Development of H_2S pretreatment system

EcoBio Holdings

KOSDAQ[038870] SINCE 2007

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Thank You !!