

Environment & Technology ECOCREATION



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CREATION

ECOCREATION CO., LTD

CEO Greeting

Dear Sirs,

I'm Beom Geun, Jeon, the CEO of Ecocreation Co., Ltd.

There was a shocking news that a dead marine mammal washed up on seashore, had dozens of kilograms of waste plastics in the stomach. However, this is only the tip of the iceberg. In fact, over five trillion pieces of plastics are in our oceans. Fishes are eating them, and we are in danger of setting the fishes on our table.

I was aware of this issue beforehand and have been developing our own technology for decades which converts waste plastics into useful oil by applying the pyrolysis technology. I'm confident that we can hand down better environment to our children by our pyrolysis plant that can fix the plastic waste issue.

According to a research, it's anticipated that plastic consumption is steadily increasing until 2050. It's a significant business opportunity for our customers or players in the related industries. We have proven superiority of our technology by supplying our pyrolysis plant home and abroad. We will do our best to make your business realized and prospered.

We appreciate for your continuous supports and interests.

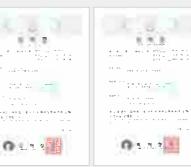




Certificate

► CERTIFICATE

















► AUTHENTICATION





























CERTIFICATE

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NEWS

Risk to Opportunity - Ultimate Solution



- ▶ 6.3 billion tons of the 8.3 billion tons ever produced have become plastic wastes.
- ▶ 500 billion plastic bags used annually worldwide.
- ightharpoonup It takes 500 to 1,000 years for plastics to degrade.
- ► More than 8 million tons of plastics are dumped into seas every year.
- ▶ 5 trillion pieces of plastics are in oceans.
- ► Pieces of plastics are consumed by fish then taken by people.

Save the earth, and take the astronomical opportunity for your business by

Ecocreation's technology

Plastic recycling EU 30% China 25% US 9%

UPCYCLING

Waste plastics(Pyrolysis) Upcycling

Technology

► The process is to get useful range of oil by cracking chemical bonds in macro-molecules to smaller ones. (10 ~ 15 carbons). The gas from pyrolysis process can be converted to pyrolysis oil by condensation.

Application

Available for waste plastics such as plastic bags, packages, cases and fishing nets, etc.

Usage

▶ Being used for fuel of generators and vessel engines, boilers, driers, farming equipment, etc.,

Strength

- Convert waste plastics into pyrolysis oil at high yield.
- ▶ Save natural resources & reduce emissions of green-house gas.
- No release of pollutants because of no supply of air to the process, different from incinerators requiring air (oxygen) for combustion that causes air pollutions.
- pollution and dioxin issues.

Facility Specifications



- ▶ Batch type with rotary kiln enables to achieve a high oil yield.
- ► Module type which shortens installation periods at sites.

Operation

Batch type with the rotary kiln reactor

Materials

► Carbon steel & stainless steel

Quality of pyrolysis oil

- ► Comply with the KR regulations
- ► Can be upgraded according to the purpose of the usage
- No Wax detected

Process

► Pyrolysis + Catalyst reforming +Distillation & post processes

Electricity

- ▶ 220 / 380V, 3phase
- ▶ Depending on site conditions

Net space for equipment

► 16m(w) x 25m(l) x 9m(h)

Reactor

► Standard volume: 40m³ 2,800mm dia. X 7,000mm long

Feedstock (Raw material)

- Waste plastics PP / PE / PS / Waste oil desirable
- ▶ PET, PVC, Nylon not recommended

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TECHNOLOGY

Advanced Technology of Ecocreation





Pyrolysis oil certification

Flexibly comply with customers' demands or purposes of usage by adding and modifying the process. (provide additional processes such as for further gum elimination if it is used for driving diesel engine.)

to heat the rotary kiln with no pollution.

Pyrolysis

- ▶ Plastic decomposition
- ► Water vaporization



► Wax reforming

Recycling non-condensed gas (Syngas)

▶ Restrain of gum

Catalyst reforming

Distillation

- ▶ Separate naphtha
- ► Adjust flash point



Filtering

- ▶ Get rid of wax remained
- ► Separate & remove gum

Stock & shipping



Reactor

Input waste

plastics

- ▶ Saving investment cost compared to others.
- Syngas being generated during the pyrolysis process can be used as fuel.
- ▶ Easy operation and control program.
- ▶ Residue (Coke) can be used as fuel for cement factory or foundry.



Catalyst / Catalyst column

- Liquid contact catalytic cracking / Vapor contact catalytic cracking.
- Decomposition of Cl compound and neutralized catalyst technology.
- ▶ Developed technology for preventing wax & gum.
- ▶ Minimize Cl gas caused the corrosion of the facility.
- ▶ Minimize the wax formation for stable operation.
- ▶ Double safety system for emergency.



Adjustment of flash point



Fractional distillation

▶ Removing the gum and impurities through the oil filtering system and adjusting the desired flash point of the pyrolysis oil.

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TECHNOLOGY COMPETITIVENESS



Cost

- ▶ Produce quality oil close to diesel which meets for a low-mid speed engine drive.
- ▶ Achieve higher oil yield by de-waxing in the catalyst process.
- Save super energy by recycling non-condensed gas to heat a rotary kiln.



Operation & Maintenance

- ▶ Provide higher equipment reliability with KS goods and QC activities.
- ▶ Provide a proper monitoring and operating system.
- ▶ Simple equipment design for beginners to do a proper maintenance.
- ► Conduct periodic feedbacks and training service. (When the first installation done)



Safety & Environment

- Double safety control by alarming and followed by press relief valve.
- ▶ Minimize disclosure of hazardous materials to operators through closed loop process.
- ▶ No air pollution due to an anaerobic reaction.
- Achieve a green factory by recycling non-condensed gas and residue.

Improve process efficiency due to our own technology such as catalyst development

Achieve earlier paybacks by economic CAPEX & operation cost.

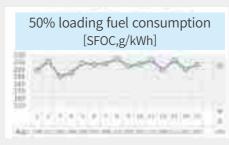
Risks	Competitors' technology	Ecocreation's technology
▶ Reactor coking	 Longer maintenance time required Low yield due to lower thermal efficiency No proper chemical suggested to remove 	Developed coking inhibitors (patent application)Extension of lifespan of reactor
Clogging of steam pipe (wax, gum)Poor quality for wax	Clogging pipe due to plenty of gum and waxPoor quality in winter season	 Developed anti-gum agent (patent application) Developed wax cracking catalyst (patent application) Innovative improvement of oil quality Applied higher safety standard
► Product deterioration by PVC, Cl ► Facilities corrosion by HCl	 Exposure to HCl corrosion Reduction of lifespan of facilities Vinyl chloride monomer is generating(Cl gas) Poor quality of oil 	 Removal of VCM monomer Developed the gas neutralization tank Minimize chemical reaction caused by salt Can get higher quality oil

Power generation plant by pyrolysis oil

- Qualified for diesel engine conformance test with pyrolysis oil by KR Services.
- ▶ Obtained certificate of test for the top quality oil from Korea and Singapore organizations.
- ▶ Pyrolysis oil operation engine performance.
- Cetane number and Wax: Available at Cetane number 37 or more and Wax 7%
- ▶ Pyrolysis oil system (10 ton) Production of electricity generation.
- 7,920MWh = 1MW x 24h x 330day. (Unit power x Average operation time/ day x Operation days)

Engine Operation Test (Comparison test between pyrolysis oil and diesel oil)







Projects for electric power generation

- ▶ Japan, Australia & etc. : Made many contracts of pyrolysis plant.
- Others: Active cooperation with local governments. (Brazil, Mexico, Vietnam, etc.)

QUESTION AND ANSWER



• Where is the pyrolysis oil traded?

- In Korea, it can be traded everywhere except only for car fuel as long as it meets quality requirements designated by the Korean regulation.
- Please check the local regulations.

Is it possible to use for electric power generations?

- Ecocreation provides customers with additional processes, to upgrade the oil to be used for low-mid speed diesel engines, which are necessary for getting rid of gum and improving lubrication, etc.
- Where can be the catalyst provided?
- Need to purchase it from Ecocreation as Ecocreation developed the catalyst which is effective for the pyrolysis process.

▶ Is it possible to be supplied a continuous pyrolysis plant?

- The continuous type is not useful for large capacity pyrolysis plant because of huge CAPEX, large building space requirement and lower oil yield. Ecocreation provides only batch type plants with rotary kilns that overcome those disadvantages.

▶ How much can the plant get oil from feedstock?

- It largely varies on materials. Please put as high a density and clean material as possible.

Price & delivery?

- They depend on local site conditions and customers' requirements as well as backlog at Ecocreation plant. Please discuss with us in detail.

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PERFORMANCE & OVERSEAS OFFICES

History of Ecocretion, Presence of Ecocreation in the world

USA

2010

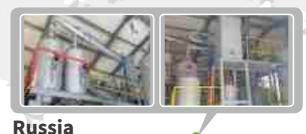




Spain







Thailand

Global partners

Korea





Pyrolysis plants supplied

































Participated in Tokyo international environmental exhibition, Launched the product in Los Angeles Expo, USA **ADP** Applied patent on Reverse Vending Machine

(10-0973548),(10-0972533) May Registered design of Reverse Vending Machine (30-0575946) Participated in Atlanta "WASTE EXPO exhibition", USA Moved to larger facility located in (541-11, Gajwa-dong, Seo-

gu, Incheon) Certificated as a venture business

Aug Established R & D Center

Man Established Ecocreation

Participated in LUFRO World congress & Forest expo (Helix)

NOV Obtained CE certification of Reverse Vending Machine Obtained certification of Kor-EFTA product-specific approved exporter

Dec Won a third prize on 2010 Korea invention patents competition





2011

Registered as a new & renewable energy specialized corporation May Participated in Re-tech recycling & Waste Management exhibition

Obtained CE certification on pyrolysis plant Installed pyrolysis plant in Spain (1 unit) (The first entry into Europe)

Sep Signed on MOU for sales in the region

NOV Won the grand prize in 2011 for the successful case of FTA

DCC Received a presidential citation as million dollar export Signed on MOU and contract with Australia for sales (Ecocreation International (Australia) PTY LTD)

2012

Signed on MOU and contract with South Africa for sales (COLLECTALL GROUP PTY LTD)

Registered as broadcasting and communication equipment

May Obtained KC certification(EC-201)

Installed pyrolysis plant in Singapore(1 unit) Participated in Malaysia 2012 exhibition

DCC Registered at Public Procurement Service, USA

2012

2015 2013 2016 2017 2018

2013

2010

Jan Obtained environmental product declaration EC-201

2011

Man Obtained certification of green technology product EC-201

Designated as promising small and medium-sized export firms EC-201 Certificated as an excellent product EC-201

Moved to larger facility located in (32-1, Wonchang-ro, Seo-gu, Incheon)

2014

Jan Registered as an excellent product EC-201

May Signed on MOU for sales in USA

Installed pyrolysis plant in Jacksonville, Florida, USA (1 unit) Certified as a venture business. / Obtained certification of R & D Center

Aug Installed pyrolysis plant in Russia (1 unit)

2015

Designated as promising small and medium-sized export firms

Set Installed pyrolysis plant at PNE company in Eumseong (1 unit) Nov Increased corporate capital (900 million KRW)

2016

Mar Got high grade assessment on technology from e-Credible

Installed pyrolysis plant at Deokcheon industry in Hongsung (1 unit)

Feb Installed pyrolysis plant at ChangSung ENT in Jeju (1 unit)

Installed pyrolysis plant at V.A. Energy in Bangkok, Thailand

Installed pyrolysis plant at ECO Clean in Okcheon (1 unit)

Aud Installed pyrolysis plant in Melbourne, Australia (1 unit)

Singapore





Australia



