



Environment & Technology ECO CREATION



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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.

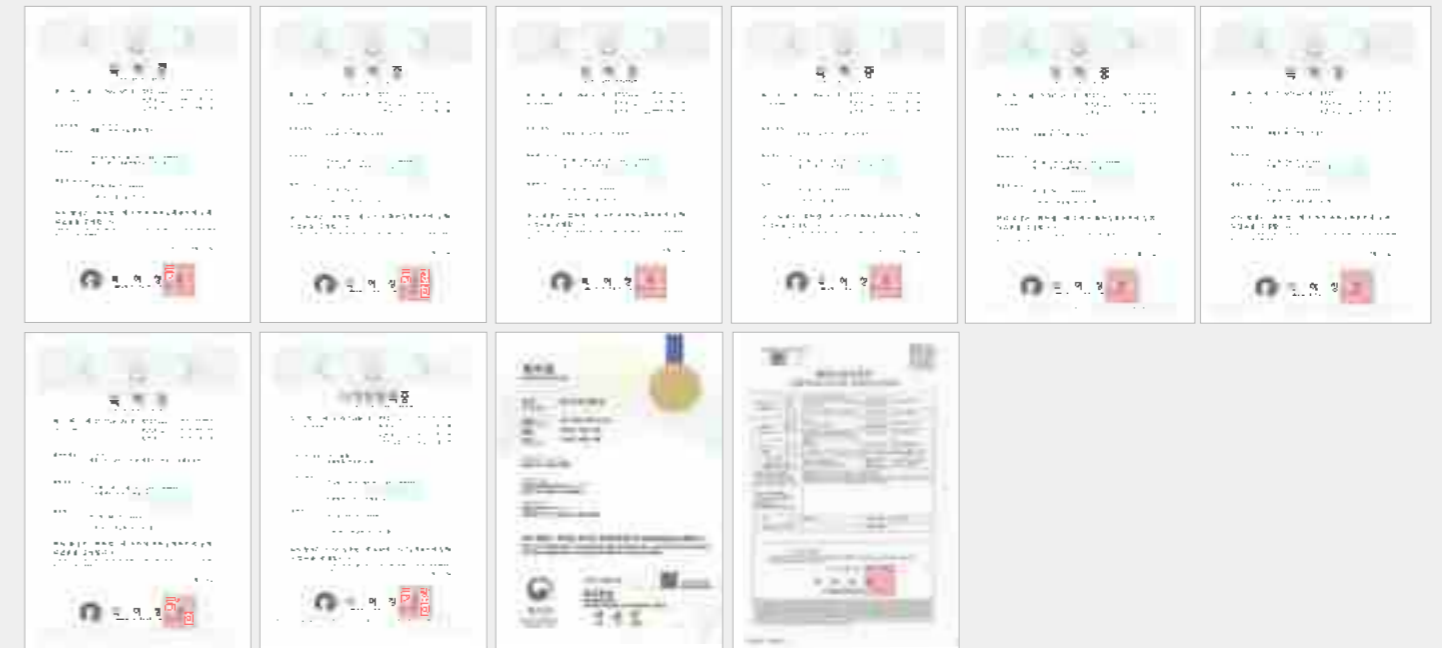
We appreciate for your continuous supports and interests.

CEO Beom Geun, Jeon.



Certificate

▶ CERTIFICATE



▶ AUTHENTICATION



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.
- ▶ 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	Process	Reactor
▶ Batch type with the rotary kiln reactor	▶ Pyrolysis + Catalyst reforming +Distillation & post processes	▶ Standard volume: 40m ³ 2,800mm dia. X 7,000mm long
Materials	Electricity	Feedstock (Raw material)
▶ Carbon steel & stainless steel	▶ 220 / 380V, 3phase ▶ Depending on site conditions	▶ Waste plastics - PP / PE / PS / Waste oil desirable ▶ PET, PVC, Nylon not recommended
Quality of pyrolysis oil	Net space for equipment	
▶ Comply with the KR regulations ▶ Can be upgraded according to the purpose of the usage ▶ No Wax detected	▶ 16m(w) x 25m(l) x 9m(h)	

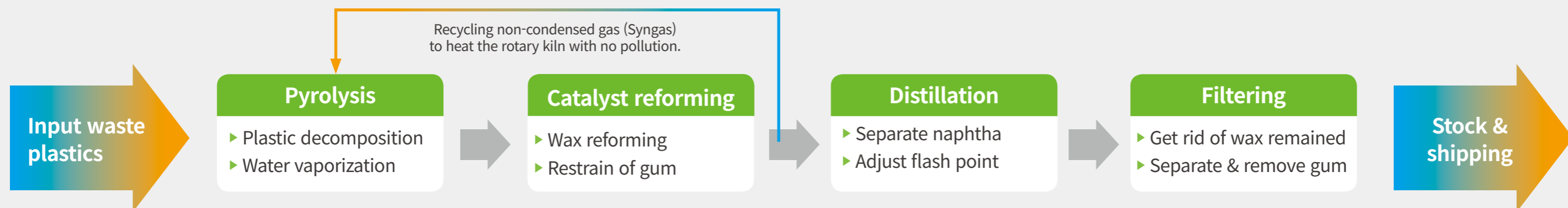
TECHNOLOGY

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.)



Reactor

- ▶ 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.

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

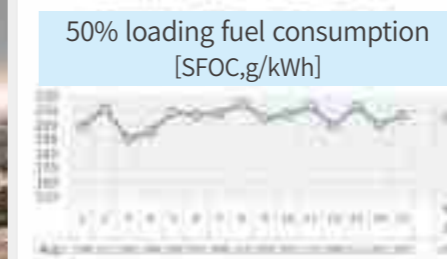
Achieve earlier paybacks by economic CAPEX & operation cost.

Risks	Competitors' technology	Ecocreation's technology
<ul style="list-style-type: none"> ▶ Reactor coking 	<ul style="list-style-type: none"> ▶ Longer maintenance time required ▶ Low yield due to lower thermal efficiency ▶ No proper chemical suggested to remove 	<ul style="list-style-type: none"> ▶ Developed coking inhibitors (patent application) ▶ Extension of lifespan of reactor
<ul style="list-style-type: none"> ▶ Clogging of steam pipe (wax, gum) ▶ Poor quality for wax 	<ul style="list-style-type: none"> ▶ Clogging pipe due to plenty of gum and wax ▶ Poor quality in winter season 	<ul style="list-style-type: none"> ▶ Developed anti-gum agent (patent application) ▶ Developed wax cracking catalyst (patent application) ▶ Innovative improvement of oil quality ▶ Applied higher safety standard
<ul style="list-style-type: none"> ▶ Product deterioration by PVC, Cl ▶ Facilities corrosion by HCl 	<ul style="list-style-type: none"> ▶ Exposure to HCl corrosion ▶ Reduction of lifespan of facilities ▶ Vinyl chloride monomer is generating(Cl gas) ▶ Poor quality of oil 	<ul style="list-style-type: none"> ▶ 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

Q&A

- ▶ **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.

PERFORMANCE & OVERSEAS OFFICES

History of Ecocreation, Presence of Ecocreation in the world

● Pyrolysis plants supplied
● Global partners

