

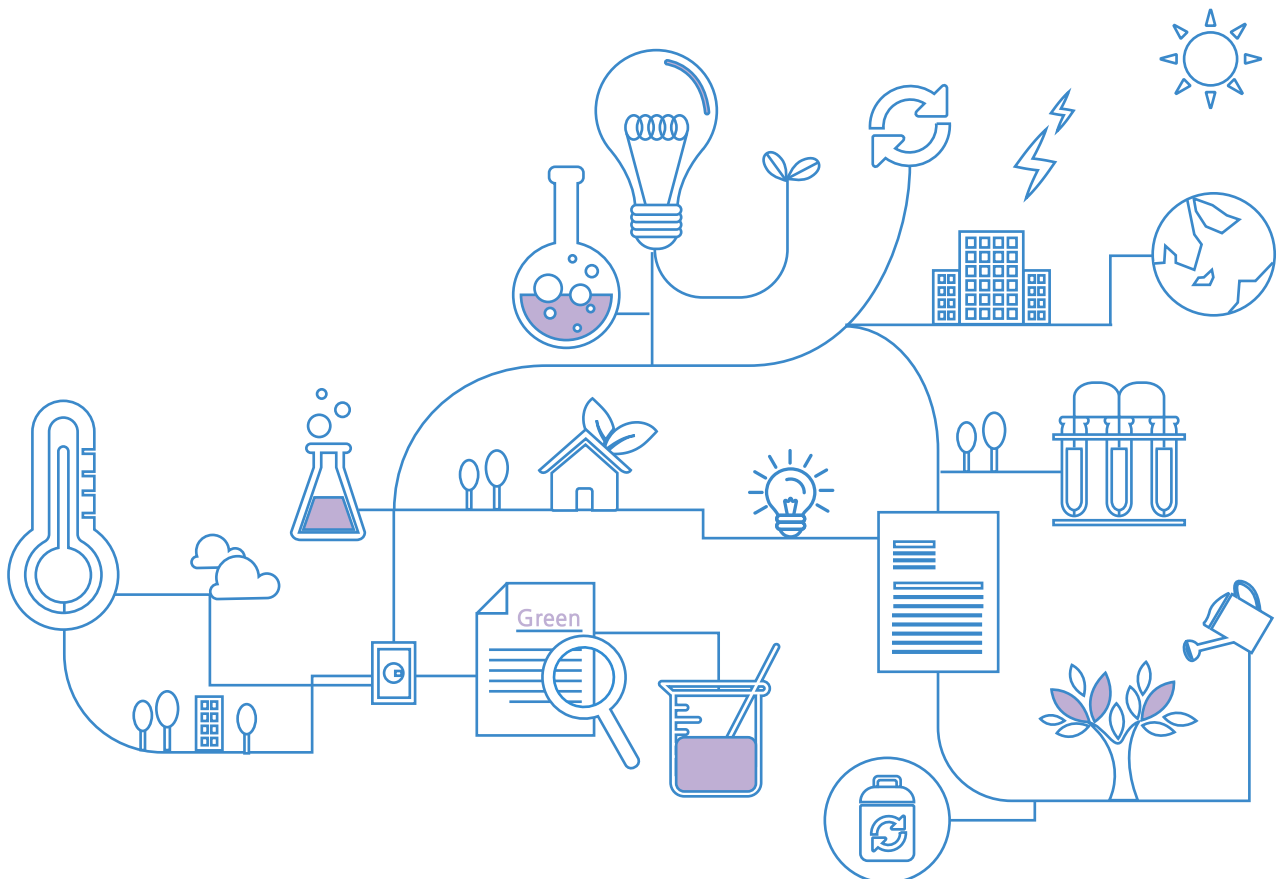
Save Earth, Save Us

ecoin energy

green technology

IoT-based Transportable Module Plastic Waste Pyrolysis Reactor

TMR4K



01
Trend“ International Social and Economic Paradigm Shift ”
for Responding in the Face of the Climate Crisis

INTL.

'In the 15 Paris Agreement, Announcing obligations for all countries to reduce greenhouse gas emissions 'In January 2023, the World Economic Forum selected 'Global Risks Report 2023'.

Among the top 10 most serious risks for the next 10 years, rankings 1 to 4 are related to climate and environmental issues

Global risks ranked by severity over the long term (10 years)

Risk categories		Economic	Environmental	Geopolitical	Societal	Technological
01	Failure to mitigate climate change					
02	Failure of climate-change adaptation					
03	Natural disaster and extreme weather events					
04	Biodiversity loss and ecosystem collapse					
05	Large-scale involuntary migration					
06	Natural resource crises					
07	Erosion of social cohesion and societal polarization					
08	Widespread cybercrime and cyber insecurity					
09	Geoeconomic confrontation					
10	Large-scale environmental damage incidents					

Source World economic Forum Global Risks Perception Survey 2022-2023.



EU

'By 2050, Achieving Carbon Neutrality.
By 2030, Reducing 55% in Carbon Emissions compared to 1990'



USA

'By 2050, Achieving Carbon Neutrality.
By 2030, Reducing 50~52% in Carbon Emissions compared to 2005'



UK

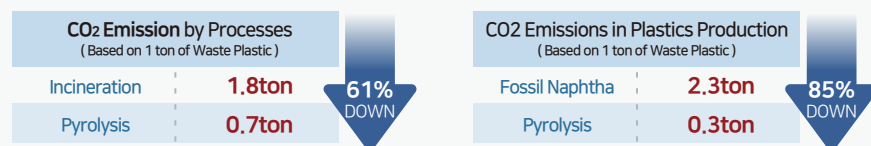
'By 2050, Achieving Carbon Neutrality.
By 2030, Reducing 68% in Carbon Emissions compared to 1990'



JPN

'By 2050, Achieving Carbon Neutrality.
By 2030, Reducing 46% in Carbon Emissions compared to 2013'

'Global companies such as BP (UK), BASF (GER), Neste (FIN), and Monroe Energy (USA) are also carrying out waste plastic pyrolysis projects to respond to carbon zero and RE100.

61% CO₂ Reduction by Pyrolysis, 85% CO₂ Reduction by Producing Plastics with Pyrolysis Oil

Source BASF LCA(Life Cycle Assessment)

DOM.

약속16·국정89 재활용을 통한 순환경제 완성 (2022.5.2)

페플라스틱 열분해로 석유·화학 원료 만들기

- (이번 구축) 페플라스틱 열분해유의 재활용 용도 확대
 - 열분해유를 석유·화학 원료 또는 수소연료 제조에 사용할 수 있게 재활용 유형 신설
 - 플라스틱 열분해 생산·사용자에 대한 인센티브 제공
- 공공열분해시설 확충
 - 폐비닐, 전자제품 등을 활용하는 공공열분해시설 26년 10개소(4만톤/년) 구축

인거레

고물이 보물로...페플라스틱 재활용 산업이 뜬다

대기업 규광 텀 플라스틱 폐기물 시장

폐기물 재활용 전문기업 에코인에너지의 하인 대표가 지난해 4월 경기도 안성시 한 자립농수산물 종합 입찰에 참가한 페플라스틱 열분해 유화장치에 대해 설명하고 있다. (왼쪽) '페플라스틱 열분해 유화장치'에서 생산된 열분해 재생 연료유 (오른쪽)

이 에틸드경제

SKC, 페플라스틱 열분해유 R&D 법인도 설립

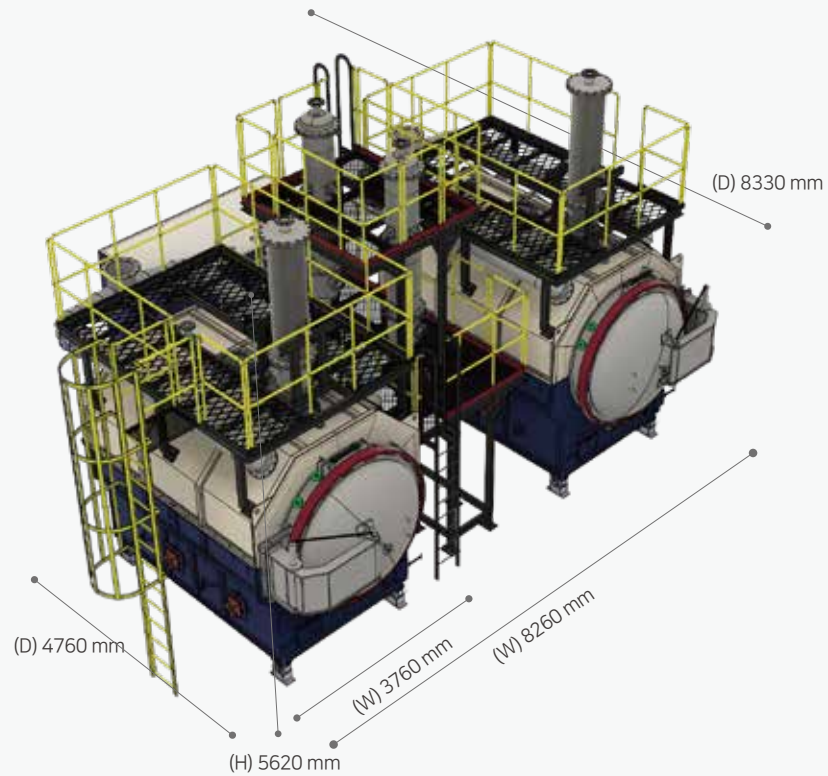
분해유 불순물 제거 수준 향상 고부가 플라스틱 원료로 활용

SKC의 화학·소재 계열사인 SKC가 페플라스틱 열분해유 관련 연구개발(R&D) 법인을 설립하는 등 친환경 사업에 박차를 가하고 있다.

"Announcement : Disposal up to 10% of all waste plastics by 2030 using pyrolysis technology, which has excellent carbon reduction effects and eco-friendly." (06.18.2021)

'Oil refining companies(SK Innovation, GS Caltex, Hyundai Oilbank) have received permission and are implementing the regulatory sandbox to allow pyrolysis oil to be used as a raw material in the oil refining process and petrochemical process (9. 2021)

02 Config.



*Metric ton

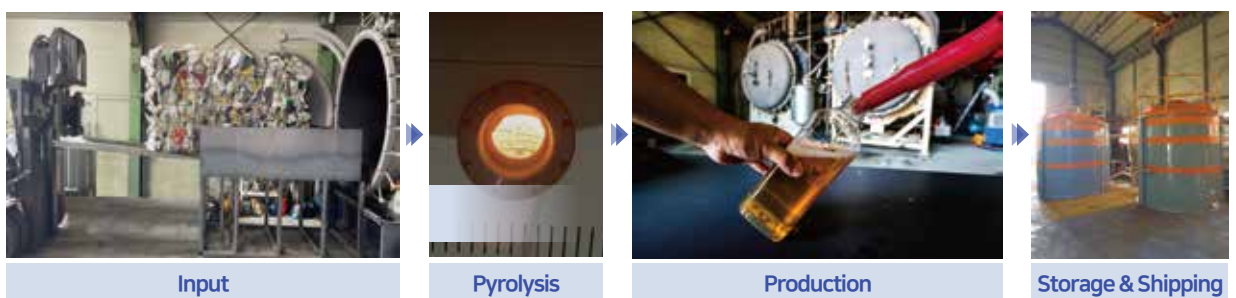
Company	Ecoin Energy, Inc.
Model	TMR4K
Reactor	BATCH TYPE
Installation	Module-Type Facility

Facility Size	8260(W)x8330(D)x5620(H)
Installation Area	69m ²
Volume	386.7m ³ /1set
Total Weight	27ton*/1set

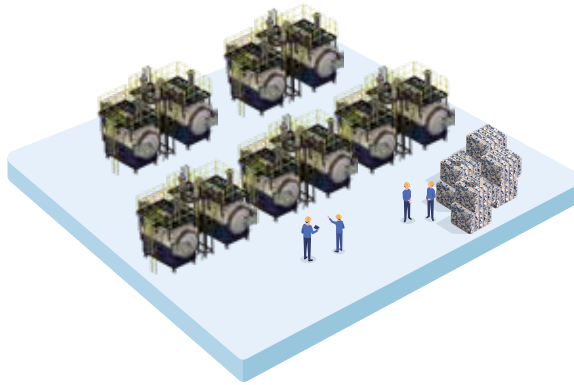
Process Capacity	Compressed Bale of Plastic Waste x 2ea
Daily Input	Compressed Bale x 4ea(1ton*/ea)
Loading Method	Forklift Load
Cycle	2times/day
Heating Method	Burner
Cooling Method	Hybrid(Air+Water)
Fuel	LPG, Pyrolysis Gas
Residue	Carbon Black
Product	Light Pyrolysis Oil (C5~C15)

-  Module-type Pyrolysis Facility
Easy to Relocate/Reinstall
-  Installation Space within **69m²**
-  Up to 60% **Low Facility Cost**
compared to Competitors
-  Real-time Online Monitoring,
Control through IoT Technology

03 Process

Pyrolysis
process

04 Business Model



20ton*/day
5,400ton*/year

*Metric ton

TMR4K 5 units operation
(270 days/year)



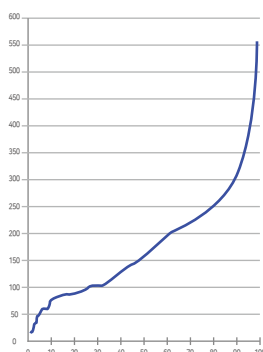
“ Carbon Neutrality through the Chemical Recycling of Plastic Waste ”

- 1 Achieving Chemical Recycling through Pyrolysis of Waste Plastic
- 2 Carbon Emission Reduction
- 3 Improving Local Community Acceptance (Prevention of Public Complaints)

05 Certi.

The Analysis Results of Pyrolysis Oil

⑤ Optimized Pyrolysis Oil for Petrochemical Feedstock (Naphtha 52.3%)



Constituent	Ratio
Naphtha (IBP-175°C)	52.3 wt%
Middle distillate (175-343°C)	40.7 wt%
Vacuum gas oil (343-524°C)	6.2 wt%
Residue (524°C-)	0.8 wt%

	면세점 폐비닐 (타사제조)	Ecoin Energy Inc. ('19)	Ecoin Energy Inc. ('20)
Naph. (~150)	11%	50%	37%
Kero (150~265)	25%	41%	55%
LGO (265~340)	21%	5%	5%
AR (340+)	43%	4%	3%

* Lotte Chemical Certification

* SK Geocentric Certification



Pyrolysis Oil 2,970ton* /year

Sales to Petrochemical Companies (S-Oil etc.)
Sales Projection : USD 1.64 M



Carbon Emission 9,355ton* Reduction

Sales through ETS* Business
Sales Projection : USD 240.9K

*Emission Trading Scheme



Pyrolysis Oil Sales

+ Cost of Plastic Waste Disposal

+ Subsidy for recycling
(from the Ministry of Environment)

+ Trading Carbon Credit



⑤ Pyrolysis Oil Yield **63%**

* Waste Plastic Vinyl



⑤ Compliance with Clean Air Conservation Act's Emission Standards for Hydrogen Sulfide(H₂S) and Hydrogen Chloride(HCl)



06 Natl. R&D Project

Business	Project	Date	Agency
Startup Growth Technology Development Program	Development of a Prototype Transportable Pyrolysis Reactor for Combustible Waste	'17.06.26 ~'18.06.25.	Korea Technology and Information Promotion Agency
Green R&D Program	Development of Advanced Feed Material Refinement Technology for Improving Pyrolysis Oil Processes	'18.05.16 ~'18.12.31.	Daejeon Green Environment Center
Startup Promotion IP Seed Support Program	Waste Resource Recycling Technology	'18.08.23. ~'18.11.30.	Daejeon Intellectual Property Center
Demonstration-Based Development of Recycled Plastic Material from Waste Plastics	Commercialization of a Reactor Converting Waste Plastic to Renewable Fuel Oil by Chemical Recycling	'20.10.21. ~'20.12.16.	Jeonnam Technopark
Support Program for the Development and Promotion of Small and Medium-sized Eco-friendly Companies	Establishment and Operational Technology Development of a Pyrolysis Facility for Waste Plastics with Hydrogen Sulfide and Hydrogen Chloride Reduction Technology	'20.05.01. ~'21.04.30.	Korea Environmental Industry & Technology Institute
Marine Industry Demand - Driven Technology Development Program	Establishment of a 1ton Capacity Ultrasonic Pretreatment and Pyrolysis Facility for Marine Waste Plastic Resource Recovery, along with Operational Technology Development	'20.05.18. ~'21.12.31.	Korea Institute of Marine Science & Technology Promotion
Industry-Academia Collaboration in Agricultural Industrial Park R&D Support Program	Development of Customized Rural Waste Resource Recycling Technology for Jeollanam-do Region	'21.04.01. ~'22.03.31.	Jeonnam Technopark
AI Training Data Building Project	Waste Plastic Image Data System Development	'21.05.01. ~'21.12.31.	National Information Society Agency
Development of Carbon Neutrality Leadership Models for Small and Medium-sized Enterprises	Development and Demonstration of Waste Plastic Pyrolysis Chemical Recycling Technology to Reduce Greenhouse Gas Emission using Landfill Gas	'22.08.22. ~'24.08.21.	Korea Technology and Information Promotion

07 Patent

Ecoin Energy's 12 Key Patents

- 10-0767639 Apparatus for making oil using chemical recycling of plastic wastes
- 10-0945529 Low-temperature pyrolysis system for recycling oil using waste plastic
- 10-1074145 Pre-heating apparatus
- 10-1074146 Power generating system using low-temperature pyrolysis reaction of waste plastic
- 10-1380871 Using waste plastic agricultural and industrial production units recycling oil
- 10-1380870 Device for pyrolysis processing waste high-temperature sterilization
- 10-1040966 Catalyst for removing the acidic compound in high TAN crude and the preparation method
- 10-1478528 Apparatus and Method for removal of Cl compounds including in high boiling-point pyrolytic oil produced from pyrolysis of waste synthetic plastics
- 10-0748624 System and Method for Pyrolysis of Waste Plastics using Rotary Kiln Type Pyrolysis Apparatus
- 10-1804805 Oil extraction device for pyrolysis of combustible waste movable
- 10-2317493 Oil extraction device for pyrolysis of combustible waste movable
- 10-2419741 Regenerated fuel oil generating device

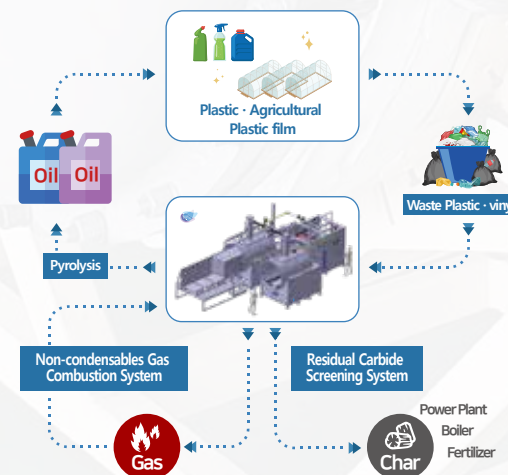


Ecoin Energy History

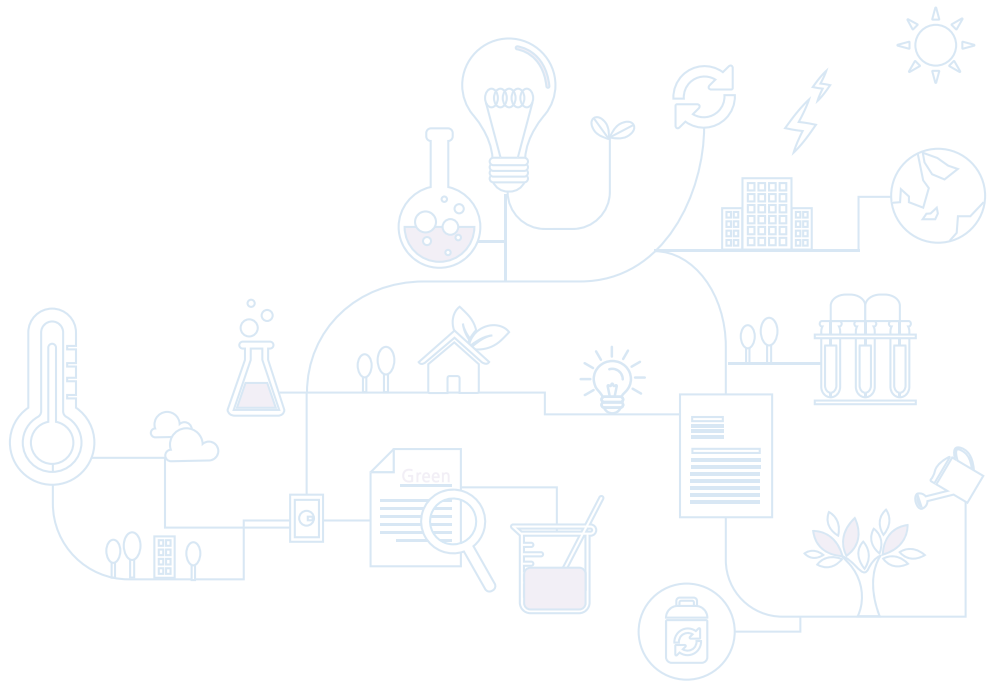
- 2015 . 03 Established 'EcoinEnergy Ltd.'
- 2017 . 06 Selected for the Ministry of Korea SMEs and Startups Technology Development Program for Startup Growth
- 2018 . 05 Selected for the Generation Convergence Startup Campus Program by the Daejeon Information & Culture Industry Promotion Agency
- 2018 . 11 Initiated operation of the TDR-1000P, a transportable module plastic waste pyrolysis reactor
- 2018 . 12 Awarded the Young Entrepreneur Award by the Venture Business Association
- 2019 . 04 Received the Green Technology Award in the Green Energy Excellence Category at the 13th Green Energy Awards by The Korea Times
- 2019 . 07 Awarded the Encouragement Prize at the National Contest of the 2019 Korea Balanced Development Expo
- 2019 . 09 Awarded the Excellence Prize at the 2019 First Half Demo Day hosted by the Korea's science ministry
- 2020 . 05 Selected for the Marine Industry Demand-Based Technology Development Project by the Korea Institute of Marine Science and Technology Promotion
- 2020 . 07 Secured a 500 million KRW investment from SK Innovation SV2 Impact Partnering (Crowdfunding)
- 2020 . 12 Signed a tripartite MOU with Korea Midland Power and SK Innovation
- 2021 . 01 Initiated operation of a transportable modular pyrolysis prototype device (TMR4K) for waste plastic
- 2022 . 06 Selected for the Small Business Innovation Voucher Program by the Korea SMEs and Startups Agency
- 2022 . 07 Selected for the 12-2nd LG Social Campus in 2022, conducted joint collaboration with LG Chem
- 2022 . 08 Selected and executed the Carbon Neutral Leading Model Development Project by the Korea Technology and Information Promotion Agency for SMEs
- 2022 . 11 Awarded the Grand Prize in the Startup Category at the 2022 4IR AWARDS by MONEYTODAY
- 2022 . 12 Designated as a Preliminary Social Enterprise in the Environmental Sector
- 2023 . 02 Acquired ISO 14001 and ISO 9001 Certifications
- 2023 . 05 Secured a 2 billion KRW investment from Hanwha Investment & Securities Co., Ltd
- 2023 . 05 Secured a 200 million KRW investment from Merry Year Social Company (MYSC)
- 2023 . 07 Completed designation as an Innovative Product by the Korea Public Procurement Service
- 2024 . 01 Awarded the Prime Minister's Commendation for Contributions to Carbon Neutrality and Green Growth
- 2024 . 03 Secured a 1 billion KRW investment from Hanwha Investment & Securities Co., Ltd
- 2024 . 05 Secured a 1 billion KRW (approximately \$750,000) investment from K-R Ventures
- 2024 . 06 Selected for the 'Super Gap Startup 1000+' Project by the Korea Institute of Startup & Entrepreneurship Development

The Complete Plastic Waste Recycling Treatment System

- 01 Creating a large scale production capable system for high quality pyrolysis oil through **"Continuous Pyrolysis Oil Purification System"**
- 02 Recycling waste pyrolysis gas as fuel through an **"Non-condensable Gas Combustion System"**
- 03 Recycling the carbide pollutants post pyrolysis as fuel through **"Residual Carbide Screening System"**
- 04 Recycling of all substances generated from waste plastic pyrolysis through the **"Complete Plastic Waste Recycling Treatment System"**



Business Partners



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