

与万物和 与天地容
Harmonize with Everything
Coexist with the World



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VARY 万容
Technology • Environment • Resources



Waste Plastic Chemical Recycling System

HUNAN VARY TECH CO.,LTD.



International Policy



Favorable policies

《Global Treaty on Plastic Pollution Prevention》

Suggests systemic changes for market transformation to achieve a circular economy for plastics and to end plastic pollution.

《European Plastics Pact》

The first regional agreement to join the Ellen MacArthur Foundation's Global Plastics Pact network.

《EU Packaging and Packaging Waste Directive》

Encourages the recycling and reuse of waste, reducing pollution caused by the incineration of mixed waste.

《The Basel Convention》

Establishes a global framework for preventing plastic waste pollution, leveraging expert knowledge to promote the implementation of new measures to combat plastic waste pollution.

《New Plastics Economy Global Commitment》

Attracted the participation of over 500 companies, governments, and other institutions, aiming to address the global plastic pollution issue and promote the development of a circular economy.



Domestic policies

《Guidelines for the Recovery and Recycling of Plastics Waste》

Chinese National Standard indicates that chemical recycling is one of the methods of material recovery.

《Technical Specifications for the Control of Waste Plastic Pollution》

encouraging chemical recycling for waste plastics that are not suitable for physical recycling. Facilities for the chemical recycling and pyrolysis of waste plastics should use continuous production equipment, which includes a continuous feeding system, a continuous pyrolysis system, and a continuous discharging system.

《Action Plan for Plastic Pollution Control during the 14th Five-Year Plan》

increase the recycling of plastic waste and accelerate the promotion and application of advanced and applicable technologies and equipment for the recycling of waste plastic.

《14th Five-Year Plan for Industrial Green Development》

proposes to encourage the development of chemical recycling of waste plastics and promote the application of technologies such as thermal cracking of low-value waste plastics.

《Technical Specifications for Pollution Control of Express Packaging Waste》

recycling enterprises should choose physical recycling, chemical recycling and other recycling processes based on factors such as the material of waste plastic, degree of contamination, cleanliness, and intended use, and adopt appropriate pollution prevention and control technologies.

“ The market space for chemical recycling of waste plastics is enormous.

70 million tons/year

Plastic chemical recycling plants input capacity in 2050

24%

The proportion of chemical recycling within the overall plastics recycling capacity

Chemical recycling of waste plastics is emerging as a new growth driver for both the petrochemical and solid waste management industries in the era of carbon neutrality. This is due to its efficient processing of plastic waste, significant reduction in carbon emissions, and its exceptional capacity to substitute for crude petroleum.

Date source: How EPCs and equipment suppliers can capitalize on chemical recycling

”



| Company profile

20⁺ Years

solid waste resource
utilization services

20⁺ Subsidiaries

focusing on
solid waste recycling

14⁺ Times

participation in formulation
of national standard

8⁺ Copyrights

of system software in
the solid waste recycling field

6⁺ Achievements

of ministry-level scientific
and technological appraisal

Vary Tech, founded in 2006, always adhere to the ecological concept of "Harmonize with everything, coexist with the world" and committed to providing the world with excellent solid waste resource utilization equipment and integrated solutions. Vary Tech consists of a marketing center, a research and design center, an equipment manufacturing center, an engineering service center, and a number of subsidiaries that apply the company's equipment and technology for solid waste recycling, forming a complete service industry chain, and has successfully developed three key technologies: "Mechanical Crushing and Sorting", "Oxygen-free Pyrolysis", and "Molecular Membrane Fermentation Tank". It has pioneered the "Physical Recycling" of all categories of waste materials with the "Blue Island Model", the "Chemical Recovery" of organic solid waste with the "Energy Island Model", and the "Molecular Membrane Fermentation Tank" for agricultural waste with the "Green Island Model".

Based on mechanical crushing and sorting technology and oxygen-free pyrolysis technology, Vary Tech has built a waste plastic resource utilization plant in Henan, with an annual processing capacity up to 220,000 tons. It successfully converts waste plastic from domestic waste into pyrolytic oil, gas, and carbon, innovatively created the industrial chain for the recycling of waste plastic of domestic waste.

The oxygen-free pyrolysis technology and equipment developed by Vary Tech have garnered multiple national accolades. This equipment enables the resource utilization of over 30 categories of organic solid wastes, such as waste plastics, domestic waste, petroleum sludge, sewage sludge, waste tires, medical waste, hazardous waste packaging, and residues from dyes and coatings. It effectively tackles global environmental concerns related to "white pollution" and "black pollution." The equipment has been successfully commercialized and implemented in numerous projects around the world.

In the future, Vary Tech will leverage its core technological strengths to broaden the scope of resource utilization for more solid wastes and deepen the recycling field of plastics. Driven by independent innovation, Vary Tech will persistently advance resource utilization technologies to contribute "Vary Power" towards achieving carbon neutrality and the sustainable development of the Earth!

Honors & Qualifications

Company Hornors

- Chinese National High-tech Enterprise
- Chinese National Small Giant Firm
- Chinese National Intellectual Property Advantage Enterprises
- National Support Unit for Advanced Applicable Technology and Equipment of Industrial Resources Comprehensive Utilization
- National Advanced Technology and Equipment Support Unit for Pollution Prevention and Control
- National and Local Joint Engineering Research Center
- Key National Recycling Enterprises
- Comprehensive Utilization Industry Standards for Waste Plastic Recycling Enterprises
- Core Working Group Members of the Chemical Circulation Task Force of the China Petroleum and Chemical Industry Federation

Product Honors

- Environmental Protection Science and Technology Progress Award
- Major Technological Invention in the Information Industry
- China Patent Award
- National Key New Products
- Industry and Information Technology Ministry, National Development and Reform Commission, Science and Technology Ministry, Ecology and Environment Ministry, advanced and applicable technologies and equipment for comprehensive utilization of industrial resources
- Ecology and Environment Ministry "Zero-waste City" construction advanced and applicable technology
- Agriculture and Rural Affairs Ministry Agricultural Technology Promotion Achievement Award

Intellectual Property and Certification

- Has applied for over 300 patents both domestically and internationally.
- Certified by ISO9001, ISO14001, and ISO45001 management systems.
- Specialized contracting qualification for environmental protection projects, second level for construction enterprises

Partial Pyrolysis Technology Patents

- A circulating pyrolysis reactor and a pyrolysis system equipped with it (Invention & Utility Model)
- A thermal carrier recycling pyrolysis device (Invention)
- A rotary kiln inner cylinder rotary sealing device (Invention)
- A system and method for preparing fuel from waste plastic (Invention)
- A pretreatment system and method for pyrolysis condensate wastewater from domestic waste (Invention)
- A method for treating solid waste (Invention)
- An anti-blocking material screw conveyor device (Utility Model)
- A rotary kiln heat transfer descaling bead circulation device (Utility Model)
- An internal heating type oxygen-free pyrolysis rotary kiln device (Utility Model)
- An organic solid waste pyrolysis oil treatment device (Utility Model)
- A continuous pyrolysis furnace (Utility Model)
- A pyrolysis oil refining system (Utility Model)
- A pyrolysis oil distillation residue treatment system (Utility Model)
- A heating device (Utility Model)
- A thermal decomposition water purification cycle device (Utility Model)
- An integrated feeding and discharging equipment and pyrolysis furnace (Utility Model)
- Integrated Drying and Carbonization Treatment System (Utility Model)



Core Working Group Members of the Chemical Recycling Subject (Vary Tech is a member)



Waste Plastic Recycling Solutions

Application fields

Domestic Waste Plastic

- Waste plastic bottles
- Plastic packaging bags
- Woven bags
- Delivery packaging
- Paper-plastic composite materials
- Other plastic products that have lost use value and etc.

Industry Mixed Plastic

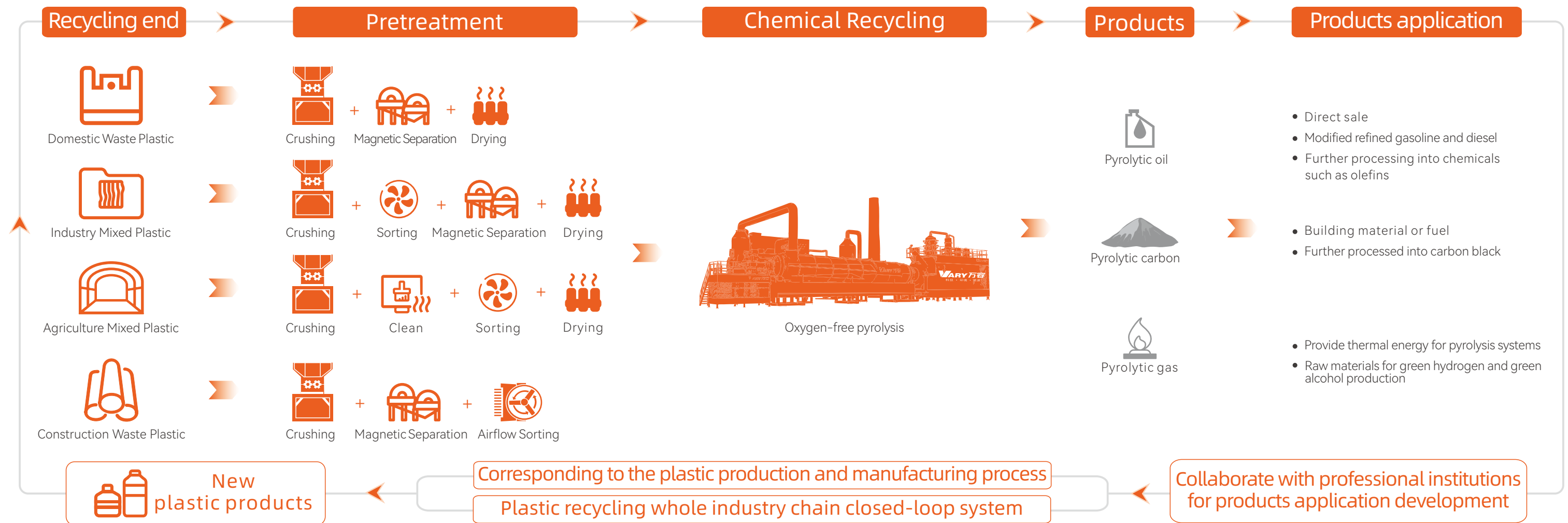
- Industrial waste packaging bags
- Mixed films
- Waste plastics from paper mills and etc.

Agriculture Mixed Plastic

- Abandoned agricultural plastic
- Film Greenhouse
- Film Agricultural pipes and etc.

Construction Waste Plastic

- Waste woven bags
- Waste fabric
- Decoration materials packaging waste



Note: Given the varying compositions of raw materials, Customers can either provide an analysis of raw materials or let Vary Tech perform tests to create customized solutions. This helps determine the product yield and evaluate the investment return.

Waste Plastic Pretreatment System

System Composition

- Crush subsystem: By means of extrusion, tearing, shearing, crushing, or flattening, various types of waste plastic are broken down to the required specifications.
- Magnetic Separation Subsystem: This subsystem effectively segregates steel from the raw materials, guaranteeing the purity of the steel components.
- Drying Subsystem: Adjust the drying temperature and duration in accordance with various types of waste plastic to efficiently eliminate moisture and enhance pyrolysis efficiency.
- Pulse Bag Dust Collection Subsystem: Equipped with efficient dust collection capabilities, it fully captures and clears dust, ensuring a clean and hygienic environment, with emissions meeting national standards.
- Automated Control Subsystem: Precisely coordinates the cooperation among various subsystems to achieve maximum capacity. It also predicts abnormal situations, thereby enhancing the reliability and safety of the system.

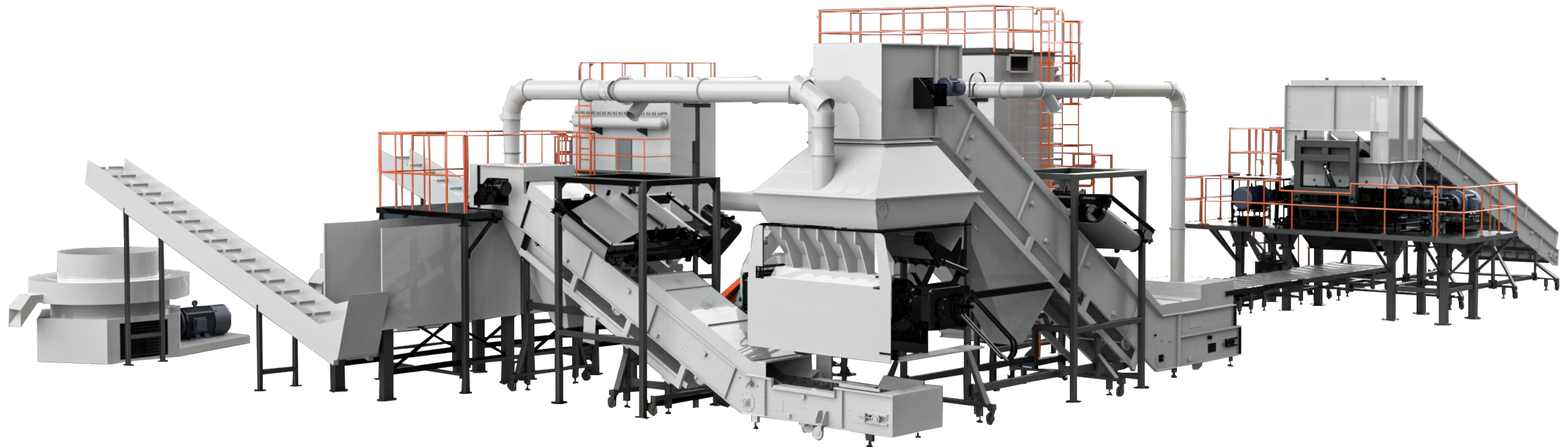
System Features



Comprehensive mechanical automation



Modular assembly, high applicability and flexibility.



Note: Given the varying compositions of raw materials, Customers can either provide an analysis of raw materials or let Vary Tech perform tests to create customized solutions.

Waste Plastic Pretreatment System

Automatic Feeding Subsystem

It employs screw conveying sealing technology to enable continuous, sealed, and precise material feeding, thereby ensuring the stability and safety of the pyrolysis process.

Continuous Oxygen-Free Pyrolysis Subsystem

By precisely controlling temperature and pressure, it optimizes the thermochemical decomposition efficiency of materials within an oxygen-free environment.

Non-condensing Gas Purifying Subsystem

It utilizes advanced gas purification technology to efficiently treat non-condensing gases produced during the pyrolysis process, thereby improving the energy recovery and utilization rate.

Security Subsystem

It integrates control measures such as fire and explosion prevention, safety valves, pressure relief valves, emergency shutdown, emergency smoke extraction, and real-time monitoring, constructing a comprehensive safety protection system to ensure the safety and reliability of the pyrolysis process.

Heating subsystem

It utilizes electric heating or hot air circulation technology to provide heat for the thermochemical decomposition process, thereby optimizing energy utilization efficiency and reducing operating costs.

Off-gas Purifying Subsystem

It employs a multi-stage combined purification process, which effectively eliminates pollutants in the gas, ensuring compliance with emission standards.

Automatic Discharging Subsystem

It facilitates the cooling of pyrolytic slag and ensures its continuous, enclosed discharge, thereby enhancing operational safety and efficiency.

Oil-liquid Separation Subsystem

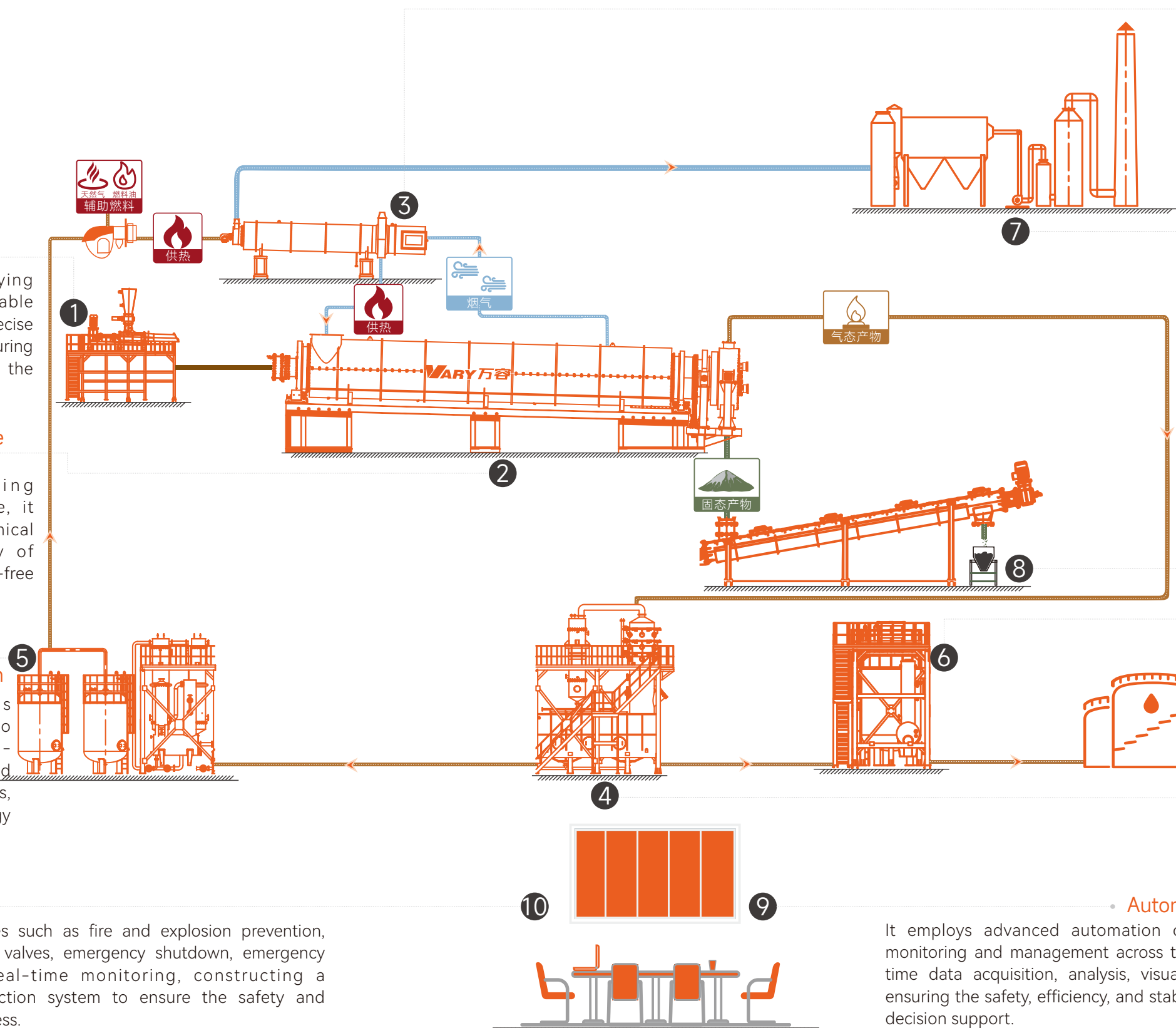
It integrates multi-phase separation technologies to achieve physical separation of pyrolytic oil and liquid.

Gas-liquid Separation Subsystem

It condensates the condensing gas into oil and separate the non-condensing gas.

Automatic Intelligent Control Subsystem

It employs advanced automation control technology to enable intelligent monitoring and management across the entire process. It is equipped with real-time data acquisition, analysis, visual display, and intelligent alarm functions, ensuring the safety, efficiency, and stability of the entire system, while also offering decision support.



Waste Plastic Pretreatment System

Wide Application Range

- It is suitable for industrial, agricultural, medical and domestic waste plastics, including PE, PP, PS, ABS and other common plastics and composite plastics.

Industrial sources (packaging bags, mixed films, waste plastics from paper mills)

Agricultural sources (waste agricultural mulch films, greenhouse films, agricultural pipelines, pesticide packaging, etc.)

Medical sources (protective clothing, surgical masks, protective goggles, etc.)

Life sources various mixed plastics (plastic bottles, plastic packaging bags, paper-plastic composite materials, and other plastic products that have lost their use value, etc.)

Prominent processing capability

- Continuous operation:** Utilizing sealed feeding and discharging technology and floating inner wall coke cleaning technology, achieving 7*24 hours uninterrupted operation.
- Mass processing:** Daily processing capacity of a single set can reach max 150 tons, meeting industrial demands.
- High Thermal Efficiency:** Advanced thermal internal circulation technology shortens material reaction times, boosting treatment efficiency.

Excellent Economic Benefits

- Low Operating Costs:** The advanced internal thermal circulation technology and hot gas multi-stage reuse technology reduces energy consumption. Adaptive sealing technology for flue gas ensures a tight seal with a coefficient of 0-0.25, cutting down oxygen content and energy use. When integrated with SNCR/SCR, oxidative denitrification and other technology, it enables ultra-low NOx emissions and slashes operational costs.
- Diversified Incomes:** Create diversified incomes through various products such as oil products, carbon black, and non-condensing gases.

Advanced Security Protection

- Multi-level Safety Measures:** 3-level emergency discharge system, equipped with safety valves, emergency stop and other multiple safety protection measures.
- Fire and Explosion-proof:** Key components are designed with fire and explosion-proof features to ensure safety under extreme conditions.
- Comprehensive Monitoring:** A comprehensive monitoring system with oxygen content monitoring and multi-point leak detection alarms and other detection functions creates a complete safety network.

Significant Environmental Benefits

- Composite Off-gas Purification:** It ensures that emissions meet or exceed the established emission standards.
- No Secondary Pollution:** The entire pyrolysis process operates within a sealed environment, ensuring no dust or volatile substances are released.
- Inhibit the generation of dioxins and solidify heavy metals:** Advanced sealing technologies in gas, feeding and discharging process create an oxygen-free environment, preventing dioxin formation and solidifying heavy metals in carbon residue, thus minimizing pollution.

Flexible Customization Capabilities

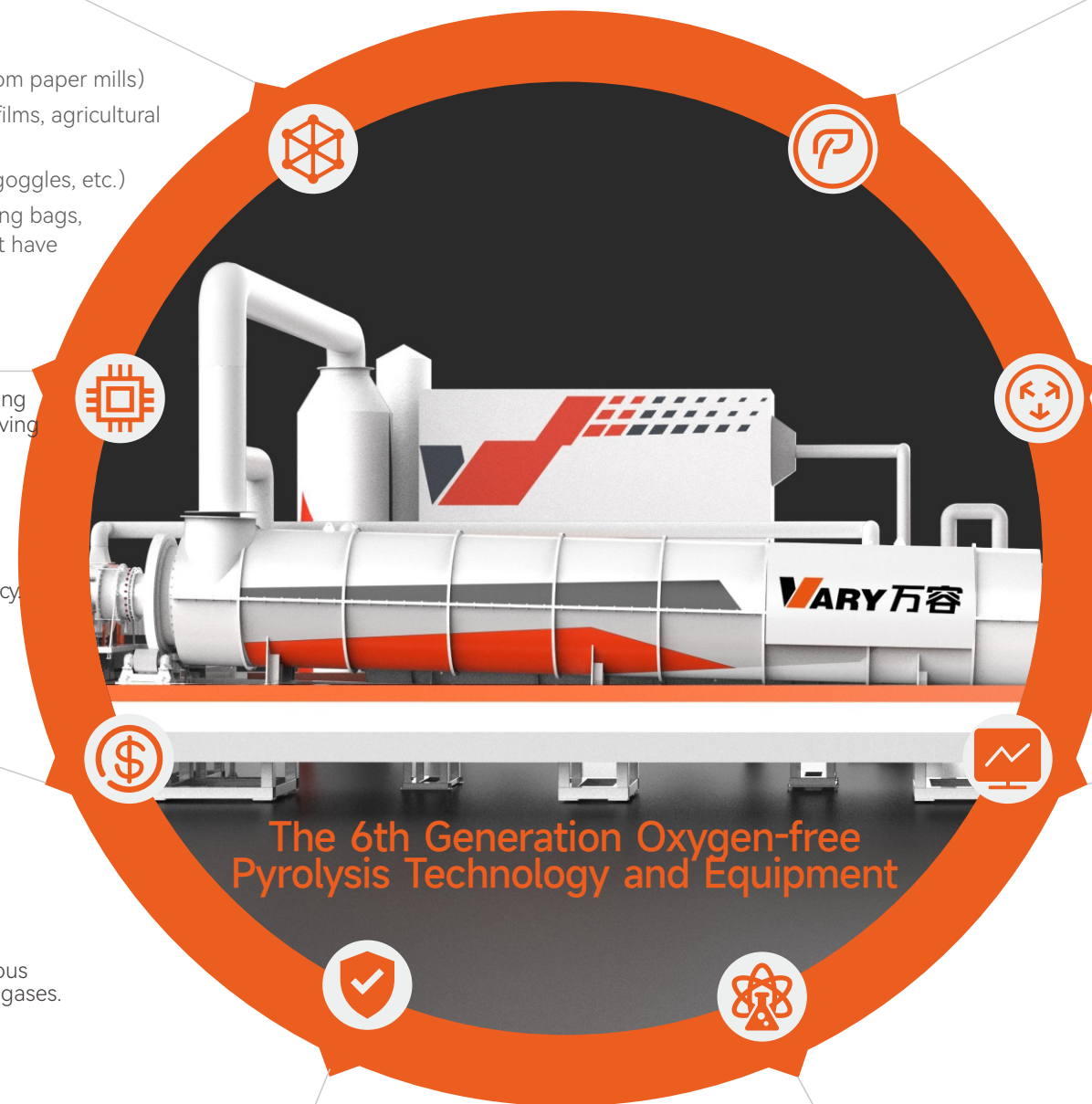
- Customized on Demand:** Customized feeding, discharging, internal thermal circulation, and lifter devices are available to meet material processing and project needs.
- Multi-heating Module:** Customized design of heating modules such as resistance heating, electromagnetic heating, hot air heating, etc.
- Integrating with the International Market:** Customizing export versions to meet the needs of overseas projects.

Superior Intelligent Control

- Automatic control:** Using DCS or PLC systems for full automatic control.
- Precision Temperature Control:** The multi-point temperature monitoring and intelligent control system guarantees precise and manageable reaction temperatures.
- Remote Control:** Supports remote access and control, enhancing management efficiency and response speed.

High-value product applications

- Pyrolytic Oil:** Directly sold or refined into gasoline, diesel, or further processed into high-value chemicals such as olefins.
- Pyrolytic Gas:** Recycled for self-heating or sold as a raw material for green hydrogen and green alcohols.
- Pyrolytic Carbon:** Used as a building material or fuel, or further processed into carbon black.



| System Service Capability

Industrialized System Services

Vary Tech employs over 60 engineers and runs a chemical recycling industrial base dedicated to waste plastics. The company follows a model of coordinated development that integrates technology research with operational management, providing comprehensive technical consulting and commercial cooperation across the entire value chain of waste plastic recycling and utilization.

High-end Equipment Manufacturing

Vary Tech has established a proprietary brand manufacturing center, spanning an area of 64,000 square meters, equipped with automatic laser cutting machines, automatic welding machines, and a variety of large-scale processing machines. Approximately 200 production personnel are employed, with an annual manufacturing capacity reaching up to 100 sets of equipment.

Professional Engineering Services

The company holds a second-level qualification for environmental contracting, employs seasoned environmental engineering professionals, and has a systematic project management system. It can provide professional services including installation, after-sales service, and management operations for waste plastic chemical recycling projects.



| Research and Development Capabilities

60⁺
R&D team

16⁺
Senior/ Senior Associate Engineers

30⁺
Intermediate Engineers

10⁺
External experts

Vary Tech, a leader in pyrolysis, emphasizes technological innovation and has established a research and design center with institutes for physical, chemical, and biological recycling, as well as system planning and design, and a comprehensive lab. The company's R&D team, composed of experts from various fields, has extensive expertise in pyrolysis, environmental engineering, and automation.

Vary Tech operates innovation platforms including the National Local Joint Engineering Research Center and the Hunan Provincial Enterprise Technology Center. The Material Process and Pyrolysis Experiment Center, spanning 600 m², is equipped with batch and continuous pilot pyrolysis tester, analysis device and advanced simulation software.

Vary Tech has forged long-term partnerships with top universities and research bodies, creating a robust innovation and IP protection framework. The company has spearheaded or been involved in over 20 significant national and provincial tech projects, secured over 300 patents, and developed several core technologies that address industry deficiencies in China. Its pyrolysis technology and equipment stand out in capacity, sealing, and energy efficiency, earning a spot in the National Industrial Resource Comprehensive Utilization Advanced Applicable Process Technology and Equipment Catalogue and several provincial tech innovation awards.

In the future, Vary Tech will persist in enhancing its investment in research and development, concentrate on cutting-edge technologies, and promote the continuous upgrading and iteration of its products. This will enable the creation of greater value for customers and a more significant contribution to environmental protection initiatives.



| Applications Cases

22 TPY Domestic Waste Treatment Project

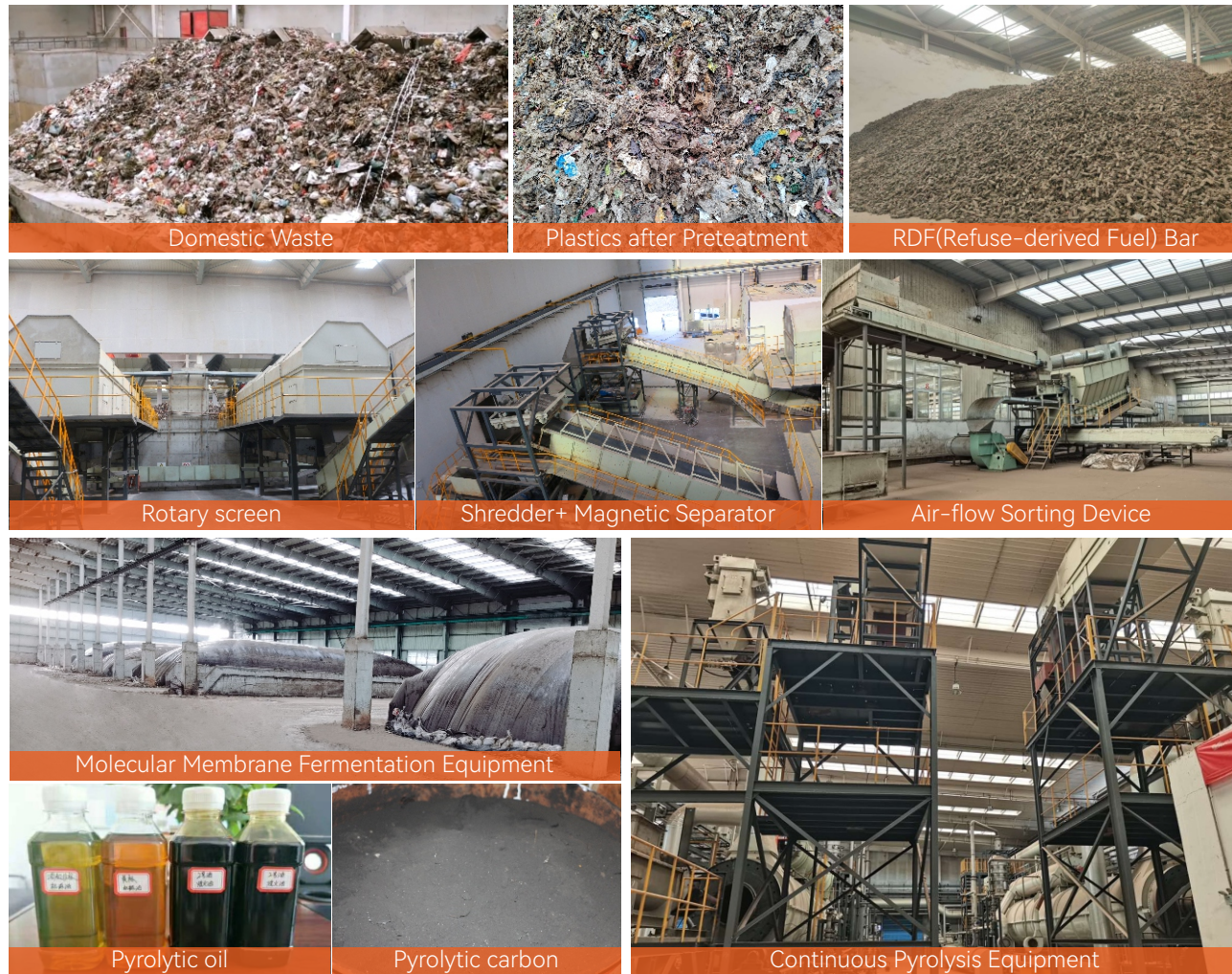
600 TPD⁺
Domestic Waste

200 TPD⁺
Pyrolysis Feedstock RDF

4 Sets⁺
Large-scale Continuous Pyrolysis Equipment

5 Years⁺
Continuous Operation

64000 m²⁺
Project area



| Continuous Pyrolysis Equipment Cases

