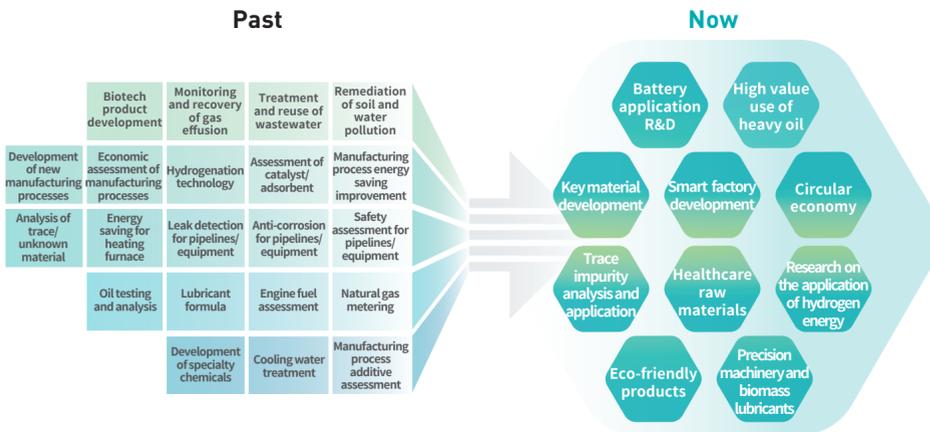
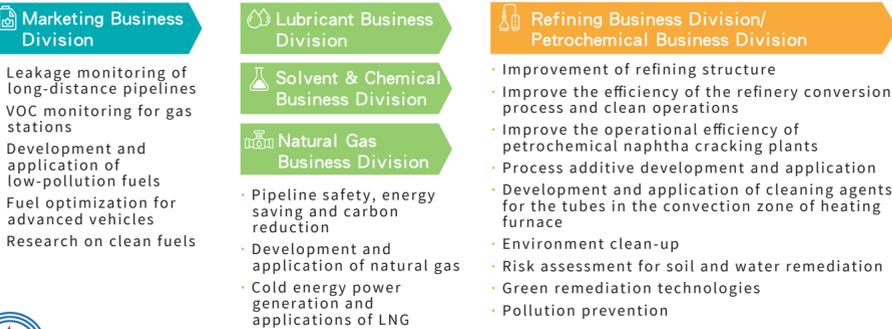


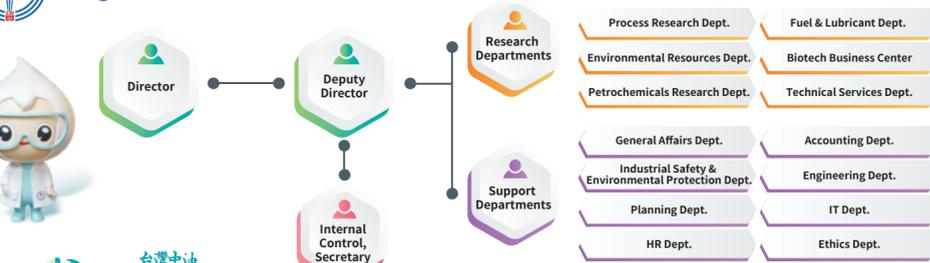
## Core Technology Development Plan



## Other On-site Technical Services



## Organizational Chart



Address: No.217, Minsheng S. Rd., West Dist., Chiayi City 600026, Taiwan (R.O.C.)  
 Tel: 05-2224171 | Fax: 05-2250324  
 Web: <https://www.cpc.com.tw/>

## Ensuring Industrial Safety and Environmental Protection

### Industrial Safety

- Gold Award from the Ministry of Labor's non-disaster working hours record in 2016
- First place in Group C of the Excellent Model Unit of Industrial Safety from the Ministry of Economic Affairs in 2017
- National Outstanding Health Workplace given by the Health Promotion Administration of the Ministry of Health and Welfare in 2021

### Environmental Protection

- Excellence Award in the R&D and Improvement Group of the "Excellent Toxic Chemical Substances Management" from the Environmental Protection Administration in 2016
- Bronze Award of the "25<sup>th</sup> ROC Enterprise Environmental Protection Award" from the Environmental Protection Administration in 2016
- Green Safe Alternative Award in the group of the "2<sup>nd</sup> Green Chemical Application and Innovation Award" from the Environmental Protection Administration in 2020

### System

- ISO 14001 certification by the Bureau of Commodity Inspection & Quarantine as the first domestic research institution to be awarded this certification in 1998
- ISO 14001:2015 version transition verification in 2019
- New system verification of ISO 45001:2018 (including TOSHMS) in 2020

## R&D Patents

263 patents

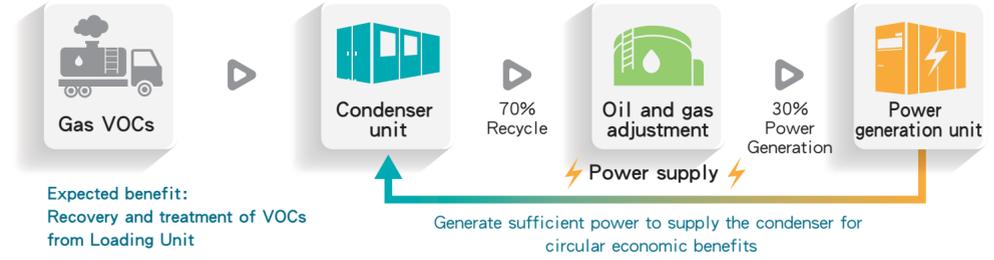
## Social Care

- Sponsorship for Chiayi City International Band Festival
- Financial assistance for installation of monitoring system in neighboring communities
- Disinfection of neighboring communities for disease vector control
- Quarterly blood donation activities

## Employee Care

- Comprehensive health checks and workplace safety protection
- Full-time employees are entitled to eight 1-hour legal and psychological consultations each year
- Non-profit kindergarten for employees' children

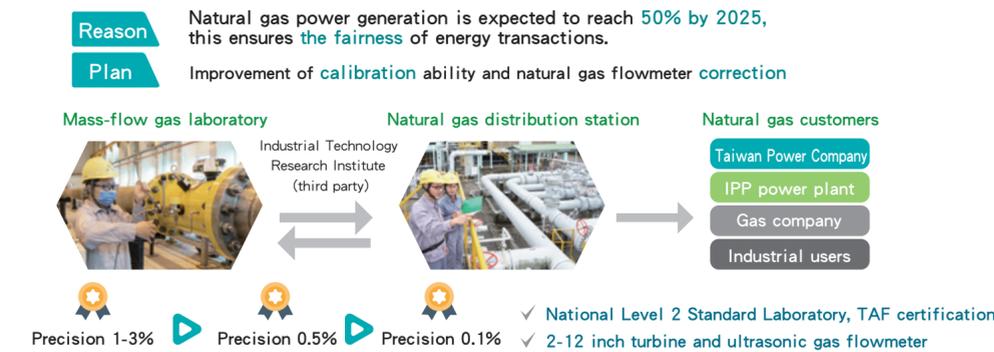
## Highlight 8: Power Generation with Exhaust in Oil Transportation and Storage Operations



## Highlight 9: R&D of Biotech Products



## Highlight 10: Development of Supporting Technical Services (Natural Gas Metering)



## Introduction



# Refining & Manufacturing Research Institute



Innovation · Transformation · Mutualism

# Refining & Manufacturing Research Institute

The Refining & Manufacturing Research Institute is one of the three research institutes of the CPC Corporation, Taiwan. Its predecessor was a solvent factory in Chiayi set up in 1947; the name was formally changed to the Refining & Manufacturing Research Institute in 1989. As an industrial research institute, our missions include developing independent key technologies, supporting our business divisions to elevate plant operational efficiency, as well as helping with the company's transformation in creating new businesses. Our R&D focus on four dimensions, including the enhancement of refinery safety and performance, fuel quality improvement and applications, circular economy and resource recovery from waste, as well as the development of new products and technologies. We have 21 core technologies in different fields. Our business philosophy is "seeking development in stability, and seizing opportunities in changing situations." Based on three decades of R&D experience and new technologies development, our research has been actively invested in four forward-looking & innovative fields to follow our company's transformation policy in recent year, including "smart green energy, high-value materials, circular economy, and smart industrial safety & environmental protection" as the strong foundation for the sustainable development of the CPC.

## R&D Focuses

### Smart Green Energy

- Key material development and application testing for batteries
- Battery cell/pack performance testing
- Establishment and management of smart green energy stations
- Smart energy management system
- AI and big data application
- Clean energy application

### High-value Materials

- Organic materials field
- High-value electronic materials
- Advanced carbon materials
- Development of lubricant products
- Development of raw materials for skincare products
- Development of car cosmetics products

### Circular Economy

- Development of carbon reduction process and technology
- Treatment and reuse of water resources
- Treatment and recovery of waste
- VOC monitoring and vapor recovery
- Development of biomass plastics and derivatives

### Smart Industrial Safety and Environmental Protection

- Process improvement and energy conservation
- Equipment safety and energy-saving/carbon reduction technology
- Smart pipeline corrosion defect detection technology
- Oil quality monitoring and performance enhancement
- Forward-looking analysis technology

## R&D Capabilities



### Human Resources

The Refining & Manufacturing Research Institute has approximately 240 R&D manpower, and the ratio of those with a master's degree and PhD is roughly 2:1. The most important tasks include providing technical services to business divisions, developing new products and engaging in forward-looking and innovative fields.

### Library

The professional library mainly collects data in fields related to petroleum refining. The core collections include professional books, electronic journals, online databases and industry information, as well as shared resources such as other databases.

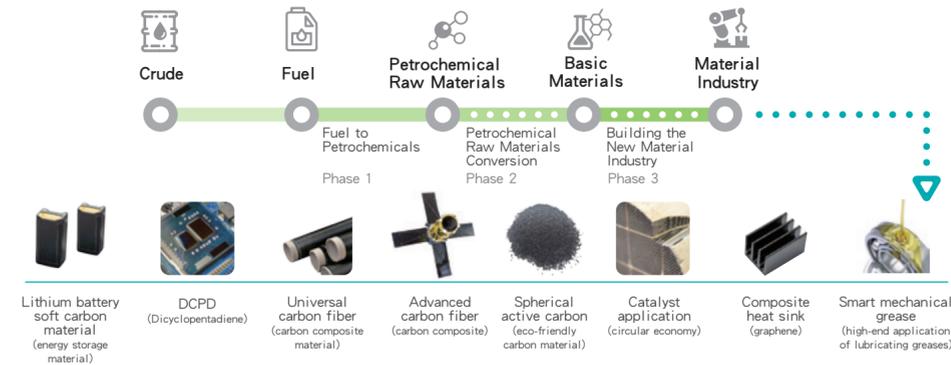
## Unique Analysis Technologies

- Oil/petrochemical analysis
- Biotech raw material/product analysis
- Catalyst characteristics analysis
- Identification of unknown substance
- Environmental monitoring and analysis (air, soil and water)



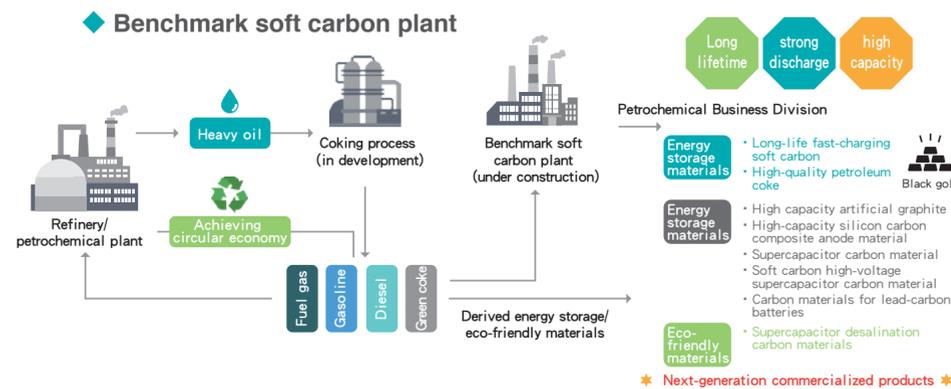
## R&D Results

### Highlight 1: New Industries of Key Materials (High Value Heavy Oil Technologies)



### Highlight 2: Construction of Forward-looking Materials R&D Plant (Soft Carbon Plant)

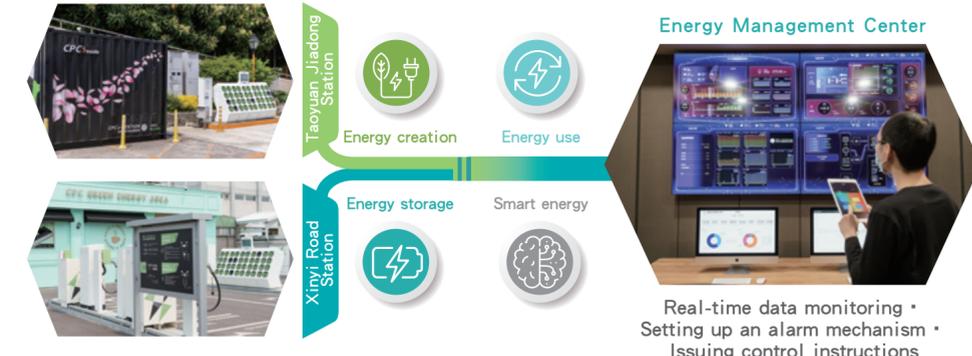
Independent R&D of soft carbon anode materials from the laboratory to commercial mass production in response to the future market demand for high power batteries.



### Highlight 3: Verification of Soft Carbon Fast-charging Battery and Energy Storage System



### Highlight 4: Smart & Green e-Stations



### Highlight 5: Polymer Diffusion Particle Synthesis Technology (Upstream Electronic Raw Materials)

CPC light diffusion particles + BASF's new patented organic optical conversion material

	Before replacement	After replacement
Blue light	Obvious	Lowered
Color rendering (Ra)	73	95
Brightness (lumens)	1090	1270
Power consumption (Amp)	0.63/0.93	0.22/0.26

**Commercialization Performance:**

- Eye Protection:** Low blue light and flicker frequency to avoid eye fatigue
- High Fidelity:** High color rendering, closer to an environment with natural light source
- Energy Saving:** Increase brightness and reduce overall light usage

### Highlight 6: Trial Production of Key Materials for 5G Communication

DCPD-PPE dicyclopentadiene derivatives

High-value application of own materials

First-generation ton-scale trial production → Second generation flame retardant → Third generation ultra-low dielectric

Patent icons for DCPD-PPE, Halogen modification, Phosphorus modification, and Cycloalkane copolymer.

Item		Trial production samples	Commercial products
		>600	>600
Float	sec	>600	>600
Peel strength	lb/in (H/H)	3.30	3.30
Tg (DMA)	°C	273	266
TMA (288°C)	min	>60'	>60'
D <sub>v</sub> /D <sub>h</sub> @10GHz		3.81/0.0051	3.90/0.0054

Production of ton-level high-frequency PCB substrate resin materials (own technology)  
Verified by copper foil substrate plant

### Highlight 7: AI and Big Data Applications for the Diagnosis of Rotating Equipment

Diagnose the status of rotating equipment to ensure industrial safety with diverse data

**Technology 1: Prediction and Health Management**

- Process/equipment operating data
- Estimate life expectancy with AI model
- Determine the equipment's health status

Health indicators: 1 is normal, 0 is the most serious fault level

Current status of the unit: Normal operations (Health indicator 1.0), Maintenance needs to be scheduled for an unstable unit (Health indicator 0.7), Unit diagnosed as faulty and needs to be shut down immediately for maintenance (Health indicator 0.3).

**Technology 2: Unmanned Inspection System**

- Full soundscape data
- Motor abnormality detection and diagnosis
- Auxiliary personnel inspection

Automatic rotating microphone for identification of motor acoustic fingerprinting.