

Electrium



PART

1



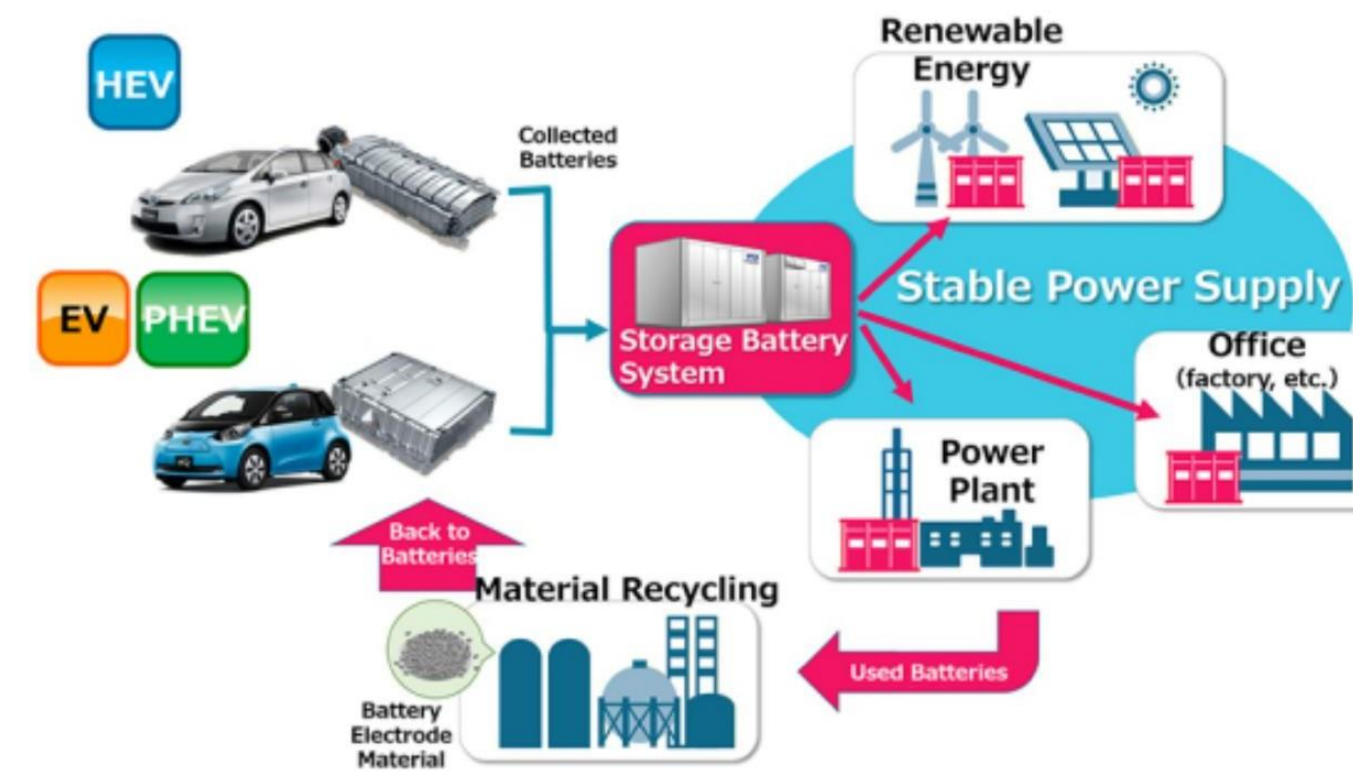
Introduction on Battery Industry

Business opportunities for lithium battery recycling

Recycling mode of power battery

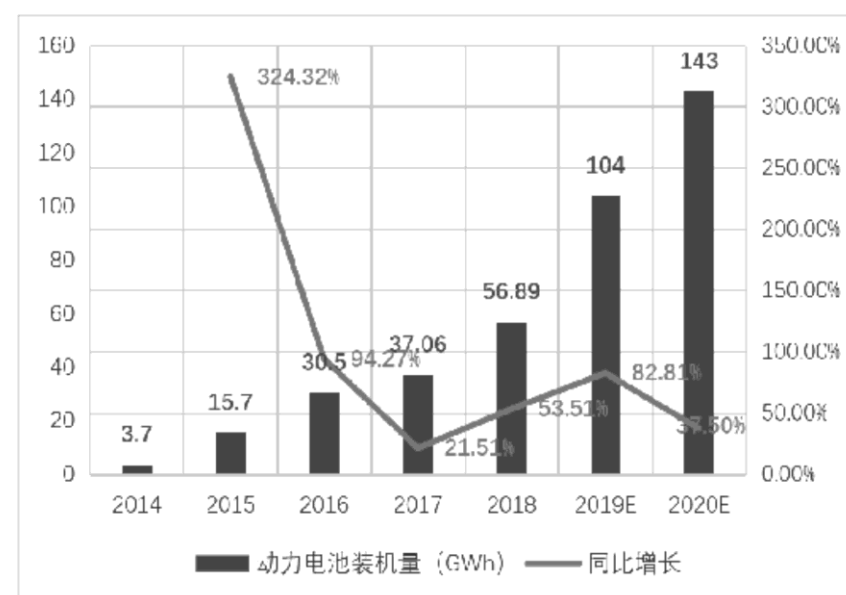
Power battery recycling, including secondary utilization and disassembly recycling

- Secondary utilization: decommission and test the batteries whose performance is reduced to less than 80%, and then reorganize the batteries with proper performance for secondary utilization.
- Disassembly and recycling: disassemble the battery with the remaining capacity less than 30% and recover the metal resources such as nickel, cobalt, manganese, copper, aluminum and lithium from the battery.
- The secondary recycling of power batteries helps to improve the service value of battery life cycle, increase the supply of battery raw material resources, reduce battery procurement costs, promote the application of electric vehicles, accomplish industrial closed-loop, properly dispose of heavy metals and organic pollutants in waste batteries to avoid environmental pollution.

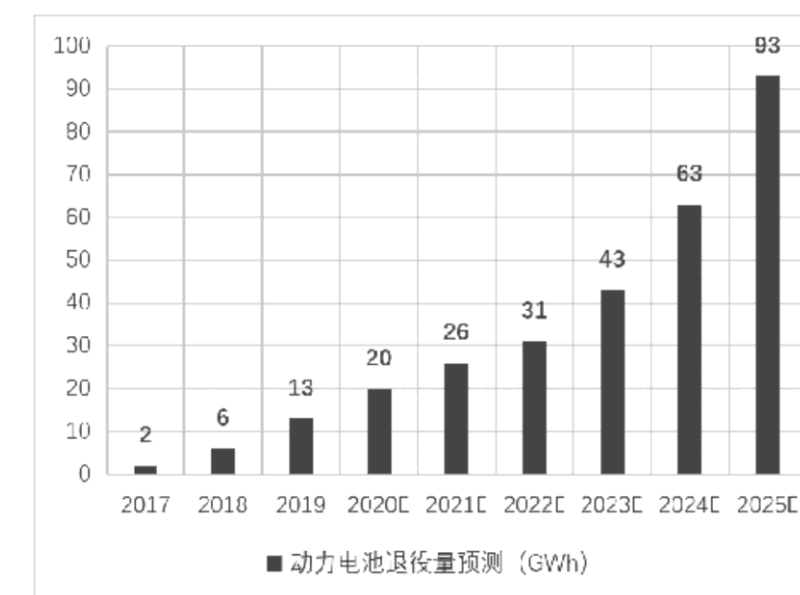


The power battery recycling market is about to boom

- Since the introduction of subsidy standards in 2013, the domestic new energy vehicle industry has witnessed rapid growth, and the production and sales volume has led the world for many consecutive years. The rapidly growing installed capacity of power batteries will also create a large power battery recycling market.
- That the power batteries put into operation in 2014 will enter the their decommission period in 2019. According to the prediction of China Tower, the decommissioning volume of power batteries will exceed 20gwh in 2020, and the corresponding market scale will reach 10 billion yuan; In 2025, the market scale will exceed 30 billion yuan.



Installed power battery over the years



Prediction of power battery decommissioning

The policy system towards to the battery

Core policy points:

- Recycling responsibility mechanism: Extend the producer's environmental responsibility to the whole battery life cycle including design, circulation, recycling, waste disposal, etc.
- Construction of recycling outlets: Based on the power battery coding standard and traceability information system, the whole life cycle management mechanism is constructed.
- Comprehensive utilization of battery: Follow the general principle of secondary utilization before recycling.
- Recycling industry management: Guide the standardized development of the industry through technical policies and industry standards, and gradually improve the industry access standards.

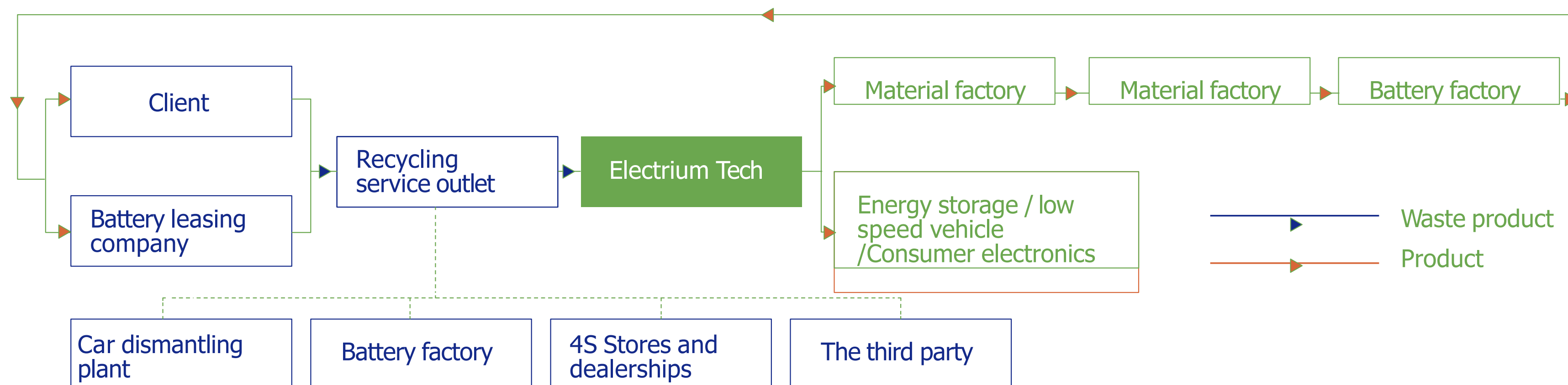
Policies related to lithium battery recycling

July 2012	Energy saving and new energy vehicle industry development plan	Encourage the development of specialized battery recycling enterprises.
July 2014	Guidance of the general office of the Nation Council on the promotion and application of new energy vehicles	Establish and improve the recycling system of waste power batteries.
Jan 2016	Technical policy for recycling of electric vehicle power battery (2015 Edition)	Establish power battery coding system and traceability system.
Feb 2018	Interim Measures for the administration of recycling of power batteries of new energy vehicles	Automobile manufacturers are required to bear the main responsibility of power battery recycling.
July 2018	Notice on the pilot work of power battery recycling of new energy vehicles	Appropriately control the scale of dismantling and secondary utilization enterprises, strictly control the number of recycling enterprises (especially hydrometallurgy), and promote the sustainable development of the industry.

Power lithium battery industry cycle chain

Core policy points:

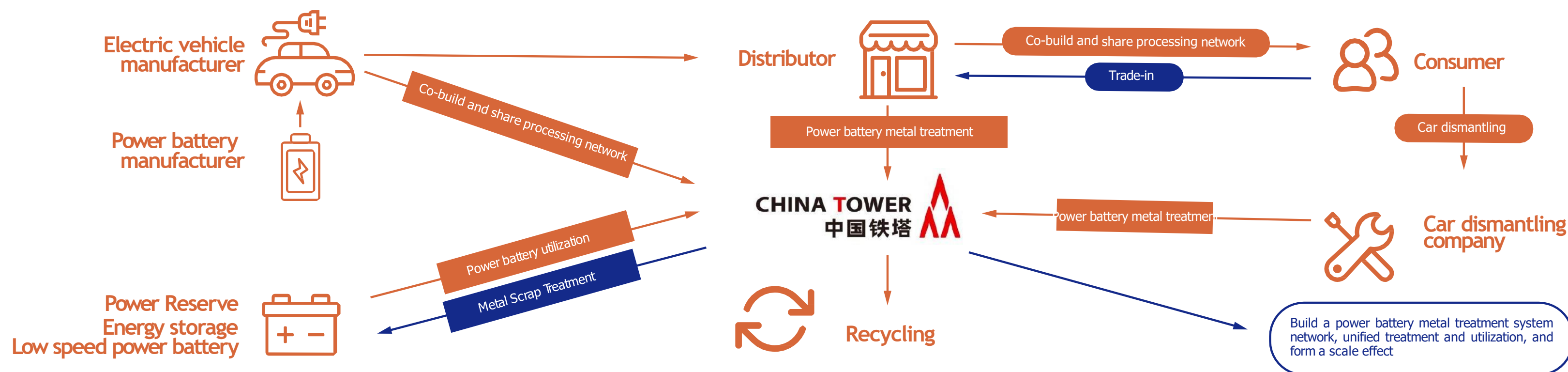
- Leading enterprises in the upstream and downstream of the industrial chain, including mainframe factories, material factories, third-party recycling institutions. China Tower and other industrial chain enterprises actively participate in building a secondary recycling industrial chain.
- The improvement of recycling network system is the foundation and top priority of the development of waste power battery recycling industry. By the end of April 2019, a total of 3500 recycling outlets were registered and filed, and by the end of December 2019, it had increased to 9037.



In-Depth Development trend of power battery value

Core policy points:

- **Source:** establish an in-depth cooperation mechanism with automobile enterprises, sign strategic cooperation agreements, and consolidate the cooperative relationship with retired battery source enterprises;
- **Data:** research and develop the coding system of retired batteries covering the whole country by taking counties and cities as units, and master the first-hand information of retired batteries for all channels such as car dealers, car dismantling enterprises and consumers;
- **Transaction:** expand the demand market for retired batteries by expanding internal application demand and external application business, and improve the bargaining power of retired batteries by relying on the market scale.





PART 2



Secondary utilization solution

Battery sorting and recombination technology

Pain point of secondary utilization: difficult to evaluate battery status



Performance

- ①Difficult to evaluate residual capacity
- ②Difficult to predict life cycle
- ③Consistency judgment is difficult
- ④Difficult to collect cell data

Lack of fast and effective
evaluation mechanism for
battery status

Safety

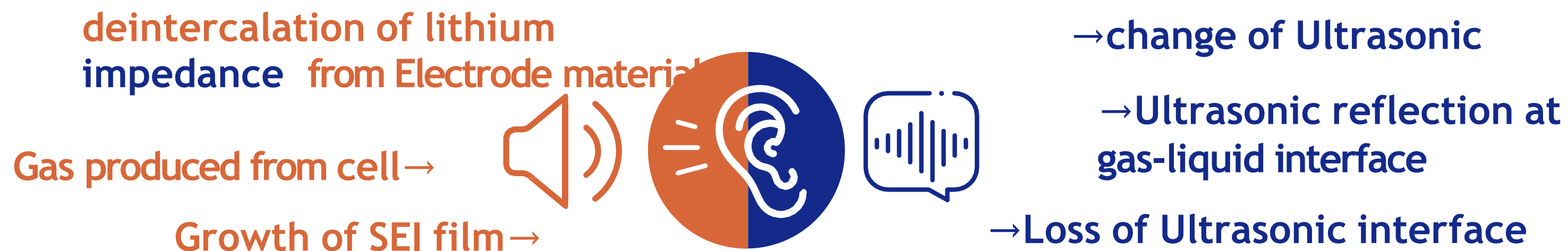
- ①Difficult to evaluate electrolyte leakage
- ②Difficult to evaluate toxic gas leakage
- ③Difficult to obtain Lithium precipitation
- ④Difficult to evaluate the deterioration of electrode materials

Cell accident probability: one in a million
Electric vehicle, 1000 cells, accident probability: 1 in 1000
Energy storage power station, millions of cells, accident probability: 63%

Go into the cell,
understand the cell
and analyze the cell

Technical route: healthy battery evaluation system

Basic principle of ultrasonic and microwave battery testing



Nondestructive testing and "B-ultrasound" for the battery

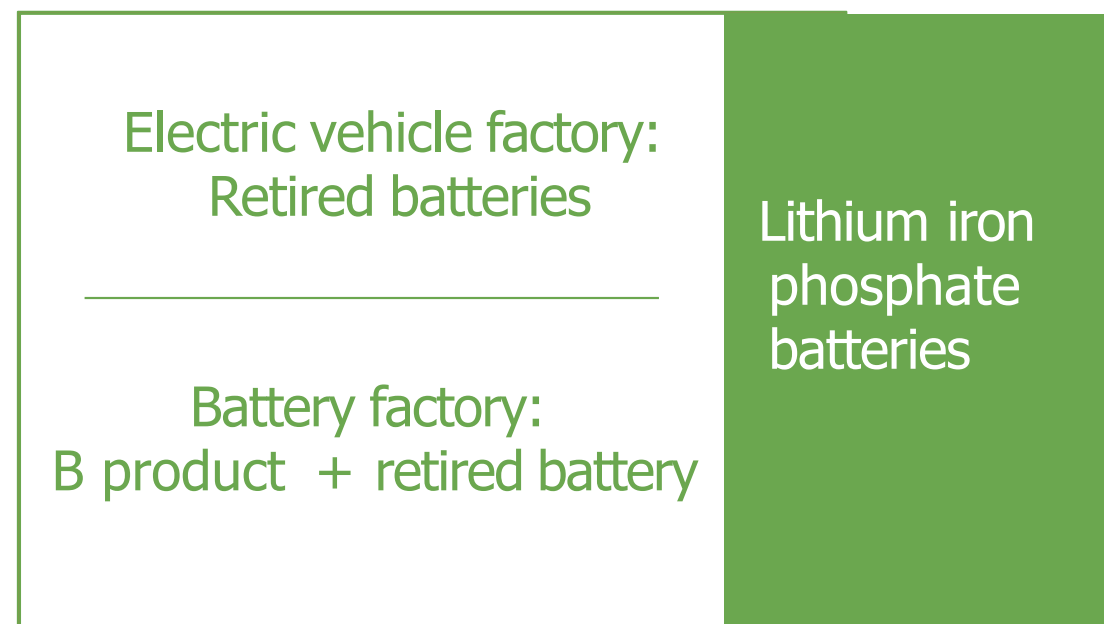


Item	Description
Applicable lithium battery type	Soft package, hard square shell
Testing items	Electrolyte infiltration range Internal short circuit Poor packaging Lithium precipitation Evaluation of state of charge Life cycle evaluation
Application	Quick inspection for used battery Quick inspection of production line

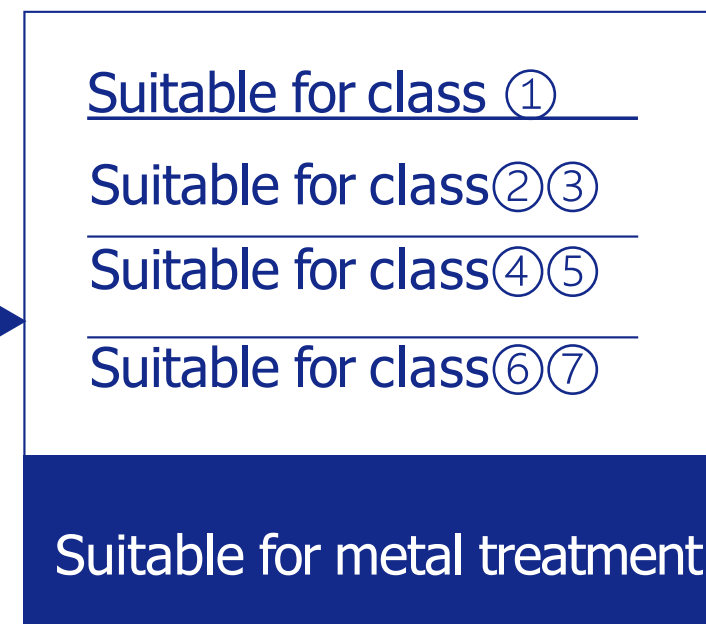
Health Battery evaluation system

- Through the automatic evaluation system of the battery, determine the real value of the battery and use the battery in the corresponding scene;
Make full use of the "residual value" of the battery to achieve the lowest cost in the whole life cycle.
-

1 Source of used battery



2 Evaluation of Ultrasonic evaluation system



Professional value explore system

3 Battery usage scenario

- ① Base Station **37%**
- ② Electric logistics vehicle **20%**
- ③ Low speed electric vehicle **20%**
- ④ Emergency light power supply **10%**
- ⑤ Photovoltaic energy storage **8%**
- ⑥ Household energy storage **4%**
- ⑦ Energy storage power station **1%**

Adjust the market price according to the evaluation results

Battery health status and related identity information collection



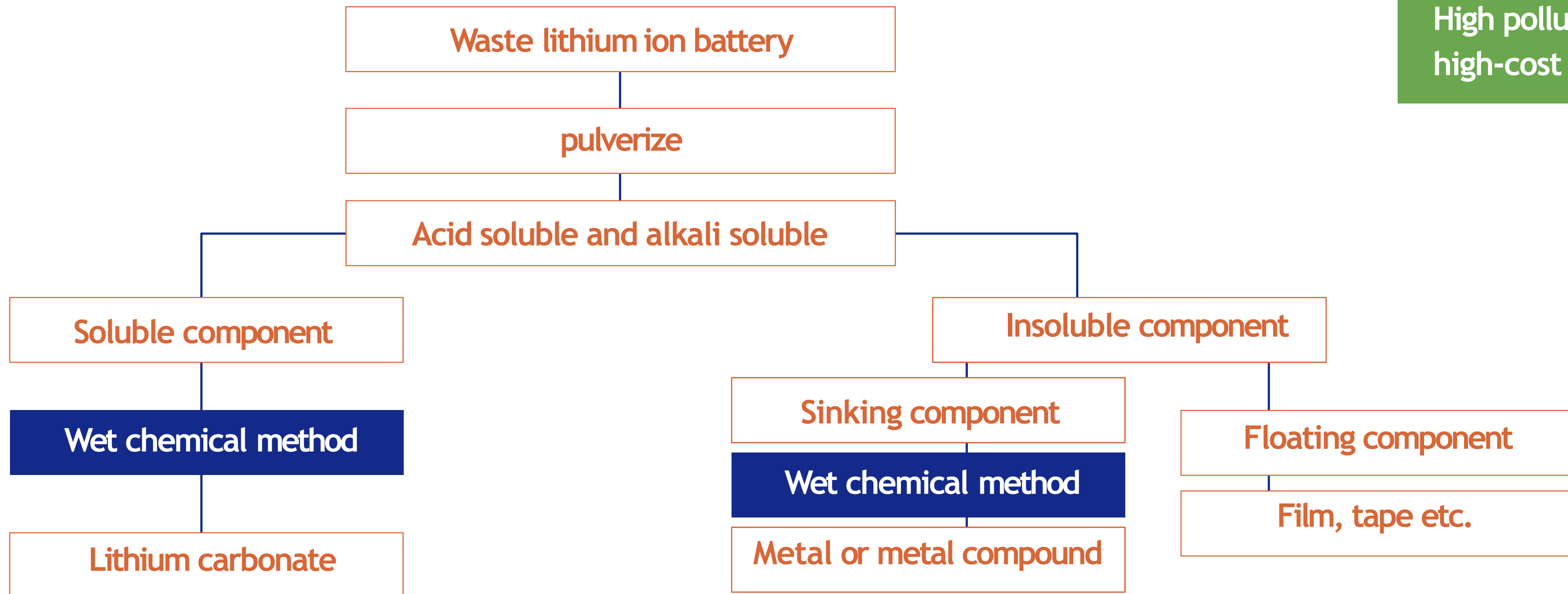
PART 3



Disassembly & recycling solution

High efficiency, environmental friendly and high recovery

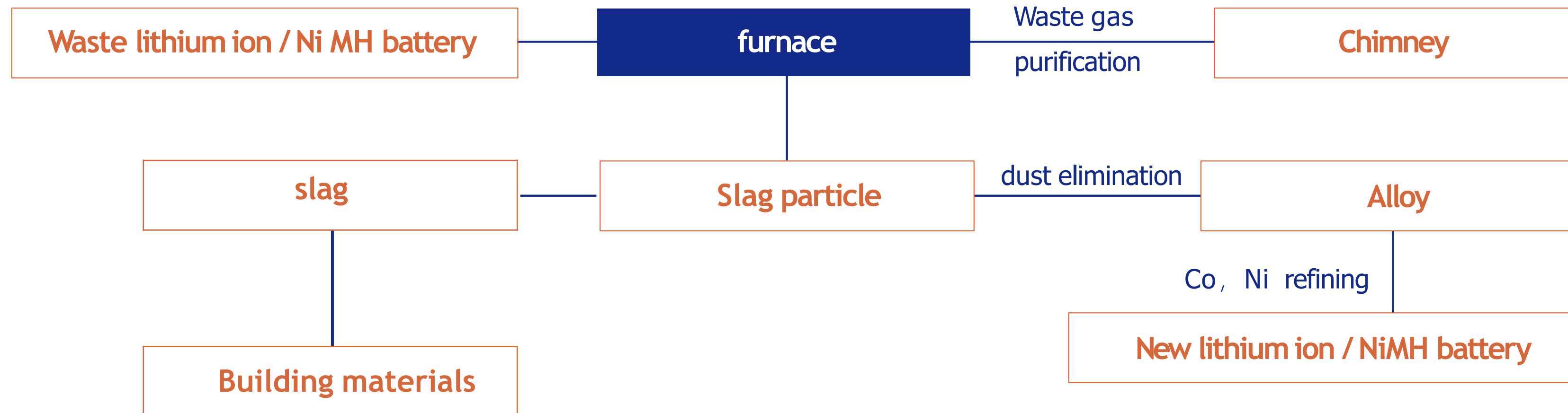
Traditional method: wet chemical method



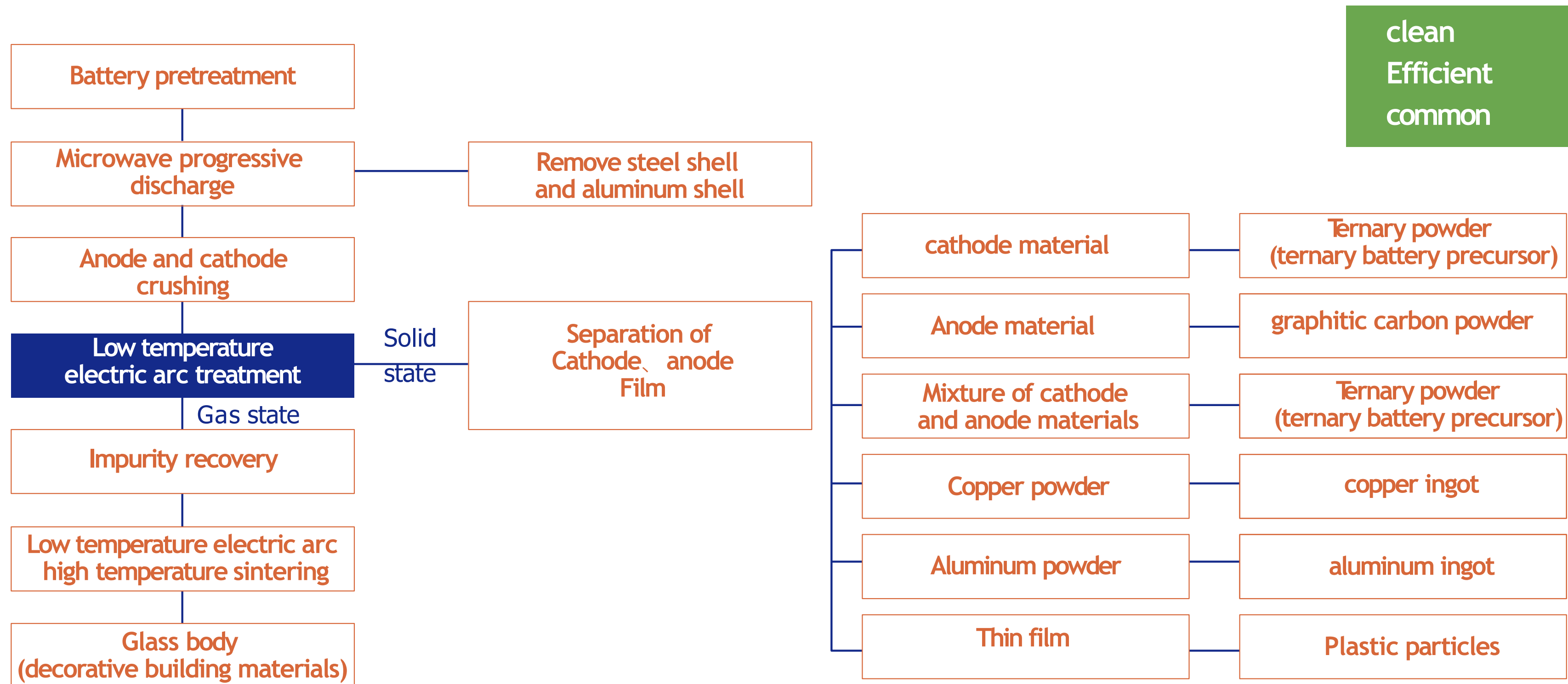
Time consuming
High pollution
high-cost

Traditional method: dry metallurgy

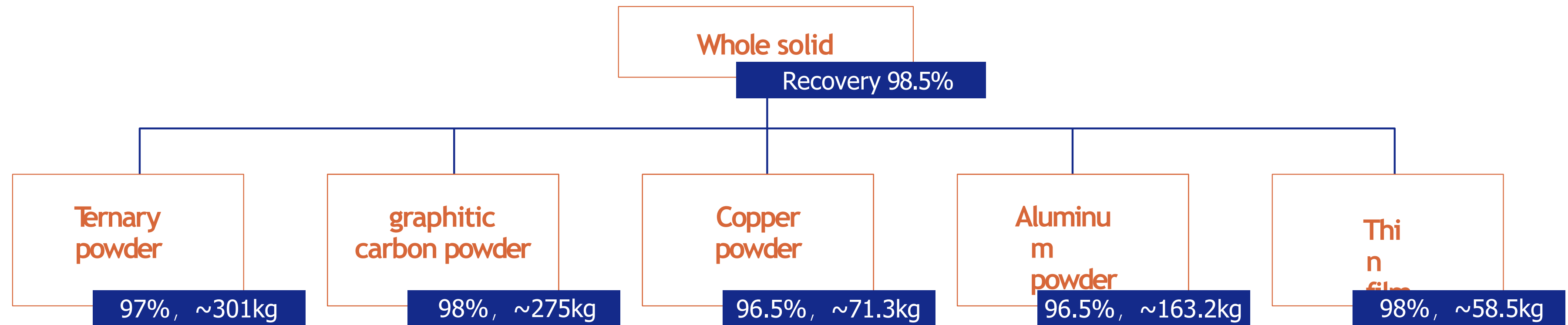
High energy consumption
High pollution
Low recovery



Luminous technology route: low temperature electric arc method



The overall recovery rate of low temperature electric arc process from Electrium



Low temperature arc method has obvious comparative advantages

Method of Treatment	Content	Advantage	Disavantage
Dry metallurgy	Directly achieve the recovery of various battery materials or valuable metals without solution and other media, mainly including mechanical separation method and high-temperature pyrolysis method.	A mixture of metal oxides can be obtained.	It is easy to cause secondary pollution with high energy consumption.
Wet chemical method	The treatment process includes crushing, sorting, dissolution leaching, separation and recovery of lithium batteries by hydrometallurgy, chemical extraction and ion exchange.	The end product reaches high purity by selective chemical reactions, low requirements for operation and equipment, and can reasonably control the feeding.	The reaction speed is slow, the input is small; the process is complex and the cost is high.
Low temperature electric arc method	Pretreatment, low temperature electric arc separation, solid separation and toxic gas treatment are carried out for lithium battery.	Do not use strong acids and bases. It is applicable to lithium iron phosphate, ternary and other lithium batteries. It does not need to consider the remaining power of waste batteries, and can be recycled in tons. Clean production, zero emission.	The electrolyte is directly decomposed and will not be recycled



PART 4



Construction of transaction platform

Legal, complete traceability and large transaction volume

Transaction platform



Main points:

- The transaction mode and transaction information shall be kept confidential for the time being.
- Construction of recycling outlets: jointly set up outlets with China automotive data.
- Current situation: more than 10 large car dismantling enterprises have started trading and tracing with Luminous.



PART 5



Company and team member profile

Management

Development History



2008-2013

Establishment

The technical reserve started in 2008. After more than five years of development, the team has now developed into a well-known enterprise in the industry with a registered capital of 10 million, and approval at all levels, traceability system, environmental impact assessment and operation qualification.

2014-2016

Development

Registered as a Shenzhen company in 2014, it has successively undertaken several environmental projects from large central enterprises and state-owned enterprises, and participated in the formulation of hazardous waste industry standards by the Ministry of environmental protection.

2017

Expanding

Focused on the secondary utility management of retired batteries, and won the angel round of investment.

2020

Breakthrough

Hubin base (sanmenxia city) has obtained the EIA approval of 20000 tons, and Wanghai base has obtained the EIA approval of 30000 tons. The company has an annual production capacity of 50000 tons of waste lithium batteries, and the recycling channel has been almost completed. The company has established strategic cooperative relations with large enterprises such as French electric power, Bangpu cycle, Yutong, wanluda and China automobile data center.

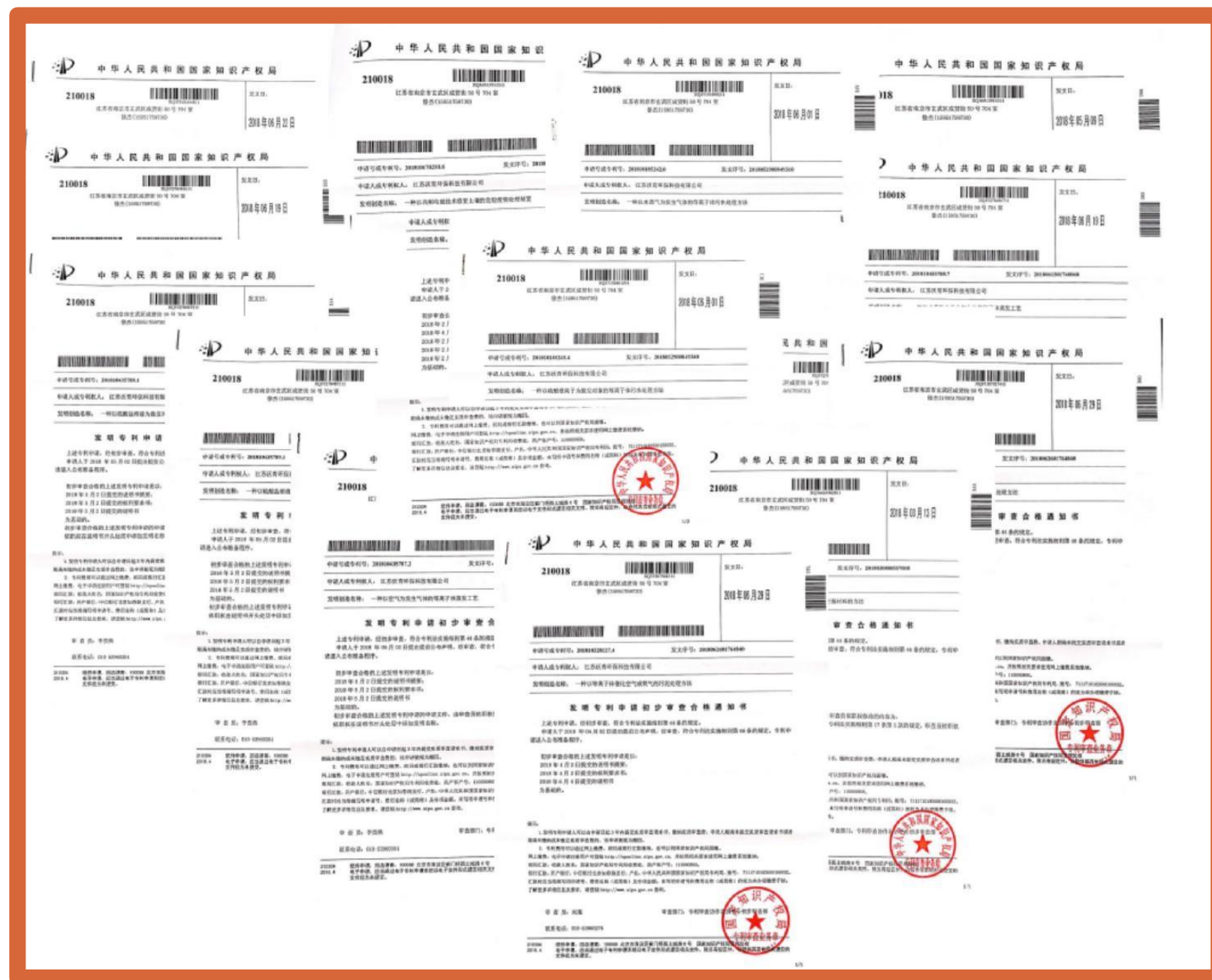
Core competitiveness of Luminous technology -complete recycling qualification



The net assets completed by the company are as follows:

- Obtain the qualification for recycling all series lithium batteries and vehicle power batteries; Taizhou factory passed the EIA review; Director unit and pilot enterprise of Jiangsu power battery recycling alliance; We are now participating in the application for the second batch of pilot enterprises of the Ministry of industry and information technology department.
- A low-temperature electric arc production line has been built to process 10 tons of waste battery per day.
- Core equipment includes:
 1. Disassembly equipment;
 2. pulverizer equipment;
 3. High temperature and low temperature electric arc treatment equipment
 4. Screening equipment;
 5. Conveying / conveying equipment, etc
- The first stage of closed-loop production and sales has been completed and has been supplied to Bangpu, Ganfeng lithium, Feinan and other enterprises.

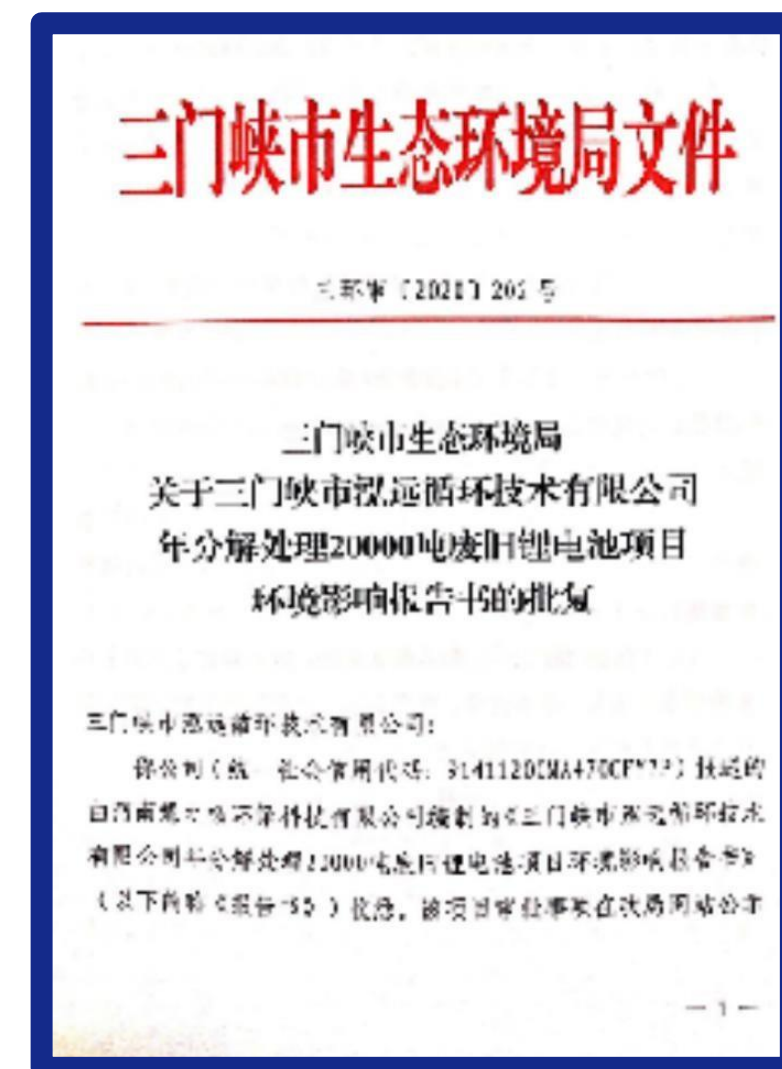
Core competitiveness -continuous Research & Development capability



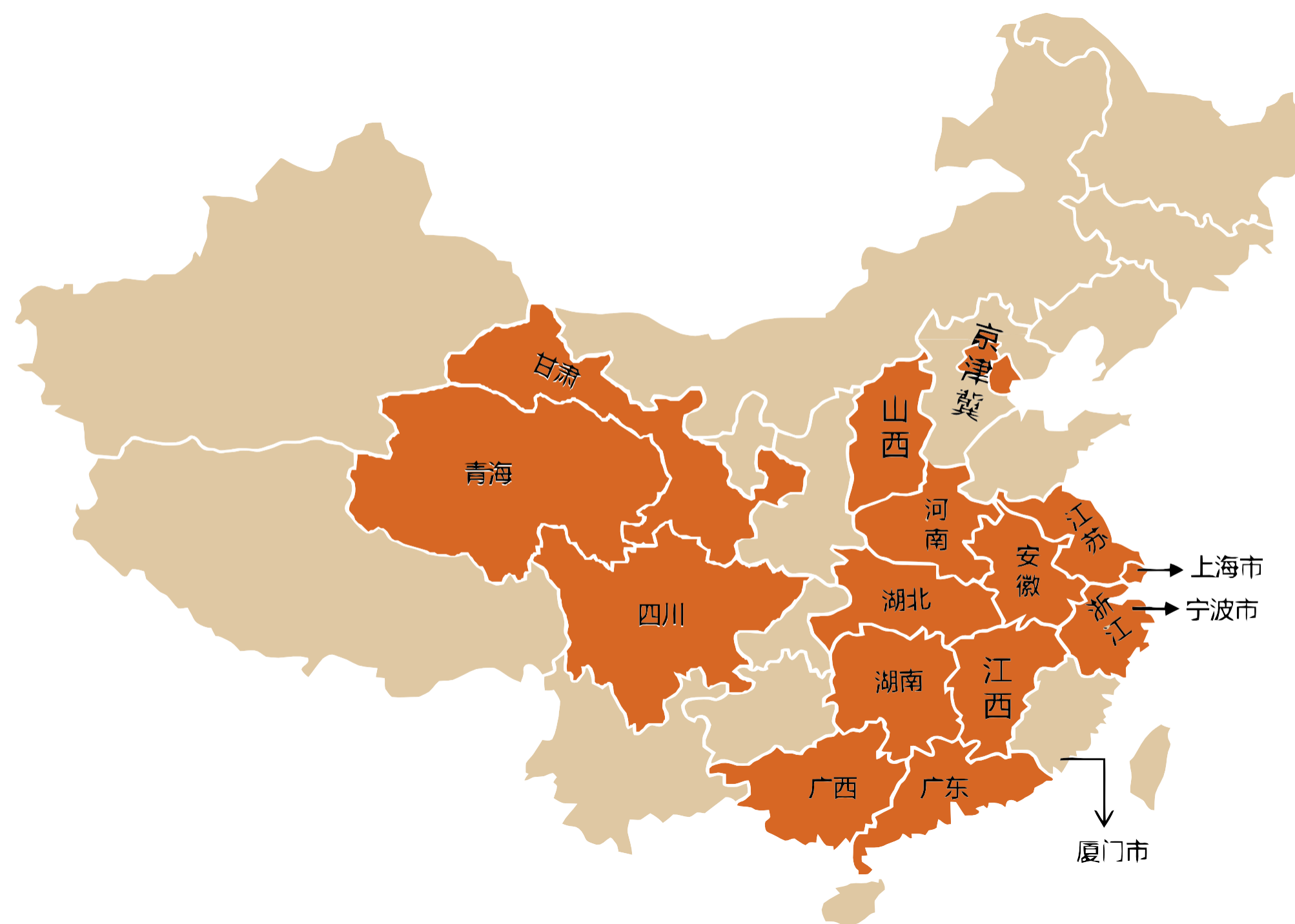
- More than 30 inventive core patents:
- Patent for recovery method of cathode material of ternary battery with low temperature electric arc body combined with hydrogen peroxide
- Patent for recycling cathode material of ternary battery with low temperature electric arc body combined with ozone
- Patent for recovery method of cathode material of ternary battery with low temperature electric arc body combined with sulfate
- A professional R & D team continues to do basic theoretical research and optimizing production process research.
- The number of patents is increasing.

Core competitiveness of Electrium science and technology - approved by environmental assessment

- As the company's treatment process is clean, environment-friendly, zero discharge and does not produce hazardous waste. The company's EIA reply is easy to obtain;
- The site selection of the company need not be limited to the chemical industry zone. In fact, the current bases are all in the city or the automobile industry park;
- Due to the high pollution characteristics of wet chemical process and dry process, it is difficult to obtain the local EIA approval, and the country does not encourage their capacity for expansion.



Luminous technology based on Jiangsu comprehensive nationwide layout



- On July 23, seven departments (the Ministry of industry and information technology, the Ministry of science and technology, the Ministry of ecological environment, the Ministry of transport, the Ministry of Commerce, the National Administration of market supervision and administration of energy) officially issued a notice on the pilot work of recycling power batteries of new energy vehicles;
- After evaluation, 17 regions and China Tower Co., Ltd. were identified as pilot regions and enterprises.
- Luminous Tech has two major recycling bases : Jiangsu and Henan
Launching the following regions: Guangdong and Zhejiang

Ban Le, founder and technical inventor of the company



Independent R & D and manufacturing of equipment, invention patents and qualification reference:

- United Nations Green Climate Fund (GCF) private sector observer
- Participate in the preparation of hazardous waste standards for high temperature and low temperature electric arc treatment by the Ministry of environmental protection
- Responsible for the connection between the National Standards Committee and the French europlasma and the standards of the European Union and the OECD (International Economic Cooperation Organization).
- Independent expert for database of hazardous waste treatment of World Bank
- Independent expert on municipal solid waste treatment of Asian Development Bank, once served as the leader of several project teams
- The head of the water treatment expert group of the African Development Bank for The Belt and Road environmental protection project.
- Environmental project expert of China 21st century development office and French Development Agency
- Ensil, French National School of engineers, isige Institute of environment, Paris University of mining and technology
- Double master's degree, EU registered engineer

Core management team



Leo

Quality Control Manager

8 years of experience in lithium battery industry, rich research experience in the chain of lithium battery industry. General manager of recycling business.



Luo Yin

General Manager

15 years of experience in infrastructure maintenance, construction and market, familiar with energy and power market.



Ryan Zhang

Director

Graduated from Nanjing University of information engineering, with rich experience in engineering construction and logistics, warehousing and supply chain management.

Enterprise Honor



2017

First prize of scientific and technological innovation of Shenhua Group



2016

France carbonium Low Carbon Technology Excellence Award



2020

Henan Sanmenxia Talent Award project



2021

Luminous retired lithium battery trading platform officially started trading and uploaded to the traceability system

Existing treatment scale

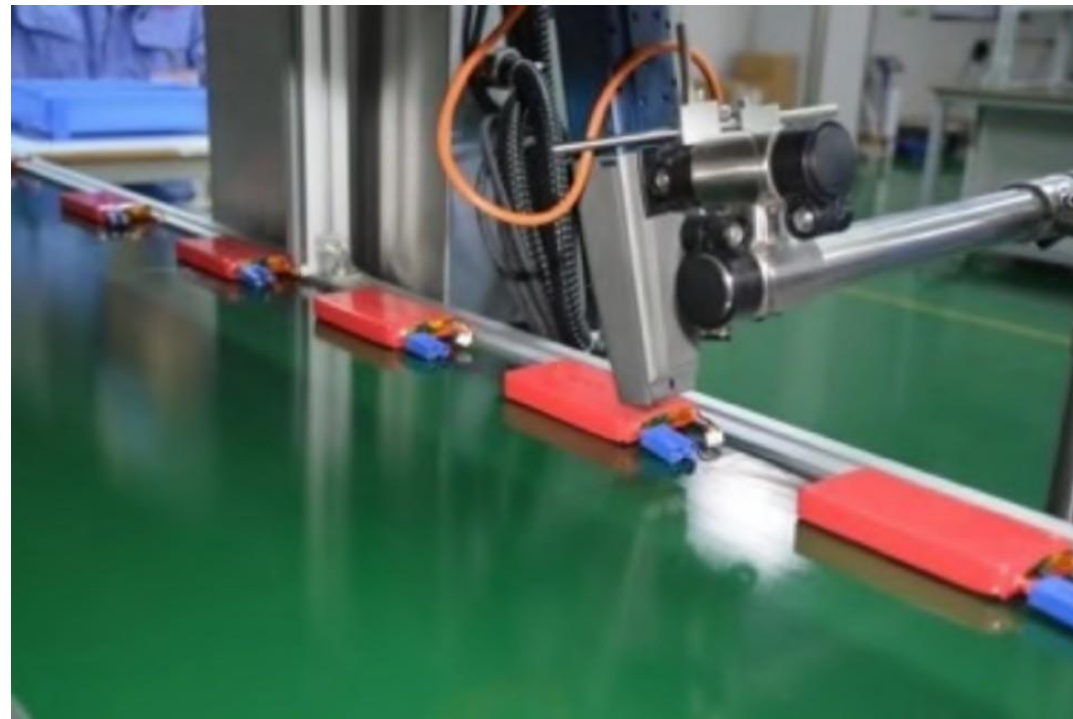


A complete production line with a daily processing capacity of 10 tons of scrap metal has been built

- The plant covers an area of 4200 square meters, with two lithium anode treatment lines, one cathode treatment line, a low-temperature material storage warehouse, dust-free negative pressure workshop, etc
- Core equipment includes: 1. Disassembly equipment; 2. Pulverizer equipment; 3. Discharge equipment 4. High temperature and low temperature electric arc treatment equipment; 5. Screening equipment; 6. Conveying equipment, etc. (since the core equipment belongs to industrial secrets, pictures will not be put separately)
- The annual processing capacity is 3600 tons of metal (the actual design capacity of the existing equipment is 500 tons / month)

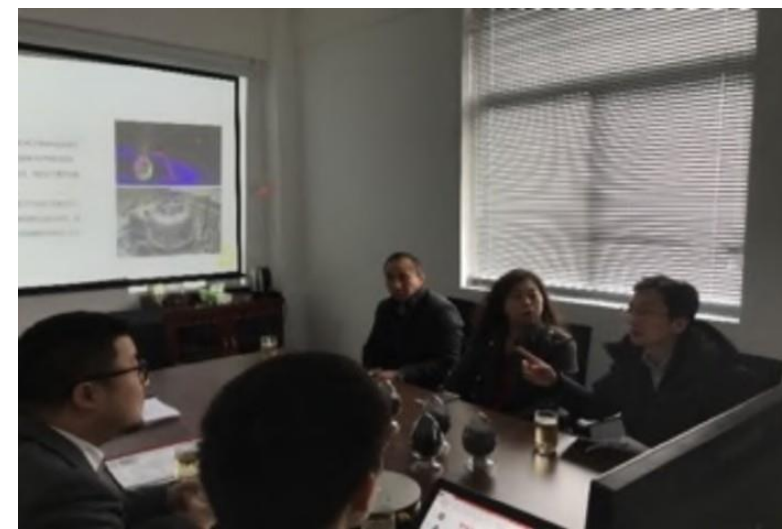
Secondary utilization plant scale

- Luminous cooperates with Shenzhen Yuanyuan lithium battery to operate Dongguan secondary utilization plant. Yuanyuan lithium battery has a large number of overseas secondary utilization battery customers, which can consume a large number of B products and batteries with secondary utilization value.
- At present, there are two pack lines in Dongguan factory, with a capacity of about 100000 ampere hours per day. The main products are: solar energy storage battery module, small power battery module, consumer electronics battery, etc.



Attention and recognition from society

United Nations experts, the Ministry of finance,
the Ministry of industry and information technology and leaders of governments at all levels visited the company

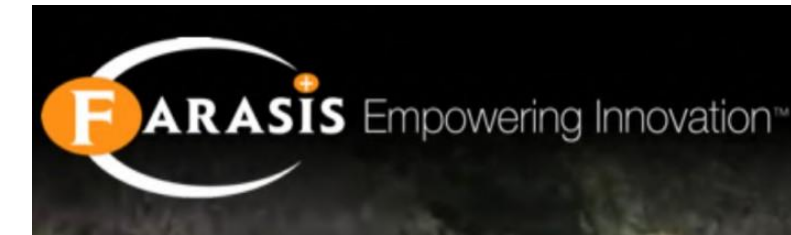


Since it was put into operation in 2018, our factory has successively received experts from the United Nations Environment Program and the United Nations Green Climate Fund, and highly praised the unprecedented technology break through by using low temperature electric arc technology to achieve the industrialized production of lithium battery metal in the world.

In November of 2018, the leaders of the Ministry of Finance and the Ministry of industry and information technology successively inspected the progress of the work in the factory and fully affirmed the progress of the project since it was put into operation.

The second stage of the project plan has also been highly praised by the local government and environmental protection departments, and the second stage project plan investment has been started.

Cooperation network and core customers



Lakeside base (Sanmenxia City)

cooperative
partner



Project
content

It covers an area of 6500 square meters, including self purchased land, plant and office building.
An annual output of 20000 tons of battery powder.

Wanghai base (Yancheng City)

cooperative
partner



Yanfu transportation

Project
content

It covers an area of 30 hectares, including self purchased land, plant and office building.
An annual output of 30000 tons of battery powder.
Comprehensive strategic cooperation with Yanfu transportation group.

Wanghai base (Yancheng City) -project positioning and objectives

Project Position

It is located in the Korea green cooperation Park, which focuses on the deep excavation of the recycling value of retired power lithium batteries, forms high-tech fields such as low-temperature electric arc equipment and ultrasonic automatic testing equipment, and integrate technology transformation and market development.

Long term target

In the future, it will become an important power battery recycling base that center in Jiangsu and even East China. The park promotes the sustainable development of social economy and contributes to the government for the construction of low-carbon economy and environment-friendly society.

Wanghai base (Yancheng City) -construction planning

60 million / 10000 tons invested in the first phase

- 1、RMB 110 million for automatic cutting equipment and low-temperature electric arc quality separation equipment; High temperature and low temperature electric arc equipment for toxic gas, etc., up to 30 tons / day to treat waste batteries; The secondary utilization battery detection and evaluation equipment
- 2、RMB 22000 is used for raw material procurement and daily operation.
- 3、RMB 330000 is used for land purchase and the construction of factories, warehouses, dormitories and office buildings.

The investment in second phase is 100 million yuan / 15000 tons

It is used for the construction of low-temperature electric arc equipment and supporting equipment, land, plant, etc. to treat waste batteries up to 50 tons / day.

The investment in the third phase is 200 million yuan / 30000 tons

It is used for the construction of low-temperature electric arc equipment and supporting equipment, land, plant, etc. to treat waste batteries up to 100 tons / day.

The total investment is about 400 million yuan, which is divided into three phases



Modular manufacturing design can quickly expand the implementation of replication for projects

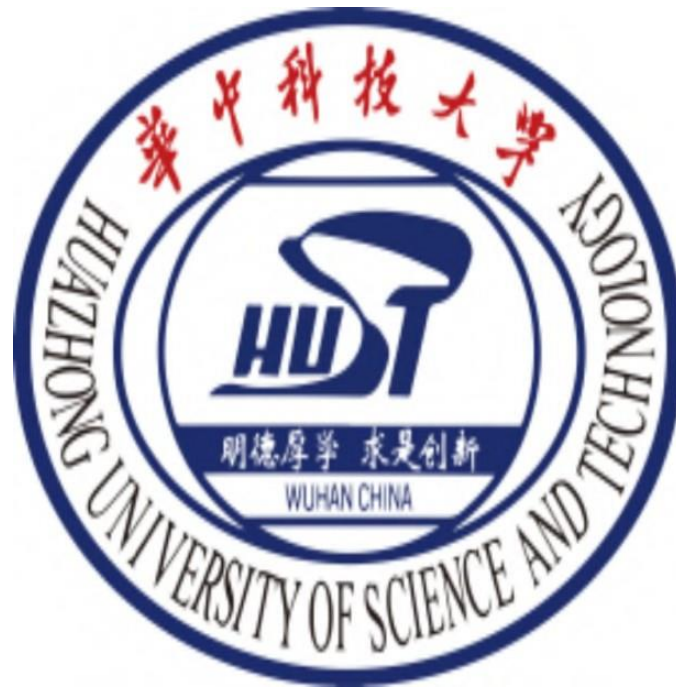
PART 6



Scientific Research Capability



Ultrasonic testing - industry university research: Huazhong University of science and technology



Cooperate with Professor **Huang Kai** and Professor **Shen Yue** of Huazhong University of science and technology to develop ultrasonic testing fixture for lithium ion battery.

The utility model patent has been successfully obtained.

Focus on practical operation technology
Research and development of utility models

Production, study and research of plasma and microwave heating: Southeast University



Work with Southeast University professor Sun Xiaohan and Professor Shen Changsheng to develop the following technologies: plasma separation furnace technology, microwave battery powder refinery technology.

It has successfully obtained the intellectual property certificate of plasma separation furnace operation software.

Upgrade the original plasma technology
World-First microwave battery powder refining

Battery fire and lightning protection - production, study and research: Nanjing University of Technology



Cooperate with professor You Fei of Nanjing University of technology to develop a series of:

- Battery fire protection and industrial fire protection technology.
- Russian advanced active fire extinguishing materials have been introduced.

Production safety is the first major concern of an enterprise
Research and development of industry-leading battery fire prevention
technology

PART 7



Social and economic benefits

Social and ecological benefits



Waste power batteries are a potential threat to the environment and human health. The existing treatment methods of waste batteries mainly include solidification, deep burial, storage in waste mines and resource recovery. However, at present, the capacity of battery resource recovery in China is limited, and most waste batteries have not been effectively disposed, which will bring potential threats to the natural environment and human health.

Although the power battery does not contain mercury, cadmium, lead and other toxic heavy metal elements, it will also bring environmental pollution. For example, once the electrode material enters the environment, the metal ions from the positive electrode, the carbon dust from the negative electrode, the strong alkali and heavy metal ions in the electrolyte may cause heavy environmental pollution, including increasing the pH value of the soil. If it is not handled properly, it may produce toxic gases. In addition, the metal and electrolyte contained in the power battery will endanger human health. For example, cobalt may cause people's intestinal disorders, deafness, myocardial ischemia and other symptoms.

The problem of power battery recycling affects the sustainable development of social economy. Electric vehicles have the advantages of dealing with environmental pollution and energy shortage. If the power battery can not be effectively recycled after it is scrapped, it will cause environmental pollution and waste of resources, which is contrary to the original intention of developing electric vehicles. For enterprises, the recycling of power batteries contains many business opportunities. After recycling, it can save the cost of raw materials for battery manufacturers. Furthermore, power battery recycling is also related to the government's construction of low-carbon economy and environment-friendly society.

Yancheng City 10000 ton project (calculated as 10000 tons in phase I)



Input & output

Output value: rmb24250000 / year

Recycle 30 tons / day of waste lithium batteries (especially ternary lithium batteries). Take "ternary" as an example, 3.2 tons of ternary powder, 0.74 tons of copper, 1.78 tons of aluminum, 2.4 tons of carbon, 0.65 tons of plastic and 1.22 tons of electrolyte can be purified every 10 tons.

The output value is RMB 242.6 million / year (cobalt is a rare precious metal and non renewable resource, and the current market value is about RMB 250000 / ton);

Project cost: RMB 25.5 million / year

Battery purchase: RMB 6 million (the average recycling price of battery modules is 10000 / ton, and the mobile storage is 600 tons)

Battery discharge: rmb1400000 (discharge equipment + materials, calculated according to the cost of 800 yuan / ton)

Battery disassembly: rmb1100000, 100 tons of battery disassembly per day, 10 personnel, and an average labor of 6000 yuan / month / person

Electricity charge: RMB 3 million / year

Equipment investment: RMB 11 million

Depreciation of land and plant: RMB 3 million / year (equipment depreciation, production and maintenance expenses, etc.);

Pre tax operating profit: 80 million yuan / year, with an operating profit margin of 33%;

Note: this calculation moderately enlarges the cost. 15% of turnover tax, government subsidy income and enterprise income tax are not considered.

Various tax returns and policy subsidies can be applied for high-tech, environmental protection and waste recycling.

Comprehensive output value and profit



- Pulverizing business: the full output is 30000 tons and the output value is 500 million yuan per year
2021 target 10000 tons, 130 million yuan
- Energy storage business: the output value of the full strength mode is 300 million yuan per year
2021 target 10000 tons, 100 million yuan
30 million yuan has been signed
- Trading platform: the total of full strength mode (target 15 provinces) has a trading volume of 2 billion yuan per year
2021 target 10000 tons, 500 million yuan, 150 million yuan has been signed
5 million yuan has been traded in January 2021

PART 8



Overall strength of the company



Comprehensive output value and profit



Team:

Down-to-earth, international vision, high compliance management preference



Business:

all large and super large enterprises upstream and downstream



Future planning:






Pulverizing business: covers Jiangsu, Henan, Guangdong and Anhui Province

High turnover: 1-2 billion yuan per year

Multi-end layout of the entire industry chain: European factories are responsible for China's export battery quality assurance and recycling, recycling business and the national carbon neutral market connection

Mid-term goal: The total MW and turnover of decommissioned battery management are both No. 1 in the country



-  **8 arc pulverizing centers**
Yancheng, Sanmenxia, Xinxiang, Nanjing, Wuhu, Suining, Shantou, Haikou Cities
-  **3 secondary utilization centers**
Yancheng, Xinxiang, Shantou Cities
-  **1 high nickel material base**
Quzhou City
-  **1 hydrometallurgy base**
Nanyang City
-  **3 secondary battery recycling economy research institutes**
Beijing headquarter, Shanghai Branch, Shenzhen Branch

Mid-term goal



First in Global leader in battery secondary life cycle management

First in Total megawatts of battery management and operating revenue in the same industry



Thank You