



# Enhance the competitiveness of industrial chain with industrial circular economy

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**Abstract.** Developing circular economy is the inevitable way to improve the efficiency of resource utilization. We should firmly establish the concept of green development, actively promote the innovation of related industrial processes and technologies in the region to achieve low consumption, low emissions and high efficiency. China's manufacturing industry ranks first in the world, and it is the only country with all industrial categories. Thus, developing industrial circular economy is an important means to improve the competitiveness of industrial chain. By taking the development of industrial circular economy as the means and improving the competitiveness of industrial chain as the goal, we will embark on a circular development path with Chinese characteristics.

**Keywords:** circular economy, manufacturing industry, industrial chain

## 1 INTRODUCTION

Since the State Council issued the "Several Opinions on Accelerating the Development of the Circular Economy" in 2005, China has begun to place emphasis on the development of the circular economy, and the competent departments have also carried out a series of work: The National Development and Reform Commission has launched pilot programs for the circular transformation of industrial parks and constructed resource recycling bases. The Ministry of Ecology and Environment has mainly implemented the review work of cleaner production of national ecological industrial parks and key enterprises. The Ministry of Industry and Information Technology has undertaken the construction of green manufacturing system, major demonstration projects of industrial circular economy and industrial resource comprehensive utilization bases, and the re-manufacturing of mechanical and electrical products. It has released the catalog of technologies for comprehensive resource utilization, promoted the recycling and utilization of power batteries for new energy vehicles, and implemented standardized management for industries such as scrap steel, waste plastics, waste rubber, etc. China has included circular economy technology in the national medium- and long-term science and technology development plan, supported the research and development of key common technologies, implemented industrialization demonstration projects of circular econ-

omy technology, and promoted the application of advanced and suitable circular economy technologies. At present, the scale of China's resource recycling industry is continuously expanding, and the traditional growth and consumption patterns of "massive production, massive consumption, and massive waste" have also been changed to a certain extent. Through sorting out and actual visits of relevant cases, the typical models for the development of industrial circular economy have been summarized as follows:

## **2 THE OVERALL SITUATION OF CHINA'S INDUSTRIAL CIRCULAR ECONOMY**

### **2.1 Typical model of industrial circular economy development in Guizhou**

Guizhou has taken the lead in promoting the "production determined by waste" of phosphor gypsum industry across the country. It has organized and implemented a batch of circular economy and resource comprehensive utilization demonstration projects with significant scale effects and high-level technological equipment, such as that of fly ash, phosphor gypsum, coal gangue, etc. It has also supported enterprises to establish centers for the research, development, and industrialization of circular economy technologies. Breakthroughs have been made in resource conservation and pollution reduction, and favorable economic and environmental benefits have been achieved<sup>[1]</sup>. The characteristics are as follows:

The first is promoting the comprehensive development and utilization of mineral resources such as phosphorus, sulfur, etc. Guizhou has strengthened the development and utilization of low-grade phosphorus mines and sulfur mines, and advanced the comprehensive utilization of by-products in phosphorus mines such as fluorine, silicon, iodine, magnesium, etc. The second is building the circular economy industrial chain for phosphorus and sulfur chemical industry. Guizhou has enhanced the cross-linking and horizontal diversification with related industries, promoted the close integration of phosphorus chemical industry with coal chemical, oil chemical, fine chemical, and functional material industries, realized comprehensive utilization of resources, reasonable product structure and industrial structure, and made the chemical industry bigger, stronger and more refined. For example, Guizhou has built industrial chains such as that of phosphate ore-phosphorus fertilizer-phosphorus gypsum-building materials, phosphogypsum-acid production-residue-cement, phosphate ore-phosphorus fertilizer-tail gas-phosphoric acid, etc. The third is about accelerating the resourceful utilization of "three wastes". Guizhou has vigorously promoted the practical application of materials such as building materials, paper fillers, gypsum powder materials, fertilizers, etc. from phosphogypsum, and has built a circular industrial chain for the production of sulfuric acid and cement from phosphogypsum, which has promoted energy conservation, reduced material consumption, and fostered the development of a circular economy in the industry.

## 2.2 Typical model of industrial circular economy development in Tianjin

Tianjin has established a circular economy information and service platform, created an industrial circular economy development model that integrates dynamics, networks, management, services, and customers. Facing a wide range of users, Tianjin has comprehensively collected waste logistics information and constructed a reasonable waste recycling network chain for waste, raw materials, products and users, enabled waste resources to be reasonably, centrally, allocated and exchanged among enterprises<sup>[1]</sup>. The characteristics are as follows:

The first is about guiding the construction of comprehensive recycling network. Tianjin has encouraged leading enterprises to establish specialized recycling and re-manufacturing departments, provided policy and tax support, improved the electronic waste recycling system, and promoted the standardization of mobile phone chargers and batteries. The second is building a complete industrial chain from recycling, dismantling, processing, remanufacturing to sales. On the one hand, recycling industrial chains are formed within large comprehensive resource recycling enterprises. On the other hand, each enterprise has carried out specialized division of labor within the resource recycling processing zone, formed industrial chains among them. Resource recycling enterprises have specialized departments for recycling, dismantling, remanufacturing, etc, and possessed qualified production technologies, building a complete industrial chain internally.

## 2.3 Typical model of industrial circular economy development in Sichuan

Sichuan Province has built composite circular economy industrial chains, vigorously promoted the construction of modern logistics systems such as deep processing of agricultural products and efficient logistics cold chains, etc, supported the deep processing model of integrated breeding and developed integrated and composite industrial chains, such as feed production, livestock and aquatic, livestock and aquatic product processing, and deep processing<sup>[1]</sup>. The characteristics are as follows:

First is about accelerating the elimination of outdated production capacity. Sichuan has eliminated outdated production capacity in the food industry and promoted the transformation and upgrading of traditional industries, adopted advanced domestic and international production technologies and complete sets of equipment, promoted the food processing technology to an advanced level, and improved the utilization and output rate of grain resources in the food processing process. The second is promoting the integrated development of the food industry as well as upstream and downstream industries. Sichuan has encouraged the extension of the food industry to upstream and downstream industries, established a full industry chain from raw material production to terminal consumption, promoted effective connection between various links, and constructed a modern composite circular economy industry system that integrates grain, vegetables, fruits, tea, livestock, fishing, forestry, processing, energy, logistics, tourism, and linkage development of the first, second, and third industries.

### 3 EXISTING PROBLEMS

#### 3.1 The circular economy is not effectively "circular"

Firstly, some circular economy projects and platforms are not effectively utilized. In recent years, many circular economy information service platforms have been established in some parks, with various forms and names, but the actual utilization rate of enterprises is low and the models are mechanically copied<sup>[2]</sup>. Some enterprises have sought government project funding subsidies under the guise of developing circular economy, but not truly used them for the development of circular economy<sup>[3]</sup>. Secondly, some enterprises do not pay enough attention to circular economy<sup>[2]</sup>. For example, Shagang Group has piled up millions of tons of industrial solid waste such as steel slag, etc, which has been accumulated for a long time on the banks of the Yangtze River, polluted the surrounding soil and water bodies, and threatened the ecological environment of the Yangtze River. The comprehensive utilization rate of industrial solid waste in China is maintained at around 60% all year round, while the average rate is 61.1% during the 12th Five Year Plan period. The overall comprehensive utilization rate of waste resources is not high<sup>[4]</sup>.

#### 3.2 The circular economy is not "economical" enough

Firstly, the high investment cost in the circular economy restricts the enthusiasm of market entities<sup>[3]</sup>. Taking 2014 as an example, the cost of treating all the industrial solid waste generated in that year would be 262.5-387.5 billion yuan, equivalent to 27-40% of the investment in environmental pollution control in that year. Secondly, the benefits of developing circular economy are not obvious<sup>[4]</sup>. At present, local governments and most enterprises consider the profit margin for developing circular economy to be relatively small, conflicts exist between developing circular economy and economic efficiency improvement, and related equipment has not been fully utilized<sup>[3]</sup>. For example, in China's waste electrical and electronic recycling industry, due to the low added value of products, the operating rate has been maintained at around 50% all year round. Thirdly, the comprehensive cost of initial resources and the cost of waste discharge are low, and the relative benefits of recycling resources are not high, which suppresses the comprehensive utilization of renewable resources<sup>[5]</sup>.

### 4 RELEVANT SUGGESTIONS

#### 4.1 Strengthen top-level design to guide the orderly development of the comprehensive utilization of resources industry

Firstly, we should accelerate the establishment and steady improvement of China's legal and regulatory system for circular economy, increase constraints, strengthen law enforcement, and raise the cost of violations. Secondly, it is necessary to promote the establishment of green low-carbon circular development industrial system, carry out

circular economy leading actions such as "Internet + resource recycling" transformation, regional circular development improvement, park circularization transformation, etc. Thirdly, we should issue guiding opinions on waste disposal, promote the formulation of relevant standards, and improve the policy system for industrial circular economy. Fourthly, It is necessary to rationalize the pricing mechanism of resource products, promote full competition in market competition links, and ensure that prices fully reflect complete costs such as resource costs, development and utilization costs, and environmental costs.

#### **4.2 Innovate technologies to promote the new development of industrial circular economy**

The application of new technologies such as intelligence, informatization, internet, big data, etc, should be actively promoted in the circular development of parks and enterprises. By carrying out a series of tasks such as information collection, data analysis, flow monitoring, network layout, etc, we are able to comprehensively build circular economy information service platforms through a series of work such as information collection, data analysis, flow direction monitoring and network layout to meet the requirements of circular, large-scale and standardized development of parks and enterprises. The circular economy information service platform has the characteristics of "flattening", "real-time", "efficient", etc. Through preset indicators, automatic calculation is performed to achieve early warning of circular development management; through introducing big data, the optimization of enterprise process technology and transformation path diagnosis are realized; and through material flow information exchange, the efficient utilization of waste, by-products, and idle resources in parks is achieved.

#### **4.3 Strengthen classification guidance to accelerate the promotion and demonstration of industrial circular economy**

We should carry out local industrial circular economy-related work, clarify the focus of circular economy development in various places based on the functional positioning, regional economic characteristics, resource endowment, and environmental carrying capacity, plan rationally, adapt to local conditions, implement classified policies, leverage regional advantages, highlight local characteristics, and effectively play the role of circular economy in promoting economic transformation and upgrading. For example, firstly, we should guide enterprises and parks to take the development of industrial circular economy as the core, enhance the competitiveness of the industrial chain as the goal, and promote the development of industrial circular economy through means such as "strong chain", "connecting chain", "supplementing chain", and "extending chain", achieve a multi-level and multi-type industrial circular economy industrial chain system. Secondly, we should focus on the industrial characteristics of the park itself, promote the circular transformation of the park by starting from optimizing spatial layout, adjusting industrial structure, and building circular economy industry chain. According

to the characteristics of natural resource development and product manufacturing industry, namely the arterial industry, we should coordinate the reasonable layout of the waste resource utilization related industry, namely the venous industry, and promote the coordinated development of the arterial industry and the venous industry. Thirdly, we should promote the establishment of the diversified risk sharing system composed of guarantee companies, banks, enterprises, intermediaries, and relevant government departments, and reduce the risks of developing the circular economy.

## 5 CONCLUSION

General Secretary Xi Jinping pointed out: Developing circular economy is the only way to improve the efficiency of resource utilization. We should firmly establish the concept of green development, actively promote the innovation of processes, technologies and techniques of relevant industries in the region, and strive to achieve low consumption, low emissions and high benefits. According to the conditions of each region, we should take the path of reasonable division of labor and optimized development, implement the strategy of main functional areas, improve spatial governance, and form a regional economic layout of complementary advantages and high-quality development. Facing the double pressure of economic development and ecological environment protection, it is necessary to more firmly establish the development concept that "Clear waters and green mountains are as valuable as mountains of gold and silver.", rely on innovation-driven, boost China's economy to shift from the stage of high-speed development to the stage of high-quality development, and achieve a win-win situation of economic benefits, social benefits and environmental benefits. China's manufacturing industry ranks first in the world in scale and is the only country in the world that has all industrial categories, and developing an industrial circular economy is an important means to improve the competitiveness of the industrial chain. Taking the development of an industrial circular economy as a means and improving the competitiveness of the industrial chain as the goal, we should embark on a path of circular development and fully implement the development concept of "innovation, coordination, green, openness and sharing".

Based on the theoretical research of circular economy and industrial chain competitiveness and combining the online and offline investigation of the development situation of industrial circular economy work in various provincial and municipal parks and enterprises, this paper puts forward opinions on policy measures for developing industrial circular economy and improving the competitiveness of China's industrial chain. To sum up, the industrial competent department should fully understand the importance of developing industrial circular economy to improve the competitiveness of the industrial chain, clearly recognize the contradictions and problems that restrict the development of industrial circular economy, from the government level, formulate scientific plans, implement the main responsibilities, improve the working mechanism, strengthen the coordination and cooperation of multiple departments, and take practical

and effective measures to ensure the healthy and orderly development of industrial circular economy and comprehensively improve the competitiveness of the industrial chain.

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