

Research on the development path of Jianghua Micro and special motor industry

Xie Liang, Jiang Jiaying

Hunan Zhengyuan Strategy Enterprise Management Consulting Co., Ltd., Changsha, 410000

Abstract: This paper discusses the current situation and future development trend of domestic micro and special motor industry, analyzes the basic situation and main problems of Jianghua micro and special motor industry, and puts forward the feasible development path and direction of Jianghua micro and special motor industry based on the case comparison.

Keywords: micro-special motor; current situation; industrial fund

1 Introduction

Micro-special motor is a small motor designed for special mechanical requirements. Its key feature is to adapt to the specific working environment and performance requirements, while has the characteristics of small size and low power. These motors are usually no more than 160 mm in diameter, weigh from tens of grams to a few kilograms, and their output power is generally no more than 750 watts. As a key electronic component, the micro-special motor plays a fundamental role in supporting the industrial innovation and progress.

2 Status and trend of domestic micromotor industry

2.1 Development status

Overall, after decades of evolution, China has become the world's largest micro and special motor manufacturing center, as well as a major exporter. Currently, China's micro-special motor industry is mainly composed of small and medium-sized enterprises, with a total number stable at over 900. It has established a complete industrial chain covering design and development, production of key materials, manufacturing of important components, production of specialized equipment, and corresponding detection and testing equipment. It possesses large-scale and efficient production capabilities for 25 major categories, 60 series, and over 5,000 specifications of micro-special motors, occupying more than 70% of the global market.

2.1.1 Domestic layout.

From a geographical perspective, China's micro-special motor industry exhibits a stronger presence in the eastern region and a relatively weaker distribution in the western region. At present, the Pearl River Delta and Yangtze River Delta have formed two core motor and electrical industry circles covering Guangzhou, Shenzhen, Zhuhai, Hong Kong and other cities, and become the main manufacturing center and export hub of micro-special motors in China. These regions are the most prominent in the supporting capacity of key parts, materials and special equipment. Due to the gradual rise of labor and operating costs in the coastal areas, coupled with the policy support in the central and western regions, some motor enterprises began to migrate to the central and western regions.

2.1.2 Hunan Layout.

Hunan province occupies an important position in the advanced

manufacturing fields such as rail transit equipment and construction machinery, demonstrating strong market influence particularly in the large and medium-sized motor industry (for example, CRRC Zhuzhou Locomotive Co., Ltd. is in a leading position in China's rail transit equipment and wind power generation components, with a market share of more than 50%). However, in the industrial chain of micro-special motors, Hunan is still in the development stage of gradual agglomeration, mainly concentrated in areas such as Jianghua and Qiyang in Yongzhou.

2.1.3 Industry characteristics.

The domestic technology in the field of micro and special motor has experienced the transformation process from imitation to emphasizing independent research and development, and from infancy to maturity. The main research objectives are to achieve several key changes, namely, shifting the working conditions of micro-special motors from simple modes to complex modes, changing the operating voltage from lower to higher levels, and expanding from individual units to comprehensive applications involving multiple units.

2.2 Development trend

From the perspective of the technical level and performance of products, the development of energy saving, high efficiency and intelligent, the application of brushless technology and the integration of various functions are gradually becoming an important development direction of the micro and special motor industry.

(1) The promotion of the policy makes the motor industry rapidly transform and upgrade towards the direction of high efficiency and energy saving. Micro-special motors play an important position in the field of motor manufacturing. They are large in number and widely used, and have become an important source of power consumption. In recent years, the Ministry of Industry and Information Technology has successively issued policies such as "Motor Energy Efficiency Improvement Plan(2021-2023)" and "Industrial Energy Efficiency Improvement Action Plan", aiming to vigorously promote the development of miniaturization, integrated and energy-saving micro-special motors. It is expected that by 2025, the proportion of new energy-efficient motors will exceed 70%.

(2) With the evolution of new consumption trends and the upgrading of manufacturing industry, the intelligent demand for micro-special motors has become more and more urgent. Emerging

consumer environments, such as smart home, wearable technology, medical robots and intelligent learning assistants, which are combined with traditional manufacturing industries and utilizing information technology and big data analysis, all require micro-special motors to have more systematic and intelligent support.

(3) The DC brushless motor is favored because of its excellent efficiency, low noise, long life and high reliability. It not only combines the excellent characteristics of DC brush motor, but also inherits the advantage of simple structure of AC async motor, so the application in many fields is increasing day by day. This is also the main development direction of micro-special motor, now has become a hot topic in the industry. At present, most brushless motor drive and control systems use specialized integrated modules. With the gradual popularization of brushless motor application, its output is also increasing, so that the integration cost of motor and drive is significantly reduced, which will contribute to the further promotion and application of brushless motor.

3 The current situation and inadequacy of Jianghua micro-motor industry

Since 2016, Jianghua Yao Autonomous County (hereinafter referred to as “Jianghua County” or “Jianghua”) has seized the strategic opportunity of a new round of transfer in the domestic micro-special motor industry. Leveraging its regional advantages such as geographical location, land, and labor costs, and relying on industrial parks, the county has actively issued various policy supports, concentrated resource allocation, and practically promoted various work. The government has made commitments and taken timely actions, implementing a series of measures to promote the development of the micro-special motor industry. These initiatives have attracted a large number of related enterprises from the Pearl River Delta region to settle in Jianghua, forming the “Jianghua Phenomenon” characterized by the “clustered” settlement, “grouped” entry, and “alliance-based” development of coastal transfer enterprises.

3.1 Foundation for Development

3.1.1 Initial formation of agglomeration effect.

At present, Jianghua County has realized the localization of the whole chain from casting to finished products in the production field of micro and special motors. According to relevant statistical data, by December 2023, there are more than 64[2] of complete motors and supporting companies in Jianghua County, among which the number of enterprises with output value of more than 100 million level exceeds 20. The local complete machine manufacturers are mainly derived from the Pearl River Delta region, and have a significant influence in some market segments.

3.1.2 Rich in industrial elements.

From the perspective of plant resources, Jianghua County High-tech Zone currently has hundreds of thousands of square meters of standardized plant, which provides good conditions for the relocation of coastal enterprises and capacity expansion. In terms of land and human resources, Jianghua shows obvious cost advantages, which is more prominent than the Pearl River Delta region. From the perspective of resource conditions, Jianghua has many advantages, such as rare earth mineral resources and green power. Looking into the future, with the new configuration of wind

energy and photovoltaic energy development in Jianghua County and the access of centralized photovoltaic projects, it will provide strong support for the economy and industry in the region.

3.2 The main bottleneck

The micro-special motor industry in Jianghua is currently undergoing a transformation from the initial incubation and preliminary concentration stage to a more mature cluster development stage. In this process, the cooperation, innovation ability and brand influence of the industrial chain need to be enhanced urgently.

3.2.1 Industrial supporting facilities need to be improved.

The challenges faced by Jianghua’s micro and special motor industry include the current situation of “the lack of close connection between clusters and the lack of some links in the industrial chain”. Specifically speaking, one is the “isolated island” phenomenon of the industrial supply chain. As local enterprises often rely on the relationship between friends and fellow villagers to gather in Jianghua, these micro and special motor manufacturers usually carry their own supporting systems, leading to the dispersion and isolation of local industrial chains and supply chains[3]. Second, the support problem of related industries and supporting industries. Taking the pallet industry as an example, local companies usually need to externally purchase pallets that meet export standards to fulfill export-oriented needs; The third is the lack of downstream links. In view of the downstream dependence characteristics of the industrial chain (involving the main components of important finished products such as automobiles and small home appliances), the extension of Jianghua Micro and special motor industry to the downstream is the inevitable choice for its expansion and strengthening, otherwise it may face the dilemma of “development bottleneck”.

3.2.2 Industrial elements need to be optimized.

The industrial elements in Jianghua area show the characteristics of “lack of primary production elements, lack of innovation of advanced production elements and artificial resource endowment still need to be improved”. Especially for the transportation and logistics elements. Although the physical distance between Jianghua and the Pearl River Delta and Changsha-Zhuzhou-Xiangtan is not far away, but due to the lack of highway and high-speed rail infrastructure, compared with Chenzhou, Yongzhou Qiyang and other competitors, convenient and efficient transportation system may become one of the key factors limiting the improvement of industrial competitiveness; The second is the labor force factors, such as the industrial labor force. Jianghua’s micro special motor manufacturing industry is still a labor-intensive industry. In the realization of the goal of ten billion or even 100 billion output value, there will be a great demand for workers with professional skills in the future.

3.2.3 Industrial ecology needs to be upgraded.

Jianghua’s industrial ecosystem is still in a relatively basic development stage, which is mainly reflected in the industrial policy. In recent years, some leading industrial parks in China have gradually promoted policy innovation, shifting their focus from traditional industrial policies (such as providing land and tax incentives) to strategic transformations centered on breakthroughs in core industrial elements (such as policies to advance key

qualifications certifications, facilitate industrial chain collaboration, and assist enterprises in obtaining orders). In order to enhance the attraction and retention ability of micro and special motor enterprises in Jianghua, it is necessary to increase the strength of policy innovation and promote the transformation from the industrial policy with investment attraction as the core to the service policy to support the development of the whole life cycle of enterprises; The second is the industrial platform. At present, Jianghua's public service system is faced with challenges such as insufficient marketization, insufficient functionality (such as, a small number of inspection and certification agencies), and a lack

of joint research and development platform of the industry.

4 Domestic cases are used for reference

Given the dependent characteristics of micro special motor industry, mainly analyzes the Shunde household appliances industry cluster, Cixi intelligent small home appliance industry cluster, Hefei smart home appliance industry cluster, and Shaoxing Shengzhou motor and kitchenware industry four areas, for the further development of Jianghua's micro-special motor industry, with specific details as follows:

Cluster name	Early mode	Main experience	Enlightenment to Jiang Hua
Shunde home appliance industry cluster	Original Equipment Manufacture	<ul style="list-style-type: none"> √ Experienced from the Original Equipment Manufacture(OEM) to Original Design Manufacturer(ODM) to Original brand Manufacture(OBM) √ Faced with the pressure of rising labor costs, the introduction of robots to replace the labor force is one of the ways generally adopted by manufacturing enterprises √ It has become the first home appliance industry e-commerce cluster area in China 	<ul style="list-style-type: none"> √ Take advantage of "Internet +", walk out of the new path of "small home appliances + e-commerce" √ Based on the contradiction between the 100 billion target and the shortage of industrial workers, machines may replace labor or a new way
Cixi intelligent small home appliance industrial cluster	From spare parts processing to small home appliances complete machine assembly	<ul style="list-style-type: none"> √ From the Original Equipment Manufacture(OEM) to the self-created brand √ Take "product structure optimization" as the breakthrough point of market competition 	<ul style="list-style-type: none"> √ Focus on the segmentation of the field of single products, to create a fist of products √ Strengthen the brand (regional / enterprise / product) construction
Hefei smart home appliance industry cluster	Government-leading + complete machine investment attraction	<ul style="list-style-type: none"> √ Guided by the governments industrial investment, a "Hefei path" of "leading enterprises--introducing big projects--improving industrial chains--cultivating industrial clusters--building industrial bases" will be developed 	<ul style="list-style-type: none"> √ Harness the leverage effect of government industrial investment
Shaoxing Shengzhou Motor · kitchenware industry cluster	Extend from the motor to the electrical appliance	<ul style="list-style-type: none"> √ Leverage industrial advantages and timely promote the extension of the industrial chain. For example, Changle Town in Shengzhou, known as the "Hometown of Motors," has upgraded its production to include range hoods, leveraging its strength in motors[4] √ For decades, with a focus on a single product category—the integrated kitchen stove, "Integrated Kitchen Stove, Made in Shengzhou" has become one of the loudest slogans for Shengzhou's kitchenware industry 	<ul style="list-style-type: none"> √ Follow the principle of "local foundation, market prospect", encourage local enterprises to extend downstream √ Adopt the centralized strategy, create small home appliance subdivision field of single product burst, form a demonstration effect

5 Countermeasures and suggestions for the development of Jianghua micro-motor industry

With "the city of motor, the hometown of small home appliance" strategic positioning as the core, around the construction of new productivity, promote regional kinds of innovation (including industrial elements, industry environment and industry development) to accelerate progress, promote regional industry competitive advantage, prompting enterprises from "passive attraction" to "active participation", to promote Jianghua micro motor industry to achieve high quality and sustainable growth.

5.1 Create new growth drivers through innovation in industrial elements

Pay attention to the development obstacles faced by Jianghua micro and special motor industry, and focus on promoting the establishment of "investment fund, scientific research platform and modern logistics system", so as to accelerate the innovation process of industrial elements and enhance the competitiveness of the region.

(1) Adhering to the principles of investment fundization, fund industrialization, and industrial securitization, we aim to promote

the high-quality development of the micro-special motor industry in Jianghua County. By introducing professional fund management institutions, we will establish a dual-layer investment system of "mother fund + sub-funds" to achieve a virtuous circle of funds, effectively conducting fund-raising, investment, management, and exit. At the same time, local platform companies will utilize diversified methods such as "direct investment and fund investment" to play a crucial guiding role in industrial development and investment attraction activities.

(2) Focus on the development of Jianghua micro and special motor industry, build a research and development platform with technology research and development as the core and relying on industrial investment and incubation, integrate all kinds of professionals, such as scientists and entrepreneurs, to accelerate the aggregation of industrial elements, so as to enhance the industrial competitiveness of the region.

(3) Actively promote the construction of important infrastructure projects in Jianghua County during the 14th Five-Year Plan period, and improve the regional logistics network, including the special logistics channel of "Jianghua Micro special motor and electrical products-regional storage center - special railway line - Guangdong-Hong Kong - Macao Greater Bay Area

and the international market”.

5.2 Build a new pattern of development around the industrial environment innovation

According to the needs of micro and special motor enterprises, build a new industrial ecology covering “platform, system and organization”, so as to promote the improvement of industrial environment and service in Jianghua area.

(1) Industrial upstream and downstream collaboration platform. Around the “leading enterprise - invisible leader - professional high quality small and medium-sized enterprise” cultivation chain, relying on leading enterprises to form industry chain upstream and downstream cooperation community, build platform for the coordinated development of key industries, to the core enterprise pull near the parts and material suppliers common development, promote the industry chain upstream and downstream and small complementary resources, improve local advantage industry of supporting ability; Hold industrial docking activities to optimize the production, supply and sales links of important industrial chains.

(2) Formulate the Guidance Manual of Market-oriented Service Institutions in Jianghua County to clarify the requirements of the identification standards, application conditions, performance evaluation and relevant policy support of service institutions. According to the actual needs of enterprises, we will accelerate the attraction and cultivation of a number of market-oriented third-party science and technology service institutions, including inspection and testing, pilot-scale maturity, intellectual property management, technology trading and science and technology consulting.

5.3 Create a new name card of Jianghua around industrial development and innovation

Through the way of investment attraction, combined with the further promotion of local brands, to enhance the influence of Jianghua micro and special motor industry cluster in the national

market.

(1) By fully seizing the strategic opportunity of “Hunan Entrepreneurs Returning Home and Alumni Returning to Hunan,” we will gather outstanding scientific research talents from universities and research institutions at home and abroad across various fields. These talents will focus on the technological needs and supply of enterprises, as well as the development direction of the industry. We will establish an expert team and create a brainstorming atmosphere through themed discussions and diversified interactive formats. This will facilitate the advanced technological transformation and industrialization of the micro-special motor and electrical appliance industry, constructing a core base for its development and incubation.

(2) Focus on emerging fields such as new consumption and new manufacturing, and promote the complete machine enterprises to expand to the downstream industrial chain; Actively introduce downstream enterprises, including chain main companies, invisible masters and specialized special new small and medium-sized enterprises projects.

6 Conclusion

As a key electronic component, with the rapid development of domestic medical equipment and new energy vehicle industries, its application fields will be more and more extensive. As an important manufacturing hub for micro-special motors in Hunan, Jianghua County has already established a solid industrial foundation. However, it still faces bottlenecks in its development. It is urgent to focus on industrial upgrading, learn from benchmarks, identify gaps, strengthen weaknesses, and enhance strengths. By doing so, it aims to promote the optimization of industrial elements and the development of an innovative environment, striving to become a new paradigm for county-level industrial development in China.

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