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Exploring the Development Path of Low-Carbon Technology in the Automobile Manufacturing Industry

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Abstract: At present, the green and low-carbon development of automobile manufacturing industry has become an important issue of general concern in the global automobile industry. To achieve the green and low-carbon development of the automobile manufacturing industry is not only an important response to the "dual carbon" goal, but also the key point to promote the high-quality development of automobiles. In this context, the paper consulted the relevant literature and materials of green low-carbon technology in the field of automobile manufacturing, and preliminarily analyzed the problems existing in the development of low-carbon technology in the automobile manufacturing industry; According to the problem, the low-carbon technology development path is proposed: the automobile manufacturing industry needs to focus on the carbon emissions of power batteries, attach importance to the construction of low-carbon infrastructure equipment, promote the development of advanced manufacturing, pay attention to the use of low-carbon materials, increase the development of intelligent manufacturing, and improve the manufacturing technology innovation ability.

Keywords: Automobile Manufacturing Industry; Low-carbon Technology; Development Path.

1. Introduction

The automobile is one of the most representative inventions in the industrial age, and the automobile manufacturing industry is an important part of the automobile industry [1]. The "14th Five-Year Plan" for Industrial Green Development proposes 1 action, 2 systems and 6 transformations, including improving the green manufacturing support system; Academician Ouyang Minggao talked about the "four modernizations" - electrification, intelligence, low carbonization and globalization [2]; China Automotive Engineering Society's "Roadmap 1.0 for Green and low-carbon Development of the automotive industry" said that the carbon emission reduction path of the automotive industry should be "target-oriented, innovation-driven, first established, then broken, market-led, and coordinated promotion" as the principle, overall industrial safety and development, focusing on low-carbon automotive products as the starting point, attaches great importance to the important role of automobile energy-saving technology to support "carbon peak". We will promote the application of low-carbon and zero-carbon technologies focusing on new energy vehicles in a high quality manner, actively, steadily and orderly promote the low-carbon development of passenger cars and commercial vehicles, and significantly reduce carbon emissions during vehicle operation. At the same time, we will coordinate the promotion of energy conservation and carbon reduction in automobile manufacturing, strengthen industrial coordination, and promote the green and low-carbon development of the entire chain of the automobile industry. At present, it is very urgent to integrate new quality productivity into the automobile manufacturing industry, and the innovation of low-carbon technology is an important embodiment of the organic integration of the automobile manufacturing industry and new quality productivity. How to do a good job in the innovation, development and application of low-carbon technology, and reduce the carbon emissions and energy consumption of the automobile manufacturing industry is an urgent problem for the automobile manufacturing industry to achieve the "double carbon" goal.

2. The Dilemma of Low-Carbon Technology Development in Automobile Manufacturing Industry

The automotive industry faces multiple dilemmas in the pursuit of low-carbon technologies, ranging from technical issues to economic, policy and market acceptance factors. Here are some of the main dilemmas for the automotive industry when it comes to low-carbon technologies:

2.1. China's Automobile Carbon Emission is Large

Automobile operation faces great pressure of carbon emission reduction. In 2022, China's carbon emissions caused by vehicle operation will account for about 8% of the total social carbon emissions, and about 80% of traffic carbon emissions. Among them, commercial vehicles, which account for only about 11% of the total, account for about 55% of the carbon emissions of commercial vehicles, and the rest are carbon emissions caused by passenger vehicles. And China's passenger car ownership of 300 million, for the world's largest total carbon emissions, to solve the problem of carbon emissions, is a very significant project, from the enterprise supply chain upstream, midstream to downstream are the need to break through the point.

2.2. It is Difficult for the Automobile Manufacturing Industry to Develop Low-Carbon Technology Transformation

It is difficult for the automobile manufacturing industry to develop low-carbon technology transformation, especially fuel vehicle manufacturers, there is a contradiction between cost and economic benefits, and many automobile companies cannot vigorously invest in green technology research and

development equipment, such as the development of new low-carbon technologies such as battery electric vehicles (BEV), fuel cell vehicles (FCEV) and hybrid electric vehicles (HEV), which require a large amount of research and development investment. And the maturity and reliability of these technologies will take time to prove. Policies and regulations are not uniform around the world, such as inconsistent emission standards and regulations in different regions of the world, which brings additional compliance costs to multinational car companies. New green fuel energy is difficult to find, the cleanliness of the power source directly affects the environmental benefits of electric vehicles, if the proportion of renewable energy in the grid is low, the low-carbon advantage of electric vehicles will be weakened. Finally, there is the consumer issue, some consumers are on the sidelines of the new technology, worried about the range, charging convenience and residual value issues.

2.3. The Enterprise's Green and Low-Carbon Technological Innovation Ability Needs to Be Improved

Technological innovation is the main way for the manufacturing industry to achieve green and low-carbon transformation, but the current manufacturing enterprises in the green and low-carbon transformation of technological innovation is weak, can withstand the market test of the technology supply is insufficient, the relevant incentive policy is not yet perfect, enterprises green and low-carbon "transformation difficult" "turn" is still a common phenomenon. At present, China vigorously promotes the transformation and upgrading of green technology such as green painting technology and welding energy-saving technology, promotes the application of advanced technologies such as servo direct drive technology, roll-dip conveying technology, robot electrostatic spraying technology, and integrated inverter welding machine technology, and explores the development of new coatings such as low-temperature drying paint and non-phosphorus water-based degreaser. In addition, there is a shortage of innovative talents in enterprises, which is closely related to the discipline construction of schools, the training of green manufacturing multidisciplinary talents, and engineering and technical talents [3].

3. Low-carbon Technology Development Path of Automobile Manufacturing Industry

3.1. Focus on Carbon Reduction of Power Batteries

Automotive power battery carbon reduction, facing the power battery recycling stage of resource recycling, carbon footprint management system construction, new battery materials and battery thermal management system research and development problems. Establish and improve the efficient recycling and utilization system of automotive power batteries, solably promote the core technology research of new energy vehicles, and focus on breaking through industrial bottlenecks such as the safety of power battery high-temperature thermal management technology, high power and long life of fuel cells, low cost of hydrogen storage system, and low-carbon fuel of power batteries. New energy vehicle power batteries need to further meet the needs of the market in all climates and scenarios. Guide enterprises to continue to strengthen the research and development and promotion of hybrid power technology, efficient internal combustion engine technology, zero-carbon power technology and low-carbon fuel technology. The government has given policies to strongly support low-carbon technology research and development, for example, the National Nature Fund can increase the number of core research topics in power battery research and development projects. In addition, we will promote the deep integration of a new generation of information technology and automobile manufacturing, and consolidate the foundation for the green and low-carbon development of the automobile industry.

3.2. Enhance the Basic Capacity of Industrial Low-Carbon Development and Promote the Development of Advanced Manufacturing

Industrial base reengineering is an important project of supply-side structural reform. Relying on the special project of industrial base reengineering and high-quality development of manufacturing industry, the basic capacity of industrial low-carbon development is improved. In advanced manufacturing, we will implement more inclusive policies such as additional deductions for R&D expenses of enterprises and preferential tax treatment for low-carbon technology enterprises, support local governments at all levels to formulate and improve supporting funding policies for enterprises under their jurisdiction to undertake major national projects, and encourage qualified, well-established and capable enterprises to actively introduce foreign advanced technology and experience, absorb and re-innovate. We will increase support for research and innovation platforms such as state-level advanced manufacturing innovation centers, key laboratories, and enterprise technology centers, and strengthen assessment and evaluation of research input and output, transfer and transformation of results, training of innovative talents, and economic and social benefits. For example, the research and development of laser additive manufacturing technology, the need to calculate the carbon emissions generated by the work process, the research and development process can train relevant talents, apply for patent research and development results to obtain technical protection, and finally, after many tests and evaluation, it is applied to actual production.

3.3. Vigorously Use New Energy Automobile Manufacturing Materials, and Build Green Automobile Manufacturing Industrial Clusters

New energy vehicle manufacturing materials include new energy vehicle battery and lithium cathode materials, motors and their control systems, electrical accessories, plug-in hybrid special engines, electromechanical coupling systems and energy recovery systems and other new energy vehicle key core parts and equipment and main materials manufacturing. When selecting manufacturing materials, materials with small or zero carbon emissions should be selected as far as possible. In terms of design, lightweight design can be used to reduce carbon emissions. For example, as shown in Figure 1, advanced high-strength steel supports lightweight design in the automotive industry to reduce energy consumption of automobile transportation. In terms of

industrial development, to achieve carbon neutral and high-quality development as the goal, accelerate the construction of automobile green manufacturing industrial clusters, and promote the coordinated development of Chengdu-Chongqing economic circle.

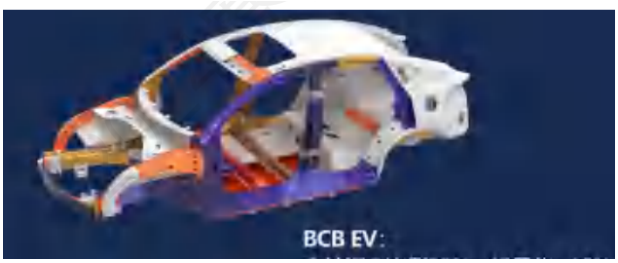

Fig 1. Advanced high-strength steel supports lightweight design in the automotive industry

3.4. Increase the Development of Intelligent Manufacturing and Enhance the Ability of Manufacturing Technology Innovation

To strengthen the development of intelligent manufacturing and enhance the ability of manufacturing technology innovation, comprehensive measures need to be taken from various aspects such as policy support, technology research and development, and personnel training [4]. From the policy perspective, the government has adopted a series of measures to promote the development of intelligent manufacturing, and attaches importance to the promotion of artificial intelligence technology, advanced manufacturing, and AI technology in technology research and development. This important directive points out the direction for training the compound innovative talents in short supply in society. This provides a way forward for colleges and universities to train relevant professionals [5].

4. Conclusion

This paper focuses on the research on the development path of low-carbon technology in China's automobile manufacturing industry, summarizes the progress of "dual-carbon" work in the automobile industry, analyzes the problems existing in the development of low-carbon technology in the automobile manufacturing industry, and discusses the implementation path of low-carbon technology in vehicle production enterprises, and draws the following conclusions: The low-carbon transformation of the automobile industry is of great significance to achieve the national "double carbon" goal. In terms of low-carbon technology, it is necessary to focus on the carbon emissions of power batteries, attach importance to the construction of low-carbon infrastructure equipment to promote the development of advanced manufacturing, pay attention to the use of low-carbon materials, increase the development of intelligent manufacturing, and enhance the manufacturing technology innovation ability. In the future, we can further explore the strategy and relevant measures of low-carbon transformation of China's automobile industry on this basis.

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References

[1] Caijin Zhao. Research on the Implementation Path of Low-carbon Strategy of Chinese Automobile Manufacturers under the background of Realizing "Dual Carbon" goal [J]. Enterprise Science and Technology Development, 2024, (05): 123-128.

[2] Minggao Ouyang . Academician Ouyang Minggao: Automobile power relies on the "Four Modernizations" to become electrified, intelligent, low-carbon and globalized [J]. High Technology and Industrialization, 2024, 30 (03): 12-15.

[3] Dan Ding , Jianchao Sha . Research on the path of green low-carbon transformation and upgrading of Manufacturing industry [J]. China Investment (English and Chinese), 2024, (Z6): 28-30.

[4] Dong Zhang . Exploration of Economic Management Innovation development Path of Manufacturing enterprises under the background of Low carbon [J]. Modern Industrial Economy and Information Technology, 2024, 14 (07): 144-146.

[5] Xinfeng Qiu. Digital empowerment, service-oriented manufacturing and low-carbon transformation of industry [J]. Technical Economics and Management Research, 2024, (07): 133-138.