

Exploration of High-Quality Development of New Energy Vehicles

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Abstract: Under the combined influence of factors such as policy support, product improvement and well-developed infrastructure, the new energy industry vehicle in our country has developed rapidly, establishing a comprehensive industrial chain system, made remarkable achievements in technology research and development and market expansion, the production and sales volume of new energy vehicles increase with years. Under the market competition, the sustainable development of new energy vehicles must follow the pathway of high-quality development. This paper based on the market of new energy vehicles, explores the development orientation of battery and drive motor, to provide references for high-quality development of new energy vehicles industry.

Keywords: new energy vehicles; power battery; drive motor; intelligent driving

1. Introduction

New energy vehicles represent the important development direction of the transformation and upgrade of the global automotive industry and green development, and also constitute a strategic choice for the high-quality development of China's automotive industry. The development of new energy vehicles is the only way for China to move from a big automobile country to an automobile power. To achieve sustainable development of the new energy vehicles industry, it is necessary to enhance high-tech automotive technologies, deepen scientific and technological innovation in the new energy vehicles area, and promote the rapid development of the new energy vehicles industry.

2. Development of China's New Energy Vehicles Industry

In 2025, China's automotive industry reached a new milestone, the production and sales of vehicles both exceeded 34 million units. with the production and sales of new energy vehicles both exceeded 16 million units, up nearly 30% over the same period last year, new energy vehicles has been the first place in the world for 11 consecutive years.

The sales of BYD Auto new energy vehicles reached 4.6024 million units, a year-on-year rise of 7.73%; the sales of SAIC Motor Corporation Limited reached 4.5075 million units, a year-on-year rise of 12.32%; the sales of Geely Automobile reached 3.0246 million, a year-on-year rise of 39%; the sales of Changan Automobile reached 2.913 million, a year-on-year rise of 8.5%; the sales of Chery Automobile reached 2.8064 million, a year-on-year rise of 7.8%; the sales of Great Wall Motor reached 1.3237 million ,a year-on-year rise of 7.33%. Additionally, the sales of Leapmotor reached 596,600 units, a year-on-year rise of 103%; the sales of Xpeng Motors reached 429,400 vehicles, a year-on-year rise of 126%; the sales of NIO reached 326,000 vehicles for the year; the sales of Li Auto reached 405,900 vehicles; under the circumstances of production capacity ramp-up, the sales of Xiaomi Automobile reached 410,000 vehicles, a year-on-year rise of 387%.

3. High-Tech Aspects of New Energy Vehicles

Under the comprehensive trade-offs among engineering feasibility, cost and safety, the mainstream technological routes for Chinese new energy vehicles are bound to

converge. Technologies such as lithium iron phosphate and ternary lithium batteries, 800V high-voltage platforms, and domain-centralized electronic and electrical architectures have become industry consensus after market validation. China's new energy vehicles industry has entered a high-quality development era centered on technological depth and global competitiveness.

3.1 Power Battery

The energy density of power batteries directly determines the driving range of vehicle's. Currently, mainstream new energy vehicles commonly use ternary lithium-ion batteries, which can achieve energy densities of 200-300 Wh/kg, ensuring a range of over 500 kilometers. However, lithium-ion batteries use liquid electrolytes, which may undergo thermal runaway under extreme conditions such as short circuits, overcharging, or high temperatures, potentially leading to fires or explosions.

To address the cost and safety issues of lithium-ion batteries, semi-solid-state batteries and solid-state batteries are being developed. CATL's Qilin Battery, a semi-solid-state battery, achieves an energy density of 350 Wh/kg, far exceeding mainstream ternary lithium and lithium iron phosphate batteries. The Qilin Battery is leak-proof, resistant to fire under compression, and supports high-voltage fast charging. At -25°C, Qilin Battery retains 85% capacity, significantly improving the vehicle's winter range disadvantage. Vehicles equipped with Qilin batteries can achieve a range of over 1,000 kilometers.

Solid-state batteries are non-flammable and non-volatile. Even if the cell is punctured or squeezed, they do not trigger thermal runaway reactions like lithium-ion batteries, offering a safety improvement of three times compared to lithium-ion batteries. At the same time, solid-state batteries can achieve an energy density of 400Wh/kg, increasing vehicle range by over 40% for the same battery weight. The electrolytes in solid-state batteries have higher ionic mobility, thus enabling faster charging speeds. Solid-state batteries are expected to enter the market around 2030 and are projected to become the mainstream technology in the future battery market.

3.2 Drive Motors

The drive motor is one of the core components of new energy vehicles. The speed and range of new energy vehicles depend largely on the performance of drive motor. High efficiency, high rotational speed, and lightweighting have become the

main research directions for drive motors. Drive motors need to have an overload capacity of 4-5 times their own rating to meet the demands of extreme acceleration and load climbing; they also require a wide speed regulation range to accommodate both low-speed and high-speed driving, while maintaining reliable performance output under high-temperature, high-humidity, and high-power conditions.

Xiaomi's self-developed V8S super motor reaches a rotational speed of 27,200rpm, with a power output of 425kW, and a peak efficiency of 98.11%, setting a benchmark in the new energy vehicles drive motor industry. Xiaomi's V6s Plus super motor achieves a rotational speed of 22,000rpm, with a power output of 288 kW, and a maximum torque of 528N·m, also maintaining an industry-leading level. In the future, drive motors will continue to evolve around high efficiency, wide speed range, and lightweighting. With the commercialization of solid-state batteries approaching, motor technology will usher in a new technological revolution.

3.3 Motor Control Unit

The electronic control system is one of the key systems in new energy vehicles, including the vehicle controller, motor control unit, and battery management system. The vehicle controller collects various vehicle signals to drive the vehicle and control of brake energy recovery. It also manages regenerative braking to ensure efficient energy conversion and utilization, keeping the vehicle operating optimally. The motor control unit connects the battery and the motor, enabling real-time monitoring and control of the motor's speed, torque, and temperature, to ensure smooth and efficient motor operation. The battery management system monitors battery status in real-time to enhance the health of the power battery.

Tesla Model3, with its excellent electronic control, achieves an energy consumption of 11.2kWh/100km, leading globally among new energy vehicles. Xiaomi Automobile's measured energy consumption is 14.6 kWh/100 km, placing it at the forefront domestically. With advancements in battery technology and electronic control systems, future energy consumption will further decrease, and vehicle range will increase accordingly.

3.4 High-Voltage Charging Platforms

With the widespread application of new energy vehicles, charging rates are also increasing. Under the traditional 400V platform, new energy vehicles must support high-current charging for faster battery replenishment. This, of course, adds to the cost. Therefore, the 800V high-voltage platform for new energy vehicles emerged. The 800V platform can handle higher charging power, and on matching dedicated charging piles, the charging speed of an 800V high-voltage platform is more than twice as fast as that of ordinary new energy vehicles.

The advantages of the 800V high-voltage platform is raised charging rates. With increased voltage, the operating current of drive motor at the same power output is correspondingly reduced, and the heat generated in wiring harnesses and inside the battery is significantly decreased. Losses in the motor and controller are also substantially reduced, resulting in longer range for new energy vehicles with the same battery capacity. Xiaomi Automobile, with its 897V high-voltage platform, can replenish 670 kilometers of range in 15 minutes, making daily usage very close to oil-fueled automotive. In the future, the 800V high-voltage platform will accelerate its popularization, enabling free charging for electric vehicles.

Solid-state batteries address the fundamental issues of energy density and safety, the 800V high-voltage platform addresses the bottleneck of charging efficiency, and electronic control systems reduce energy consumption to increase range. Together, these three elements promoted high-quality development of new energy vehicles

4. Intelligent Development of New Energy Vehicles

With the continued increase in new energy vehicles market penetration rate, intelligent configurations have become a key area of competition for automakers. In 2025, mainstream new energy vehicles saw further upgrades in smart cockpit and intelligent driver-assistance systems, meeting the convenience needs of daily commuting while providing users with safer and more efficient travel experiences.

4.1 Smart Cockpit

As the core of human-vehicle interaction, the smart cockpit has transformed our driving experience. Empowered by AI, the smart cockpit can perceive the driver's status in real-time and provide appropriate alerts when the driver is not in optimal condition. At the same time, the smart cockpit integrates multiple AI systems, such as voice assistants, gesture recognition, and facial recognition. Through voice or gestures, the system can respond quickly, and simplifies the driving process and enhancing driving safety.

Through the smart cockpit, drivers can customize their preferred driving environment, such as cabin temperature, seat position, and sound effects, creating a relaxed driving environment. Smart cockpits can also feature AR navigation, projecting driving routes onto the windshield, so drivers don't need to frequently turn their heads to look at the in-vehicle navigation, thereby improved driving safety. Smart cockpits can also recommend scenic spots, dining options, and other suggestions along the route, achieved the perfect combination of drivers and vehicles.

4.2 Intelligent Driver-Assistance Systems

Intelligent driver-assistance systems are equipped with LiDAR and high-definition cameras to form a 360-degree environmental perception network. They can recognize pedestrians, non-motorized vehicles, static obstacles, and complex road conditions, autonomously perform lane changes, overtaking, and intersection navigation, and can also predict dangers in advance, issue warnings, and take proactive actions at critical moments to actively avoid hazards, significantly reducing traffic accidents caused by human error.

Intelligent driver-assistance systems can achieve human-like parking thinking, achieve automatic parking in complex environment. Currently, the development of intelligent driving is still in the phase of transitioning from L2 to L3. In the future, intelligent driving of vehicles will require deep integration of automakers with energy, transportation, urban infrastructure, etc., to jointly build smart energy, intelligent transportation, and even future urban ecosystems.

5. Conclusion

The high-quality development of new energy vehicles requires not only strong national policy support but also continuous innovation in high-tech fields such as power batteries, drive motors, design processes, and charging facilities. It also requires the deep integration of new energy vehicles with intelligent driving, promote the transformation of vehicles into intelligent mobile terminals.

We look forward to China's new energy vehicles industry continue to forge ahead on its journey toward high-quality development, while also drives the rapid growth of other related high-tech industries, and redouble our efforts to upgrade China from a manufacturer of quantity to one of quality.

6. References

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