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Research on Application of Automobile New Energy and Energy Saving Technology

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Abstract. At the same time of rapid development of economy and science and technology, energy crisis and environmental pollution are becoming important issues affecting human survival and development. Energy conservation and environmental protection are becoming themes for the harmonious development of human society in the 21st century. Automobile fuel consumption and exhaust emissions have become the main cause of energy crisis and environmental pollution. For the sustainable development of human society, it is urgent to apply new energy and energy-saving technologies in the automotive industry to reduce energy consumption and environmental pollution. Researching new energy sources and energy-saving technologies for automobiles has become an important direction for the development of automobiles. The power for braking is shifting from gasoline to clean diesel, hybrid power, and fuel cells. This article briefly discusses the development and application of new automotive energy and energy-saving technologies.

1. Introduction

At present, China's energy-saving and new energy vehicle technologies have gradually matured. The relevant state departments have begun to implement small-scale demonstration operations, providing protection for technologies, products, and operating experience for the further promotion of energy-saving and new energy vehicles, and at the same time achieving good social benefits. In April 1999, China launched the "Clean Car Campaign." As of the end of 2008, the number of gas vehicles in 20 key cities for clean vehicles nationwide reached 350,000, and more than 800 gas stations have been built. Each year, more than 3 million tons of fuel are replaced, and an annual production value of nearly 20 billion yuan has been achieved. In 2003, the Ministry of Science and Technology launched small-scale demonstrations of electric vehicles in seven cities including Beijing, Wuhan, Tianjin, Zhuzhou, Hangzhou, Weihai, and Shenzhen. The company has put in more than 500 vehicles and has operated over 15 million kilometers. The reliability of the demonstration vehicles has been significantly improved and the average time between failures has exceeded 3,500 kilometers.

2. Automotive energy saving technology

Automotive energy-saving technologies refer to technologies used to improve the energy consumption of automobiles. Car energy-saving measures involve all aspects. As far as China's status is concerned, effective measures include the following aspects: rational support for roads and transport facilities, on-demand production and configuration of models and oil products, and reasonable operational and other non-technical issues. In terms of technology, we ensure product quality, use and maintain machines in accordance with specifications, and change the combustion method of gasoline engines to increase energy

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conversion efficiency. In the existing combustion methods, the following methods can be used to save energy: improve the fuel supply system, gasoline engine fuel injection to improve gasoline combustion efficiency; improve the ignition system, improve the stability of gasoline engine operation; reduce the loss of engine accessories, the rational use of accessories, make corresponding modifications. The following describes several technologies commonly used in automotive energy-saving technologies.

2.1. Hybrid Vehicle Technology

Hybrid vehicle technology has outstanding energy-saving effects. The technology is relatively mature, and it has been industrialized and commercialized internationally. In addition, hybrid technology has universal applicability to all vehicles powered by internal combustion engines and has the potential to achieve substantially more energy-saving results on the basis of any energy-saving technology. Therefore, the state should focus on supporting the development, industrialization, and application of hybrid technology. According to the degree of difficulty of the technology, it is recommended to independently research, develop, popularize, and apply hybrid power technology to urban buses and buses, and then apply hybrid power technology to cars using a combination of independent research and development and introduction of technology. It is recommended that the production of hybrid vehicles account for more than 5% of the total vehicle output.

To this end, the state needs to support the following aspects: 1) Development and industrialization of battery technology and special motors for hybrid vehicles; 2) Development and industrialization of engine electrical control technologies and motor control technologies; 3) Complete vehicles The development and industrialization of performance optimization control technology and brake energy recovery technology; 4) In the initial stage, give appropriate incentives for hybrid vehicles.

2.2. High-efficiency gasoline engine and diesel engine technology

The technological advancement of internal combustion engines is the key to energy saving in automobiles. In terms of energy-saving technologies for internal combustion engines, the state should focus on supporting the following aspects: 1) In-cylinder direct injection technology and lean, stratified combustion technology for gasoline engines; 2) High-pressure injection technology for diesel engines (eg, high-pressure common rail fuel injection technology, etc.); 3) Multiple injection technology for diesel engines; 4) Variable valve timing technology; 5) Exhaust turbocharger technology; 6) Variable cylinder technology.

2.3. Efficient Truck and Engine Technology

China currently has a shortage of trucks and its technology is relatively backward. The development of efficient trucks is an important measure to improve transport efficiency and reduce vehicle energy consumption under the highly developed modern logistics situation. Therefore, the state should focus on supporting the development and industrialization of high-power and high-efficiency diesel engines for heavy-duty vehicles, as well as the development and industrialization of serialized trucks.

2.4. Diesel Technology of Cars and Light Vehicles

Dieselization is an important way to achieve energy savings. With the acceleration of cars entering homes, the fuel consumption of cars and light vehicles is considerable. It is recommended that countries should give priority to supporting the dieselization of sedans and light vehicles. Attention should be paid to the following two aspects: 1) Research and development of light high-speed diesel engine technology; 2) Improvement of vehicle diesel oil quality and quality assurance.

2.5. Automotive Compression Technology

At present, the reciprocating internal combustion engine used in automobiles is mainly used for gasoline and diesel fuel. Gasoline is ignited by a spark plug. Diesel is ignited by a piston compression ignition method. Different ignition methods result in a higher compression ratio of the oil purifier than that of a gasoline engine and relatively low fuel efficiency. High, but the spark plug ignition used in gasoline

engines makes the engine work with low vibration and noise. The automotive compression ignition technology is a new technology resulting from the fusion of the two technologies. The engine of the automobile compression ignition technology has a more complex technical structure than an ordinary engine. The compression ratio is higher, and the fuel can burn at the same time. Therefore, the fuel utilization rate is improved, and at the same time, due to the use of a lean mixed gas compression ignition, it is possible to directly adjust the torque by adjusting the fuel injection amount without using a throttle valve. In addition, the use of compression ignition technology, the engine combustion temperature is extremely low, can effectively reduce the radiative heat transfer, and the combustion cycle is short, the combustion process is more of a chemical reaction, in the current sewage vehicle energy-saving technology is relatively mature.

3. Automotive new energy

New energy vehicles include pure electric vehicles, extended-range electric vehicles, hybrid vehicles, fuel cell electric vehicles, hydrogen engine vehicles, and other new energy vehicles. At present, the main type of existing new energy vehicles in China is natural gas vehicles. Judging from the current state of development, the main application areas of natural gas vehicles are urban buses and taxis, which are determined by the policies of various local governments [1]. For example, Sichuan Province has made great efforts to develop natural gas vehicles, and its natural gas vehicles have developed rapidly. Table 1 below shows the CNG vehicle ownership in major cities in China from 2002 to 2008.

Table 1. CNG Car Ownership in Major Cities in China, 2002-2008

	year 2002	year 2003	year 2004	year 2005	year 2006	year 2007	year 2008
Bei Jing	2800	2618	2289	2703	3424	3705	5000
Shang Hai	/	438	140	200	280	280	320
Chong Qin	5010	11000	18985	24371	40840	49268	60453
Xi An	/	9264	10497	12238	12380	13900	15100
Si Chuan	32570	47100	52461	57960	85862	129800	150600
Wu Lu Mu Qi	2480	3483	5398	7266	11094	15370	19413

3.1. Folding pure electric car

A pure electric vehicle is a kind of automobile that uses a single battery as a power source for energy storage. It uses a battery as a power source for energy storage to provide electric energy to a motor through a battery to drive the operation of the motor, thereby driving the vehicle to run. The electric drive is to replace the gasoline engine and diesel engine of an automobile with an electric motor and use electric energy as an energy source to provide power for driving the car [2]. The clear tide of the fuel used by this technology, at the same time, the output torque is large, and it has better economic benefits when applied in automobiles. However, the difficulty of adopting electric drive technology lies in the problem of power charging and the problem of the battery life after charging. Although the current application of electric power technology has started mass production, these two problems have still not been well solved. In fact, battery technology is one of the key technologies for the research of new energy vehicles. Currently, battery technology is mainly focused on battery safety, reliability, and light weight. It needs to focus on supporting drive motor systems, electric air conditioning, electric steering, electric braking, etc. ability. According to the plan, in 2015, the maximum speed of pure electric passenger cars and plug-in hybrid passenger cars will be no less than 100 km/h, and the driving capacity and cost will be further improved.

3.2. Folding hybrid car

A hybrid vehicle is a vehicle in which the drive system is a combination of two or more single drive trains that can operate simultaneously. The travel power of the vehicle is provided by a single drive train alone or multiple drive trains depending on the actual vehicle running state. Due to different components,

layouts, and control strategies, hybrid vehicles come in many forms. However, the system structure is relatively complex; long-distance high-speed driving fuel economy is not obvious.

3.3. Folding fuel cell electric vehicles

Fuel cell technology is a new energy technology that uses hydrogen gas, methanol, and the like as a fuel to produce a current-driven automobile through a chemical reaction. The fuel cell's energy is produced by the chemical interaction of hydrogen and oxygen, not by combustion. This process is to directly convert hydrogen, methanol, etc. into electricity, the whole process will not produce harmful substances, and the energy conversion efficiency is higher than the internal combustion engine. It is an ideal energy-saving and environmental protection technology. However, in practical applications, the power provided by a single fuel cell is extremely limited, and it is usually necessary to combine it into a fuel cell stack in order to obtain sufficient power. At present, fuel cell technology has been widely used in Ford, Toyota, General Motors and other steam conversion companies, and has extremely high value [3].

Fuel cell electric vehicles are essentially a type of pure electric vehicle. The main difference is that the power battery works in different ways. In general, fuel cells convert chemical energy into electrical energy through electrochemical reactions. Hydrogen is usually used as the reducing agent for the electrochemical reaction, and oxygen is used as the oxidant. Therefore, the earliest fuel cell electric vehicles developed are directly using hydrogen fuel [4]. Hydrogen can be stored in the form of liquid hydrogen, compressed hydrogen, or hydrogen storage of metal hydride.

4. Conclusion

At present, the world is facing energy problems. The main manifestations include energy shortages, low energy efficiency, and serious pollution of existing energy structures. It is necessary to actively study new energy as a substitute and develop new energy-saving technologies so as to reduce the energy consumption and environmental pollution of automobiles and promote the sustainable development of human society.

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