ABSTRACT
In the most recent period, gasoline and diesel are still the main energy sources of the car. The new energy vehicles need to be solved in the near future. The new medium of the internal combustion engine and the alternative combustion vehicles. The medium-term scheme is to reduce the fuel consumption and emissions of the hybrid vehicles. The program is pure electric vehicles and fuel cell vehicles. While new energy vehicles offer a wide range of alternative fuels for fuel-based fuels, hybrid vehicles, and fuel cell vehicles that use fuel and power systems for automotive hydrogen fuel cells, but because of the current level of technological development, search for a wide range of alternative fuels, the development of closer to the market of hybrid technology, is the development of alternative energy is the most practical step. And pure electric vehicles and hydrogen fuel cells because of its technology is still difficult to achieve a revolutionary breakthrough, it is difficult to become the automotive industry's recent development goals. In today's social situation, the hybrid can be a better solution to fuel consumption problems and pollution problems. It will mainly introduce the advantages and feasibility of hybrid.

KEYWORDS: new energy car, fuel cell, hybrid technology

1. A hybrid car

(A) Definition
The hybrid car is a vehicle that uses two or more different power sources to propel the vehicle to drive the vehicle. The abbreviation for the hybrid car is HEV. The basic structure of the HEV is to add a set of auxiliary power systems - power generators or some prime mover on the basis of electric vehicles (EV) and fuel cell electric vehicles (FCEV). The prime mover can be a heat engine such as an internal combustion engine or a gas turbine.

(B) Classification
A, according to the hybrid drive mode, the hybrid system is divided into the following three categories:

First, the series of hybrid power system. Tandem hybrid system is usually driven by the internal combustion engine generators, the resulting power through the control unit to the battery, and then transferred to the motor by the battery into kinetic energy, and finally through the transmission to drive the car. In this connection, the battery is like a reservoir, but the object of regulation is not water, but electricity. The battery adjusts the energy generated by the generator and the energy required by the motor to ensure proper operation of the vehicle. This power system in the city bus on the application of more cars rarely used.

Second, parallel hybrid system. The parallel hybrid system has two sets of drive systems: the traditional internal combustion engine system and the motor drive system. The two systems can either work together at the same time, or they can work alone to drive the car. This system is suitable for a variety of different driving conditions, especially for complex road conditions. The connection structure is simple, low cost. Honda's accord and civic use a parallel connection.

Third, hybrid system. Hybrid system is characterized by the internal combustion engine system and the motor drive system. The two systems work together at the same time, or they can work alone to drive the car. This system is suitable for a variety of different driving conditions, especially for complex road conditions. The connection structure is simple, low cost. Honda's accord and civic use a parallel connection.
B, according to the hybrid system, the output power of the motor in the entire system output power accounted for the proportion, which is often said that the mixing degree of the hybrid system can also be divided into the following four categories:

First, micro-hybrid system. This hybrid system in the traditional internal combustion engine on the starter motor (usually 12V) installed on the belt drive starter motor (that is often said belt-alternator starter generator, referred to as BSG system). The motor is a start-stop motor that controls the start and stop of the engine, eliminating engine idling and reducing fuel consumption and emissions. In the strict sense, the micro-hybrid system of the car does not belong to the real hybrid car, because its motor and did not provide continuous driving for the driving force. In the micro-hybrid system, the motor voltage is usually two: 12v and 42v. Of which 42v is mainly used for diesel hybrid system.

Second, light hybrid system. The representative model is a generic hybrid pickup truck. The hybrid system uses an integrated starter motor (that is, often said Integrated starter generator, referred to as ISG system). Compared with the micro-hybrid system, the light hybrid system can realize the following steps: (1) absorbs some energy in the deceleration and braking conditions; (2) during the running, the engine is running at constant speed, and the energy generated by the engine can be adjusted between the drive requirements of the wheels and the charging requirements of the generators. The mixing degree of the light hybrid system is generally below 20%.

Third, the hybrid system. The hybrid system also uses the ISG system. Unlike the mild hybrid system, the hybrid system uses a high-voltage motor. In addition, the hybrid system also adds a function: the car is in the acceleration or heavy load conditions, the motor can assist in driving the wheel, thus complementing the engine itself, the lack of power output, so as to better improve the performance of the vehicle. This system is a high degree of mixing, can reach about 30%, the current technology has matured, widely used.

Four is a complete hybrid system. The system uses a 272-650v high-voltage start-up motor, a higher degree of mixing. Compared with the hybrid system, the hybrid system can be mixed even more than 50%. The development of technology will make the complete hybrid system gradually become the main development direction of hybrid technology.

2. The series of hybrid cars (SHEV)

The series-type hybrid (SHEV) mode consists of three main engines of the engine, the generator and the drive motor. The engine, the generator and the drive motor use the 'series' method to make the SHEV drive system.

(A) The structure of the SHEV

The structure of the SHEV is shown above. It consists of engine, generator and drive motor three powertrain composition, they use the 'series' way to form the drive system.

(2) The working principle of SHEV

At the beginning of the vehicle, the battery pack is in a state of full charge, its energy output can meet the requirements of the vehicle. The auxiliary power system does not need to work. The DC output of the battery is supplied to the drive motor after the inverter is AC, and the torque driven by transmission, drive shaft and drive axle wheel. When the battery pack is less than 60%, the auxiliary power system starts to provide energy to the drive system and the battery pack is charged. When the vehicle energy demand is large, the auxiliary power system and the battery pack at the same time to provide energy for the drive system, the engine - generator generated by the rectifier into the DC and battery output DC power through the controller into the AC power supply drive motor. Due to the presence of the battery pack, the engine is operated in a relatively stable condition to improve its emissions.

3. The parallel hybrid electric vehicle (PHEV)

The parallel hybrid (PHEV) consists of two mains: engine, electric/generator or drive motor. The engine, electric/generator or drive motor uses 'parallel' to form the PHEV drive system.

(A) The structure of PSHEV

The composition of parallel hybrid electric vehicles

1, engine 2, motor/engine 3, mechanical transmission system 4, drive motor 5, inverter 6, battery pack

PHEV is composed of engine and motor, engine or drive motor two powertrain composition. As shown above, they use the 'parallel' way to form the drive system. The power of the motor is to be combined with the vehicle drive system, which can: (1) be combined at the engine output shaft; (2) the combination is carried out at the transmission (including the drive axle); and (3) the combination is carried out at the drive axle.

(B) The working principle of PSHEV
The above diagram is a driving force of the motor in the drive wheel combination of driving wheel power combination PHEV, the drive mode is:

1) To the engine drive as the basic drive mode, independent drive after the drive wheel;
2) Drive the motor for the auxiliary drive mode, can independently drive the front drive wheel;
3) In the hybrid drive, the engine driven rear wheel power and drive motor driven front wheel power combination, a hybrid four drive mode.

Hybrid electric vehicles (PSHEV)
Hybrid electric vehicle integrated SHEV and PHEV structural characteristics, by the engine, electric - generator and drive motor composed of three powertrains.

(A) The structure of PSHEV

Hybrid cars
1, the engine 2, the motor/engine 3, the transmission or reducer 4, the drive axle 5, the inverter 6, the drive motor 7, the battery pack

PSHEV is a combination of SHEV and PHEV structural characteristics, by the engine, motor or engine and drive motor composed of three powertrains. The power of the motor is suitable for the vehicle drive system and can be combined at the transmission (including the drive axle), or at the drive wheel.

(B) The working principle of PSHEV

The above figure is a way of driving the power of the engine and driving the power of the motor at the drive wheel. The driving mode is:

1) To drive the engine as the basic drive mode, drive the motor/engine, and independent drive after the drive wheel;
2) To drive the motor as the auxiliary drive mode, can independently drive the front drive wheel;
3) In the hybrid drive, the engine driven rear wheel power and drive the motor driven front wheel power combination, a hybrid four-wheel drive mode.

Development and future

(A) The development of hybrid cars at home and abroad

1. The development of foreign hybrid cars

Since 1995, the world's major automobile manufacturers have shifted the focus of research to research and development of hybrid vehicles. Japan's toyota motor corporation developed the prius brand hybrid car, honda developed the insight brand hybrid car. The three major US auto companies have developed hybrids including cars, vans and trucks, such as precept from general motors, escape and prodigy of ford motor company, citadel, and ESX3, and others. At present, the hybrid vehicle technology and the market are optimistic. Japan has more than 70,000 hybrid electric vehicles, and is expected to reach 2.1 million in 2010. Japan's toyota motor company plans to produce 300,000 hybrid vehicles by 2005. At the beginning of 2003, the united states 'finance times' reported that in the event of an oil crisis, general motors plan to sell 1 million hybrid vehicles in five years and has decided to sell 12 hybrids in 2003.

At present, japan's toyota motor corporation is walking in the forefront of hybrid vehicle research and development of the car company, the development of hybrid vehicles has reached the practical level. In 1997, toyota launched the world's first mass production of hybrid cars prius, and later in 2001 have launched the 'ESTIMA' hybrid van and 'crown (CROWN)' car. By the end of 2002, toyota motor company's hybrid cars in japan and overseas cumulative sales have exceeded 100,000, is now in the world more than 20 countries on the market. The famous prius is a four-door, five-compartment, three-tiered hybrid sedan with a horizontal in-line 4-cylinder 16-valve double overhead camshaft ejection gasoline engine (1.5 liters, maximum power of 53 kW), nickel-powered batteries and electric CVT system, the standard configuration of dual airbags, electric doors and windows, the home digital liquid dashboard, driving computer display, automatic air conditioning, audio and so on. Toyota prius hybrid system (THS) electronic control device is characterized by the use of electricity, gasoline or a combination of the two at the same time work. Depending on vehicle speed and load conditions, THS can control the power ratio provided by each energy source to ensure that the vehicle operates in the most efficient mode. In the process of driving the vehicle, the passenger's conversion to THS is not felt. A key part of the THS system is the power shunt device. The device utilizes a set of planetary gear sets to transmit the engine power directly to the front wheels and generators of the vehicle. The electrically controlled transmission combines the power output of the gasoline engine, the generator and the motor to achieve the acceleration and deceleration of the vehicle. In 2002, toyota ESTIMA hybrid van production, the hybrid system uses the world's first mass production of electric four-wheel drive and four-wheel drive braking force integrated control system, it is to the hybrid vehicle driving performance
Automotive Hybrid Technology

has brought revolutionary the improvement. All this shows that Toyota has been at the forefront of the world in terms of low fuel consumption, low emissions and improved driving performance in the popular hybrid system. Toyota motor company plans to use the system to increase fuel economy and reduce emissions.

In September 1993, the United States launched a new generation of auto partner program, the timetable: 1997 to complete the technical options, launched in 2000 concept car, introduced in 2004 can be used for production of the type of car. At that time, the US Department of Energy and the three major auto companies signed a hybrid car development contract, which general motors invested $148 million, ford invested 138 million US dollars, chrysler invested 84.8 million US dollars, for a period of 6 years of research and development work. In 1997, PNGV program has completed a new generation of automotive technology options, after full brewing, careful screening, identified lightweight materials, hybrid, high-performance engine (four-stroke direct-fired engine) and fuel cell (PEM fuel cell) the main direction for PNGV technology. Of the 21 federal laboratories and 51 universities in 47 states in the United States, more than 1,200 PNGV research projects are in progress and the PNGV program has enabled the United States to form a national action for automotive technology innovation. After years of efforts, the three companies in 1998 at the North American international auto show were exhibited on the prototype. On this basis, has now launched three hybrid cars - general recept, ford prodigy, chrysler dodge ESX3, three cars are close to or achieve a 3 liters/100 km target. Among them, general motors precept is currently the only new generation of car partnership (PNGV) fuel consumption requirements of the model. This is a four-door, five-seater sedan, the drive system consists of a 3-cylinder 1.3-liter direct injection diesel engine with two motors (including the front wheel of the motor and drive the rear wheel diesel - motor group) and a Taiwan manual automatic transmission box, and the motor can absorb the braking process of braking energy, and to the above battery pack. According to statistics, the US market sold hybrid cars close to 70,000, in 2002 the US hybrid car market reached 35,000 units. The United States has nearly 20 cities in the trial of hybrid buses, the major European car manufacturers have also introduced a hybrid car. France BE group has launched the bellinger and sarah hybrid vehicles. The sarah hybrid car is modeled on citroen's estate lengthened sedan, equipped with a 55kW DE gasoline engine and a 25kW motor, reducing emissions by 35% compared to similar cars, up to 1000km per trip.

2. Development of domestic hybrid vehicles

With the increasing supply of oil and environmental pollution is increasing, electric vehicles, such as power-powered vehicles with its energy saving, the advantages of environmental protection have become the focus of attention in the industry. Since the 1980s, many developed countries have invested heavily in research and development of electric vehicles, China's '863 plan' has also been clear to the electric car as a key research project. At present, China's electric vehicle Ru0026 D level and developed countries are basically at the same starting line, in some ways even more than abroad. In 1999, Tsinghua University and Xiamen JINLONG United Automotive Industry Co., Ltd. successfully developed the first domestic hybrid light passenger car. By the end of 2001, the National '863' Electric Vehicle Technology Project was officially launched, the first batch of projects is mainly hybrid cars, is currently underway. FAW and Dongfeng Motor Group jointly located at universities and research institutes, in their respective bus chassis, research and development of hybrid drive bus and large passenger cars. In addition, Dongfeng Electric Car Company also assumed the research and development of hybrid cars. '15' goal is to overcome the key technology, the introduction of new products, the main research includes: engine, motor, battery and other unit technology; the system of electronic control technology and vehicle power system optimization and control technology, 50%, 80% drop in emissions; brake energy recovery technology, should be able to recover 30% of the braking energy. At present, the main research and development of hybrid cars are as follows:

Dongfeng Electric Vehicle Co., Ltd. developed a hybrid car. Among them, EQ7200HEV hybrid car to fengshen bluebird as a platform to meet the future of urban business, rental car demand as the goal, the maximum use of dongfeng's existing product platform and social resources developed to achieve product serialization, general standardized design. The main technical parameters: the maximum speed of 160km/h; lithium-ion batteries. EQ6110HEV hybrid city bus with mixed program, designed for the 2008 Beijing Olympic Games bus and development. The main performance parameters: dongfeng motor company produced Cummins 6BTA diesel engine (maximum torque 488Nm, rated speed 2200rpm), the Chinese Academy of Sciences developed by the electric motor, pure battery electric running the maximum speed of 31km/h, the maximum power of 27kW, the maximum current of 119A; engine and motor hybrid drive; the maximum speed of 72km/h.

Tianjin Qingyuan Electric Vehicle Co., Ltd. developed a hybrid medium-sized passenger car. Its main technical characteristics: the use of fuel and electricity dual energy, taking into account the convenience of traditional cars and electric vehicles environmental performance; emissions to Euro III standard, fuel economy increased by more than 15%; suitable for urban and intercity public transit. The main technical indicators: size parameters 7210 × 2110 × 2670 (mm); total weight 7t; seat number 22 + 10; engine type CY4105Q diesel engine; engine maximum power 72kW; transmission 5-speed mechanical speed; motor type AC asynchronous (vector control) power 10 kW; battery type maintenance-free lead-acid batteries; battery capacity 100Ah; maximum speed of 110km or more; maximum climbing more than 20%; braking distance of less than 10m (30 km per hour).
Shenzhen Minghua Environmental Protection Automobile Co., Ltd. develops a hybrid electric light bus. Its technical characteristics: the use of parallel hybrid system, the internal combustion engine to achieve the European II emission standards of diesel engines; motor using the international advanced asynchronous AC motor, with frequency control vector control system; own anti-charging function: internal combustion engine as a power source drive the vehicle at the same time through the motor/generator function interchange the engine as a generator for the car battery charging to supplement the energy, improve the electric drive driving range.

Beijing Jia Jie Bo Electric Co., Ltd. and Changzhou bus factory to develop China's first gas turbine as a power of hybrid electric bus. The vehicle is 11.5 m long, 2.48 m wide, 3.6 m high and 46, and the emission target is lower than the euro V standard that will be implemented in Europe in 2008 and is the ideal city environment-friendly bus and coach.

First automobile group, the United States Electric Car (Asia), Shantou National Electric Vehicle Test Demonstration area tripartite cooperation to launch a hybrid car - red flag CA7180AE. The series of hybrid cars in the high-end, 13kW gasoline engine, 15kW DC motor, 144v (105Ah) lead-acid batteries, 4 × 2 front drive form, the maximum speed of up to 135km/h.

(B) The prospect of hybrid cars

On the current situation, hybrid electric vehicles have the characteristics of hybrid electric vehicles with good power performance, good fuel economy, clean and environmentally friendly, economical and practical, but in order to achieve the vehicle to improve the power, environmental protection, it is necessary to use the most advanced internal combustion engine technology in-depth analysis of low fuel consumption characteristics; select the specific power, specific energy and efficiency of the highest torque maximum motor, to study its low-speed large torque, efficiency and regenerative braking energy feedback performance; after careful analysis and experimental study of the characteristics of the best choice of their high-performance sections of the combination and superposition.

On the other hand, the high cost of hybrid cars is definitely the main difficulty of the current application of hybrid electric vehicles, it is because the hybrid car in addition to the previous power plant, at least must also install the battery, the cost cannot be reduced to ordinary cars of the standard. Therefore, the first problem in the development of hybrid vehicle technology is to reduce costs, which is the biggest problem to be solved in the future, in particular, must reduce the power battery, motor drive systems, electronic control systems and other costs. In addition, to improve the efficiency of energy recovery in the process of car driving, you have to proceed from the automobile manufacturing stage, design and improve the vehicle power system to meet the requirements of automobile regenerative braking recovery, strengthen the reliability of hybrid electric vehicles, solve the power battery of the service life and reliability issues, is the premise of hybrid electric vehicles to promote the use of.

But in the international energy shortage, the hybrid can be a good way to save the car during the process of deceleration, downhill process energy consumption, while its low displacement, pollution is small, but also the inevitable trend of future car development.

4. Conclusions

In conclusion, in view of the oil industry will become exhausted and the growing reality of environmental pollution, domestic and foreign car manufacturers in their government support, are competing to develop various types of electric vehicles. At present, pure electric vehicles, fuel cell electric vehicles and hybrid electric vehicle three kinds of electric vehicle research and development and industrialization of the progressive features are: pure electric vehicle technology is basically mature. Foreign countries have a small amount of pure electric vehicles into the commercial operation, the domestic prototype in the trial stage. As the power of the battery than the energy, less than the power, a short charging trip, the high cost of fatal shortcomings, a wide range of market by a certain constraint. Fuel cell vehicles with fuel variety, high efficiency, less emissions, etc., may become the mainstream of the future car, so by the major foreign car companies' attention, but it is also facing many technical difficulties. Foreign countries are in research and development and small batch production stage, from the low-cost, mass production level there is still a gap; domestic is still in the initial stage of research and development. The hybrid car is a revolution in the automotive industry, the car is the final zero-emission transition to the future is a high-end product, an effective configuration in the next one or two years will have a lot of fuel vehicles to achieve hybrid drive, sharing the market with traditional fuel cars. Domestic hybrid cars are in the prototype production phase has developed a hybrid car, hybrid bus, hybrid bus cars, and foreign countries such as Japan, car manufacturers have begun to increase the number of small-scale commercialization production, and is widely into the world market.
References

1. XW. Cai, editor. BH. Huang, HF. Ouyang, deputy editor. For the 21st century automobile engine Reform curriculum materials planning materials in automobile construction and principle.
4. QB. Yang, editor. Hybrid vehicle structure and repair.
5. CC. Chan, editor. Hybrid electric vehicle basis.