

Traditional engines and pure electric engines

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Abstract. China's oil production is not as good as before, and China's oil production has completely failed to keep up with people's demand for oil, and the situation of relying heavily on imports needs to be changed. The conversion rate from oil to gasoline is low, which is not conducive to the utilization of raw materials. There are many unavoidable losses during the transportation of oil. The conversion rate of traditional engines in automobiles is very low, and it cannot be improved in a short period of time. The exhaust gases emitted by conventional engines can cause serious pollution to the environment. In contrast, China has abundant power resources, and the loss of electrical energy in the transmission process is also very small. Pure electric vehicle engines are highly efficient and have the potential for further improvement. Brake energy recovery is also an important part of improving efficiency. Pure electric engines bring little pollution to the environment.

Keywords: Traditional Engine, Electric Engine, Resource Reserves, Environment, Efficiency.

1. Introduction

Authors in [1] mentioned that advantages and disadvantages of electric vehicles. Authors in [2] found the concerns and recommendations for China's oil supply. Authors in [3] found the direction and characteristics of the development of oil and gas in China. Authors in [4] warned China about oil reserves and oil security. Authors in [5] said new discoveries and expectations for China's oil and gas exploration. Authors in [6] mentioned evaporation during oil storage and some countermeasures. Authors in [7] talked about how to use the waste heat of the car and recover it. Authors in [8] used big data to map air pollution at resolution. Authors in [9] talks about the relationship between pollution and health. Authors in [10] referred to the current situation of thermal power generation in China. Authors in [11] focused more on the efficiency and productivity of thermal power generation. Authors in [12] spoken of self-driving cars for the environment.

This article first mentions traditional engines, and takes a comprehensive view of traditional engines from many aspects. The entire process discusses the environmental impact of raw materials that have not been mined in the first place to the end of use. After that, various aspects of the pure electric engine are discussed, and a simple comparison is made with the traditional engine. For traditional engines, there will be certain deficiencies in energy supply, conversion rates and losses will not satisfy people, driving efficiency will not meet people's expectations, and environmental pollution has become a solution that people have been solving. The pure electric engine performs well in terms of energy supply, convenient

power transportation and less loss, extremely high driving efficiency and low environmental pollution. How will people choose in the future?

2. Traditional engines

People are going to comprehensively understand the traditional engine from the following aspects, from oil extraction to conversion rate, and finally see the pollution of the environment. People should think about what can they do for changing the situation now to make the world better.

2.1. Resource reserves

From the perspective of China's independent oil extraction and actual demand, it can be found that China relies heavily on imported oil. From 2016 to 2018, China's average annual newly discovered petroleum geological reserves available for development were below 10×10^8 t in those three years. This figure is much lower than the average of the previous five years which is able to reach 12.25×10^8 t. In these three years of low production, the output in 2017 is even more worrying which is only about 8.77×10^8 t. These figures are only known about the amount of oil that can be extracted, but in fact, China's domestic oil production is even less than satisfactory. According to China's National Bureau of Statistics and the General Administration of Customs, in 2018, domestic oil production was only about 1.89×10^8 t (Figure 1). This data seems to ordinary people to be an astronomical figure. However, considering that there is a large population in China, and oil plays an integral role in people's daily lives and the functioning of entire countries. Then this astronomical figure also seems insignificant in this special case. As China's development has accelerated in recent years, oil consumption has also increased rapidly. On the one hand, China's domestic oil output is getting lower and lower, and on the other hand, demand of people for oil is increasing significantly. In order to achieve a balance between supply and demand, China has to rely heavily on imported oil. By the end of 2018, dependence on foreign oil in China had risen sharply to 71 percent. That is about ten percent more than the end of 2015. In just three years, it is extremely rare for China's oil dependence to rise to such a large extent.

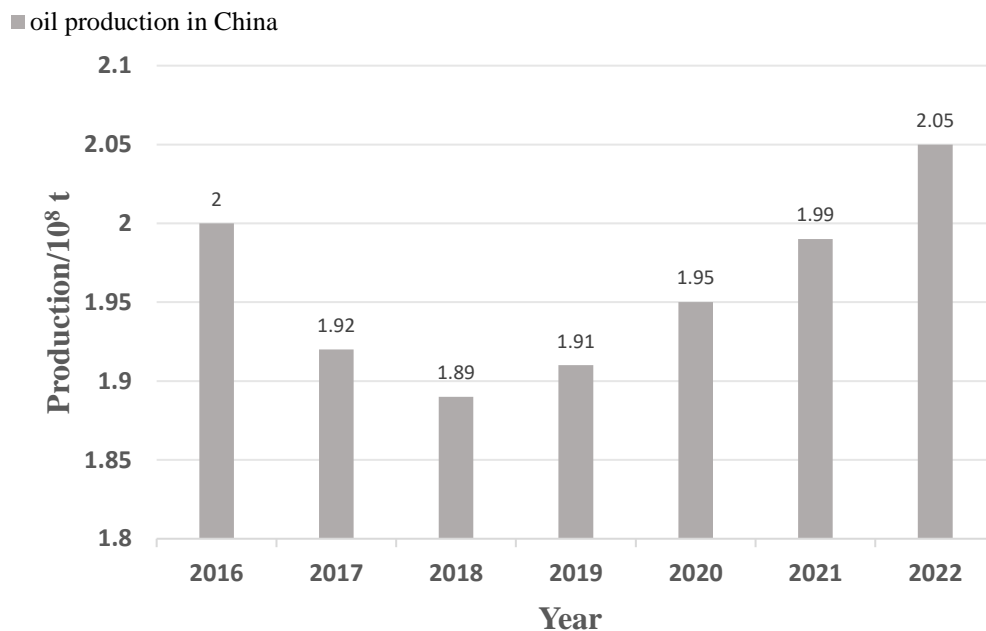


Figure 1. Statistic of China's oil production in 2016-2022.

So China has no advantage in terms of oil resources, on the contrary, excessive dependence on imported oil will also expose China's shortcomings to other countries without reservation. If people can

convert the traditional engines of the car into the pure electric engines, which can really help of oil resource reserves in China.

2.2. Conversion rate

According to previous surveys, Sinopec's conversion rate into refined oil is only 60 percent, while other small companies have a lower conversion rate. At the same time, the conversion rate in developed countries has reached 80 percent, and the conversion rate cannot be rapidly increased in a short period of time.

How to improve the conversion rate of oil is a world-wide problem. In China, the problem is even more stretched. Sinopec is the dominant oil company in China. However, in 2017, Sinopec processed 239 million tons of crude oil and only refined 151 million tons of it. The oil yield of refined oil is only 63.18 percent. The oil yield of other petrochemical enterprises can only reach between 40 percent to 60 percent. Such a low conversion rate for oil resources, which is not very rich, made the situation even worse. To make matters worse, China's conversion rate of 60 percent or so is even less than that of developed countries, which has reached about 80 percent. It is also impractical to increase conversion rates in a short period of time.

2.3. Losses

Refined oil products will have various losses during transportation, and sometimes abnormal conditions will lead to a large amount of oil loss, and the safety during transportation is also questionable.

When people store the extracted oil and place it still, it is inevitable that there will be evaporation loss during the storage of the oil. The main reason for the evaporation loss is big breathing and small breathing. The big breathing just mentioned describes a process that when people inject oil into the container where the oil is stored, the liquid level of gasoline vapor in the container is higher and higher. As the pressure gradually increases, the gasoline vapor in the container will overflow the container and be discharged. Then the gasoline vapor will be volatilizing into the atmosphere and causing losses because people cannot recycle it. What about small breathing? Because the temperature is different during the day and at night, when the night comes, the temperature decreases, and the pressure in the container used to store gasoline will drop due to the decrease in air temperature, because of the action of the outside atmospheric pressure, the air outside the container enters the container because of the pressure difference. When the sun rises slowly, the temperature gradually rises, and the air pressure in the container will increase with the increase of temperature, so that the gasoline vapor in the container will be squeezed into the atmosphere. Due to the large temperature difference between day and night in the north of China, only the small breathing can cause over 0.7 percent losses. For the large oil station, gasoline storage is large, and the amount of oil loss is a number that cannot be ignored.

Gasoline always needs to go from one place to another. During the transportation of gasoline, there are many processes of changing from one container to another. Because of the viscosity of gasoline, there is no way to transfer all gasoline in the process of exchanging containers. Just like people drink bottled yogurt in people's lives, no matter how hard people tries to pour out the yogurt, there will always be yogurt left on the wall of the cup that cannot be poured out. People would be sad that they cannot drink all yogurt, and people should also be sorrow about the loss of gasoline.

In addition, considering the fact that the special properties of gasoline, accidents are prone to occur during the transportation. As people often see in the news or newspapers---Explosions, leaks, contamination and much more people do not want to hear about. These major incidents will not only cause a lot of gasoline loss, but more importantly, cause casualties and financial losses. Furthermore, the gasoline vapor that is discharged into the air also causes environmental pollution.

One must to be recognized that some normal losses are inevitable, and some abnormal situations people cannot control whether it will happen or not. These losses have become a large number which people cannot be ignored.

2.4. *Efficiency*

Only 30 percent of the energy of gasoline cars is used to drive the car forward, which is very inefficient. As people think. Not all the energy is used to drive the car forward. For most gasoline cars seen in life today, only about 30 percent of the energy is used to move the car. Approximately 32 percent of the energy is turned into heat in the exhaust gases emitted by cars, and people have no idea to recycle this part of heat. And about 28 percent of the energy is used to cool the engine to avoid abnormalities in the engine temperature. The remaining 10 percent is also a pity, in the process of driving and braking once and once become a part of frictional heat release, which people cannot recycle either.

The highest known efficiency of conventional engines is only 41 percent and this is not enough. From mining to refining and then through long-distance transportation, the final conversion rate of less than half is really unsatisfactory.

2.5. *Environment*

The environmental pollution of gasoline vehicles is a big problem, and it is also a problem that people urgently need to solve. Gasoline vehicle exhaust emissions produce large amounts of greenhouse gases that contribute to global warming.

People should focus on the harmful to the world first. The exhaust gases emitted by people when driving is caused by insufficient combustion of automobile fuel, and its main components are a combination of different kinds of pollutants such as carbon dioxide and carbon monoxide. The most well-known of these is that excessive carbon dioxide emissions can cause the greenhouse effect. Excessive inhalation of carbon monoxide can lead to human blood poisoning, which can be fatal in severe cases. As more and more carbon oxides are emitted in the air, carbon oxides continue to undergo chemical reactions under light, and then produce chemical smoke. These chemical fumes can have a very serious corrosive effect on buildings and monuments. It will also produce a substance called sulfur dioxide, which is one of the main components of acid rain, which will cause serious damage to human skin, and will also lead to corrosion of the surface of buildings, but also affect the growth and survival of vegetation, and in the most serious cases, it will directly affect groundwater.

In China, with the rapid development of the economy, the number of cars is also growing uncontrollably, and the emission of automobile exhaust is increasing. Although people have recognized the vehicle emissions, they have begun to make a difference in many places. But cars do not emit exhaust gases unless they are used with a different energy source.

3. **Pure electric engines**

3.1. *Resource reserves*

China's power generation technology is good, there are a variety of power generation methods, thermal power generation is the mainstay, coal resources are abundant. So there are abundant power resources of China.

Thermal power generation occupies a very important position in China, and over 50 percent of the power resources are completed by thermal power generation. The main raw material for thermal power generation is coal. Coal resources are one of the energy mineral resources, and coal resources are the world's largest and most widely distributed conventional energy, but also an important strategic resource. Compared with oil resources, no wonder that, coal resources are much richer. China's coal reserves are as high as more than 700 billion tons. First, China has a vast territory and a large distribution of coal resources. China occupies an advantage in terms of geography. The second is because China has invested a lot of time, manpower and financial resources in coal exploration and mining, and has adopted advanced equipment and technology to the coal with the support of the government. It is precisely because of the characteristics of large resources, wide distribution, and low price of China's coal resources, which can provide a stable energy supply for power resources.

However, with the improvement of people's awareness of environmental protection. The pollution of thermal power generation to the environment cannot be ignored. On the bright side, the pollution caused

by coal combustion is far less than that caused by automobile exhaust emissions. China also has many cleaner ways to generate electricity. Hydro-power in China is pretty well. China's terrain is high in the west and low in the east, and the altitude difference is large, which brings very convenient conditions for hydroelectric power generation. And there are many rivers in China, which makes China rich in hydraulic resources. Up to now, there are 100,000 large and small hydro-power stations in China, including the world-famous Three Gorges Dam. Wind power generation is also increasing in China, considering the fact that China has large areas of plains and hills, and China is in the monsoon zone. Therefore, China has good conditions for the development of wind power generation.

3.2. Losses

There are just few losses during transportation. China's target for electricity supply losses is between two and five percent. Although at present, some place cannot fully meet the requirements due to the old facilities or some weather conditions. However, the gap from the target is already tiny, and it has been moving closer to the target.

Electric transportation does not take up a lot of space compared to gasoline transportation, and does not require the use of more additional manpower and resources. China already has complete electric transportation lines, which can easily and quickly transport electricity to every user. Compared to gasoline transportation, electric transportation causes fewer accidents because there are fewer personnel involved in the whole process, so the number of casualties caused by accidents is reduced. In addition, there is room for further improvement in the loss of power transportation.

3.3. Efficiency

The efficiency of electric vehicles reaches an average of 85 percent, and Tesla reaches up to 92 percent, which is a great advantage over oil vehicles. After looking at the efficiency of traditional engines, people can find that this is a staggering number, and the upper limit of this number is still increasing. The electric engine has a nice prospects and future.

Since 2016, the market for new energy vehicles has gradually expanded. After several years of development and innovation, according to data released by the Ministry of Industry and Information Technology, the sales of pure electric vehicles in China have reached 2.734 million units in 2021, accounting for 78 percent of the annual sales of new energy vehicles. It is clear that pure electric vehicles have dominated the field of new energy. Pure electric vehicles can gain more favor thanks to its efficiency. If people just use the same energy and one is only 30 percent efficient, while the other is as high as 90 percent, and there is no doubt that people will choose the more efficient one. Not to mention the fact that the price of electricity is much cheaper than gasoline.

There is a unique feature for pure electric vehicles that is braking energy recovery. Braking energy recovery is to convert the energy of the vehicle when decelerating into electrical energy and return it to the power battery, rather than waste it by friction, which is undoubtedly equivalent to increasing the power of the battery. Simply put, when braking deceleration, through the control of the circuit, the drive motor becomes a generator, brakes with the resistance generated by the generator, and the converted electrical energy is stored in the battery.

Braking energy recovery technology is one of the important technologies to improve the cruising range of pure electric vehicles and reduce the energy consumption of the whole vehicle. For conventional engines, the kinetic energy generated during braking is converted into heat energy and dissipated directly in the air, thus wasting a lot of energy. Pure electric vehicles can use braking energy recovery technology, which can convert most of the kinetic energy generated during braking into electrical energy and store it in the battery for subsequent use, reducing energy waste and improving energy utilization.

3.4. Environment

Electric has little pollution to the environment, and the treatment of batteries is becoming more and more mature. Low noise. Start with these two aspects. Unlike conventional engines, pure electric engines

need to burn gasoline to power them. Therefore, when the pure electric engine is working, there will be no large amount of carbon dioxide and other environmentally harmful gases discharged. It is also easy to overlook that pure electric vehicles have very little noise during driving, which is also extremely environmentally friendly.

4. Conclusion

The article is generally divided into two large sections: traditional engine and pure electric engine. Traditional engines were introduced from resource reserves, conversion rate, losses, efficiency and environment this five aspects, and pure electric engines were recognized from resource reserves, losses, efficiency and environment this four aspects. People can clearly see that traditional engines have great disadvantages in the extraction and utilization of raw materials, and in view of the current situation, people must reduce the dependence on oil. In addition, the large amount of transportation loss cannot be ignored, and people need to cherish every piece of energy. The bottleneck of efficiency is also an urgent problem for people to solve. The pollution caused by the environment should not be underestimated. On the other hand, pure electric engines, electric energy is abundant and not expensive, the power generation method is clean, the pollution is small, the damage is less, although it is inevitable that there will be transportation losses, but this loss is not high, with the development of science and technology will be lower and lower. Efficiency is a great advantage of pure electric engines, its efficiency is much higher than traditional engines, which is unmatched by traditional engines. Pollution to the environment, which is largely negligible, and very little driving noise are also reasons for people's favor.

New energy vehicles are a major trend, and pure electric vehicles will become the mainstay of new energy vehicles. Now more and more people are beginning to buy pure electric vehicles, many car brands such as Porsche, Mercedes-Benz have invested a lot of energy in the research and development of new energy vehicles. The improvement of new energy vehicles, both in terms of cruising range and battery life in a short period of time, is huge. In this way, the dominance of pure electric engines in the automotive field is about to come.

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