

Study on improving vehicle power

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Abstract. With the development of automobile consumption increasingly civilians, how to choose a good family car has become a topic of growing concern. In the course of our purchase of cars, the appearance, performance and safety of the indicators are considered. In order to improve the dynamic performance of the vehicle, and make the vehicle have a reasonable dynamic parameters, the factors that affect the dynamic performance of the vehicle must be analyzed. This article from the engine characteristics, transmission factor parameters, vehicle quality and use of comprehensive analysis, and discusses the factors influencing the power performance of automobile engine, hope to provide theoretical reference for the relevant industry, in order to encourage each other.

Introduction

Power is the most basic and important performance of automobile, and it is the premise to realize the other performance of automobile. So what are the components of the powertrain? Mainly includes: engine, gearbox, central differential, transmission machinery parts, all kinds of shafts, bearings, tires. In so many parts, we need the power generated by the engine after transfer to convert the gearbox and gear parts arrive at the wheel. The tire and ground friction to need enough engine power into the speed of the vehicle. Below, we will look at the various parameters for the specific impact of the car power.

The influence of engine parameters on vehicle power

It is well known that the maximum power, the maximum torque and the external characteristic curve of the engine have great influence on the dynamic performance of the vehicle. In this section, I will analyze in detail the impact of these three factors on vehicle dynamics.

Automotive engine power

When the engine is low, the backup power of the piston engine is small, and the driving force can be reduced. This is because the engine low power at low speed, if not equipped with transmission, only through a small slope. The greater the power of the car, the better the power of the car, but the power is too large, it will reduce the economy. In order to evaluate the dynamic performance of the vehicle, the specific power of the vehicle can be used as an indicator. Specific power refers to the engine maximum power P_{max} and the total mass of M , also known as the power utilization factor, is one of the important basis for the selection of engine power.

Automotive engine torque characteristics

Low speed engine, the torque variation, adaptive coefficient (maximum engine torque and torque at maximum power ratio) is slightly higher in low speed range, with large torque, but low speed will lead to decrease in power, reduce automobile power at high speed. The high speed engine, the torque variation adaptive coefficient diminished, but the choice of the appropriate transmission system, can make the torque with increasing speed and decreased slowly. This can ensure that the car in the first position of all the speed range has good acceleration. This is particularly important for high-speed vehicles, so that it has a good overtaking performance, to ensure high speed, the development of modern automobile engine multi direction.

Engine external characteristic curve shape

The shape of the external characteristic curve of the engine has great influence on the dynamic performance of the vehicle. So, I use figure 1 to illustrate the problem.

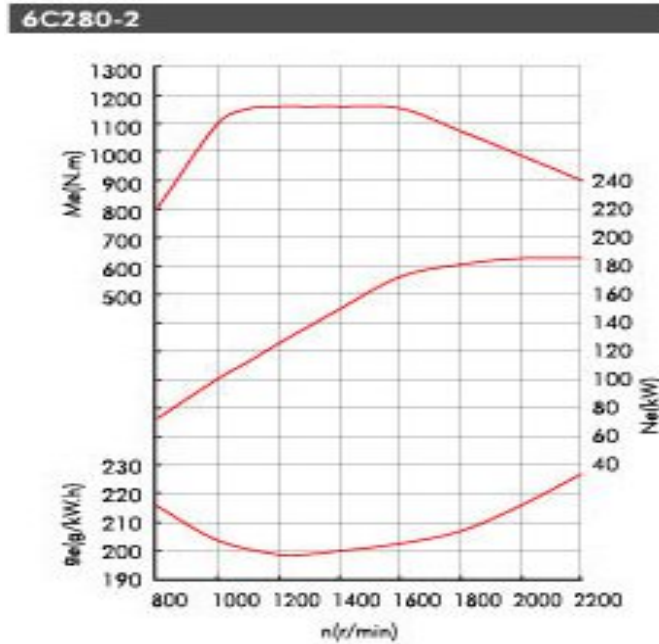


Figure 1: Effect of the external characteristic curve of the engine on the vehicle power performance
 In the figure above, the maximum power of the external characteristic curve of the two engines is equal to that of the corresponding engine, but its shape is different. Suppose the car total quality, aerodynamic characteristics, transmission ratio is known, for comparison, and assume that the total resistance of the two engine power curve and power curve to the maximum power point, it can be seen that the reserve power characteristic curve of the larger, so that the car has a larger acceleration and climbing capacity, and dynamic performance good.

Influence of transmission parameters on vehicle power performance

The influence of transmission system on the power performance of the vehicle is determined by the ratio of the main reducer, the number of transmission and the transmission ratio. Below, I will explain the impact of each factor on the vehicle dynamics.

Main drive ratio

Once the automobile engine is determined, its dynamic performance can change with the change of the main reducer transmission ratio. Figure 2 shows the power balance of the car. When the engine power curve is shifted to the left, the external characteristics of the engine with three different main drive ratios are shown in the diagram.

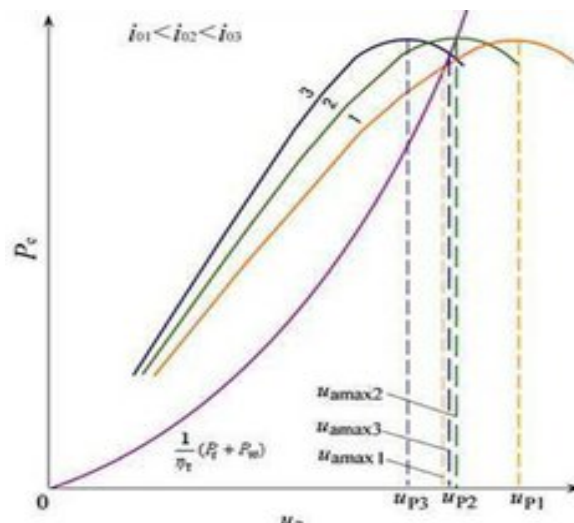


Figure 2: Power balance diagram

As can be seen from Figure 2, with the increase in speed, the car's reserve power increased, but

the car's maximum speed U_{max} also changed. When the main drive ratio is, the resistance power curve and the engine external characteristic curve intersect at the maximum power, the U_{max} value is the highest. If the main transmission ratio is greater than or less than, U_{max} values are slightly reduced. Starting from improving the acceleration of the car should be as large as possible. However, if too much, the maximum speed of the vehicle will be reduced U_{max} , and the engine to work at a higher speed and affect its life. Improve fuel economy will also reduce the car. In addition, due to the increase, the main driver size and the corresponding increase, so that the structure is too complicated, and reduces the driving axle ground clearance, affecting the car through.

For general purpose vehicle, in order to ensure the backup power enough, in the selection, the maximum speed should be the intersection of resistance power curve and power curve determined by the engine power is higher than the maximum speed, maximum speed at the intersection with the maximum power at the speed ratio should be 1.1 ~ 1.25, but this time the fuel the economy is a bit poor.

Transmission parameters

In order to enlarge the range of engine torque and overcome the defects of the characteristic curve of the piston engine, the vehicle must be used in the transmission system to improve the dynamic performance of the vehicle. The transmission parameters that affect the dynamic performance of the vehicle are the number of transmission gears and the transmission ratio of each gear.

(1) The number of transmissions has a great influence on the dynamic performance of the vehicle. The more the transmission gear, the closer to the power engine. Increase the number of transmission gear, backup power can be increased. However, the increase in the number of stalls, transmission structure becomes complex, manipulation is also complicated. As a result, the actual number of gear shift is still limited, generally three to five gear transmission.

(2) The transmission ratio and the transmission ratio of each gear should be taken into account in the transmission ratio. Have a significant impact on the low transmission ratio and power performance, the low transmission ratio is bigger, the car can overcome the road resistance is bigger, but should consider the conditions attached between the drive wheel and the road whether can meet the driving wheel of the maximum driving energy is greater than the input method between the drive wheel and the road adhesion. The transmission ratio of the transmission gear of the transmission has an influence on the power performance of the vehicle. Properly distributed, the engine can operate in a wide range of power near the maximum power of P_{max} , thereby increasing the reserve power of the vehicle, improving the acceleration and the ability of the vehicle to improve the speed of the vehicle. If the transmission ratio of each gear is not allocated properly, it will result in the difficulty of gear shifting and the dynamic performance of the vehicle.

The influence of automobile structure on the dynamic performance of automobile

Car exterior dimensions

The size of the car directly affects the air drag coefficient C_D and the windward area. So to improve the appearance of the car and reduce the size of the car will make the vehicle's power significantly improved, but also an effective measure of automobile energy saving.

Total automotive quality

The total quality of the car has a great influence on the dynamic performance of the vehicle. In addition to air resistance, all driving resistance is related to the overall quality of the vehicle. Under the same conditions, the overall quality of the car is increased, and the dynamic performance of the vehicle decreases. Therefore, to reduce the weight of the car, will improve the power of the car. The vehicle with the same load, the smaller the weight, the smaller the total quality, and thus better power. For the automobile which has a larger proportion of the total weight of the vehicle, the effect of reducing self weight is also significant. The main measures to reduce the total quality of the automobile is increased with the application of Aluminum Alloy composite material in automobile proportion, improve the structure of the vehicle assembly and parts, to meet the strength conditions, as far as possible to reduce the structure size; the bearing body, front wheel drive, less leaf spring, to

improve the reliability of tire.

Tire size and structure

Tire size and structure, directly affect the driving force and driving force of the vehicle. In addition, the reduction of the rolling resistance coefficient can also improve the power performance of the vehicle and reduce the fuel consumption of the vehicle. The tread pattern has a great influence on the adhesion and rolling resistance, and the choice of tire pattern should be taken into account in different vehicles. Practice has proved that the radial tire in reducing the comprehensive performance of the rolling resistance coefficient is better than bias tyre, the rolling resistance coefficient than the low bias tires 20% ~ 30%.

Chassis technical conditions on the vehicle power performance

Chassis technical conditions directly affect the transmission efficiency and driving resistance. Here are the details of the various factors that affect the dynamics of the car.

(1) The power consumption of the transmission system is about 10 to 15% of the transmission power, and the power loss of the transmission and the main reducer is the majority. If the transmission side parts in the technical condition, driving in the clutch slip, separation, automatic transmission mechanism, transmission shaft noise and jitter of fault, which means that will consume energy, so the power of the car down. In the use of the car should be in the process of the transmission assembly, parts maintenance, maintenance, to ensure their normal work.

(2) The tightness of the rim bearing in the driving system has a great influence on the transmission of the driving force and the driving resistance. Wheel bearing adjustment tight, will increase the wheel rotation resistance and friction loss; if the adjustment is too loose, the wheel driving will appear when the swing, the wheel rolling resistance increased, but also make the brake drum brake shoe and easy collision rub, the increase of rotational resistance.

(3) Whether the wheel alignment is correct or not has a significant influence on the driving resistance of the wheel. Tire pressure does not meet the standards, tire deformation will increase the tire rolling resistance. Each position of the front axle and the rear axle and the frame if not installed properly, will make the car in motion cannot maintain a straight line driving and driving resistance deviation, lead to increased. Brake adjustment must ensure that the work is reliable, brake hair loss power loss.

Conclusion

The power of a car is the highest speed of a vehicle when it is in a straight line on a good road. The dynamic performance is mainly affected by the parameters of the engine. The car is a precision machine, its function is to drive on the road. Driving power is of course the engine, but the engine also requires the entire power assembly to pass, output. At the same time, through the analysis of the above article, we know that the impact of the power of the car is a lot of factors, the above factors are only a small number of these factors. In addition, the reasonable use of the driver and the correct maintenance or not will directly lead to the automobile engine, chassis, body, electrical equipment, such as the technical status of the good or bad, thus affecting the vehicle's power and even life.

References

- [1] Brown, H.D. Applied mechanics of Automotive Engineering[M]. NewYork: Prentice Regents, 2014.
- [2] Kramsch, C.Influencing factors of vehicle power [M]. New York: Doubledny and Company, 2009.
- [3] H Holec, Applied mechanics of Automotive Engineering (Oxford: Pergamum Press, 2011), 22.
- [4] Zhang Xiaoyu. Applied mechanics of automotive engineering [M]. automotive power, 2013:

65-98.

[5] Tan Ying, Zhang Jun. motor vehicle driver, 2011, (5): 127-131.

[6] Liu Jianjun. Influencing factors of vehicle power performance [J]. Journal of Xinyu University. 2012 (02)

[7] Yang Fei. Influence of Journal of automobile dynamic performance research of [J]. Foreign Language School of Shandong Normal University. 2011 (05)

[8] Liu Liping. How to improve driving dynamics [J]. exam week. 2011 (17)

[9] Weiguo. Improve the statistical study of [J]. Pang auto power of Journal of East China Normal University, 2012 (2): 19-21.