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THE DEPENDENCE OF THE FUEL EFFICIENCY OF THE CAR ON THE TEMPERATURE REGIME OF THE MAIN UNITS DURING OPERATION IN A COLD CLIMATE

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ABSTRACT: - The analysis of fuel efficiency makes it possible to make a reasonable choice of the rolling stock of a motor transport company and its rational use when performing transport work.

The temperature regime of the units and the associated change in the fuel efficiency of cars depends both on the design parameters and on the conditions in which the cars are operated, and primarily on the ambient temperature.

A change in ambient temperature by 10 ° C leads to the fact that the total resistance to movement changes by about 8-10%, fuel consumption by 6-7%. If the ambient temperature decreases by 30 ° C, fuel consumption may increase by 25%. When the exhaust gas temperature increases by 10 ° C, the engine power decreases by 1.8-2.2% (more for diesels).

KEYWORDS: Fuel efficiency, rational use, specific fuel consumption, engine power, environment, engine.

INTRODUCTION

Fuel efficiency indicators characterize the consumer qualities of the car. The cost of fuel is up to 20-30% of all transportation costs, so fuel efficiency has a significant impact on the economic efficiency of road transport. The analysis of fuel efficiency makes it possible to make a reasonable choice of the rolling stock of a motor transport company and its rational use when performing transport work. The estimated fuel efficiency indicators of the car are largely determined by such engine indicators as the hourly fuel consumption Gt, kg / h – the mass of fuel consumed in one hour, and the specific fuel consumption Ge, g / (kWh) – the mass of fuel consumed in one hour per unit of engine power. To assess the efficiency of fuel use when performing transport work, fuel consumption per unit of transport work (100 t• km) QW is used, l is the ratio of actual fuel consumption to the transport work performed.

RESEARCH ANALYSIS

The temperature regime of the units and the associated change in the fuel efficiency of cars depends both on the design parameters and on the conditions in which the cars are operated, and primarily on the ambient temperature.

The following factors have a significant impact on the fuel efficiency of the car:

- initial cost, which depends on: the weight of the structure; complexity of manufacture; cost of materials;
- depreciation costs, which are lower the longer the durability of the structure;
- operational factors consisting of: fuel consumption, tire consumption, quality of fuel used, environment, type and complexity of the route, driving style, technical condition of the car;
- the weight of the structure, the complexity of manufacturing and the cost of the material, with subsequent depreciation is laid down when designing the machine.

The environment also affects the operation of the engine, power transmission and chassis, and therefore its fuel efficiency. A change in ambient temperature by 10 ° C leads to the fact that the total resistance to movement changes by about 8-10%, fuel consumption by 6-7%. If the ambient temperature decreases by 30 ° C, fuel consumption may increase by 25%. When the exhaust gas temperature increases by 10 ° C, the engine power decreases by 1.8-2.2% (more for diesels).

Lowering the outdoor temperature by 20 °C leads to an increase in fuel consumption by an average of 20%. Fuel consumption at low ambient temperature increases due to increased fuel consumption by the engine, increased transmission and tire resistance, and increased aerodynamic drag. Let's consider these components.

The increase in fuel consumption by the engine is explained by the deterioration of working processes caused by a reduced thermal regime. Cold air has an increased density; therefore, the mass of the sucked air increases. The density of cold fuel is also higher, but its viscosity is higher and its evaporation is lower, therefore, in general, the combustible mixture turns out to be depleted. The cold depleted mixture does not burn intensively enough, the fuel burns incompletely, its consumption increases. In diesel engines, due to the insufficient temperature of the end of the compression stroke, the fuel ignites with a large delay. This is accompanied by an increased rate of pressure build-up and incomplete combustion of fuel.

The increase in transmission resistance is due to insufficient oil temperature. With an increase in the amount of transmission oil, the increase in resistance increases. Thus, for trucks at an ambient temperature of -30 ° C, the increased resistance of the drive axles causes an increase in fuel consumption by 5.6% compared to the total consumption at a favorable temperature. In this situation, from 10 to 30% of the increment in fuel consumption falls on the drive axles. For passenger cars, where the amount of transmission oil is small compared to trucks, this increase can be neglected.

The increase in tire resistance is the main factor in increasing fuel consumption at low ambient temperatures. So, at an air temperature of -40 °The increased tire resistance causes an increase in fuel consumption from 10 to 20% or more compared to the total consumption at a favorable temperature. As a rule, tires account for more than half of the total increase in this consumption, and in some cases more than 80%.

The increase in aerodynamic drag is due to increased air density, changes in its viscosity and the nature of the flow around the car. At an air temperature of -30 ° C, the increased aerodynamic drag increases fuel consumption compared to the total consumption at an optimal temperature in the city from 2 to 5%, outside the city – from 4 to 7%. In the increment of fuel consumption, the share of aerodynamic drag falls in the city from 10 to 20%, outside the city – from 20 to 30%.

At a low ambient temperature, each stop of the car causes additional fuel consumption, which consists of fuel consumption for warming up the engine during parking and fuel consumption for warming up the units and tires at the beginning of the movement after parking. When the coolant temperature dropped to +40 °C, the engine turned on and idled until the temperature reached +60 °C. Then the engine turned off, cooled down to +40 ° C, turned on again. With this method and ambient temperature -30 °C the fuel consumption in the city for warming up the engine is from a fraction of a percent to 4.5% of the fuel consumption for non-stop movement in the same conditions.

At an ambient temperature of -30 ° C, the fuel consumption for warming up the units after parking is from 1.6 to 4.5% relative to the consumption for non-stop movement under the same conditions. When driving outside the city, this indicator ranges from 1.6 to 2.5%.

The total fuel losses due to parking (i.e. for warming up the engine at a stop and warming up the units and tires after parking) under normal driving conditions and ambient temperature -30 ° C are relatively non–stop traffic in the city from 2.6 to 9%, outside the city - about 2.5%.

In real conditions at low ambient temperature these factors interact and significantly increase the fuel consumption of cars.

CONCLUSION

Thus, fuel consumption and fuel efficiency in general are affected by changes in ambient air temperature and the quality of the fuel used. With a decrease in ambient temperature (from the optimal range), fuel consumption increases somewhat faster than with an increase. This is largely due to the influence of the transmission, tires, aerodynamic drag. In real conditions at low temperatures, part of the fuel is additionally consumed to maintain the thermal condition of the engine.

Based on this, if you improve the low-temperature properties of diesel fuel, which characterizes the operation of fuel at low temperatures, you can significantly increase the fuel efficiency of transport.

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