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Fuel Consumption for Trucks in Operation

载货汽车运行燃料消耗量

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Fuel Consumption for Trucks in Operation

1 Scope

This Document specifies the classification of truck operating conditions and correction factors, as well as the calculation method of fuel consumption for operation.

This Document is applicable to the calculation of the fuel consumption of trucks running on highways and urban roads that use gasoline or diesel as the single fuel. The fuel consumption quota management of road transport enterprises shall be used as a reference.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 19233 Measurement methods of fuel consumption for light-duty vehicles

JT/T 719 Limits and measurement methods of fuel consumption for commercial vehicle for cargos transportation

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in JT/T 719 apply.

3.1 Fuel consumption for truck in operation

The amount of fuel a truck consumes during operation.

NOTE: The unit is L.

3.2 Basic fuel consumption of truck

When a truck with a total mass of more than 3500kg is under the comprehensive working conditions given in JT/T 719, and a truck with a total mass of no more than 3500kg is under the comprehensive working conditions given in GB/T 19233, the fuel consumption per 100 km, if they drive with curb mass (no load).

NOTE: The unit is L/100km.

3.3 Fuel consumption of fully loaded truck

When a truck with a total mass of more than 3500kg under the comprehensive working conditions given in JT/T 719, and a truck with a total mass of no more than 3500kg under the comprehensive working conditions given in GB/T 19233, the fuel consumption per 100km if they drive with total mass (full load).

NOTE: The unit is L/100km.

3.4 Changes in fuel consumption per unit load of truck

For every 1000kg (1 ton) increase in the loading capacity of a truck, the fuel consumption increased by driving 100km.

NOTE: The unit is L/(t·100km).

3.5 Fuel consumption correction coefficient of road

The ratio of the fuel consumption of a truck running on a certain type of road to the fuel consumption of a Type 1 road (other operating conditions are the same).

3.6 Fuel consumption correction coefficient of temperature

The ratio of the fuel consumption when a truck is running in a certain monthly average temperature range to the fuel consumption when the monthly average temperature range is 5°C to 28°C (inclusive) (other operating conditions are the same).

3.7 Fuel consumption correction coefficient of traffic congestion

The ratio of the fuel consumption of a truck in a certain average speed range to the fuel consumption of an average speed of 30km/h to 40km/h (inclusive) (other operating conditions are the same) when the truck is operating on urban roads.

4 Classification of Truck Operating Conditions and Correction Coefficients

4.1 Road category and fuel consumption correction coefficient of road

Road category and fuel consumption correction coefficient of road (K_r) is according to Table 1.

4.4 Fuel consumption correction coefficient of other influential factors

The correction coefficient K_x of other factors that affect the fuel consumption of trucks in operation (such as the running-in period of trucks, seasonal rainy seasons and ice and snow roads in the operating area, loading of dangerous goods, loading of over-limited goods, road construction, etc.), the unit shall be decided by the truck users.

5 Fuel Consumption for Truck in Operation

5.1 Values for basic fuel consumption of truck and fuel consumption of fully loaded truck

5.1.1 Trucks more than 3500kg

The value of basic fuel consumption is the comprehensive fuel consumption of the vehicle under the test conditions specified in JT/T 719 and at no load; and the unit is L/100km.

The value of full-loaded fuel consumption is the comprehensive fuel consumption obtained under the test conditions specified in JT/T 719, or the comprehensive fuel consumption given in the announcement issued by the competent department of transportation for the qualified types of road transport vehicles; and the unit is L/100km.

5.1.2 Trucks no more than 3500kg

The value of the basic fuel consumption is the comprehensive fuel consumption obtained under the test cycle conditions specified in GB/T 19233, or the light vehicle fuel consumption label query; and the unit is L/100km.

The value of full-loaded fuel consumption is the comprehensive fuel consumption obtained under the test cycle conditions specified in GB/T 19233 when the vehicle is fully-loaded; and the unit is L/100km.

5.2 Changes in fuel consumption per unit load of truck

5.2.1 Calculation

When the basic fuel consumption and full-loaded fuel consumption are given by the automobile manufacturer, the changes in fuel consumption per unit load of the truck is calculated according to Formula (1).

$$Q_b = \frac{Q_m - Q_k}{W_m - W_k} \dots\dots\dots (1)$$

Where:

Q_b – changes in fuel consumption per unit load of truck, in L/(t•100km);

Q_i - the fuel consumption of the truck in operation under the i^{th} operating mode, in L;

S_i - the driving mileage of the truck under the i^{th} operating mode, in km;

ΔW_i - the load mass of the truck under the i^{th} operating mode, in t;

K_{ri} - the fuel consumption correction coefficient of the road of the truck under the i^{th} operating mode, see Table 1;

K_{ti} - the fuel consumption correction coefficient of the temperature of the truck under the i^{th} operating mode, see Table 2;

K_{vi} - the fuel consumption correction coefficient of the traffic congestion of the truck under the i^{th} operating mode, see Table 3;

K_{xi} - the fuel consumption correction coefficient of other influential factors of the truck under the i^{th} operating mode, which is specified by the vehicle user itself;

Q_{ai} - the additional fuel consumption of the truck under the i^{th} operating mode, the specific value is specified by the vehicle user itself, in L.

NOTE: The additional fuel consumption of truck is the main energy-consuming equipment of truck that are not used to drive vehicles, such as the fuel consumption of air conditioners, refrigeration units for refrigerated trucks, and truck-mounted loading and unloading machinery; the unit is L.

The total fuel consumption of trucks in different operating modes is calculated according to Formula (3).

$$Q = \sum_{i=1}^n Q_i \dots\dots\dots (3)$$

Where:

Q - total fuel consumption of trucks in different operating modes, in L.

5.4 Calculation example of the fuel consumption of truck in operation

See Appendix A for the calculation example of fuel consumption of truck in operation with a maximum gross mass more than 3500kg.

See Appendix B for the calculation example of fuel consumption of trucks in operation with a maximum gross mass of no more than 3500kg.

Appendix A

(Informative)

Calculation Example of Fuel Consumption of a Truck in Operation with a Maximum Gross Mass of more than 3500kg

An ordinary truck has a maximum gross mass of 9.29t, a curb mass of 4.29t, and a rated load mass of 5t. It travels 30km with a full load on a slightly hilly Class-III highway between cities with an average monthly temperature of -6°C. After unloading, it returns to the original place with no load. The operating period is the evening rush hour in the city, there is congestion, the average driving speed is 22km/h; the hot air air-conditioner is turned on during driving; and the fuel consumption of the air conditioner is calculated as 0.1L for one-way operation. Find the total fuel consumption of the truck in operation.

Method 1: When the truck manufacturer gives the basic fuel consumption and full-load fuel consumption

Calculate as follows.

- a) The basic fuel consumption of truck Q_k provided by truck manufacturers is 16.1 (L/100km); the fuel consumption of the full-loaded truck Q_m is 20.4 (L/100km) after checking the announcement of the qualified vehicle model for the road transportation issued by the competent department of transportation.
- b) According to the Formula (1), calculate the changes in fuel consumption per unit load of truck Q_b .

$$Q_b = \frac{Q_m - Q_k}{W_m - W_k} = \frac{20.4 - 16.1}{9.29 - 4.29} = 0.86 [\text{L}/(\text{t} \cdot 100 \text{ km})]$$

- c) Calculate the fuel consumption of the truck in operation according to the Formula (2).

According to the known conditions, the correction coefficient of the Type-2 roads is 1.10; the correction coefficient at the monthly average temperature of -6°C is 1.06; the correction coefficient of traffic congestion at an average driving speed of 22km/h is 1.15; and the correction coefficient with no other influential factors is 1.00; the hot air air-conditioner is turned on during driving, and the fuel consumption of the air conditioner is 0.1L for one-way operation; so the fuel consumption of the truck in operation is as follows:

Appendix B

(Informative)

Calculation Example of Fuel Consumption of a Truck with a Maximum Gross Mass no more than 3500kg

A truck with a maximum gross mass of 3.4t, a curb mass of 1.9t, and a rated load mass of 1.5t is driving 30km with a full load on a Class-III highway between cities at a monthly average temperature of -3°C, and returns to its original place with no load after unloading. The operating period is the evening rush hour in the city, there is congestion; the average driving speed is 22km/h; the hot air air-conditioner is turned on during driving, and the fuel consumption of the air conditioner is calculated as 0.1L for one-way operation. Find the total fuel consumption of the truck in operation.

Method 1: When the truck manufacturer gives the basic fuel consumption and full-loaded fuel consumption

Calculate as follows.

- a) The basic fuel consumption of trucks Q_k is 9.2 (L/100km), which is obtained through checking the light-duty truck fuel consumption label, and the full-loaded fuel consumption of trucks Q_m provided by truck manufacturers is 11.2 (L/100km).
- b) Calculate the changes in fuel consumption per unit load truck Q_b according to the formula (1).

$$Q_b = \frac{Q_m - Q_k}{W_m - W_k} = \frac{11.2 - 9.2}{3.4 - 1.9} \approx 1.33 [\text{L}/(\text{t} \cdot 100 \text{ km})]$$

- c) Calculate the fuel consumption of the truck in operation according to the Formula (2).

According to the known conditions, the correction coefficient of the Type-2 roads is 1.10; the correction coefficient at the monthly average temperature -3°C is 1.03; the correction coefficient of traffic congestion at an average driving speed of 22km/h is 1.15; and the correction coefficient with no other influential factors is 1.00; when the hot air air-conditioner is turned on during driving, the fuel consumption of air-conditioner is calculated as 0.1L for one-way operation; so the fuel consumption of the truck in operation is as follows:

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