ULTIMATE MODE: NOVELTY AND URGENCY OF ULTIMATE MODE FOR HIGH FLOTATION TRUCK TYPE “URAL”

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1. Novelty and urgency of ultimate mode for high flotation truck type "Ural"

Ural-type vehicles are widely used in various sectors of the economy. They can be used on all types of roads, as well as in various environmental conditions (flooding, snow-covered or sandy terrain, etc.). Cars in all the circumstances, have to transport people and cargo, and tow wheeled equipment. For example, there was flooding some areas, then perhaps the following:

1. Water and resident objects, creates additional resistance force.

2. The load on the body may exceed the rated capacity.

3. The need to reduce travel time from one object to another, which is likely to reduce the risk of threats to life and health.

These possible factors lead to specific requirements to acceleration and vehicle flotation. One way to improve both the acceleration and flotation vehicle is to increase traction, the forward transmission to the driving wheels. The traction force is dependent on many factors. These factors include and engine torque car. Its increase will improve the overall flotation and acceleration of the car if there is enough clutch wheel with the surface on which they roll.

The increase in engine torque can be achieved by various methods. One possibility is rarely used - short-term forcing, the work which is hereinafter referred to ultimate mode. For the automotive industry ultimate mode anywhere previously used, as shown by a review of known literature and Internet sources. Speeding up the engine - it is increasing its liter capacity. Ural-type vehicles equipped with diesel engines, and here we consider speeding up the diesel engine with various types of power systems. The main feature of this crossing is its brevity. The engine was originally not designed for prolonged operation at loads exceeding the nominal, but a certain period, briefly, can work. The essence of the crossing is a short-term increase in the fuel cycle in excess of par, with the extreme position management body of the fuel supply - slats. There is an increase of effective pressure on the pistons, and this, in turn, leads to an increase in engine torque. Thus, the engine during temporary increase fuel cycle in-cylinder engine and is ultimate mode of his work. Opening hours for preliminary estimations of 10 ... 20 min, until the maximum permissible temperature of the liquid engine cooling system.

Ultimate mode can also be implemented on other types of trucks with diesel engines, depending on the type of power supply systems and other features.

One of the problems of the legitimate use of ultimate mode series cars is the need for certification under this mode of operation of the engine and car in general. This requires further theoretical and practical study ultimate mode to have the exact parameters that characterize this mode. And on the basis of these data to the harmonization of ultimate modeon cars with certification authorities. Also note the following: manufacture of cars and engines, they are equipped, are engaged in a single enterprise. Therefore, changes in engine design, which affect its output parameters must be coordinated with the car manufacturer, where these engines are supplied.

2. Technical description of the project

Analysis of years of experience operating vehicles off-road conditions in the Urals with different masses of transported goods, and under various loads on the towing hook has shown that these vehicles can operate, according to preliminary estimations, under these conditions on the ultimate mode10-20 minutes. It is a time limit the thermal and mechanical stresses of the engine and transmission in the car, and requires experimental clarification of the time. Reuse of this regime is possible only with a decrease in engine coolant temperature below 100 ˚C, which is indicated in its technical characteristics. The rate of change coolant temperature depends on the specific heat of the liquid and the volume occupied by the fluid in the cooling system of the engine.

The increase in the fuel cycle can increase the indicated pressure pi diesel engine. This is due to the principles of organization in the engine mixture formation and combustion. The diesel engine has never adjusted to a maximum of pi due to the need to reduce the opacity its exhaust gases, thermal and mechanical stress components. Despite the fact that during the transition to the ultimate mode of the engine increases p_i accompanied by increasing its opacity of exhaust gases and heat intensity of parts, increases torque and engine power.

Constructive proposals for the implementation of ultimate mode is proposed for power system divided by type, in which section of high pressure fuel pump and the jets are made separately and connected by high-pressure fuel line. Ultimate mode possible to realize a change of the limit of the screw-limiter 6 (Figure 1), slats 9 high pressure fuel pump, exhibited at the factory. Screw-limiter to move sufficiently to increase the maximum torque did not exceed 120% of the nominal value. The limiting value of torque increases due to the fact that the values of more than 120% of the diesel engine starts operating at the limit of external torques, and it is unacceptable to use.

The effectiveness of this mode estimated by the ratio ultimate moment M_{max} to nominal M_{nom}. For the analysis of this mode is used external speed characteristic (ESC) of torque (M_{nom}) engine JAMZ-236NE2 according to the manufacturer and ESC maximum allowable torque (M_{max}). For this engine ESC M_{max} built in the likeness of ESC M_{max}, given for diesel engines (Figure 2). As described above, the ultimate mode vehicle assumes an increase in engine torque. The upper limit of increase as has been agreed - no more than 120% of rated torque. The lower limit must be greater than 100%, otherwise the ultimate mode coincides with the nominal operating mode on the car.

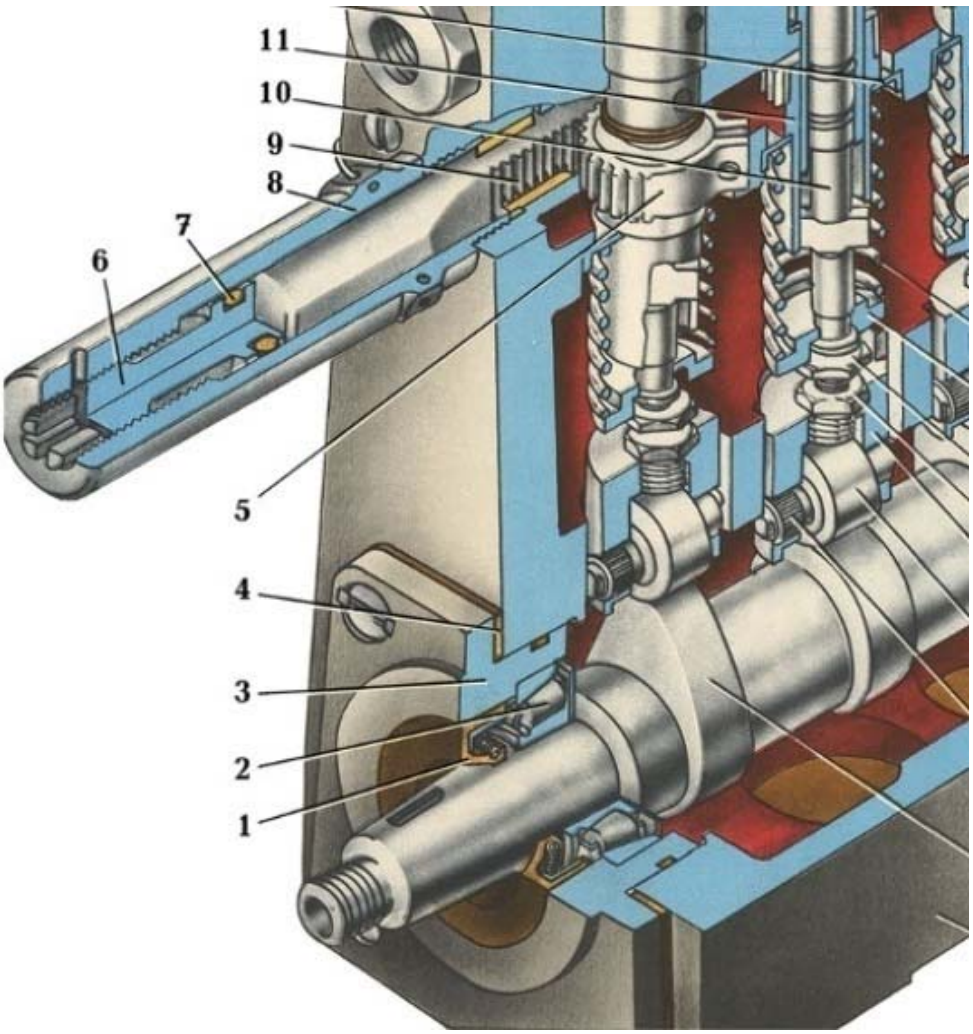

Figure 1: High Pressure Fuel Pump

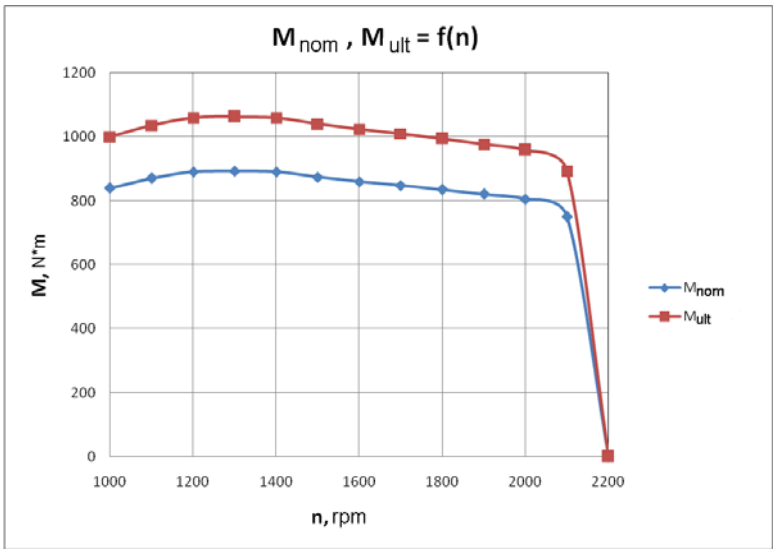

Figure 2: ESC M_{nom} and ESC M_{max}

3. Design proposals for the implementation ultimate mode

Following the scheme of the device on and off the ultimate mode (see Figure 3). Also, given the functioning and management of this device.

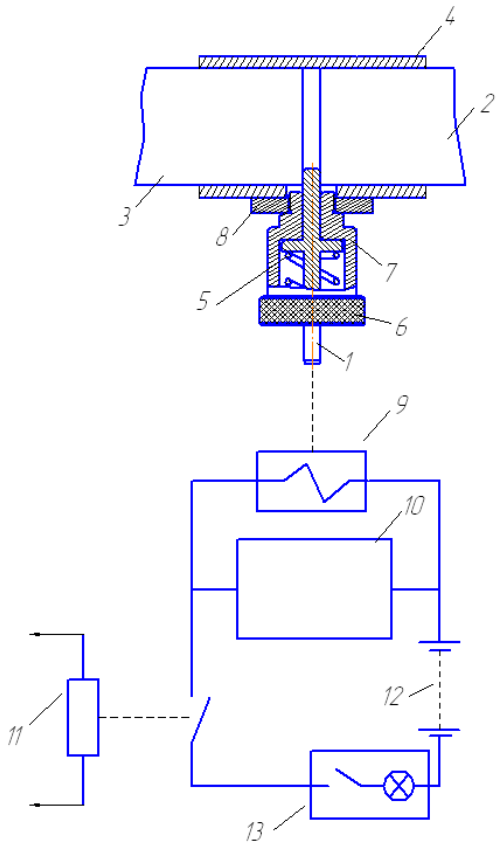

Figure 3: The device on and off ultimate mode:
1 - stop slats; **2** - slats; **3** - screw-stop; **4** - bush strips; **5** - return spring; **6** - cap sleeve stop strips; **7** - bush stop strips; **8** - bracket stop; **9** - electromagnet; **10** - hour meter; **11** - switches on and off ultimate mode; **12** - generator automobile; **13** - switch with signal lamp

The device on and off the ultimate mode (Figure 3) is driven focus slats 1, whose position depends on whether on or off an electromagnet 9, as the focus rack is rigidly connected with a rod of the electromagnet. An electromagnet is a solenoid to the anchor, which, depending on the availability of current in the coil is located in one of two extreme points: the top or bottom. If the top position, the slats and the stop is in the top position, and therefore rake in nominal position - ultimate mode is off. If the bottom - ultimate mode is enabled. When the stop is in the lower position and no current in the solenoid, the return spring 5 moves the focus to the upright position. The current in the solenoid depends on three factors:

1. The presence of voltage generator 13;

2. Switch position 14;

3. The relay switching on and off ultimate mode 11.

The first factor is not changed when running the car (if the generator is working properly). The second factor influences the driver (the driver from the cab can turn on or turn off the ultimate mode regime, by clicking on the switch 13). The third factor depends on the temperature of the cooling liquid (coolant), located in the cooling system. Upon reaching the limit temperature coolant thermistor resistance TSC (temperature sensor coolant) is reduced, light detectors emergency coolant temperature and turns off the relay 11 (not connected in parallel detectors), which disables the electromagnet and the spring moves the focus to the bottom position - ultimate mode is off.

Hour Meter 10 is designed to accommodate the engine in the ultimate mode . It is included in parallel electromagnet 9, and works just as much stop is in the lower position.
Stop strips located in the hub 7, which is attached by threaded connection to the bracket 8. Bracket is fastened with four bolts to the hub rail.

Bush strips must first be finalized. First, you want to groove all the way for installation of rails, and secondly, to drill the 4 holes, and cut them into threads to be able to connect the rack bushing and bracket stops.

For the power systems of diesel engines with pump-injector

The solenoid valve high pressure (SVHP) regulates the start and duration of injection. Management SVHP by an electronic control unit (ECU) engine. By varying the duration of injection (i.e., the amount supplied to the cylinders of fuel) you can make the transition from nominal mode of operation of the engine on ultimate mode, and vice versa. This requires changes in management program at SVHP ECU engine.

For the power systems of diesel engines with battery injection system Common Rail

Fuel from the battery to short mains pressure supplied to the injectors, which inject it directly into the combustion chamber cylinder. Each jet consists essentially of a spray and high-speed solenoid valve, which controls the spray through a mechanical drive. The solenoid valves are activated by signals from the power management of the diesel.

Number of fuel injected at a constant pressure in the fuel battery is proportional to the time the inclusion of the electromagnetic valve and does not depend at the same speed of the engine crankshaft or fuel pump shaft rotation frequency.

Thus, the change signals the control unit (through reprogramming and / or unit settings) can regulate the magnitude of the cyclic fuel supply. And there by make the transition from nominal mode of operation of the engine on ultimate mode, and vice versa.

Conclusions

1. Ultimate mode - this is a short-term (based on preliminary estimates of 10–20 minutes) conditions of the engine and car in general.

2. Hours for afterburning limit the maximum load occurring in the engine and drivetrain in the car. Reuse of this regime is possible only when the permissible engine coolant temperature.

3. The transition from nominal mode to ultimate mode increases the engine torque.

4. With increasing engine torque is increased traction force that supplied transmission to the wheels of the car.

5. Ultimate mode may constructively to implement in any diesel engine fitted to cars such as the "Ural" with any of the known systems of power.

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