

INJECTION ENGINE FAULTS AND THEIR PREVENTION

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Abstract: Crankshaft position sensor, Gasoline pump, Camshaft position sensor, Throttle position sensor, Oxygen sensor.

Key words: Control system reacting to its failure, symptoms are clearly visible - loss of power, ignition coil failure, the fuel supply system is a closed ring system.

Modern cars with electronic injection systems, powerful and economical engines perform well on long trips. But far from service stations and qualified specialists, the "Check Engine" alarm (Check Engine is a light on the instrument panel indicating that the ECU (electronic control unit) has detected problems in the engine control system) especially frightens travelers. Some panic and, fearing irreversible consequences, take the cable out of the trunk. Others, on the contrary, are cold-blooded: since the engine is running, it means the lamp "just made a mistake" and "will go out on its own" - you can drive at the same pace [1-2].

The ability to recognize the symptoms of typical injection ailments and imagine what a burning yellow lamp threatens will help save nerves, money, time and the engine. If the engine is working properly, the "Check Engine" signal should go out 0.6 seconds after starting - this is enough for the self-diagnosis system to make sure that everything is in order [3]. If, nevertheless, the light continues to light, then there is a malfunction that can be identified using a special motor tester at a service station or on your own.

As for "on your own," this is a superficial diagnosis that can give an approximate definition of the malfunction; the reason for this is the lack of special measuring instruments and parameters of the injection system components. But on the road, in the absence of a service station, this can help you and give you confidence that the car will still get to its destination [4].

Something is not working, what could happen now? To answer this question, we need to get acquainted with some devices that affect the performance of the power system.

Crankshaft position sensor. Anything but this. This is the only sensor whose malfunction will prevent you from even getting to the garage. His refusal is an exceptional phenomenon. Installed on the boss of the oil pump housing at a distance of (1 ± 0.4) mm from the top of the crankshaft pulley teeth. Based on the synchronization pulse from the crankshaft position sensor, the controller determines the position and speed of the crankshaft and calculates the moment of activation of the injectors and the ignition module.

Fuel pump - you won't go anywhere. If the fuel pump begins to work worse, the reasons are mainly due to dirt and water in the gasoline, then dips, loss of power, and popping noises appear in the intake system. If he completely dies, then the car will not go further: the heart has stopped.

If all other sensors and mechanisms malfunction, the engine will work: the computer will switch to the emergency program.

The "death" of the camshaft position (phase) sensor is very difficult for an inexperienced repairman without diagnostic equipment to detect. Although the engine operates in an abnormal mode of pairwise parallel fuel supply, when each injector fires twice as often (once for each crankshaft revolution), do not try to determine this by ear. The exhaust loses its former purity, but the increase in toxicity can only be caught by measuring the driving cycle. You can tell that the engine is unhealthy by the increased fuel consumption. Another sign of a malfunction is a

malfunction of the self-diagnosis system. Failure of the phase sensor will not lead to other unpleasant consequences for the engine [5].

If your car requires “playing” with the gas pedal when starting up, or has lost its former agility at maximum power and torque modes, the mass air flow sensor is most likely to blame. The control system, reacting to its failure, “lates” the ignition by 10-12 degrees. In this case, the response to the gas pedal at the beginning of acceleration may even improve. The exhaust will become dirtier, and the engine will become noticeably more power-hungry [5-6].

It is much more difficult to drive with a faulty throttle position sensor. The symptoms are clearly visible - loss of power, unpleasant jerks and dips during acceleration, unstable idle speed, no engine braking. The engine seems to have been replaced, but the warning light may not light up. The control unit is able to detect a break or short circuit in the sensor and its circuit, but gives in to the “floating” signal.

Driving for a long time with this malfunction is not just unpleasant, but dangerous. Under heavy loads, the computer, without receiving the proper information, will assume that the car is moving in moderate mode, using an economical mixture. Therefore, driving “with the pedal to the floor” will lead to overheating and detonation with all the ensuing consequences. In this case, you should move to the garage or service station slowly, at a gentle pace [6].

A faulty secondary air regulator makes itself felt by difficult starting with the gas pedal released and unstable idle speed. The unit is not dismountable; if flushing the idle air passages and throttle valve does not help, you will have to replace it entirely.

If the coolant temperature sensor fails, the computer assumes the engine starting temperature is 0°C and gives the corresponding command to the additional air regulator. A non-optimal ratio of gasoline and air will make starting in cold weather difficult. Within two minutes after the engine is finally started, the computer will decide that the coolant temperature has reached 80°C. So you will have to not only start, but also warm up the engine by operating the gas pedal.

Another trouble awaits the driver when the engine heats up to a temperature close to critical, for example, in the heat, in a traffic jam. The computer, receiving an incorrect signal and believing that the Antifreeze temperature is normal, will not adjust the ignition timing. The engine will lose power and detonate [7].

It is extremely rare for a knock sensor to fail. More often than not, the wires that connect to it are damaged. They need to be checked if the self-diagnosis lamp lights up at 3000 rpm and above. The engine will become more sensitive to the quality of gasoline - refueling with untested fuel will lead to “knocking fingers.”

Unfortunately, ignition coil failure is not uncommon. Signs are failures during acceleration, loss of power, unstable idle and, finally, complete shutdown of two cylinders. If you need to drive several kilometers with a “dual” engine, disconnect the connectors of the corresponding pair of injectors so that gasoline does not wash off the oil from the walls of the non-working cylinders and does not get into the crankcase.

The oxygen sensor (L-probe) seems to be nothing serious, but over time people begin to understand what the greenhouse effect is, fuel is wasted and the converter dies, followed by a sharp drop in power.

It should be noted that more accurate diagnostics are possible only with the use of special equipment: a motor tester, a pressure gauge for measuring fuel pressure, technical parameters. A visit to a service station will allow you to save money when purchasing sensors that you think are out of order. Since a non-working sensor is not always a breakdown of the sensor itself, but also of the electrical wiring and the computer. Agree, malfunctions of control system sensors and fuel supply devices are not as terrible as it seems to some staunch adherents of carburetors or simply the uninitiated. Before a long journey, stock up on a crankshaft sensor, an ignition coil, and, to be on the safe side, a fuel pump and start [8].

Malfunctions in fuel supply systems can mainly be divided into two large groups, one way or another related to increased or decreased pressure in the system. The fuel supply system is a

closed ring system (with the exception of the most modern single-circuit fuel supply systems). Fuel is supplied from the tank to the fuel rail (monoblock throttle valves) and injectors, while excess fuel is returned to the tank through the pressure regulator. The fuel pressure regulator is the dividing point between the supply and return lines. The reasons for high pressure in the system are mainly due to malfunctions in the return flow circuit, and low pressure is mainly due to problems in the fuel supply circuit [9].

High blood pressure can be caused by the following faults:

- faulty fuel pressure regulator;
- reduced capacity (jammed or twisted) of the fuel return line;
- increased fuel vapor pressure in the tank due to unsatisfactory operation of the gas tank ventilation system.

Low pressure can be a consequence of the following malfunctions:

- fuel filter contamination;
- reduction in capacity (jamming or kinking) of the fuel supply line;
- wear or malfunction of the fuel pump;
- malfunction of the pressure regulator;
- clogging of the fuel intake filter in the tank;
- increased vacuum in the fuel tank due to a malfunction of the gas tank ventilation system

[1-2].

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