

## Analysis of operational indicators of the injector fuel supply system

**Meliqo'ziyev Abdulaziz Rasuljon o'g'li**  
Andijon mashinasozlik instituti assistenti

+998-93-789-41-81

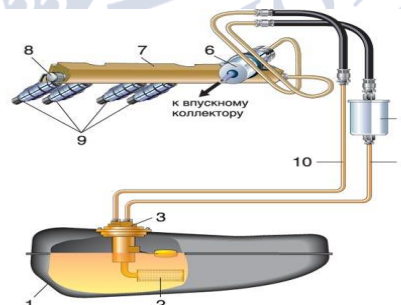
[melikuzievabdulaziz@gmail.com](mailto:melikuzievabdulaziz@gmail.com)

**Annotation.** This article provides information on the advantages and disadvantages of the injector fuel supply system, drawings and operating characteristics of the multi-branch injection system, the principles of operation.

**Key words:** injector, multi-line spraying system, fuel tank, filter, fuel pump, main fuel line, pressure regulator, distribution pipe.

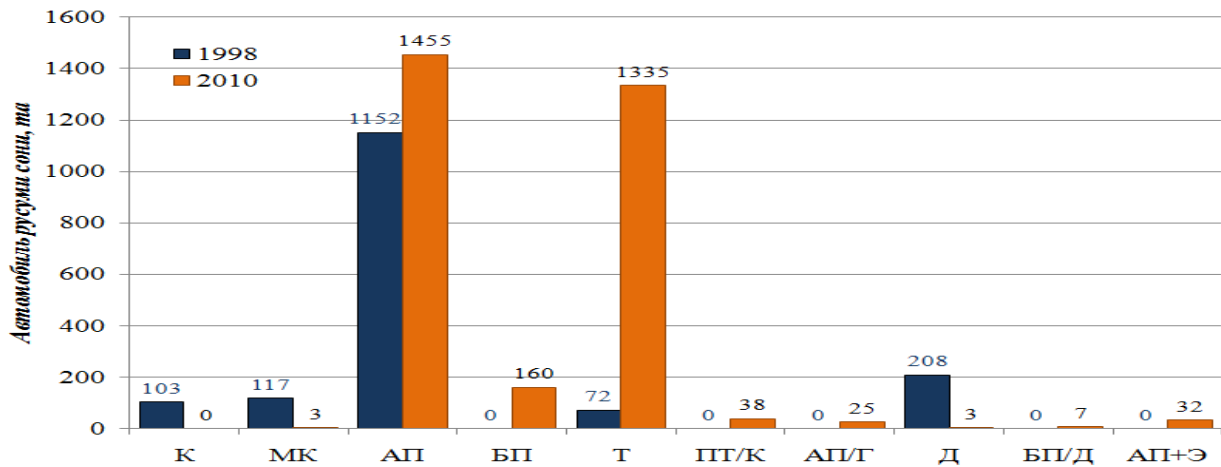
Nowadays, every new car is an injector. Although they are more expensive to maintain than carburetor machines, in recent years computerized sensor injector systems have demonstrated sufficient sensitivity, accuracy, and precision. They justify their high cost with good performance, high fuel economy, cleaner emissions and higher power. Some car models even burn 95-100%. Thanks to innovations in the design, the systems are constantly being improved, and the cost is becoming cheaper. The refueling system is not as new as some people think[1]. For example, the 1957 Chevrolet Corvette is equipped with a fuel injection system. These early injector engines used mechanical injectors (also called injectors). They appeared as spring-loaded plate valves. In such engines, when the fuel pressure reaches the level given in the mechanical injectors, the injector is opened and the fuel is sprayed into the inlet manifold to mix with the air in the combustion chamber path. Modern engines use computer-controlled electronic injectors[2]. A transistor connects an injector to a computer (also called an injector driver) and in this case it connects the circuit. This allows current to flow through the solenoid (coil) in the injector[3].

*An injector* is a mechanism that supplies fuel to the combustion chamber.



**Photo 1.** Injector view

1-fuel tank, 2-coarse filter, 3-fuel pump, 4-main fuel line, 5-fine filter, 6-pressure regulator, 7-distribution pipe, 8- nozzle, 9 injectors, 10 fuel return path.

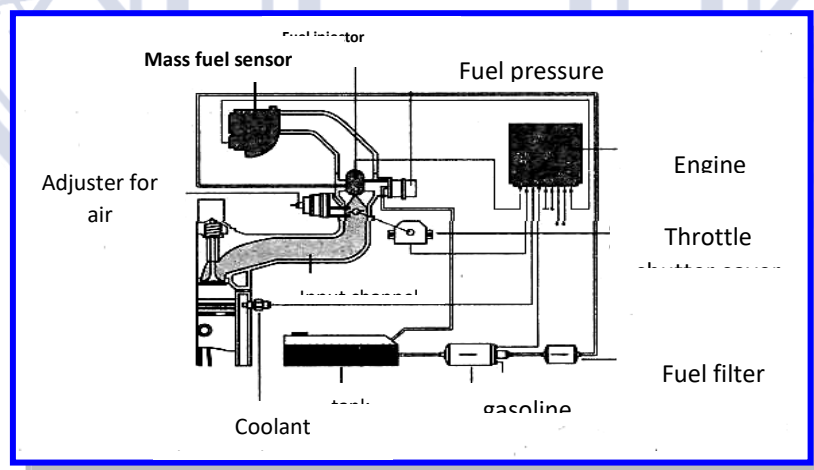


**Photo 2.** Dynamics of changes in the types of car engine systems.

Improvements in engine design, improved fuel quality, and the use of modern materials have resulted in a significant reduction in vehicle emissions compared to 1998. In particular, the amount of carbon monoxide emitted by cars in accordance with the requirements of Euro 1 is 2.7 times less than the requirements of Euro 5, and the amount of hydrocarbons and nitrogen oxides is 7.1 times less[4]. This is due to the improvement of the type of fast control unit and supply system used in the engines. Figure 1 shows the dynamics of change in the types of automotive supply systems currently in production compared to 1998[5,6,7].

### **Multi-injector fuel injection**

Multi-injector fuel injection is a carburetor-free system that mixes fuel directly with the air in the car's throttle without spraying it into each cylinder of the individual injectors (Figure 8). These systems are simpler and usually cheaper than multi-point fuel injection systems. Some of these systems use solenoids (coils) to inject fuel into the air.



**Figure 3.** Schematic diagram of a multi-injector fuel injection system.

The principle of operation of a multi-injector spray system.

- An electric fuel pump pumps fuel into the throttle body. The throttle body is similar to a carburetor and includes an injector and a fuel pressure regulator[8,9,10].

- The fuel pressure regulator maintains the required pressure in the fuel and returns the unused fuel to the fuel tank.
- The engine control unit controls the operation of one or two injectors located inside the throttle body. It reduces the electric current (by adjusting the pulse length) to the injector solenoid for a certain period of time, the fuel is sprayed under pressure, mixed with air, and passes through the throttle on the way to the engine[11,12].

*Multi-point fuel injection is another type of carburetor-free system.*

The principle of operation of a multi-point spray system.

1. An electric fuel pump injects fuel into the fuel rail with injectors attached. The fuel rail may also have a fuel pressure regulator. It is designed to maintain the required pressure in the fuel and return the unused fuel to the fuel tank. The injectors on each cylinder are mounted on one side to the fuel rail and on the other side to the engine inlet[13,14].

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