

Practical Lesson 7

DIESEL FUELS. QUALITY INDICATORS. RESEARCH METHODS FOR IMPROVING DIESEL FUEL QUALITY

1. Objective of the practical session

The objective of this practical session is to study the main operational requirements imposed on diesel fuel and to examine research methods used to improve the quality of diesel fuel.

2. Procedure for performing the practical work

1. To study modern and prospective requirements imposed on diesel fuels;
2. To analyze the quality indicators of diesel fuels;
3. To analyze the main operational requirements for diesel fuel.

3. Theoretical information

Diesel fuel has a number of advantages compared to gasoline, namely: it is more economical, allows the use of wider and heavier fractions of petroleum as fuel, has a lower risk of fire, enables easier engine starting, and ensures reliable and longer engine operation. For these reasons, diesel fuel is widely used.

Diesel engines are mainly installed in heavy-duty vehicles and diesel fuel is used as the primary fuel in these engines.

Diesel fuel is a petroleum fraction consisting of hydrocarbons with a boiling range of 200–350 °C. It is a liquid with a color ranging from yellow to light brown (this color is caused by the resins contained in the fuel). Compared with gasoline, diesel fuel has higher viscosity and lower volatility, making it a less easily evaporating combustible liquid.

By mass composition, diesel fuel contains approximately:

- 87% carbon,
- 13% hydrogen,
- up to 0.5% sulfur,
- and very small amounts of oxygen and nitrogen.

The density of diesel fuel, like that of gasoline, is lower than the density of water (0.78–0.86 g/cm³), and it does not dissolve in water.

Diesel fuel is used in diesel engines, which are 25–30% more economical than gasoline engines. During combustion, diesel fuel releases approximately 42.5 MJ/kg of heat energy.

The reliable operation of an engine, as well as the cost of maintenance and repair, directly depends on the quality of the fuel used. Knowledge of fuel properties and their proper application is one of the key factors determining the efficiency of diesel engines and the profitability of motor transport enterprises. Diesel fuel grades may differ slightly in terms of density and surface tension (25–30 mN/m), but they may vary significantly in viscosity and other physicochemical properties.

4. Assessment questions

1. What requirements are imposed on diesel engine fuels?
2. What is meant by fuel viscosity, and how does it affect engine performance?