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**ЎЗБЕКИСТОН RESPУБЛИКАСИ ОЛИЙ ВА ЎРТА МАХСУС  
ТАЪЛИМ ВАЗИРЛИГИ**

**МИНИСТЕРСТВО ВЫСШЕГО И СРЕДНЕГО СПЕЦИАЛЬНОГО  
ОБРАЗОВАНИЯ РЕСПУБЛИКИ УЗБЕКИСТАН**

**БУХОРО МУҲАНДИСЛИК-ТЕХНОЛОГИЯ ИНСТИТУТИ  
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**«ОЗИҚ-ОВҚАТ, НЕФТГАЗ ВА КИМЁ САНОАТИНИ  
РИВОЖЛАНТИРИШНИНГ ДОЛЗАРЪ МУАММОЛАРИНИ  
ЕЧИШНИНГ ИННОВАЦИОН ЙЎЛЛАРИ»**

**«ИННОВАЦИОННЫЕ ПУТИ РЕШЕНИЯ АКТУАЛЬНЫХ ПРОБЛЕМ  
РАЗВИТИЯ ПИЩЕВОЙ И НЕФТЕГАЗОХИМИЧЕСКОЙ  
ПРОМЫШЛЕННОСТИ»**

**МАТЕРИАЛЫ**

**МЕЖДУНАРОДНОЙ НАУЧНО-ПРАКТИЧЕСКОЙ КОНФЕРЕНЦИИ  
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## PHYSICAL AND CHEMICAL PROPERTIES OF MOTOR OILS

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The function of motor oils is to reduce friction and wear of rubbing surfaces, remove heat from heating parts, protect against corrosion damage, and clean surfaces from accumulated contamination products [1].

Each type of engine requires oil to ensure reliable, economical and long - lasting operation. But as the oil group increases, its ash content increases, and the ash content of diesel oils is higher than the ash content of gasoline and gas engine oils (even within the same group). An increase in the ash content of oils can cause an increase in the amount of deposits in the combustion chamber, worsen the operation of spark plugs in engines with spark ignition, increase the propensity to co - ignition, increase the possibility of piston burnout, and wear of the cylinder-piston group.

Depending on the performance properties of motor oils, there are six groups:

A, B, C, D, D, E. the Oils of group B, C, D Are divided into two subgroups: 1 - for carburetor engines, 2 - for diesels. These indexes are specified in the mark [2]. The standard also provides for the production of universal oils that can be used in both carburetor and diesel engines. In this case, the digital index is not set. According to the viscosity of the oil is divided into summer, winter and all-season. For summer and winter oils, the viscosity value is normalized at 100°C; in addition, for winter oils at-18°C. All-season oils must simultaneously meet the viscosity standards of certain samples of summer and winter oil. They are denoted by a fraction, the numerator of which indicates the viscosity class of winter oil, and the denominator - summer oil.

Engine oils are designated as follows. At the beginning is the letter M, which indicates that the engine oil, then the numbers 6, 8, 10, etc., showing the value of the viscosity in Santi - Stokes at 100°C and a letter describing the level of performance properties, with an index of 1 or 2, which indicate which engines can use oil (no index - universal oil). Example: M-10G2-engine oil with a viscosity at 100°C, intended for use in high-powered (G) diesels (2). The main properties of motor oils include detergent-dispersing, anti-oxidation, anti-wear, anti-corrosion and viscosity-temperature properties.

The operating conditions of motor oils in engines are so harsh that it is not possible to prevent their oxidation completely. Appropriate cleaning of base oils from undesirable compounds present in the raw material, as well as the introduction of manti-oxidizing additives, can significantly slow down the processes of oil oxidation,

which lead to the formation of deposits, contamination of oil filters, an increase in oil viscosity, corrosion activity and other adverse consequences [3].

Oil oxidation in engines occurs most intensively in a thin layer: on the metal surfaces of parts that are heated to a high temperature. In volume, the oil is oxidized less intensively. In the internal cavities of the engine, the oil is located in the form of fog, which creates favorable conditions for the contact of small drops of oil with the crankcase gases and, consequently, for its oxidation.

When working on fuels with a high sulfur content, as well as in conditions that contribute to the formation of nitric acid from combustion products (gas engines, high-boost diesels), the most important characteristic of the oil's ability to prevent wear of piston rings and cylinders is the alkaline number, its neutralizing ability[4].

The multiplicity of factors that affect the wear of engine parts, the fundamental differences in the modes of friction and wear of components make it very difficult to optimize the anti-wear properties of engine oils. However, the presence of alkaline cleaning agents and anti - oxidants in the oil, in particular zinc dithiophosphates, is often sufficient to prevent corrosion and mechanical wear and modification of the surface of parts with heavy-loaded interfaces. In some cases additional anti-wear components must be added to the oil.

The corrosion activity of motor oils depends on the hydrocarbon composition of the base components, the concentration of the effectiveness of anti-oxidation and anti-corrosion additives, the presence of natural anti-corrosion compounds and anti-oxidants in the oil. In many motor oils, the role of anti - oxidative and anti - corrosion additives is performed by zinc dialkyldithiophosphates [5].

In laboratory conditions, the anticorrosive properties of motor oils are evaluated by the weight loss of lead plates (per 1 m<sup>2</sup> of their surface) during the test in the OK-3 device at a temperature of 140C. During motor tests, the corrosion activity of oils is characterized by the loss of mass of connecting rod bearings, the liners of which are filled with lead - bronze (engine-yaaz-204 or installation Leter10-1).

Viscosity is one of the most important characteristics of lubricating oils. It determines the ability to provide liquid friction, cooling efficiency, ease of start-up, and oil pumpability through the lubrication system. The intensity of changes in viscosity with changes in temperature depends on the hydrocarbon composition of oils: the lowest is for paraffinic hydrocarbons and the highest is for aromatic hydrocarbons, a naphthenic ones occupy an intermediate position.

At a temperature of 100C, the viscosity of oils is significantly reduced. To ensure the operability of loaded crankshaft bearings, the minimum allowable kinematic viscosity at operating temperature is 4 - 5mm<sup>2</sup>/s. When using the most common oils, the oil temperature in the crankcase should not exceed 125 C.

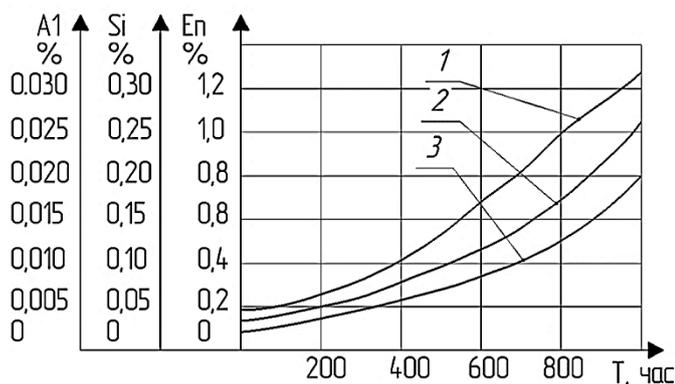
The low-temperature properties of oils are also characterized by the pour point. This is the temperature at which the oil loses its mobility (when the test tube with oil is tilted at an angle of 45 degrees, the liquid level does not change for 1 minute). The solidification temperature depends mainly on the content of paraffin hydrocarbons in the oil, their structure and molecular weight. Oils with a pour point of up to -15C are obtained by removing paraffin's during dew axing. To obtain winter oils with a

solidification temperature of -25-30C and below, dew axing is not economically feasible, and depressors are used to lower the solidification temperature.

Effective depressors in concentrations from tenths of a percent to 1.5 can lower the pour point of the oil by 20-25 C. For the production of oils with a low stable pour point and a low maximum pumping temperature, base oils subjected to deep dew axing are preferred.

Motor oils are obtained from fuel oil-the residue of primary oil refining. If fuel oil is heated at atmospheric pressure, many individual hydrocarbons begin to decompose at a lower temperature than their boiling point. When the pressure decreases, the boiling point decreases, which allows you to select the desired fractions. This process is called vacuum acceleration. For its implementation, special installations are being built that allow obtaining oils of various viscosities from fuel oil.

At the beginning of the test, after 8-10 hours of operation of the unit, after changing the oil, the total concentration of mechanical impurities is up to 0.18%, including silicon 0.015% and aluminum 0.003%. This indicates that after changing the oil, some of the mechanical impurities remain, which have settled on the bottom of the crankcase of the unit during prolonged downtime of the machine.



**Fig. 1. change in the total concentration of mechanical impurities (1), silicon (2) and aluminum (3) in the oil of the additional final drive of a cotton tractor of 1.4 traction class from the duration of operation**

Especially clearly it is possible to perform acceleration in installations with double evaporation, used in modern oil refining complexes. These oils are called distillate oils. Their production involves distillation or evaporation, followed by condensation of individual fractions of liquids or their mixtures.

Currently, motor oils occupy, and will continue to occupy, the first place in terms of use among other lubricants for a long time, since every year the number of mobile cars with internal combustion engines, in which engine oil is an integral part, is growing more and more. In connection with the NTR, new alternative types of engines are emerging, which in some technological characteristics are superior to internal combustion engines, and which do not need engine oil to operate. But at the moment, their production is not established in a large enough volume to compete with traditional engines.

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## ENERGY EFFICIENCY OF PHOTOCELL OF THE SOLAR STATION

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### Abstract

A methodology has been developed for calculating the power and efficiency of solar power plants and its elements, allowing to take into account the change in load during the day and thereby accurately determine the required battery capacity.

**Key words:** solar module, solar power plant, autonomous solar power plant, pulsed converter, autonomous voltage inverter.

### INTRODUCTION

Solar power refers to renewable energy sources and has almost unlimited potential for use in terms of resources spent. It is one of the environmentally friendly sources of energy that does not pollute the environment. Today, the solar industry is experiencing rapid growth, around the world actively exploring the possibility of increasing the efficiency of solar cells. In this case, the urgent task is the problem of increasing the efficiency (efficiency) of the solar battery. It is known that the efficiency of solar cells depends on the material used in them. More than 95% of solar panels operate on silicon semiconductors, which provide an efficiency of 15–25% [1]. For example, the efficiency of solar panels based on perovskite is 12% [2], and for thin films based on cadmium telluride, the efficiency reaches 22% [3]. Important factors that determine the efficiency are the level of insolation in the installation region, the azimuth and the angle of inclination of the solar panels [4].

It is well known that a solar photovoltaic station (hereinafter - FES) is designed to provide electric power to household and other devices and is a power plant belonging to the class of renewable energy sources. The principle of operation of the FES is based on the direct conversion of solar radiation into electrical energy

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