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METHODS FOR CLEANING Tp-30 TURBINE OIL FROM UNWANTED COMPONENTS

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ABSTRACT
In this paper, we study the Tp-30 turbine brand oil and examine the possibility of its purification from undesirable components, in particular, we consider the issue of regeneration of used oil. At an enlarged laboratory facility, the optimal conditions for the purification of used turbine oil were determined and its purification was carried out. Received 12.5% purified oil. A comparative analysis of the purified turbine oil with the original oil is made. Conducted research on the purification of used oil showed the possibility of degeneration of used oil using an adsorbent. A comparative analysis of the initial and purified by adsorption method showed that the purified oil in almost all physico-chemical parameters is not inferior to the original.
KEY WORDS: *petroleum, petroleum oils, refining, silica gel, component, TP-30 turbine oils, regeneration, used oils, paraffin, benzene, toluene, methyl ethyl ketone.*

1. INTRODUCTION

Petroleum oils are the main type of lubricant designed to reduce friction and wear of rubbing surfaces, to prevent their scuffing. They have long been widely used in various fields of technology, and the reliability and durability of machines, mechanisms and various equipment depend on the correct use of oils. The increase in the speed of machines, the increase in operating temperatures, contact loads and the duration of equipment operation have significantly changed the role and increased requirements for lubricants. The growing importance of petroleum oils for the reliable operation of technology has necessitated a more in-depth study of their nature and properties, and the identification of optimal conditions for their production and use.

2. LUBRICATING OILS

The raw materials for the production of lubricating oils are oil fractions boiling above 350 ° C. High molecular weight oil compounds are concentrated in these fractions, which are complex multicomponent mixtures of hydrocarbons of various groups and their hetero derivatives, the molecules of which contain atoms of oxygen, sulfur, nitrogen and some metals (nickel, vanadium and others). The components of the oil fractions have different properties, and their content in the finished oils can be useful and necessary, or harmful and undesirable. Therefore, the most common way of processing oil fractions to obtain oils is to remove "undesirable" components from them while preserving the "desirable" ones, which can provide the finished products with the necessary physicochemical and operational properties.

The production of oils includes the following operations: A) Obtaining several distillate oil fractions: 300-400 °C, 400-450 °C, tar fraction above 500 °C; B) Purification of fractions from undesirable components and dewaxing, deasphalting of tar using selective solvents. C) Hydrotreating components; D) Mixing the refined components in various proportions with each other and additives. The distillate fractions are purified by selective solvents (phenol), dewaxing (with a solution of methyl ethyl ketone, benzene - toluene), and hydrotreating with catalysts. The residual basic components are obtained in two ways: by deasphalting the tar with propane followed by selective purification with phenol (option 1) or by cleaning the tar with pair solvents (option 2). The residual raffinate is then subjected to dewaxing and post-treatment.

The viscosity and viscosity-temperature properties of oils depend on their fractional and chemical composition. With increasing temperature, the viscosity of the oils decreases. The hydrocarbons contained in the oil have different effects on viscosity and its change with temperature. Paraffin hydrocarbons are characterized by the lowest viscosity. Branched hydrocarbons are characterized by the lowest viscosity. With the branching of the chain, their viscosity increases, and the viscosity-temperature properties deteriorate. Cyclic hydrocarbons (naphthenic and aromatic) are significantly more viscous than paraffinic. With the same structure, the viscosity of naphthenic hydrocarbons is higher than aromatic. In general, the more rings there are in the structure of a molecule, and the branched side chains, the higher the viscosity. Resin-asphaltene substances have the highest viscosity.

The most important characteristic of oils is the change in their viscosity with temperature - viscosity index (VI) or viscosity-temperature characteristic, an indicator of which is the viscosity coefficient (ratio V50 / V100). The more gentle the temperature viscosity curve (the lower the viscosity coefficient), the higher the VI value and the better the oil (modern oils should have a viscosity index of at least 90). The viscosity-temperature characteristics of the oil depend on the type and structure of the hydrocarbons included in its composition. The most gentle viscosity-temperature curve and, therefore, the highest VI have paraffinic hydrocarbons. IW from paraffin hydrocarbons is less than normal. Cyclic hydrocarbons are characterized by an improvement in the viscosity-temperature properties with a decrease in the cyclic nature of the molecules and an increase in the length of the side chains.

3. CLASSIFICATION AND CHARACTERIZATION OF OILS

Classification and characterization of oils for various purposes. The operation of lubricating oil in the friction unit is largely dependent on operating conditions (temperature, load, travel speed, environmental composition, etc.) and the nature of the mechanism or machine (constant or variable external influences, stops, etc.) . Of greatest importance are: design features of the friction unit (type, size, nature of the movement of the rubbing surfaces, etc.); lubrication system and materials with which the oil is in contact during operation: operating conditions of the friction unit, timing of the oil change.

There are three generally accepted classification of petroleum oils: composition, method of production (or purification method) and purpose.

By their origin, lubricants are divided into vegetable, animal and mineral. The issues of separation and purification of technically important environmental protection products, improving the quality of products manufactured by industry, increasing the degree of purity of individual chemicals, and many others, are associated with the use of adsorbents. Using adsorption technology, a high vacuum is created, deep and fine purification of gases and liquids, recovery of volatile solvents, purification of environmental pollution, emission of trace amounts of useful substances from mixtures, regulation of the composition of the gaseous medium in agricultural storage facilities, etc.

Active carbon, silica gel and aluminum gel, aluminum silica gel, synthetic zeolites, porous glass, polymer adsorbents, as well as adsorbents of natural origin - montmorillonite, palygorskite clays, flasks, diatomites, zeolites, etc. are widely used in the adsorption technique. Natural mineral sorbents have a specific surface and good absorption capacity, in relation to various substances from steam and liquid media; they are widespread and readily available. The development of effective methods for the directed regulation of the physicochemical properties of the surface and the porous structure allows us to expand the scope of use of these adsorbents.

Engineering calculations of adsorption processes and their regulation are based on the results of theoretical studies of the adsorption phenomenon.
A great deal of research has been devoted to the thermodynamics and thermochemistry of adsorption phenomena on activated carbons, zeolites, silica gels, and other synthetic adsorbents. They reveal the essence of adsorption processes, allow one to calculate their energy characteristics, determine the direction of change in the state of the adsorption substance in the adsorption layer, the nature of the formed bonds between the components of the adsorbate-adsorbent system and the role of the surface of adsorbents, their porous structure in the adsorption interaction.

For several years, the IONH AN RUz has been studying the thermodynamics and thermochemistry of adsorption of vapors of polar and nonpolar substances on natural mineral sorbents and on the products of their activation and modification. They are aimed at identifying the mechanisms of the occurrence of adsorption processes, the role of active centers and the porous structure of sorbents in these phenomena, at determining the thermodynamic data of adsorption, the heats of wetting of adsorbents by individual liquids and their mixtures, the phase state of the adsorbate in the adsorption layer, and also at estimating the energy of interlayer adsorption.

When studying capillary condensation on mesoporous adsorbents, the thermodynamic criteria for the applicability of the Kelvin equation are established, equations for calculating the differential heat and adsorption entropy are proposed, which describe well the adsorption energy in the region of capillary condensation from one adsorption isotherm,

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and the temperature dependence of the point of the beginning of the sharp rise of the differential condensation , the dependence of the heat of the phase transition (type of melting) of the adsorption substance on s refills on various adsorbents that differ in the nature of the surface.

The established patterns can be used to solve practical problems associated with the use of adsorbents based on natural mineral raw materials in adsorption technology.

And so, petroleum oils or otherwise they are called mineral oils - these are liquid mixtures of high boiling hydrocarbons (tokip. 300-600 ° C). Basically, they are obtained by fractional distillation of oil.

Petroleum oils are widely used in various sectors of the economy: as preservation, isolation, lubricating and process oils. Based on them, plastic greases are widely used in technology and the national economy: these are lubricants for gas cranes, railway lubricants, etc.

4. PURPOSE OF THE WORK

The purpose of this work is to study petroleum oils from local oils, in particular, source and used turbine oil, and to purify used oil from undesirable components.

The object of the study was spent TP-30 turbine oil. For its purification from undesirable components, KSK silica gel was chosen, because industrial silica gel (table. 1.) has a lower capacity, it was activated by a special technique.

Table 1
Technical characteristics of silica gels used in chromatography

№	Mark silicagel	Bulk weight with utensil in g / cm3	Structure						Moisture absorption in weight% at relative humidity				Note
			surface, m2/g	true specific weight,g/cm3	apparent weight,g/cm3	pore volume cm3/g..	average pore radius AA	porosity,%	20	40	60	100	
1.	KSK № 2	0,39	338	2,240	0,011	1,19	70	72,7	2,5	4,6	7,8	119	Calcined
2.	KSK № 2,5	0,46	376	2,244	0,706	0,974	51,6	67,4	2,2	4,6	8,7	97,9	Calcined
3.	KSK № 3	0,50	522	2,236	0,729	0,925	35,4	67,4	2,9	5,7	13,5	87,1	Calcined
4.	KSK № 4	0,58	650	2,235	0,831	0,760	23,4	62,8	2,4	7,4	20,1	70,4	-
5.	KSK № 5	0,66	715	2,250	0,980	0,575	16,1	56,4	4,4	15,5	34,9	56,8	Calcined
6.	KSK №6	0,87	527	2,255	1,353	0,296	11,2	40	5,7	15,2	24,7	26,9	Calcined
7.	KSM–16c.	0,87	624	2,179	1,218	0,362	11,6	44,1	11,3	20,5	33,1	34,8	dry fractions. 2,5-0,5

The waste turbine oil was purified in a glass chromatographic column 1 m high, 1.5 cm in diameter. The silica gel KSK fr., Dried at 160-180 ° C, was loaded onto the column. (0.25 - 0.5 mm), filled in oil (100 ml.) And after complete saturation of the sorbent, the valve was opened and the oil flowing out by gravity (control by refractive index) was collected until clean turbine oil. It turned out 12.5 ml of the remaining oil in quality corresponded to the used oil. The cleaning results are shown in table 2.

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Table 2
Physico-chemical characteristics of the source and spent mineral oil TP-30

№	Indicators	Turbine oil	
		Source	Spent
1.	Color	yellow	light brown
2.	Transparency at 0 ° C	transparent	muddy
3.	The moisture content,% of the mass.	out	10,0
4.	Mechanical impurities,% of the mass.	0,005	0,1
5.	Density at 20 ° C, g/cm3.	0,8658	0,9253
6.	Viscosity index	90	70
7.	Corrosion on copper plates	withstands	can't stand
8.	Closed cup flash point	192	195
9.	Acid number, mg KOH / g	0,1	0,4
10.	Viscosity at 50 ° C, cSt	23,30	30,30
11.	Refractive index ($n_{д}^{20}$)	1,4820	1,4850

5. CONCLUSION

1. Based on the analysis of domestic and foreign literature, an information - patent search for work has been done.
2. The appropriate methodology for the study of the quality of petroleum oils has been selected. Along with the use of well-known classical and modern methods of analysis, new research methods are applied that were developed at the IONKh AN RUz, such as the cryoscopic method for determining the dynamic salinity and selectivity of the sorbent.
3. The used TP-30 brand turbine oil was used as an object of study, for which all physicochemical parameters were determined in accordance with GOSTs.
4. The optimal sorbent for purification of used turbine oil was chosen - KSK silica gel, which was worked out according to a special method (activated with hydrochloric acid) to increase the sorption capacity. Its dynamic oil capacity was 2.67% of the mass.
5. At an enlarged laboratory facility, the optimal conditions for the purification of used turbine oil were determined and its purification was carried out. Received 12.5% purified oil. A comparative analysis of the purified turbine oil with the original oil is made. Conducted research on the purification of used oil showed the possibility of degeneration of used oil using an adsorbent. A comparative analysis of the initial and purified by adsorption method showed that the purified oil in almost all physico-chemical parameters is not inferior to the original.

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