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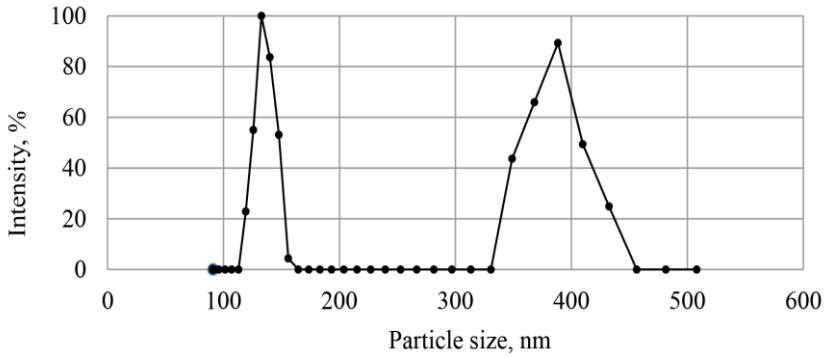

Figure 3. Graph of the particle size distribution of the dispersed phase of the spent emulsion concentrate

According to Figure 3 and Table 1, the spent coolant concentrate is a polydisperse system, the particle sizes of which are distributed in the range from 112-165 and 331-456 nm. The emulsion is not stable, the absolute value of the ξ potential is 4.3 mV.

Next, we conducted a study of the component composition of the spent coolant concentrate. The study of the mass content of fatty acids in the concentrate spent coolant brand "Isanol VPS-2" was carried out by HPLC. Two types of fatty acids, palmitic and stearic, were identified in the spent coolant concentrate. The release time of palmitic acid in the chromatogram was set at 12 minutes, and stearic acid in 18 minutes. The peak intensity was at a concentration of fatty acids of 6 mg / dm^3 from 90 to 110 mV.

The component composition of the spent coolant concentrate is presented in table 2. The content of petroleum products, solids, fatty acids and surfactants was determined as a component of the coolant concentrate.

Table 2. The component composition of the concentrate spent cutting fluid "Isanol VPS-2".

Ingredients	Concentration, mg / kg (P=0.95, n=2)	Content, % (P=0.95, n=2)
Oil products	585500	58,55
Mechanical impurities	3250	0,33
Stearic acid	30234	3,02
Palmitic acid	161456	16,14
Nonionic surfactants	147312	14,73
Water	5433	5,43
Total	1000000	100,00

From table 2 it follows that the composition of the spent emulsion concentrate has a high concentration of petroleum products of more than 58%, palmitic acid of more than 16% and nonionic surfactants of more than 14%. The water content in the concentrate is 5.4%, also in the concentrate there are mechanical impurities established by the gravimetric method, equal to 3%.

The main component in the composition of the oil-water emulsion is industrial oil. Technical requirements, acceptance rules, test methods, transportation and storage conditions, as well as industrial quality control methods for industrial oil I 20A are strictly regulated by GOST 20799-88. The most common area of application of I-20A industrial oil is its operation in various hydraulic systems of industrial equipment, construction machines, metal cutting machines, automatic lines, press lines, for lubricating light-loaded gears, medium-loaded gears, rolling and sliding guides of machines and other mechanisms for which specialty lubricants are not required. The parameters of the coolant concentrate do not comply with GOST for the content of water and solids.

Coolant concentrate Isanol VPS-2 is a flammable liquid. with a self-ignition temperature of 320 ºC. To use the spent coolant concentrate as heating oil, we consider the conditions in accordance with GOST 10585–99, which establishes requirements for the composition and properties of heating and naval fuels. According to the requirements of GOST, the spent coolant concentrate is close to fuel oil 100, type IV. So, the flash point of heating oil 100 in an open crucible is 110 ºC, and for a coolant concentrate not more

than 140 ºC. The density of fuel oil is not standardized, the mass concentration of water and mechanical impurities should be no more than 1%, the water content in the coolant concentrate does not comply with this GOST.

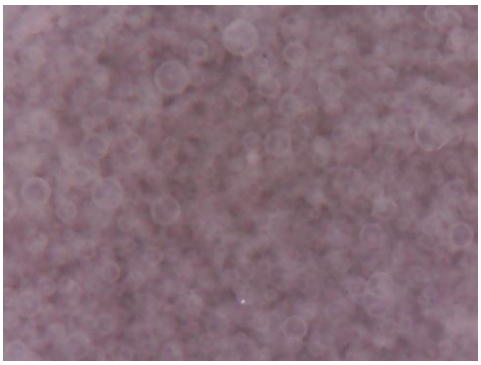

Figure 4. Optical photo of spent coolant concentrate (1000x magnification).

Figure 4 shows the presence in the concentrate of spent coolant many oil particles that are interconnected.

IV. SUMMARY

The spent 3% water-oil coolant was subjected to concentration by ultrafiltration using a dynamic membrane. The average specific membrane productivity was 10 dm^3 / m^2h, at a pressure of 0.6 MPa and under the condition of washing the membrane every 30-40 minutes of operation.

As a result of the separation of 5 dm^3 of spent coolant, 4.2 dm^3 of filtrate and 0.6 dm^3 of concentrate were formed. The concentration coefficient was 8.3 times.

The properties of the spent coolant concentrate were studied: density, hydrogen index, mineralization. The particle sizes of the dispersed phase and the value of the ζ-potential of the emulsion are established.

Using the methods of gravimetry, photometry, IR spectrometry and high performance liquid chromatography, the component composition was established. The main components of the spent coolant concentrate in order to reduce the mass content are: petroleum products, fatty acids, nonionic surfactants, water and solids.

By properties and component composition, the spent coolant concentrate is close to fuel oil of grade 100, type IV.

V. CONCLUSIONS

Thus, as a result of the studies, the possibility of using a concentrate formed as a result of membrane separation of the spent emulsion as a heating oil after removing water has been shown. The studies determined the composition and properties of the spent coolant concentrate and the parameters of the membrane concentration of the emulsion.

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