

CHANGE IN OIL QUALITY DURING PROLONGED STORAGE

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Lubricating oils have been stored in aboveground cylindrical steel tanks 2000 to 3200 m³ capacity, in the northern and intermediate climate zones.

MS-20 oil* has been stored starting in 1956 and has been shipped out after five years' storage with essentially no change in quality. MT-16 oil (additives TsIATIM-339 and AzNII-TsIATIM-1)* and MK-8 oil have been stored for five years, and DSp-11 oil (additive TsIATIM-339) has been stored for two years.

The study of oil quality change during prolonged storage has been carried out in two directions.

1. Experimental observation of oil condition for MT-16p with TsIATIM-339 and AzNII-TsIATIM-1 additives and for DSp-11 with TsIATIM-339 additive, with the aim of determining additive behavior during storage. Assuming the possibility of precipitation of additives or chemical degeneration during storage, the investigation of the oils included a study of the different layers (tank levels) as well as average samples with respect to changes in service indices. The upper-layer samples were taken from a level 200 mm below the surface of the petroleum product, and the lower-layer samples from a level 100 mm below the lower edge of the fill-issue line. The observations were made over a three-year period (1963-1965).

2. Generalization of data on the change in physical and chemical properties of oils (data for 1957-1965).

As a result of analysis of the "layer" sample and the average samples of additives-containing oils, it was established that the physical and chemical indices of various batches of the oils vary within the following limits: ash content from 0.27 to 0.29% for MT-16p oil and from 0.26 to 0.27% for DSp-11 oil; barium content from 0.15 to 0.17% for MT-16p oil and from 0.14 to 0.16% for DSp-11 oil.

The corrosivity (Pinkevich, grade S-1 lead specimens) was 4-6 g/m² for MT-16p oil and 2-3 g/m² for DSp-11 oil. The thermal-oxidative stability of the oils ranged from 39 to 55 min, engine evaporability from 48 to 60%, working fraction [unevaporated oil] from 38 to 55%, and lacquer from 0 to 3%.

As can be seen from these data, the oils have a reserve in quality on the basis of the primary physical and chemical indices.

The insignificant changes in the service properties of the oils show that the additives TsIATIM 339 and AzNII-TsIATIM-1 in the MT-16p oil and the additive TsIATIM-339 in the DSp-11 oil do not lose their effectiveness in storage and do not precipitate from the MT-16p oil over the course of five years or from the DSp-11 oil over the course of two years.

In order to define the changes in physical and chemical properties of the oils during storage, analytical results on samples taken from two terminals were generalized for five to seven years of storage in the case of MS-20, four to five years for MT-16p, and two years for DSp-11. The analyses were run at the time of receipt of the oils, each year during storage, and at the time of dispensing, including the following properties: content of solid contaminants, kinematic viscosity at 100°C, carbon residue, ash content, acid number, flash point (closed cup), density, and solidification point.

There were no significant changes in the physicochemical indices of the oils during storage. For example, in the case of the MS 20 oil, the following increases were noted: viscosity 0.5-1.0 cs, carbon residue 0.03%, ash content 0.001%, acid number 0.01 mg KOH/100 g, closed-cup flash-point 4-5°C, solidification point 1°C, and density 0.002.

*MS 20 oil is a solvent-refined aviation bright stock. MK-8 is a light acid-treated distillate used as a jet engine lubricant. MT-16p is a heavy engine oil (16 cs at 100°C) with detergent additives (3.5% TsIATIM-339 and 1% AzNII-TsIATIM-1). DSp-11 is a solvent-refined oil (11 cs at 100°C) with 3% TsIATIM-339 additive, used as a diesel engine lubricant. The two additives mentioned are both barium salts of sulfurized alkylphenols—Publisher's note.

For the MT-16 oil, the maximum increases that were noted were: viscosity 0.4 cs, ash content 0.04%, closed-cup flash point 4°C, solidification point 3°C, and density 0.002.

For the DSp-11 oil, the viscosity, ash content, and open-cup flash point did not change, and the density increased by 0.001.

MK-8 oil that was stored in a single tank from 1960 to 1965 likewise showed little change in quality indices.

As a result of these studies, it has been established that oils can be stored without appreciable change in quality as follows: MS-20 for 5-7 years, MK-8 for 5 years, MT-16p for 4-5 years, and DSp-11 for 2 years.