Table 1. Results of determining the pour point of synthetic compressor oil with additives

Characteristics	DA1 0.5 ml	DA1 1.0 ml	DA2 0.5 ml	DA2 1.0 ml
PP, °C	–52	–59	–51	–61
Δ PP, °C	↑2	↓5	↑3	↓7

Table 2. Results of determining the pour point of mineral compressor oil with additives

Characteristics	DA1 0.5 ml	DA1 1.0 ml	DA2 0.5 ml	DA2 1.0 ml
PP, °C	–28	–32	–29	–36
Δ PP, °C	↓15	↓19	↓16	↓23

Table 1 shows the results of determining the pour point (PP) of synthetic compressor oil after adding pour point depressants according to the requirements of the standard [1].

Based on the data presented in Table 1, we can conclude that when adding 0.5 ml of additive per 100 ml, the pour point of oils changes slightly. A further increase in the concentration of additives leads to an improvement in their efficiency in relation to PP (the highest decrease in the pour point was 7 °C).

Table 2 shows the results of determining the PP of mineral compressor oil after adding pour point depressants according to the requirements of the standard [1].

From the data in Table 2, we can conclude that in the case of mineral compressor oil, depressants work more efficiently. The highest change in the pour point is observed at a concentration of 1.0 ml of DA2 per 100 ml of oil (decrease in the pour point by 23 °C).

Table 3. Characteristics of compressor oil samples

Characteristics	Synthetic oil	Compressor oil
Density in 70 °C, g/cm^3	0.957	0.825
Sulfur content, mg/kg	160	0

The obtained results indicate that compressor oil composition effect on the effectiveness of depressants and that is why need to select the optimal concentration of additives.

In the case of synthetic oil, the pour point depressant worked less effectively, in the case of mineral oil, a significant effect is observed at both concentrations of the pour point depressant. This effect of the pour point depressant is due to differences in the composition of the oils (Table 3). Compressor mineral oil is lighter than synthetic, in addition, it does not contain sulfur compounds, which, being heteroatomic compounds, reduce the effectiveness of additives.

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COMPARISON OF THE EFFECTS OF N-PARAFFINS AND PETROLEUM RESINS ON EFFIECTIVENESS OF DEPRESSOR ADDITIVES

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The data presented in [1, 2] indicates an increase in the production and consumption of diesel fuel (DF) from 2017 to 2022. At the same time, the issue of increasing the production volumes of low-freezing DF for the northern and Arctic regions does not lose its relevance. From the economic and technological point of view, the most preferable way to produce low-freezing DF is the addition of depressor additives (depressors).

However, the using of depressor additives does not always allow achieving the required low-temperature properties of DF. In order to increase the effectiveness of depressants, oil alcohol-benzene resins are added to DF, which are adsorbed on the primary centers of crystallization of n-paraffin and crush them, thereby significantly reducing the crystal growth rate. In addition, heavy petroleum paraffins, being additional centers of crystallization, activate the action of depressant and thus preventing the growth of n-paraffins crystals that are part of the fuel.

The paper considers the low-temperature properties of mixture of straight-run DF with depressors, additional concentration of n-paraffins (0.10; 0.25 % by weight), as well as an additional concentration of alcohol-benzene resins (ABR) (0.0025; 0.0050 % by weight). The determination of low-temperature properties was carried out according to the methods [3–5].

According to Figure 1, the input of additional concentration of n-paraffins negatively effects on the effectiveness of depressor with respect to Cp, while improving the effectiveness with respect to CFPP and Pp. The greatest depression of CFPP is provided by the input of n-paraffin at a concentration of 0.25 % by weight (Δ CFPP = 6 °C), while the greatest depression of Pp is at a concentration of 0.10 % by weight (Δ Pp = 5 °C).

According to Figure 2, the input of additional concentration of ABR negatively effects on the effectiveness of depressor with respect to Cp, while improving the effectiveness with respect to Pp and having a dual effect with respect to CFPP. The greatest depression of Pp is provided by the input of at a concentration of 0.0050 % by weight (Δ Pp = 4 °C). The best effect on the effectiveness of depressant with respect to CFPP is provided by input of ABR at a concentration of 0.0025 % by weight (Δ CFPP = 4 °C).

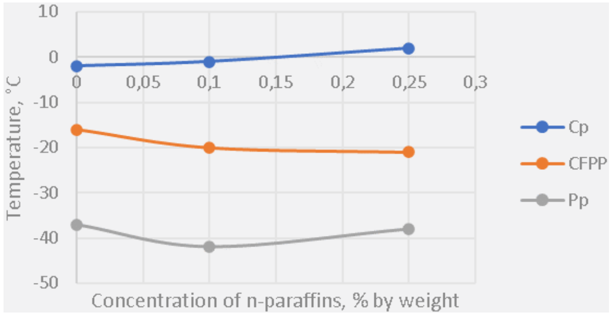

Fig. 1. *Effect of additional concentrations of n-paraffins:*

Cp – cloud point, CFPP – cold filter plugging point, Pp – pour point

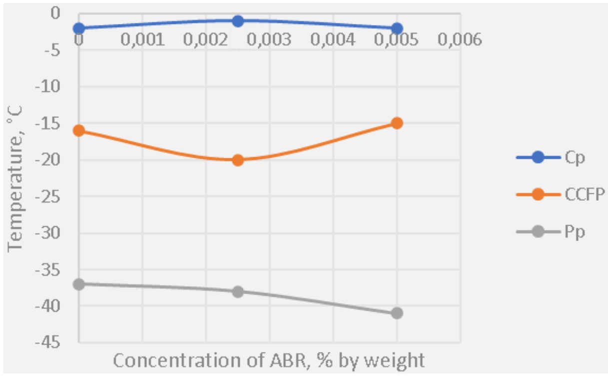

Fig. 2. *Effect of additional concentrations of ABR*

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