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COMPARISON THE EFFECT OF THE VACUUM GASOIL AND HIGH-PARAFFIN FRACTION ADDITION ON THE EFFECTIVENESS OF THE DEPRESSOR

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The active development of the Arctic and the northern territories of the Russian Federation leads to an increase in consumption and, accordingly, the need to produce diesel fuel capable of operating at low temperatures. In addition, for the smooth operation of the equipment, it is necessary that low freezing diesel fuel meets the requirements of the standard [1]. The most optimal and cost-effective way to achieve the necessary low-temperature properties of diesel fuel is the use of depressor additives.

In [2], it was found that when adding heavy components to the composition of diesel fuel with an additive, low-temperature proprties have a positive dynamic of changes.

The aim of this work is to compare the effect of the addition of vacuum gasoil and high-paraffin diesel fraction on the effectiveness of the depressor.

As samples for the study, 2 sets of diesel fuel blends with a depressor additive were used, which included a heavy component, namely a highly paraffin diesel fraction (1) and vacuum gasoil (2). The concentration of the depressor additive used was 0.6 ml per 100 ml of fuel, according to the recommendations from the manufacturer, the concentration of the heavy component was 0, 1, 3, 5 and 10 % vol.

To determine the effectiveness of adding vacuum gas oil and high-paraffin diesel fraction to blends of diesel fuel with a depressor additive, the cold filter plugging point (CFPP) was determined, according to the requirements of the standard [3]. The CFPP is strictly regulated by the standard [1].

Figure 1 shows the results of determining the CFPP of the studied samples.

According to the obtained data, it can be concluded that the addition of high-paraffin diesel fraction in concentrations of 1, 3 and 5 % vol. in the diesel fuel with a depressor additive have a positive effect. The maximum CFPP depression for the first set of diesel fuel blends with an additive is 7 °C.

Concentrations of vacuum gasoil equal to 1, 3 and 5 % vol. do not give significant changes in the low-temperature characteristic. The addition of vacuum gasoil at a concentration of 10 % vol. is impractical, since there is a deterioration of CFPP. The reason for this trend is the positive values of the CFPP of vacuum gasoil, the proportion of which in the studied blend becomes significant.

Thus, the greatest positive effect on CFPP is observed when adding a highly paraffin diesel fraction at a concentration of 5 % vol., in addition, the resulting blend, in contrast to the substandard source fuel, meet the requirements to the summer grade of diesel fuel according to CFPP [1].

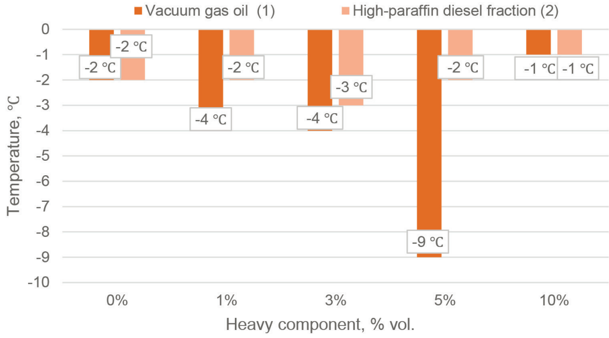

Fig. 1. *Results of the studied samples CFPP determination*

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FINNED-PLATE RADIATORS AS A PERSPECTIVE ADSORBER-HEAT EXCHANGER FOR ADSORPTION HEAT TRANSFORMATION

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Adsorption heat transformation is energy-saving technology allowing to use the energy from alternative energy sources (e. g. solar, geothermal, waste heat produced by transport and industry) [1]. The principle of the technology is the reversible sorption/desorption process. The main parts of an adsorption heat transformer are condenser, evaporator, and "adsorbent-heat exchanger" (Ad-HEx) with the adsorbent. The porous adsorbent can be dried by the energy of an alternative source. Connection of dry adsorbent with evaporator leads to cold generation. Then adsorbent can be regenerated using the same source of energy, vapour will condensate in the condenser. According to this way, different cycles of air conditioning and ice-making can be organized. For example, waste heat dissipated by the engine of a fishing vessel can provide freezing of fish [2]. The heat dissipated by the locomotive engine can support air conditioning for the driver's cab [3]. The study of various configurations of the Ad-Hex under the conditions of the working cycles of the AHT is necessary to identify the optimal geometry of the heat exchangers, which makes it possible to create the most compact AHT of interest to the consumer. One of the most promising working pairs for air conditioning adsorption cycle organization is composite LiCl/silica gel-methanol [4]. The dynamic experiments in the flat layer approximation demonstrate specific cooling power (SCP) up to 0.4–2.5 kW/kg [4]. This value of SCP seems very impressive, unfortunately, values of SCP obtained in real AHTs are much lower 0.2–0.3 kW/kg [5]. One of the most important factors affecting AHT efficiency is heat transfer in the system, which is a function of geometrical parameters of the Ad-Hex. The study of various Ad-HEx configurations under typical working conditions of the AHT cycles is aimed to identify the optimal HEx geometry, which makes it possible to select/design the most compact and efficient Ad-HEx.

Small pieces of the plate-fin core of 9 different commercial radiators were used for investigations. The geometry of the plates and fins was studied in details with use of optical microscope. Fluid-to-metal, fluid-to-fluid heat transfer coefficients, as well as the global *UA* coefficient were estimated theoretically for all 9 cores under the assumption of stabilized laminar fluid flow [6]:

$$UA = S_{pr} \bullet \left[\frac{1}{\alpha_1} + \frac{\delta_w}{\lambda_w} + \frac{1}{\alpha_2(1 + E(k-1))} \right]^{-1} \quad (1)$$

where S_{pr} – primary surface (m^2), α_1 and α_2 – heat transfer coefficients water-metal plate and metal plate-adsorbent respectively (W/(m$^2 \bullet$K)), λ_w – thermal conductivity of adHex material (W/(m$\bullet$K)), δ_w – thickness of the wall AdHex channel, (m), E – fin efficiency factor, k – the ratio of the primary and secondary surface of the AdHex to the primary surface. Experimentally the global heat transfer coefficient *UA* for small Hexes was measured using the MTD method. The performance of Ad-Hexes under the conditions of the typical adsorption cooling/heating cycles was studied with use of the thermal response method.