**Table 1.** Properties of SGC samples

| Property | SGC 1 | SGC 2 | SGC 3 |
|---|---|---|---|
| RON, points | 66.4 | 69.0 | 66.5 |
| MON, points | 63.5 | 65.7 | 63.4 |
| RVP, kPa | 74.1 | 67.2 | 58.7 |
| Density under 15 °C, kg/m³ | 678.8 | 685.4 | 685.5 |
| Benzene content, vol. % | 0.14 | 0.10 | 0.14 |

**Table 2.** Properties of zeoforming products

| Property | ZP 1 | ZP 2 | ZP 3 |
|---|---|---|---|
| RON, points | 88.4 | 86.1 | 82.6 |
| MON, points | 84.1 | 81.3 | 77.8 |
| RVP, kPa | 153.6 | 168.5 | 127.3 |
| Density under 15 °C, kg/m³ | 681.8 | 690.6 | 703.2 |
| Benzene content, % vol. | 1.14 | 1.05 | 0.93 |

0.5–1.0 mm. Zeolite was provided by "Novosibirsk chemical concentrates factory". Table 2 shows the zeoforming products (ZP) properties data.

The table 2 data shows the increasing octane number of the product in comparison with the feedstock by an average of 27 %, which sets these obtained products as promising blending components for production of various brands of passenger cars gasoline, despite of exceeding the passenger cars gasoline and slightly exceeding the benzene content, as well as low density values.

## References


1. *USS 32513-2013 Automotive fuels. Unleaded petrol. Specifications. – M.: Standardinform, 2014 – 16 p.*
2. *NCCF. [Web course]. – Website URL: http://www.nccp.ru/products/zeolite_catalysts, free. – Date of application 27.02.2022.*


# INFLUENCE OF THE N-PARAFFIN MOLECULE HYDROCARBON CHAIN LENGTH IN THE COMPOSITION OF DIESEL FUEL ON THE EFFECTIVENESS OF THE DEPRESSANT


Y. P. Morozova, I. A. Bogdanov

Linguistic advisor – researcher I. A. Bogdanov

*National Research Tomsk Polytechnic University*

*Russia, Tomsk, Lenin avenue, 30, yana_morozova@tpu.ru*


According to the Ministry of Energy in the Russian Federation, there is an increased need for the production of diesel fuel (DF) especially of winter and arctic brands. Such method of obtaining low-freezing brands of diesel fuel as the use of depressant additives makes it possible to avoid significant costs in the development of fuel and simplify the production process. It is known that the content of n-paraffin hydrocarbons in the composition of diesel fuel affects the effectiveness of the depressant additive, and to a greater extent this effect depends on the structure of hydrocarbons [1]. Thus, the aim of this work is to study the effect of the of the n-paraffin molecule hydrocarbon chain length in the composition of diesel fuel on the effectiveness of the depressant.

In the course of the work, the cold filter plugging point (CFPP) was determined for two samples of diesel fuel of various compositions (DF1 and DF2) with the depressant additive (Ad). Next, blends of diesel fuel samples with an additive and the addition of n-paraffin hydrocarbons (n PH) were prepared and CFPP was determined for them.

The representatives of n-paraffins were chosen: cetane ($C_{16}H_{34}$), heptadecan ($C_{17}H_{36}$), heneicosane ($C_{21}H_{44}$) and docosane ($C_{22}H_{46}$). Changes in CFPP of DF/Ad/n-PH blends relative to CFPP of DF/Ad blends are shown in Figures 1 and 2.

Based on Figure 1, it can be seen that the addition of small concentrations (1 and 3 % vol.) of

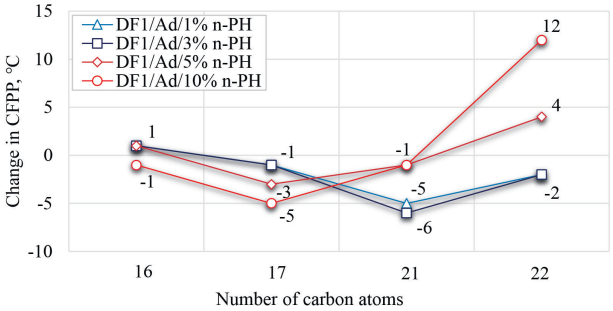


**Fig. 1.** *Changes in CFPP of DF1/Ad/n-PH blends relative to the properties of DF1/Ad blends*

heavy n-paraffins (heneicosane and docosane) has a positive effect on the effectiveness of the additive, and with the addition of 3 % vol. heneicosane to the DF1/Ad blend, the greatest positive effect was observed.

Based on Figure 2, it can be seen that with an increase in the concentration of heavier n-paraffins, the positive effect on the effectiveness of the depressant additive decreases and turns into a negative one. It is also seen that the addition of cetane in any amount has a positive effect on the effectiveness of the additive, and at a cetane concentration of 5 % vol. the greatest improvement in the efficiency of the additive is observed.

Thus, it is shown that the depressant addiive with the same addition of pure hydrocarbons to diesel fuel samples gives a different effect, which is due to the difference in the initial composition of diesel fuel samples.

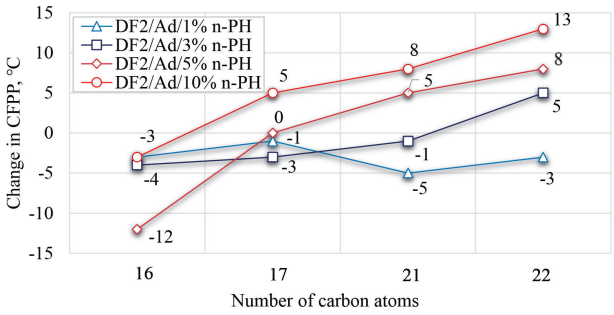


**Fig. 2.** *Changes in CFPP of DF2/Ad/n-PH blends relative to the properties of DF2/Ad blends*

## References

1. *Study of the influence of the composition of straight-run diesel fuels on the effectiveness of low-temperature additives / I. A. Bogdanov, A. A. Altynov, N. S. Belinskaya, M. V. Kirgina // Oil refining and petrochemistry. Scientific and technical achievements and best practices, 2018. – № 11. – P. 37–42. (In Russ.).*

# OBTAINING DIESEL FUELS WITH IMPROVED LOW TEMPERATURE PROPERTIES BY ADDING PETROLEUM RESINS, n-PARAFFINS AND A DEPRESSANT

A. M. Orlova
Supervisor – Associate Professor of School of Earth Sciences & Engineering M. V. Kirgina
*National Research Tomsk Polytechnic University*
*30 Lenina Avenue, Tomsk, 634050, Russia, orlovaalina41@gmail.com*

Nowadays the search for technologies and methods for obtaining diesel fuels with improved low temperature properties (DF) for regions located in the Arctic climatic zone has not lost its relevance [1]. Low-temperature characteristics, such as cloud point (Cp), Cold filter plugging point (CFPP) and pour point (Pp) of diesel fuel, mostly depend on the hydrocarbon composition of the fuel, especially on the content of long-chain alkanes (n-paraffins) having a high crystallization temperature [2]. The introduction of depressants, both synthetic (Ds) and natural (petroleum resins, Dn), allows diesel fuel to remain mobile at lower temperatures, blocking the growth of crystals during interactions with the initial crystallization centers of n-paraffins.

The research presents the results of studies of the effect of adding depressants of various nature on the low-temperature properties of the mixtures of DF and depressants (Table 1).

As can be seen from the results of the determination of low-temperature properties in Table 1, the addition of depressants of different nature leads to an improvement in cold filter plugging point (Δ16 °C and 1 °C, respectively) and pour point (Δ29 °C and 8 °C, respectively). Simultaneous addition of depressants of synthetic and natural origin gives the best result in relation to CFPP (Δ19 °C).

The effectiveness of low temperature additives is determined by the content of n-paraffins (P) in

**Table 1.** Low-temperature properties of diesel fuel with depressants mixtures

| Sample | Cp | CFPP | Pp |
|---|---|---|---|
| | °C | | |
| F | 0 | 0 | –8 |
| FDs | –2 | –16 | –37 |
| FDn | 0 | –1 | –16 |
| FDsDn | –2 | –19 | –36 |