STUDYING THE INFLUENCE OF RAW MATERIAL PROPERTIES ON CATALYTIC CRACKING INDICATORS.

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ABSTRACT. This paper investigated the effects of vacuum Gaza on catalytic cracking performance. When Catalytic Cracking of raw materials with the participation of the DA-250 catalyst, the reaction yield was good, and the properties of gasoline in the case of opaque and non-transparent were analyzed**.**

Key words: vacuumgazoil, aromatic compounds, cracking, da-250 catalyst, fraction, constant, coke, mathematical mode

Annotatsiya. Bu qog'oz katalitik yorilish bajarish vakuum G'azo ta'sirini tekshirilayotgan. DA-250 katalizatori ishtirokida xom ashyoni katalitik krekinglashda reaksiya rentabelligi yaxshi bo'ldi va shaffof va shaffof bo'lmagan hollarda benzinning xususiyatlari tahlil qilindi.

Kalit so'zlar: vakuumgazoil, aromatik birikmalar, yorilish, da-250 katalizatori, fraktsiya, doimiy, koks, matematik model

Аннотация. В данной работе исследовалось влияние вакуумного газа на эффективность каталитического крекинга. При каталитическом крекинге сырья с участием катализатора DA-250 выход реакции был хорошим, а также были проанализированы свойства бензина в случае непрозрачного и некондиционного.

Ключевые слова: вакуумный газойль, ароматические соединения, крекинг, катализатор da-250, фракция, константа, кокс, математическая модель.

Introduction

Vacuum gas oil, often abbreviated as VG or VGO, is a group of intermediate petroleum products obtained during oil refining. VGO is produced in vacuum distillation equipment, which operates at pressures well below atmospheric pressure, which allows the oil to be separated at lower temperatures, thereby minimizing thermal cracking. This separation prevents the breakdown of heavier fractions, thereby preserving their potential for further processing.

VGO is typically between 370°C and 565°C and is a complex mixture of various hydrocarbon molecules. Due to its intermediate state, VGO is not a final product, but rather a feedstock for further refining processes such as catalytic cracking, hydrocracking, and coking. These processes break down the larger molecules in VGO into smaller, more valuable products such as gasoline, diesel, jet fuel, and petrochemical feedstocks.

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Since VGO is an essential input for the production of higher-value transportation fuels, it plays a critical role in the petroleum refining industry. The quality and composition of VGO can significantly affect the efficiency and economics of the downstream conversion processes, influencing the refinery's overall output and profitability.

Literature reviyew: Several types of vacuum gasoil obtained from oil refineries were used as raw materials. Data on gasoil parameters are presented in Table 1. Raw materials 1 and raw materials 2 are characterized by a relatively high content of saturated hydrocarbons (up to 55%), the third raw material is hydrotreated vacuum gasoil, and the fourth is gasoil obtained from oil with a high content of aromatic compounds (the content of aromatic compounds in gasoil is 71% by mass.)

Table 1

Characteristics of raw materials used in cracking

Indicator name	Raw material 1	Raw material 2	Raw material 3	Raw material 4
Fraction composition was driven at T, ^{0}C				
-nk	321	310	258	319
-10%	372	355	350	385
-50%	435	415	423	458
-kk	536	510	525	577
Density at 20 °C, kg/m3	0,906	0,885	0,901	0,921
Sulfur mass, %	1,77	1,64	0,05	1,88

From the data in Table 1, it follows that the S content in raw materials 1, 2, and 4 is equal, and raw material 3 is almost sulfur-free.

Research Methodology: Initially, non-hydrotreated vacuum gas oil was cracked in the presence of DA-250 catalyst. The results of the experiments are presented in

Table 2.

Catalytic cracking of non-hydrotreated vacuum gas oil at 420 °C.

Products	Raw material No. 1				Raw material No. 2	
	After activation	1 day	2 day	Raw materials	After activation	Raw materials

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Gasoline fraction $<C_{11}$	63	55	50	45	54	46
Diesel fraction C_{11} - C_{16}	23	21	19	27	17	16
Gases + coke	10	8	6	4	15	7

The coke content does not exceed 2-4% by mass and up to 7% by mass at high cracking temperatures of 420^0 C.

The coke content does not exceed 2-4% by mass, and at a high cracking temperature of 420° C, it is 7% by mass. From the data in Table 2, the following characteristics of vacuum gasoil without activation and activation of the reaction mixture with wave irradiation can be noted:

Analysis and result: − Cracking of raw materials with the participation of the DA-250 catalyst allows obtaining a gasoline fraction of up to 45% by mass; With the storage of raw material No. 1, after the raw material was clarified, the gasoline yield increased to 63.% by weight, i.e., the gasoline yield increased by Δx = 18.% by weight. When storing the clarified vacuum gas oil for one day and cracking it, the gasoline yield decreased to 55% by weight, and after storing the vacuum gas oil for two days during cracking, the gasoline yield decreased to 50% by weight.

No. 2- has less effect on the transparency of the raw material, but the decrease in activity when cracking the raw material is the same as the first raw material.

The gasoline fraction yield for the initial and clarified feedstock and the decrease in the effect during cracking after 3 days of storage of the clarified feedstock are shown graphically in Figure 1.

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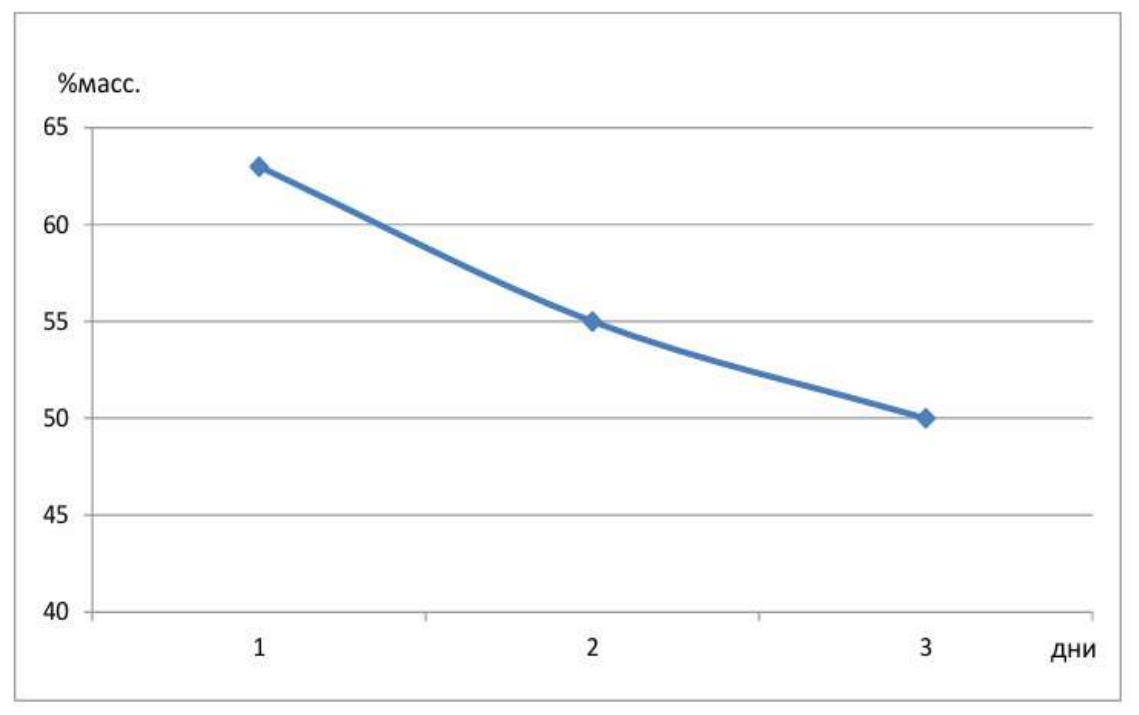


Figure 1. Dependence of gasoline fraction yield during cracking of clarified feedstock 1 on storage period of clarified feedstock.

From Figure 1, it can be noted that the activity of the clarified raw material decreases with storage time. As shown below, you can create a mathematical model taking into account the characteristics of this activity decrease.

For the presented curves, the tangent of the angle of inclination to the abscissa axis is negative, and the rate of the process of reducing the reserve of radiant energy in the raw material can be expressed by the derivative:

$$-\frac{dx}{d\tau} = f(\tau, x) \leq 0$$

The equation for catalytic processes, in which the activity of clarified raw materials decreases during storage, can be expressed in the following form:

$$-\ln(1-x)+1 = k\frac{1}{\sqrt[-3]{\tau+1}}$$

To calculate the rate constant, auxiliary table 2 is used, the data for the calculation are used from Figure 2.

Table 2

Auxiliary table for calculating the constant

T, day	-ln(1-x) +1	$\frac{1}{\sqrt[-3]{\tau+1}}$	K	
0,7	1,37	1,19	1,15	
1,0.	1,50	1,26	1,19	

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2,0	1,52	1,44	1,05	
3,0	1,54	1,7	0, 99	
			$K_{o'r}$=1,095	

From the data in Table 2, it follows that the kinetic equation we obtained corresponds to the experimental dependence of the decrease in the activity of the raw material on the time of storage of the raw material at room temperature. The mathematical model of the process can be obtained in a certain form:

$$-\ln(1-x)+1=1{,}095\frac{1}{\sqrt[-3]{\tau+1}}$$

Conclusion: This mathematical model allowed the calculation of the curve shown in Figure 1. The points in Figure 1 are experimental data. The points are satisfactorily located near the curve.

The paper presents the results on the composition of products (gasoline and diesel fractions) obtained before and after the activation of raw materials during cracking at temperatures of 420 and 500 ° C. Raw material No. 4 was selected for the experiments.

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