TOMSK POLYTECHNIC UNIVERSITY

JOINT HYDROTREATING OF DIESEL FRACTION WITH GASOLINE

Krivtsova N.I., Kotkova E.P.

RELEVANCE

Currently in the field of oil general trend is to increase the consumption of motor fuels, the crude oil consumption is reduced. Oil quality deteriorates, it is more sour and heavy on the composition of each year [1]. However, the requirements for motor fuels, stricter every year. This poses the problem of researchers to improve technology of secondary processes. The most large-capacity process is hydrotreating of diesel fuel.

PROBLEMATICS

Today this process is given special attention. To improve the efficiency of the results hydrotreating today research is being conducted to develop new formulations of the mixing process of raw materials [2]. To feed hydrotreating a middle fraction was added the lighter fractions, the products of thermal processes, oil and vegetable oil [3].

EXPERIMENT

In laboratory conditions, an experiment was conducted to study the effect of the composition of the feedstock on the degree of hydrotreatment. The experiment was conducted on a facility designed to study processes occurring under conditions of high pressure in a flow mode. The installation includes three blocks: block distribution and hydrogen feedstock, a reaction unit, a separation of the product (fig.1).

The technological scheme of the laboratory catalytic plant is shown in Figure 2.

The diesel fraction with a total sulfur content of 0.699% was used as raw material weight. and diesel fraction mixture (95, 85 and 75 vol.%) with the light gasoline fraction (5, 15 and 25 vol.%), respectively. Physicochemical characteristics of light atmospheric gas oil and gasoline fraction are presented in Table 1.

The process was carried out on a nickel-molybdenum catalyst. The properties of the catalyst are shown in Table 2.

It was established experimentally that the optimum parameters of the process are hydrotreatment of diesel fuel **the following process conditions**:

- temperature = 340 ^{0}C,
- H_2/feedstock 350/1,
- pressure = 3,5MPa,
- volumetric feed rate = 2 h^{-1}.

Raising the temperature above 340 ^{0}C has no significant impact on the composition and degree of hydrogenation of sulfur removal. When the feed space velocity (OSPS) 2 h^{-1} observed best degree of hydrotreatment.

Table 1. Physicochemical characteristics of light atmospheric gas oil and gasoline fraction

The name of indicators	Light atmospheric gas oil	Gasoline fraction
Density, kg / m^3	875	730
Fractional composition start to boil 50% end of boil	 230 350 380	 40 115 146
Viscosity, mm^2 / s	20,08	0,63
Sulfur content,% wt.	0,699	0,003
Composition of raw materials		
The content of olefinic hydrocarbons, % wt.	10,10	0,27
The content of saturated hydrocarbon, % wt.	58,38	73,14
The content of aromatic hydrocarbons,% wt.	31,53	26,59
Total	100,00	100,00

Fig. 1. Laboratory setup

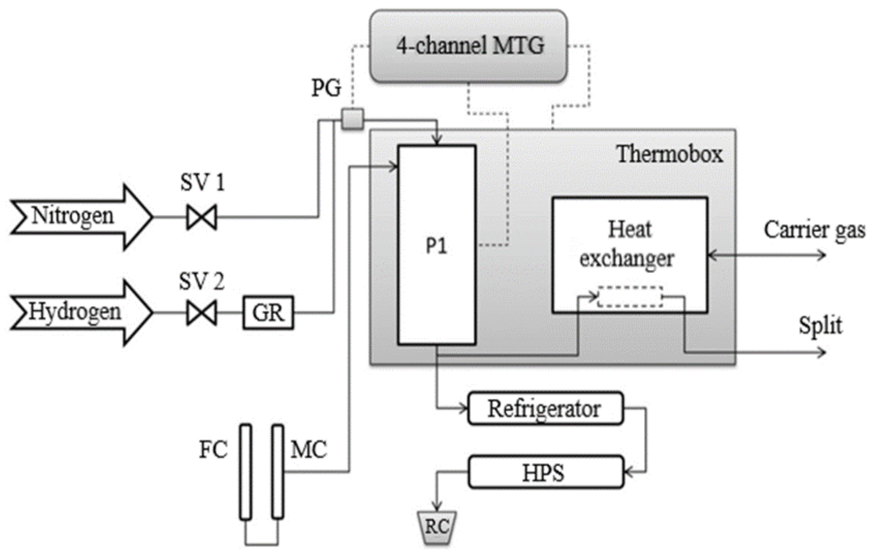

Fig. 2. Technological diagram of a laboratory catalytic installation

Table 2. Properties of the catalyst

Characteristic	Parameter
Bulk density, g/cm^3	0,55 – 0,75
Composition, %: CoO NiO MoO_3 Na_2O	 12,0 2,2 >13,0 >0,4
Carrier	Active aluminium oxide
Strength, kg/mm	>2

RESULTS AND DISCUSSION

When added to diesel fuel sulfur content of gasoline fraction and hydrogenate aromatic hydrocarbons is markedly reduced, and the proportion of saturated hydrocarbons increased. Results for hydrotreating a mixture of diesel and gasoline fractions given in Table 3.

Table 3. The results of hydrotreating a mixture of diesel and gasoline fractions (T = 340 ^{0}C, H2/feed = 350/1, P = 3,5 MPa, OSPS = 2 h^{-1}).

Mixture of fractions	The content in the initial mixture,% wt.			The content in the hydrogenate,% wt.			The degree of hydrotreatment %
	Sulfur	Saturated hydro-carbons	Aromatic hydro-carbons	Sulfur	Saturated hydro-carbons	Aromatic hydro-carbons	
100% DF	0,699	58,38	31,53	0,061	59,31	26,39	91,3
95% DF + 5% GF	0.674	65,67	34,33	0.0499	67,26	32,73	92.5
85% DF + 15% GF	0.668	68,13	31,87	0.0451	70,94	29,06	93.3
75% DF + 25% GF	0.621	70,67	29,33	0.0416	71,54	28,46	93.3

The best results were obtained by hydrotreating when added to diesel fraction is about 5%. gasoline fraction. The total sulfur content in this case is reduced from 0.061 to 0.049 wt%. Further dilution of the gasoline fraction (up to 25 vol.%) does not significantly increase the degree of hydrotreatment. The degree of sulfur removal increases by 2% during hydrotreating of mixed raw materials in comparison with hydrotreating only diesel fraction. The content of aromatic hydrocarbons increases by 4.11% wt.

REFERENCES

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