8 # 2014

IN SIGHT

Khavkin V.A., Gulyaeva L.A., Vinokurov B.V.
(ALL-Russia Research Institute of oil Refining JQC, Moscow)

Domestic hydrogenation processes at refineries in Russia

Keywords: Deep petroleum refining, ecology properties of fuels, hydrodesufurization, hydrocracking, middle distillates, petroleum residiums, vacuum distillates.

Russian refining industry in the coming years should solve two challenges:
- substantially deepen oil refining due to the development of new destructive processes of refining vacuum distillates and oil residues (with the achievement of processing depth by 2015 – 80%, 2020 – 85%);
- improve environmental and operational characteristics of motor fuels due to the wide development processes to organize the production of high-octane "green" components of gasoline, as well as secondary refining of petroleum distillates, including those obtained by destructive residue refining processes with the development of deeply purified diesel fuel; the latter should make the transition to the production of all types of motor fuels to Euro-4 standard from 2015 and Euro-5 with 2016.

Solving these problems is possible only on the basis of the radical modernization of domestic refineries (construction of new, modern installations, reconstruction of existing oil-processing plants).
Crucial role in deepening oil refining and the production of motor fuels the current level of quality should play hydrogenation processes: light distillate hydrotreating, hydrocracking of vacuum distillates, hydrogenation refining of petroleum residues.
The article presents the results of the implementation of some industrial development of VNII NP.

1. Joint gasoline hydrotreating thermal cracking and coking with straight-run diesel fuel. Process allows to reduce the sulfur content in gasoline from thermal cracking from 0.55 wt% to 5–10 ppm (by a two-stage technology). Simultaneously reduced iodine number - complete absence of unsaturated hydrocarbons. Obtained gasoline fraction is a quality raw material for catalytic reforming process. Ennobled diesel fuel requires additional hydrotreating to bring the sulfur content below 10 ppm.
2. "Mild" hydrocracking of vacuum distillates. The process allows to obtain 34–40 wt% from vacuum distillate and also ennobled raw material for a catalytic cracking process or producing oil.

"Mild" hydrocracking was done on a commercial plant at a pressure of 5.6 MPa, a temperature of 380–400°C, the LHSV 0.55–0.61 h^{-1}. On receipt of the diesel distillate containing less than 0.05 wt% sulfur. Used a two-stage technology: raw hydrotreating (I stage) and the actual hydrocracking (II stage).
The resulting diesel distillate requires further purification in order to achieve a residual content of sulfur – less than 10 ppm.

3. Catalytic dewaxing of diesel distillates. Process can significantly reduce the temperature limit of filterability of diesel distillates and thereby ensure the production of fuels suitable for use in cold and arctic climates. Catalytic dewaxing performed in an industrial plant at a pressure of 3.6–3.8 MPa, temperature of 325–350° C, the LHSV 0.77–1.20 h^{-1}. Used two-stage scheme: first – catalytic dewaxing (I stage), then – hydrotreating (II stage). The proposed technology provides a reduction of sulfur in diesel distillate to less than 10 ppm.
4. Hydrogenation of petroleum distillates with high hydrogen pressure. Process allows to obtain diesel fuel that meets modern requirements from sulfur aromatic catalytic cracking gasoils and delayed coking.

The hydrogenation is carried out at a pressure of 28 MPa, a temperature of 380–400°C, LHSV of 0.3–1.0 h^{-1}. Depending on the requirements to raw materials, producing diesel fuels for cold or temperate climate with a residual sulfur content below 10 ppm.
Thus, technologies developed by VNII NP JSC in its technical level is not inferior to the best foreign analogues. Mastering these developments will enable the refinery to raise the Russian domestic refining to a new level.

PETROLEUM PRODUCTS: TECHNOLOGY, INNOVATION, MARKET

Abbasov V.M., Ibragimova M.D., Naghiyev V.A., Movsumova P.A.,
Alizadeh A.E., Najafova G.A., Aliyev B.M.
(The Institute of Petrochemical Processes named after Yu.G. Mamedaliyev
Azerbaijan National Academy of Sciences, Baku)

Selective treatment of naphthalan oil with N-methylpyrrolidone

Keywords: naphthalan oil extraction, extract, raffinate, selective treatment.

There have been given results of studying selective treatment of Naphthalan petroleum by method of liquid extraction using N-methylpyrrolidone as an extragent. There have been studied a mass ratio of feedstock

and extragent, time of components contact and extraction temperature on yield and quality of raffinate. Optimal conditions of cleaning Naphthalan petroleum from aromatic hydrocasrbons (mass ratio extragent : feedstock – 2:1, temperature 60°C, duration of components contact – 3 h) have been determined. Determination of structural-group composition of the obtained raffinate by method of liquid chromatography showed that the contents of naphthene – paraffinic and aromatic hydrocarbons equal 94.8 and 3.6% respectively. However the residual amount of aromatic hydrocarbons in the raffinate obtained by selective treatment of Naphthalan petroleum, determined by sylphonation method, makes only 2.1% mass.

Ivanchina E.D., Ivashkina E.N., Frantsina E.V., Platonov V.V.
(National Research Tomsk Polytechnic University)
Kozlov I.A., Andreev A.B.
(Kirishinefteorgsintez Ltd.)

Choice of the Feed Composition Optimize Criteria in the linear alkyl benzene production

Keywords: dehydrogenation, Pt-catalyst, hydrocarbons, linear alkyl benzene, mathematical model.

Annual increase in demand for synthetic detergents leads to the need to increase the feedstock for the production of olefins plants. Increase in output without increasing the consumption of raw materials required to find new ways of chemical processes intensification. It is necessary to take into account a large number of technological, physical, chemical, and other factors that have a direct impact on production. The most efficient in terms of time and financial costs is to use a mathematical model that can adequately describe the entire process cycle. The authors have developed a mathematical model of the process of dehydrogenation of n-paraffins C_{10}-C_{13} to olefins can simulate operation of the reactor.

Using the developed mathematical model authors explore the effect of the concentration in the raw mix tridecane reactor to work an industrial plant for producing olefins and propose a criterion to optimize the composition of raw materials.

For three compositions of raw materials, the content of which is tridecane in 30, 40 and 50%wt, respectively, was carried out model calculations and determined the effect of concentration on tridecane operation modes, the lifetime and the degree of coking dehydrogenation catalyst with the same given output equal to 9.15% oleic wt. The results showed that with the increase of tridecane feed mixture decreases the required temperature at the reactor inlet. This is because tridecane has the highest reactivity for the dehydrogenation of hydrocarbons of C_{10}-C_{13} series. This has a positive effect on the duration of the dehydrogenation catalyst life. Thus, for the three test formulations of raw expected lifetime of the Pt-catalyst was 504, 564 and 634 days, respectively.

Calculation of the coke concentration on the dehydrogenation catalyst of various materials showed that the minimum speed of coke formation for feedstock with a maximum content component of $C_{13}H_{28}$, when the processing temperature can be maintained at 2–3°C lower than with a short-chain hydrocarbons.

The authors studied the effect of side reactions of diolefins formation at work on raw materials with different contents tridecane. The higher content of component C_{13} in the feed, the higher the concentration of diolefins in the dehydrogenation reactor products, and it has unacceptably high at 258th day of the installation. Proposed as a criterion for optimizing the composition of raw materials used in the C_{13} content of the component mixture prior to the dehydrogenation reactor within 26–34% by weight, as provided that when the olefin production by 9.7 to 10.1 wt%. while reducing coke formation on the catalyst surface and diolefins.

KHIMMOTOLOGIYA

Chudinovskikh A.L. (NAMI-HIM JSC, Moscow)
Meschcherin E.M. (NPP Kvalitet LLC, Moscow)
Bartko R.V. (State Research and Development Institute 25 of himmotologiya
of the Ministry of Defence of the Russian Federation, Moscow)

Forecasting of oils tendency to deposits formation in two-stroke gasoline engines

Keywords: motor oil, two-stroke gasoline engine, carbon caking, anti-scale properties, high-temperature oxidation.

When developing oils for two-stroke gasoline engines (DTBD) for approbation of their quality a special complex of oils qualification assessment methods (KMKO) for DTBD is used in domestic practice. It includes among others the check of washing (anti-scale) properties on a single-cylinder motor unit (OTSU). Bench tests with the OTSU are not rapid enough.

It was assumed expedient to develop a laboratory method for rapid assessment of washing (anti-scale) properties of oils and to receive results on the basis of which to forecast oils behaviour under operating conditions.

It is known that process of carbon cake formation is defined by change of oil condition during its thermooxidizing transformations and is characterised by the disperse phase content, viscosity and acidity. For

rapid forecasting of washing properties of oils for DTBD a method of high-temperature catalytic oxidation was used.
The research conducted showed that on the basis of results received by laboratory methods and corresponding calculation algorithms it is possible to predict tendency of oils towards carbon cake formation. The offered rapid approach to oils quality determination uses the chemmotologiya principle of assessment. It does not set a goal to completely exclude motor check, yet (if necessary) it gives a chance to achieve objective optimisation of oils composition, reliable samples sorting-out for subsequent motor check and development of practical recommendations on a tight timetable.

STUDYNG TOGETHER

Abridged English-Russian dictionary of Chimmotologiya terms and expressions: Q-U
The Compiler – Danilov A.M.

OIL and GAS BUSINESS

Tyukavkina O.V. (Surgut Oil and Gas Institute [branch of Tyumen State Oil and Gas University])
Tectonic division into districts and of oil and gas accumulation zones of the Jurassic material complexes of the central part of the west siberian plate
Keywords: West Siberian plate, deep faults, tectonic division into districts, collector, fatsia, layer.
In work questions of tectonics of the central part of the West Siberian plate are considered. The description of tectonic areas is given. Results of research of the Jurassic deposits and rocks of the base of a plate are given. Perspective sites for oil and gas production in the central part of the West Siberian plate are allocated. It is possible to note that rocks of the base and Yura are connected with granitoid massifs, rift zones and sites of physical and chemical destruction. For an assessment of oil-bearing capacity it is necessary to investigate examples of breeds and to carry out detailed studying of geologic-geophysical materials. Rocks of the base and Yura of the central part of the West Siberian plate are broken by cracks, gidrotermalno are changed. In zones of tectonic breaks sites of secondary transformation and change of physical properties of breeds are noted. It is connected with activity of hydrothermal processes and conditions of education and change of rocks.

HISTORY PAGES

Saifullin S.R. (BashNIPIneft LLC, RB, Ufa)
Telyashev G.G. (Institute of Petroleum Refining and Petrochemistry of the Republic of Bashkortostan, RB, Ufa)
Management structures of the Bashkortostan Republic oil refining industry. Part II. Reorganization of Management structures from the year 1945 up to nowadays
Keywords: Bashkortostan Republic oil refining industry, organizational structure, oil refining companies.
The article is devoted to the development of the control structures of oil processing in the Bashkortostan Republic from 1945 to the present. The process of origin and development of oil refining and its management is divided into 8 stages, starting with the quest for oil in the Bashkir region after the October revolution of 1917. The First three stages (1917–1944) are considered in the first part of the article [1].

CONFERENCES. SEMINARS. EXHIBITIONS

The 21 World Petroleum Congress (15–19 June, Moscow)

MATERIALS of the PETROCHEMICAL and REFINERS ASSOCIATION

Extracts of the protocol #117 of ANN board meeting of 22.01.2014 / Subject – Main results of Russian oil refining industry in 2013