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IN SIGHT

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State of the world GTL market

Keywords: GTL, Fischer-Tropsch synthesis, synthetic liquid fuels, GTL-world market, leading companies, production capacity, commercial risk, forecast for market development.

Abstract. In this study, the world market conditions for GTL market are analyzed. The current opportunities and trends of international and regional markets are observed concerning the following items: conventional GTL technologies; leading companies and producers of GTL products (especially, synthetic liquid fuels); large-scale GTL facilities (Pearl GTL and Oryx GTL in Ras Laffan, Qatar); main problems and commercial risks of large-scale GTL projects; small-scale GTL technologies and key companies (CompactGTL, Velocys); viability of GTL for the North American market; projects to develop GTL of a new generation; state of the Russian GTL market; forecast for market development (lucrative future for GTL sector or not).
The increased world demand for high quality transport fuels, a record arbitrage between liquids and gas commodity prices, the emergence of recoverable shale gas resources, and the problem on monetization of huge gas resources (many of them remote) have led to a renewed interest to GTL (gas-to-liquids) technologies. F-T GTL technologies are based on Fischer-Tropsch synthesis (F-T) that was first developed in Germany in the1920s and widely used during the Second World War in Germany and during the apartheid era in South Africa to produce synthetic liquid fuels.
The GTL technologies used to produce liquid fuels from the unconventional sources (natural and associated petroleum gases) are explained. The technologies look very different. Instead of the giant Fischer-Tropsch reactors used in large-scale plants, small-scale plants use much smaller modular reactors made up of micro-channels, where the reactions take place.
The structure of the liquid fuel market (characterizing as a competitive one) and the potential of alternative fuels in the market are discussed. As the GTL industry adapts to developments in natural gas supply, it will seek smaller and more dispersed GTL options that carry a limited capacity. Based on the analysis, it is concluded that the current optimism surrounding the GTL industry as a viable alternative to crude-derived liquid fuels in the global transport sector is overstated. As usual, the further development of GTL will first of all depend on difference between crude oil and gas prices.

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Modern base oils of Russia: plans and realities

Keywords: base oils, catalysis, reactor, PAOM, α-olefins.

Abstract. Against the backdrop of rapidly falling Russian ruble rate the issue of import substitution regarding most important and crucial goods and services becomes more actual. Such are base oils of II-IV groups, which are coming into Russia alone as such or as part of lubricating oils, imported in significant volume. The organization of production of these bases requires high-end technologies and unique equipment. Up till now there is only one operating unit of VHVI base oils generation, constructed after VNII NP technology with the use of Russian and foreign catalysts for hydroprocesses. In November 2014 the TANECO company in Nizhnekamsk brought into operation the unit for generation of base oils of II and III groups on the base of residue of fuel hydrocracking of Tatarian Devonian and Carbonic oils mix. In the same enterprise the renewal of polealphaolefin oils production is expected at the end of 2015. Currently the construction of production site for oils of II and III groups at Novokuibyshevsk Rosneft Oils and Additives plant with implementation of the technology of raffinate hydroconversion and further iso-dewaxing and hydrofinishing under license of ChevronLumusGlobal is in progress. The estimated implementation deadline for this production entity is the end of 2015 - beginning of 2016. The Angarsk Petrochemical company is also conducting the construction of a unit for generation of base oils of II and III groups under license of ExxonMobil with expected operational implementation deadline in 2017-2018. The development of hydrocracking units for vacuum gasoil and oil raffinates with further iso-dewaxing and hydrofinishing has become possible due to production of high-pressure reactors of large diameter from nickel-free hydrogen-resistant alloy steel at Izhorskiy plant. Meanwhile, further progress of oils research is required in the area of development of catalysts for hydroprocesses of generation of base oils, establishment of full-fledged production of α-olefins and back-up unit for polyalphaolefin oils, as well as significant extension of scientific researches, creation of domestic technologies of modern base oils and advanced lubricating oils on their base, testing methods for mobile machinery lubricating oils, revival of engineering education and sectoral research science.

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PETROLEUM PRODUCTS:
TECHNOLOGY, INNOVATION, MARKET

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Study of the dehydration and desalination process of heavy and high-viscosity oil of Camel field of the Astrakhan region on the crude- electric desalting plant

Keywords: heavy and high-viscosity oil, dehydration, desalination, pilot plant, technological regime, demulsifier.

Abstract. Investigated physico-chemical characteristics and the emulsion-forming ability of the Camel field oil of the Astrakhan region, Executed the selection of the demulsifier from the used demulsifiers in the industry. Carried out studies to determine the optimal parameters of the dehydration and desalination process on the crude- electric desalination pilot plant in the VNII NP: the specific performance of electric dehydrator, temperature, amount of the used wash water and demulsifier, the ratio of the oil: kerosene fraction. At the mathematical Design of experiments used a mathematical model of the third-order polynomial. Recommended 2 technological regimes for industrial crude- electric desalting plant.

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The study of the cracking products of oleic acid and mixtures of vacuum gas oil with vegetable oils

Keywords: halloysites, the catalytic cracking, oleic acid, vegetable oils.

Abstract. Requirements of modern standards on quality of obtained benzines limits the content of aromatic hydrocarbons in it no more 42% mass. (Euro-3) and 35% mass. (Euro-4 and Euro-5). Benzines obtained on catalytic cracking process of vegetable oils have a high content of aromatic hydrocarbons. Therefore investigations about involvement of vegetable types of raw materials into the obtaining processes of benzene fractions directed to obtaining of high aromatic benzene with the following compounding or to the searching of catalyst system permitting to decrease the content of aromatic hydrocarbons (as possible) in composition of obtained benzines on combined cracking of oil and vegetable raw materials mixture.
At the present work as cracking catalyst of mixture of vacuum gas-oil with vegetable oils there were investigated the industrial catalysts of cracking such as Омникат-210П (Omnikat-210P) and Цеокар-600 (Tseokar-600) per se and in mixture with natural nanotubes of halloysites.

Transformation mechanism researching of fatty acids of vegetable oils during catalytic changing them into the hydrocarbons of petrol line realized by example of model oleic acid on flow laboratory set. Investigations showed that in case of using of catalytic systems with halloysites the obtaining mechanism of aromatic compounds leaks mainly by route of hydrocarbon chain cyclization especially with participating of hydrogen atom connected with C atom in α-position with respect to carbonyl group. The results showed that adding of halloysites into the composition of catalysts leads to increasing of quantity of created olefinic hydrocarbons while simultaneous decreasing of generated benzol amount.

At the next step of researching there were investigated the process of catalytic cracking of vacuum gas-oil by involving of vegetable oils (cotton-seed, sunflower seed oils, and also the mixture of vegetable oils used in food industry) into it composition in quantity of 5% mass, temperature interval 480-520°C and mass feed rate – 22.0 h^{-1}.
Analysis of obtained data makes it possible to draw a conclusion about tendency of benzene fraction yield increasing with rising of catalytic cracking process temperature from 480°C up to 500°C. In these conditions there were revealed increasing of gas and benzene fraction yield and decreasing of heavy gas oil content. Thereby increment of benzene fraction yield on temperature 500oC in comparison with findings on clean vacuum gas oil processing composed 0.7–1.4% and maximal increasing was observed for catalyst system with halloysites. Minimal increment of benzene fraction was observed with using of waste vegetable oils mixture (with more weighting composition) for catalysts such as Omnikat-210P and Tseokar-600 (0,7-0,8% mass.). However adding of halloysites into the composition of catalyst allows increasing of benzene yield (up to 1%). Qualitative measures of benzene fractions obtained on catalytic cracking process of vacuum gas-oil mixture with waste vegetable oils practically identical to quality index of traditional benzines of catalytic cracking. However they have some weighted fractional and more aromatized hydrocarbon composition.
During investigations there were revealed the possibility to involve vegetable oil into the process of catalytic cracking. Also there were determined that adding 5% of vegetable oils into the composition of vacuum gas-oil increases the benzene fraction yield with simultaneous improvement of obtained benzines quality, both operational and ecological. Thereby adding halloysites into the composition of industry catalysts of catalytic cracking allows to decrease the content of aromatic hydrocarbons in benzene fraction composition by 1.4-1.8% mass.

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ECOLOGY and INDUSTRIAL SAFETY

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Scheme and composition of streams of formation of petroleum prodacts pot setting G-64 of JSC "ANKhK"

Keywords: refining, chemical composition of the waste oil refining, fractional composition, group composition, gas chromatography-mass spectrometry, gas-liquid chromatography.

Abstract. Petroleum pot setting G-64 of JSC "ANKhK" is formed by 12 flows of refinery, two flows of plant oils, three flows of commodity park and two flows of a chemical plant. The comprehensive study of all flows was conducted by GCMS, gas chromatography and calculation methods. Chemical, fractional, mixtures and group composition of flows has been studied. Was presents comparative characteristics hydrocarbon component. It was established that all incoming G 64-unit flows can be divided into two types: type "A" and type "B". Flows "A" type characterized by a low water content and mechanical impurities, relatively high content of alkanes and naphthenes, are easily fractionated. The fractionation graphs (experimental and calculated) correlate well with each other. This demonstrates the correctness of the chosen mathematical models and may be applied in the design of future equipment needed. Flows "B" type characterized by high water content and mechanical impurities, a relatively high content of arenes compared with alkanes and naphthenes. These flows are stable emulsions, which leads to instability fractionation. The obtained results allow us to give technological and ecological characteristics of recyclable at JSC "ANKhK" streams, to assess the contribution of each production in the formation of the oil pot, develop a set of measures to optimize the collection scheme and quality training product to G 64-unit.

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JSC "Angarsk petrochemical company")

CHEMMOTOLOGOS

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Subjective view on the past, the present and the future of chemmotologos

Keywords: methodology, development dynamics, professional skill.

Abstract. Stages of chemmotology development as a science considered. Reasons shown leading to unstable development at present, and ways of their elimination on the prospect.