ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 6, Issue 5 , May 2019

Receiving Good Petrol and Coke with Improved Environmental and Operational Characteristics with Attracting in the Raw Material Turnover of Alternative and Renewable Sources

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ABSTRACT: This scientific, experimental and analytical material presents the results of analytical and experimental studies of the production process for the metallurgical process of metallurgical coke and a science-based technology for the production of commercial gasoline with improved environmental and operational characteristics using as a raw material for coking a compound mixture and renewable hydrocarbon material and raw material resources of secondary production walking. There are a number of examples of cases where it can be used. coking cheese compound This is a mixture of the secondary origin.

KEY WORDS: petroleum coke, thermal cracking, coking i.e., residual oil, a renewable source.

I.INTRODUCTION

One of the main operational and environmental characteristics of petroleum coke is the residual sulfur content in the composition of commercial products. Currently, the delayed coking process of heavy oil residues on - remains one of the main processes in the scheme of deep oil refining. Sufficient flexibility of the process associated with the possibility of using different types of raw materials, relatively low capital and operating costs contribute to its widespread use in the world practice of oil refining.

II. METHODOLOGY

To increase the economic efficiency of the coking process, it is necessary to use a qualified approach to the production and refining of all the products obtained. This approach in solving the problem will determine the most efficient process variant coking process by increasing the amount of desired products produced by most popular on the market and having a high added value. Coke production is carried out on delayed coking units UZK . A characteristic feature of the operating conditions of the UT is the use as raw materials of various mixtures remaining at the plants as a result of oil refining. The raw materials are the heavy fractions of oil resulting from atmospheric and vacuum distillation of crude oil (fuel oils, half-tar pits, tars), cracking residues from thermal cracking of mazuts and tar oils, heavy gas oils of catalytic cracking, oil production residues (asphalt - propane tar deasphalting, extracts of phenolic oil purification, etc.). Among the main parameters that determine the quality of raw materials for coking, the most significant are density and sulfur content index .Sulfur is one of the most undesirable impurities in the composition of raw materials for coking. Depending on the mass fraction of sulfur, coke, as well as oil, is classified into low-sulfur, sulfur, high-sulfur. Sulfur cokes have less favorable properties compared to low-sulfur cokes. Currently, the main raw material for coke production is sulfurous oil. The use of technologies to produce high-quality coke, regardless of the composition of the original oil, solves many problems. Coking of crude oil is the most severe form of thermal cracking of oil residues.

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Table 1.
Raw Coke Properties

No	Indicators	Low-sulfur coke		Sulfur coke		Sour coke	
		> 25mm	<25mm	> 25mm	<25mm	> 25 mm	<25mm
one	Yield% by weight:						
1.1	Fractions	41.5	58.5	35.7	64.3	45.0	55.0
1.2	Volatile matter	8.7	10.2	6.8	9.3	6.8	7.2
2	Content% by weight						
2.1	Sulfur	0.52	0.53	1.20	1.37	4.00	4.70
2.2	Ashes	0.43	0.50	0.27	0.34	0.46	0.49
3	Mechanical strength, MPa	5.7	4.0	4.6	2.8	6.0	5.3

Coking is carried out at low pressure and a temperature of 480-560 ^{o}C, in order to obtain petroleum coke, as well as hydrocarbon gases, gasolines and kerosene-gas oil fractions. During coking, all the components of the feedstock are split with the formation of liquid distillate fractions and hydrocarbon gases; destruction and cyclization of hydrocarbons with intensive release of kerosene-gasoil fractions; condensation and polycondensation of hydrocarbons and deep compaction of high-molecular compounds with the formation of a solid coke residue. The advantages of delayed coking is a high yield of low-ash coke. From the same amount of raw material, this method can produce 1.5–1.6 times more coke than when carrying out the process according to the continuous coking scheme.

The main indicators of coke quality are true density, sulfur content, ash and microstructure. Sulfur content coke is almost always greater than in residual raw coking. Low-sulfur coke is obtained from residues of low-sulfur oils, containing, as a rule, up to 1.5 % (mass) sulfur; coke from sulfur residues usually contains 2.0 - 4.5 % of the mass. sulfur as well from high sulfur - more 4.0 % of the mass.

The raw coke obtained as a result of coking is a chemically stable and inert material, containing 88-95% carbon, 3-4% hydrogen, 1-2% nitrogen, 0.58-6% sulfur and 1-7% oxygen. Coke quality is determined by a set of parameters that depend on the quality of the feedstock and the conditions of processing e. The article discusses the tasks of forming the structure of the chemical composition and properties of petroleum coke at the technological stages of its production.

The prepared raw material is subjected to deep thermal cracking at UZK. With an increase in pressure increases the output I of coke and gases, but the total yield of liquid products of coking is reduced. This is due to the increase in the degree of pyrolysis of high-boiling fractions, which are converted into light products and coke. The quality of coke improves with increasing pressure: the content of asphaltenes and metallic impurities decreases. Most USO intended to maximize the yield of liquid products and, accordingly, the designing were at the lowest possible pressure. The coking temperature determines the volatile matter content of the raw coke. High coking temperature leads to a decrease in the content of volatile substances and an increase in the strength of the coke cake. Typically, the coking time takes from 12 to 24 hours. The duration of coking is determined by the overall performance of the refinery. Reducing the coking time at the request of the main technology leads to an increase in the content of volatile substances in green coke, a decrease in density and an increase in the porosity of the calcined coke. This especially affects the quality of coke, which is located in the upper layer of the reactor. Since an increase in coking temperature contributes to a decrease in the content of volatile substances, a reduction in time can be compensated for by an increase in temperature.

An important technological characteristic is the reactivity of coke. At high temperatures, carbon interacts with oxygen and carbon dioxide: $C + O_2 = CO_2$, (2) $C + CO_2 = 2CO$ (3) .

Different methods are used to assess the reactivity of carbon materials. The reactivity of coke is determined by catalytic impurities, the most important of which are sulfur, sodium and vanadium. Sodium is a universal catalytic impurity, it increases the reactivity of coke in carbon dioxide and in the air. Vanadium catalyzes the air oxidation reaction. Strict requirements for sulfur content are associated with the requirements for the environment, as well as the peculiarities of the technological process.

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During the coking of sulfur oil residues, a coking additive with high sulfur content is formed, which subsequently goes into metallurgical coke and, as a result, adversely affects the quality of cast iron (viscosity increases, deterioration of molds), as well as the quality of steel produced during the conversion of sulfur cast iron (steel becomes reddish). To neutralize the negative effects of organic sulfur contained in the metallurgical coke used in the blast furnace, fluxes are added to the charge in the process of smelting pig iron: oxides of calcium and magnesium, which, interacting with sulfur contained in the metallurgical coke, convert it into inorganic the form of the reaction: CaO + S + C - CaS + CO slag and displayed in the form of slag. Moreover, the higher the sulfur content in the metallurgical coke, the greater the amount of flux should be added to the mixture, since it is advisable to carry out the desulfurization process with an excess of calcium oxide in the slag. And the need to introduce a large amount of flux in the smelting of cast iron overloads the blast furnace, reducing the performance of the cast iron.

As can be seen, from the analysis of the technological process, the quality indicators of metallurgical coke do not fully meet the requirements. Reduction of work containing n s sulfur metallurgical coke did not give the desired results, which stimulated to study the desulfurization is, not of raw coking, and combine technological processes chemical method desulfurization raw material in the coking process, which gave a positive results on beam ennyh within the laboratory experimental studies.

In order to combine the process delayed coker residual oil feedstock, which occurs in a scheme works FNPZ for conducting coking of petroleum residues process author s applied compound feed e, consisting of its wood residue mixture (10 - 50 wt.%), Residual oil (30 - 80% by weight) and powder of waste automobile tires (10 wt%) and in the second case, the author s applied compound feed mixture, consisting of wood material Separated mixture and the residual oil in equal proportions... The results of the analysis on the content of residual sulfur showed that, in contrast to the initial monocomponent raw material, 5.02% of the mass occurred in the coking product . sulfur compounds, in the first experimental variant the content of residual sulfur was 0.22% by weight , and in the second compound - raw variant was 0.39% by weight . That speaks catalytic properties of m of the iron oxide from the oxidation, having ee third component in the compounding.

The desulfurization mechanism occurs due to the steam reforming of sulfur in the coking process. It is known that up to 375 - 450 °C in the reactor Protek w t gasification reaction and thermal dehydrogenation of hydrocarbon molecules. Under normal conditions, coking, when have been applied monocomponent raw materials, the exposed after the dehydrogenation in the structure of the hydrocarbon molecules of carbon and sulfur are mutually contacted and images yv Ali S_2 - gray carbon, further removal of which th was connected to a temperature increase of marketable products calcination to 2500 ^{o}C, that in the process of regulation limited camping to 1300 °C, that was not enough to provide a complete thermal desulfurization.

In the case of raw material compound, consisting of its residues of wood-based material and waste automobile tires to achieve a temperature in the reaction zones is, 375 - 450 °C causes thermal decomposition of wood material components with dehydration e d uniformly throughout. Thus educating s evaporate water molecules in the presence of catalytic properties of iron oxide and found in waste automobile tires powdersoccurs steam conversion of carbon and sulfur, which is removed as a result of sulfur as SO_2 and H_2S. The residual iron content in the course of inventory of the product and - the production of coke and metallurgical coke has no adverse effects. In operation, - reducing the iron on the contrary increases the yield of metallic iron by the reduction including iron having Gosia consisting of metallurgical coke.

The pyrocondensate is sent for co-processing with a traditional hydrocarbon fraction. In the process of dry distillation of wood material, a mixture of hydrocarbons with their oxygenates is formed , such as CH_3OH; C_2H_5OH; CH_3 COOH; HCOOH and others that they will et the place and composed pyrocondensate. In Scheme upgrading of gasoline fractions in existing technologies light naphtha with a boiling interval - 40 - 78 °C without secondary processing octane 56-65 by IM is sent to the commodity department where CME Shiva with heavy naphtha, leaving the e nd of the reformer octane 103-105 in number according to IM, before obtaining commercial quality , like AI-80, AI-91 and others.

It should be noted that in the fractions boiling Interval -40 - 78 °C will have s location methanol (bp - 63 °C), and ethanol (bp - 78 °C), and the remaining chemical aggressive oxygenates as formic acid (bp - 101 °C)' acetic acid

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 6, Issue 5 , May 2019

(bp - 107 °C) remain as part of the heavy naphtha passing recycle like alkalization, hydrotreating and (hydrotreating) and a reformer, where these products are moving only in a chemically non-aggressive thhydrocarbyl formula and will not pose an operational hazard. In addition, in connection with the WHO ban on the production of leaded gasoline worldwide conducted research on successful the replacement of the universal additive, which limited the use of recommendation I oxygenate as an additive enabling full e e combustion of hydrocarbon fuels and in a closed system. Unlike as described in our case combined process for producing metallurgical coke with improved environmental and operating parameters of production and gasoline fractions's compound origin with the presence in the composition of additives, consisting x of oxygenates, improving x their ecological and operational parameters with response requirements and the present compound raw materials consisting of a mixture of traditional and renewable raw materials in the form of residualwood and (agricultural residues) materials. In addition, depending on the amount of the second component in the composition of the initial compound of the raw material, the gross volume of the pyrocondensate increases without additional energy and operating costs, which affects the increase in the yield of gasoline fractions.

Given the interest s metallurgical industry, the implementation of the process administration mode of the compound I in Scheme raw petroleum coke production is a challenging and important. It does not require a change in the technological mode of operation of the plant for the production of coke. The use of compound materials without requiring e r i change in the technological regime against raw materials.

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