

In Order to Produce Low-Viscosity Deasphalted Hydrocarbon Feedstock and Asphalt Binders from Natural Bitumen

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Abstract

The peculiarities of the composition of natural hydrocarbon from Russia deposits bring about to more process and transportation issues thanks to necessity of construction of process units on the brink of their production areas. So as to unravel this drawback, a technique of pretreatment of natural hydrocarbon was planned; as a result, potential asphalt binders and low-viscosity deasphalted oil appropriate for transportation to refineries square measure created. Supported experimental information, the optimum conditions for the method was hand-picked. It had been suggested to hold out the primary stage of crude preparation, particularly thermo-mechanical dehydration of hydrocarbon, with Associate in nursing end-point for distillation of a 100°C and 50°C. This resolved the matter of stable water-hydrocarbon emulsions and more dewatering of hydrocarbon, and excluded the chance of destruction reactions leading to additional unstable organic compound compounds. At consequent stage, it had been planned to hold out the method of deasphalting of hydrocarbon with dissolvent at a solvent: crude quantitative relation of 3:1. Therefore, production of deasphalted oil, with consistency on the brink of that of natural oil, and asphalt, as a feedstock for the assembly of universal road hydrocarbon, meant for each summer and winter in operation conditions.

Keywords: Extractive deasphalting; Asphalt binders; Natural hydrocarbon; Deasphalted oil; Acetone

Introduction

Currently, oil remains one among the most resources within the world, accounting for quite half-hour of the full energy consumption. The identified world oil reserves in 2019 faded by 0.1% compared to 2018 and amounted to 1733.9 billion barrels. The most important tested oil reserves square measure possessed by such countries as Venezuela – 17.5%, Asian country – 17.2%, Canada – 9.8%, Iran – 9.0% and Al-Iraq – 8.4%. As for the Russia, the tested oil reserves quantity to roughly half-dozen 0.2% of the world and reach 107.2 billion barrels [1]. However, the depletion of standard organic compound reserves outlined the requirement for the event of other fuel unconventional resources of organic compound raw materials, which, in contrast to lightweight oils, square measure characterised by high consistency, density, high coking capability thanks to Associate in nursing enlarged content of resin-asphaltene compounds. At identical time, they gift vast potential resources for the fuel and energy complicated. Canada is on the primary place within the world ranking of significant and hydrocarbon oil reserves, that square measure calculable at 1.7 trillion barrels and square measure situated in the main in 3 fields – Athabasca, Cold Lake and Peace watercourse [2]. Venezuela conjointly possesses one among the most important significant oil fields within the world. However, despite the very fact that forty six billion heaps of oil belongs to Venezuela, the country is in tenth place in terms of production volume, 2.5 million barrels daily. In terms of tested reserves of significant oil, Russia ranks third within the world. The reserves of significant oil within the Russia square measure 182 billion barrels, and natural hydrocarbon -347 billion barrels. Resources of Russia square measure focused in the main within the Volga-Ural, Dnieper-Pripyat, Caspian and Timan-Pechora oil and gas provinces. Despite the most important deposits, industrial development of reserves in Russia is continuing at a slow rate, in contrast to in Canada, wherever natural hydrocarbon has been obtained and processed for quite thirty years [3]. process of hydrocarbon sandstones in Canada is concentrated in the main on the assembly of artificial oil. Its properties and structure square measure on the brink of that of sunshine oil that makes ancient

process potential. One among the most important firms specializing within the production of artificial oil in Canada is Suncor Energy. The corporate annually processes quite sixty million heaps of hydrocarbons [4]. However, it'll not be potential to adopt and apply the expertise of foreign firms within the fields of Russia. The deposits of Russia, specifically of Tatarstan, square measure territorially scattered and also the construction of huge units for the process of significant crude are resource- and energy-consuming. For the rational process of natural hydrocarbon, various schemes are developed, targeted in the main on the extraction of asphalt. At identical time, these technologies ought to be aimed toward increasing the yield of sunshine fractions as potential oil processing feedstock. One among the promising technologies, that permits more process and transportation of natural hydrocarbon, relies on solvent treatment, i.e. deasphalting by extraction. in contrast to classical forms of deasphalting (LEDA, ROSE, DEMEX), wherever fuel, alkane or gas square measure used as solvents, the planned technique uses Associate in Nursing oxygen-containing element – dissolvent as a solvent. It's a special dissolving capability in regard to oil, which makes it potential to separate the crude with high property [5-6]. However, the method of deasphalting with dissolvent is poorly understood. Mainly, dissolvent is employed together with different solvents, eg. For extraction of Athabasca hydrocarbon, and its impact and potency in deasphalting is small investigated. So as to optimize the method, at intervals the framework of this study, the impact of varied factors

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(separating lightweight fractions supported the utmost distillation temperature, solvent to crude ratio) on the standard of asphalt grade obtained was investigated and more application risk determined [7].

Materials

The main object of analysis is getting the acceptable conditions for manufacturing mineral materials to be used in building in Russia from the natural hydrocarbon of Ashalchinsky deposit in Tatarstan, chemical science characteristics of that were given antecedently. Throughout production by SAGD technique, formation of extremely stable water-hydrocarbon emulsions is ascertained, therefore it's necessary to hold preliminary crude dehydration before its consequent process [8].

Methods

Within the framework of this study, hydrocarbon was subjected to thermo-mechanical stirring, as a results of that the method of evaporation of water and light-weight organic compound fractions proceeded stably. The end-point for region distillation varied over a good vary of 150–370 °C, heating rate was 1–5° per min, admixture rate– 100–200 revolutions per minute. Then extractive deasphalting of hydrocarbon with dissolvent at numerous solvent: crude quantitative relation (3:1–4:1), temperature 55°C was carried in an exceedingly flask for 30min. below these conditions, resin-asphaltene substances won't dissolve within the solvent, however can precipitate as Associate in Nursing asphalt part [9]. The use of this solvent was even by the subsequent factors: the boiling purpose of the solvent at air pressure is 56°C; the solvent is well regenerated from asphalt and deasphalted solutions; there's a high distinction within the boiling points of the solvent and distillation merchandise (more than 50°C); the solvent contains a totally different dissolving capability in regard to parts of the crude; the solvent is out there and non-toxic. Subsequently, once subsiding for 2h at 55°C, the formation of 2 layers was ascertained. The higher layer (deasphalted material) in the main consisted of dissolvent and dissolved hydrocarbons and a little quantity of resins, the lower layer (asphalt solution) consisted of asphaltenes, resins and a little quantity of solvent. The highest layer was poured into a clean flask. Regeneration of the solvent from deasphalted and asphalt solutions were applied by distillation and drying at temperatures no more than 120°C so as to avoid thermal decomposition of merchandise [10].

Discussions

The key issue that determines the standard of asphalt and its more use for road pavement is that the penetration depth of the needle. This indicator characterizes the steadiness of hydrocarbon at intervals numerous external factors, for instance, warmth gradients (heat resistance), and is standardized in most International standards (ASTM D946, AASHTO M 20, EN 12591). The penetration depth of the needle into the hydrocarbon depends on temperature and chemical composition of the merchandise. It's obvious that because the distillation depth will increase, in general, a rise within the penetration depth is ascertained [11]. This means the prevalence of destruction reactions of high mass resin-asphaltene substances with the formation of lower mass homologues. Because the temperature rises to 200°C, a small increase within the penetration depth of the needle happens. Later on, because the end-point for distillation rises, the ensuing hydrocarbon becomes tougher, the relative content of asphaltenes will increase, and, consequently, the penetration depth of the needle slightly decreases. a pointy increase within the worth is ascertained for all samples at 300°C, that indicates a major destruction of resin-asphaltene compounds below these conditions [12–14].

Conclusion

A diagram for natural hydrocarbon preparation in field conditions with the assembly of deasphalted oil and asphalt was shown. Supported the experimental information, optimum conditions for the method were hand-picked. The primary stage of the feedstock preparation, particularly thermo-mechanical dehydration of hydrocarbon, was suggested to be applied with end-point distillation of a hundred and 50°C, that provided consequent breaking of extremely stable water-hydrocarbon emulsions and dehydration of the feedstock, whereas excluding the chance of destruction reactions with the formation of additional unstable hydrocarbons. Because the next stage deasphalting with dissolvent in field conditions was planned. Solvent: crude quantitative relation 3:1 was tested to be optimum. At this solvent quantitative relation, the formation of deasphalted oil was ascertained; its consistency was love the consistency of natural oil, so transportation to industrial plant drawback was resolved. The asphalt obtained by extractive deasphalting was conjointly suggested as a possible stuff for getting universal road hydrocarbon meant for each summer and winter in operation conditions. Thus, the planned method of natural hydrocarbon process has the prospects for wide industrial development [15].

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