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Synthetic Crude Oil Preparations and Simulation of the Industrial Distillation of Crude Oil in the Laboratory.

Falade A.A[1], Rotimi, I.A*,OSO O.O[1]and Oke, O.O [1]
[1,]*Dept of Minerals and Petroleum Engineering, Federal Polytechnic, Ado Ekiti.*
*Department of Mineral & Petroleum Engineering, Federal Polytechnic, Ado Ekiti

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ABSTRACT: Synthetic Crude oil Preparation by laboratory means is necessary as process description analysis is concerned. This is deemed fit as the conventional crude oil is carcinogenic as regards usage in the laboratory. This crude oil alternative(Synthetic crude) is produced from proportions of liquid paraffin, paraffin oil, white spirit,4ml petroleum ether subjected at two various temperature conditions(80^0C&100^0C)and 6ml of petroleum ether at 60^0C. This article presents results of the various fractions of crude oil alternatives(synthetic crude) generated when distillation takes place. It is an approach to simulate the industrial fractional distillation of crude oil. The results from laboratory procedure from distillation process shows four fractions obtained ;product A derived at room temperature, product B derived at (100-150^{0}C),Product C derived at (150-200^{0}C)and Product D derived at (200-250^{0}C).The Four fractions were tested for viscosity, colour, smell and flammability. This article analyzes understanding how we obtain chemicals from Crude Oil.

Keywords: Chemicals, Crude Oil, Distillation, Fractions, Laboratory and Synthetic Crude.

I. INTRODUCTION

One of the First pieces of Industrial distillation designed for oil and gas production is the FRACTIONAL DISTILLATION COLUMN is a top temperature column that allows complete vaporization of overhead product and the bottom temperature is the bubble point temperature of the bottom liquid and it controls the quality of the bottom product. The fractional distillation column is set up with the heat source at the bottom on the still pot. Fractional distillation is the most common form of separation technology used in petroleum refineries and petrochemical plants. The simulation model of this work mimic the industrial crude distillation as it collects the various products at a predetermined temperature: room temperature, 100-150^{0}C,150-200^{0}C and 200-250^{0}C. This experiment forms an important part of understanding how we obtain chemicals from crude oil.Simulation apparatus to mimic the industrial industrial fractional distillation of crude oil(laboratory means) is an apparatus, specialized glass material or similar petroleum processing device, usually used in laboratories, used to obtain fractions of chemicals from synthetic crude oil prepared by fractionating means. This apparatus were developed to understand the process description of the distillation process. Simulation methods for distillation columns are divided into three categories/methods according to the assumptions made on the development of the model as(Jelinet and Hlavecek(1975); Gani et al.,(1986): approximate, equilibrium and the based methods.The Equilibrium based methods are the most commonly used method and is based on the equilibrium assumption between leaving vapour and liquid flows for each stage (Ramosh, et al, 2007). No matter the method used, the model equations that describe multi component separation processes are non linear and inter dependent(Abdullah et al.,2007 with solutions that are iterative). Simulation is presently a mature well tested technology and it is widely used for a variety of purposes, including design, control, test, optimization and integration of process plants(Denn et al., 2004).To establish the simulation, both the operating variables(input specifications) and the definition of the mixture(characterization) have to be specified first(leelavanichkul et al., 2014; ekert and vanek, 2005). Simulation is widely used in petrochemical industry. Many models have been proposed in the past for predicting wax precipitation(lira-Galena and Firoozabadi., 1996; casavant and cote, 2004; pan et al., 2009). Chryssolouris et al.(2005) have proposed a simulation –based approach to the

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refinery operation which addressed primarily the scheduling of a refinery importing various types of crude oil.Robertson et al(2011) suggested a multi level simulation approach for the crude oil loading/ unloading scheduling problem, they have used the non linear simulation model for the process limits to find optimized refining costs and revenue for a blend of two crudes.Falla et al(2006) have proposed a methodology for the estimation of the SimDis(Simulated Distillation) properties of crude petroleum based on Near Infrared(NIR) spectroscopy.

II. METHODS AND MATERIALS

Procedure to produce 1000ml of synthetic crude oil;Materials required: 200ml measuring tube, Paraffin liquid(Medicinal), Paraffin oil(Kerosene), White Spirit, 80ml of petroleum ether(105-125^{0}C), 80ml of petroleum ether(85-105^{0}C) and 120ml of petroleum ether(65-85^{0}C).Procedure to produce the artificial crude; Mix together 100ml of liquid paraffin(Medicinal), 400ml of paraffin oil(Kerosene), 220ml of white spirit, 80ml of petroleum ether(105-125^{0}C), 80ml of petroleum ether(85-105^{0}C) and 120ml of petroleum ether(65-85^{0}C).Add a squeeze of oil plant from a tube and stir well. After adding to a labelled bottle, shake the mixture well. Thereafter, label the container HIGHLY FLAMMABLE and HARMFUL

Precaution: Always shake the mixture well before use.

Simulation of the distillation of the synthetic crude oil requires the use of the following resources: Eye protection, Bunsen burner, Heat resistant materials, side arm hard glass, test tube, bent delivery tube and rubber connecting tubing, small sample tubes(40mm×10mm) minimum size, thermometer(0-360^{0}C) with core to fit side arm test tube, teat pipette, beaker(100cm3), hard glass(borosilicate) with glass mineral fibre and the synthetic crude.

Practical Note:

The use of side arm boiling tubes produce consistent result than boiling tubes fitted with bungs with two holes, one for a thermometer and the other for a delivery tube.

The addition of a low boiling point fraction(chloroform or cyclohexane) obtaining something below 70^{0}C.

Actual crude oil contains more than 0.1% benzene, which is carcinogenic. Therefore its utility is not accepted in schools.

Experimental Procedure: Place about 4cm3 depth of mineral fibre in the bottom side arm test tube. Add about 4cm3 of synthetic crude oil to this using the teat pipette or droppers. Set up the apparatus as shown below; with one additional beaker of cold water around the collecting tube. Ensure the bulb of the thermometer should be level with the side arm. Gently apply heat to the bottom of the side arm test tube with a minimum level Bunsen flame. Watch the thermometer when the temperature reach 100^{0}C, carefully replace the collection with another empty side arm. Collect three further fractions to give the fractions as follows on the following temperature variation:

i)Room temperature-100^{0}C
ii)100-150^{0}C
iii)150-200^{0}C
iv)200-250^{0}C
Test the four fractions for
i)Viscosity(i.e how easily a fluid flows or pour or the resistance of a fluid to flow).
ii)Smell: Gently through the air smell towards you with your hand.
iii)Flammability: Pour onto a hard hard glass(borosilicate) and light the fraction with a burning splint.
iv)Colour: Observe the colour of the fractions.

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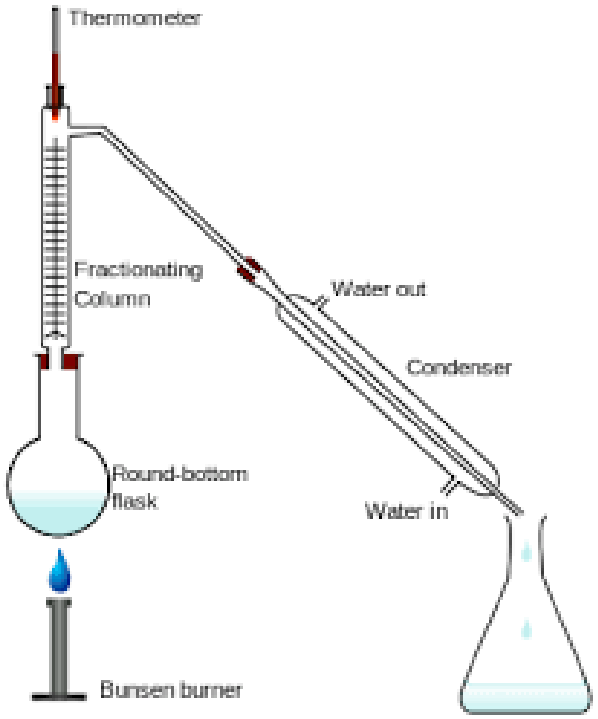

Fig1: Diagram of a typical laboratory simulation ditillation of Reservoir rock Oil.

III. RESULTS:

A residue deposits observed in the side arm test tube.

Table1: Results showing Viscosity, Flammability, Colour and Smell

S/N	Chemical Product Obtained from Crude	Viscosity of Product Obtained(sec)	Flammability	Colour	Smell
1	Product A	15	Easily Ignited	Grey	Fairly Pleasant
2	Product B	21	Normal Combustibility	Ash	Odious
3	Product C	25	Difficult to Ignite	Black	Sweet Sour
4	Product D	34	95% Non Combustible	Deep Black	Sweet

IV. OBSERVATION:

The fractions increase in viscosity with boiling temperature and become more coloured as the temperature increases. The samples become increasingly difficult to burn and burn with increasingly smoky flames.

V. CONCLUSION:

This technical process explained an important part of understanding how we obtain Chemicals from crude oil.

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