Abstract

The present study focuses on the new technology for the isomerization of light naphtha used in Al-Daura refinery including the major guidelines (principals of the process, mechanism of the process, catalyst used, major elements of the unit, process variables), A kinetic model was derived for the prediction of the reaction kinetics of the isomerization reactions (the reaction rate constants K_1 and K_2 and activation energy E_a) by using five different operating temperatures (120,135,150,165,180^{o}C).

Paraffin $\xrightarrow{k_1}$ olefin $\xrightarrow{k_2}$ iso-paraffin

$$K_1 = \frac{F_A{}^o}{VC_A{}^o}\left[\ln\frac{1}{1-X}(1+\varepsilon)-\varepsilon X\right]\frac{T}{T_o}$$

$$C_{iso} = C_A{}^o\left[1-\exp^{(-K_1 t)}-\frac{K_1}{K_2-K_1}\left[\exp^{(-K_1 t)}-\exp^{(-K_2 t)}\right]\right]$$

And using Arrhenius equation for determination of activation energy E_a

$$\ln K_1 = \ln K_o - \frac{E_a}{RT}$$

Abstract

The five mentioned operating temperatures were applied in the kinetic model in the range of activation of the used catalyst (pt/Al_2O_3-Cl), a mass balance calculations was done on the unit for kinetics prediction purpose, the results of the model show that the values of the activation energy were relatively small indicating that the reactions were towards the formation of isomers, and that k_1 values proportional directly with the temperature.

$$E_a \text{ of } nC_6 < E_a \text{ of } nC_5 < E_a \text{ of CH}$$
$$(1525.74) \quad (2738.82) \quad (2880.394)$$

Also the present study show that the effect of blending different isomerate portions (10, 20, 30, 40, 50 %vol.) with the prepared gasoline pool on the final octane number of the final gasoline pool and comparing the gasoline pool (with the mentioned isomerate portions) with different gasoline kinds, such as premium gasoline and leaded gasoline according to the values of research octane number (RON).