

https://dspace.org/

Modelling and simulation of modular refinery for production of fuels with low environmental pollution

Ngwanza, Mbinzi Kita Deddy

2020-05
https://hdl.handle.net/10539/30081

Downloaded from a DSpace repository. https://dspace.org/

Abstract

Production and upgrading of fuels and petrochemicals, used worldwide, are based on a type of refinery (characteristics, capacity), market, consumption demands, and development of engine technology. Although the composition of crude oil differs by origin, the key operations (units) performed are same. Crude oil distillation, cracking and reforming constitute the operations' key in oil refineries to produce useful product. Each process has attracted more researches since the discovery of method separating crude oil cuts. The complexed operations that occur in the production of fuels' and their impact on environment are reflected, paving the way for many additional researches.

Industrial processes cover a wide range of operations that deal with solids, liquids and gases as feeding process or product. This requires a contribution from Chemical Engineering science to solve any problem occurs during the operations. Modelling and simulation are tools that are combined or useful on their own to solve real-life troubleshooting situations, and/or upgrade researches. These can bring great advantages to the industrial process.

Due to the need of upgrading petroleum refining products, this research aimed to develop models and simulate the main refining units. Design data based on the characteristics of crude oil, operating parameters of the involved units, and other essential data were calculated and collected, and then entered into the Aspen Plus simulation software to generate the modular refinery model. The results of the full simulation were studied and allowed to obtain the composition of different products and to determine conditions of petroleum products. This study shows that it is definitely possible to predict impact of sulphur on environment. Different information on the modular refinery in this study were obtained and used for the simulation. Simulation was performed using data such as the number of trays (24), a reflux of 0.61, total catalyst flowrate of 6.92 m^3/h, 36.42 m^3/h and 44.01 m^3/h respectively for the hydrotreater, the reformer and the cracker; and the composition of distillate, the bottom and the feed rate for paraffins, naphtenes and aromatics.