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Simulation of Fluid Catalytic Cracking Unit for Optimum Production of Gasoline Using Aspen HYSYS

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ABSTRACT

This study presents the steady-state behavior of the Fluid Catalytic Cracking of Vacuum Gas Oil in an existing industrial Unit. The riser and regenerator reactors, coupled with the main fractionator, were simulated using Aspen HYSYS software with a 21-lump kinetic model that accounts for catalytic cracking kinetics and heat balance within the unit. Model predictions for the product species showed good agreement with the industrial plant data at the same operating conditions, with a percentage deviation ranging from 1.13% to 16.85%. Simulation results indicate that the Riser Outlet Temperature (ROT) and feed flow rate have significant effects on the performance of the riser and regenerator reactors. Sensitivity analysis performed on the reactor gave the following optimum values: To increase the total yield of Gasoline and Diesel, an ROT within the interval of 510-515°C should be selected; for an increase in the total yield of Gasoline and LPG, an ROT in the range 524-535°C is recommended; An ROT of 530°C should be used when increasing unit throughput to maximize gasoline output.

Introduction

Refineries remain competitive in present markets due to the Fluid Catalytic Cracking (FCC) Unit, which industry professionals refer to as the 'Heart of a Refinery.' This unit demonstrates direct importance for profitability, as it enables refineries to remain competitive in terms of both economic conditions and environmental standards [1]. Due to its diverse capabilities, the unit has been recognized as an efficient and economical conversion process in refineries; therefore, it will continue to fulfill its critical function in meeting reformulated fuel needs [1]. The gasoline production pool receives its primary source from the FCC unit, which also provides feed materials and a light olefins supply to the petrochemical industry [2]. The plant requires optimal operation to prevent equipment failures, as it plays a direct role in creating the refinery’s unreliable operational conditions [3].

The Organization of the Petroleum Exporting Countries (OPEC), in conjunction with the International Energy Agency (IEA), anticipates global oil demand to rise by 12% and 8%,

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respectively, from 2021 to 2030 [4]. Examining these projections reveals that fuel consumption is expected to continue growing steadily into the future, indicating that Nigeria should strategically restart its refining operations to effectively utilize its crude oil resources. Stanley Macebuh, President of the Manufacturers Association of Nigeria (MAN), refers to Nigeria as the largest market in Africa because it possesses a young, thriving, and dynamic demographic. The latest UN population projections indicate that Nigeria currently has a population of over 211 million citizens, growing at a rate of 2.4% annually, resulting in approximately five million additional residents [5]. The increasing population creates higher energy demand nationwide. Petroleum-derived fuels operate as energy suppliers, and people refer to them as the "lifeblood " of economic growth because they play a vital role in daily operations. The country's state-run refineries deliver only mediocre results, resulting in a significant shortage of refined petroleum products [6].

The Fluid Catalytic Cracking (FCC) unit operates within the refining industry, producing petroleum-based products. The unit achieves its primary objective by processing high-boiling atmospheric gasoil and vacuum residue feedstocks into valuable products, including high-octane gasoline, olefins, and liquefied petroleum gas, using catalysts. The FCC process functions as a singular operating system that combines the reaction section with the fractionating section. The reactor-riser operates together with the regenerator within a two-part reaction section. All endothermic hydrocarbon feed cracking reactions, along with catalyst coke formation activities, take place in the riser component. The regenerator-reactor uses air to remove accumulated coke from the catalyst after the riser reactor process. The heat required for the endothermic cracking processes within the riser reactor is generated during the catalyst regeneration stage [7].

The profitability of FCCUs depends on operating them to achieve optimal gasoline output while minimizing coke accumulation. Current market energy cost increases necessitate that operations within the FCCU optimize their processes for producing market-relevant products. There is no room for online FCCU optimization through "trial-and-error" because it results in expensive procedures with potential production losses that lead to reduced revenue. Process simulation stands as an optimal method for optimizing the FCCU, providing security against the risks inherent in trial-and-error operations due to advanced computer systems [8]. The modeling and simulation of catalytic crackers has been extensively discussed in the literature, and several scholars have proposed several process models to predict feed conversion. McFarlane et al. [9] dedicated their research to optimizing the Exxon model IV's Reactor/Regenerator section that contains most elements of a Fluid Catalytic Cracking Unit (FCCU). The study aimed to replicate complex interactions that produce difficult control situations within standard industrial FCCU systems. The description of combustion reactions is absent from the model, while it uses a simplified cracking kinetic model. The author implemented the simulation code through the Advanced Continuous Simulation Language (ACSL) software system. A comprehensive kinetic model that controls a fluidized catalytic cracker during dynamic operation was developed by Arbel et al. [10], covering both the reactor and regenerator sections. The paper provides an extensive explanation of the complete CO combustion kinetics, which produces CO2 products in the regenerator zone using catalytic promoters. The reactor kinetics depend on the ten-lump model developed by Jacob et al. [11], allowing laboratory experiments to determine feed and catalyst properties.

Fernandes et al. [12] conducted a study that investigated a simulation model of an industrial fluid catalytic cracking (FCC) UOP unit, which included a high-efficiency regenerator. A six-lump kinetic scheme for gas-oil cracking and coke-on-catalyst function operated in the reactor section to simulate cracking kinetics and catalyst deactivation reactions. Scientists understood the need to model the freeboard zone of the regenerator vessel. The model developers coded the steady-state program in FORTRAN before performing validation tests using readily available industrial data. The behavior of the industrial FCC unit riser and regenerator reactors was evaluated using a well-developed model presented by Dagde et al. [13]. A model based on five kinetic lumps represented all cracking reactions active within the riser reactor. Simulation results from this research showed that reactor performance was significantly affected by the ratio of catalyst to oil feed, as well as regenerator inlet airflow speeds. Dasila et al. [14] unified the reactor kinetic models for riser and regenerator sections to recreate industrial operations of a Full Characterization Cracking plant. The primary objective of this study was to predict the cracking reaction temperature, along with feed conversion rates, product yield levels, coke formation on spent catalysts, and the properties of regenerated material.

The proposed models allowed researchers to investigate the sensitivity of FCC performance to changes in feed preheat temperature, feed flow rate, and air flow rate parameters. Increasing the catalyst circulation rate, along with an elevated air flow rate, produces maximum conversion levels and product outputs when the feed preheats temperature decreases. Former studies about the FCC unit depicted riser reactor kinetics through a simplified reaction framework (yield model), which explained the catalytic cracking unit operations. Models with three to six lump kinetic schemes serve well for simulations, provided the model was developed for a specific feed combined with a particular catalyst [2]. Previous researchers analyzing the FCC unit used simplified reaction chemistry (yield model) to explain the catalytic cracking reactions in riser reactor systems. For specific simulations that use a particular feed with a catalyst combination, the kinetic model should contain three to six lump kinetic schemes. Typical refinery operations differ from this description because the composition of refinery feedstock adjusts based on the availability of different feedstocks.

Higher-order chemical lump models, which consist of over ten components, prove disadvantageous because they require additional differential equations in the mathematical model of an FCC unit. The estimation process becomes more complicated because more kinetic parameters require measurement alongside an increase in the complexity level of numerical solutions [2, 7]. The use of such models remains restricted for monitoring FCC dynamics and control functions, as noted in works [9] and [11]. The steady-state operation of gas oil cracking in a UOP-type FCC process was predicted using the Refining FCC model in the Aspen Engineering Suite, which provided detailed output yield predictions along with projections of product properties. An industrial optimization process for yield and throughput will be implemented in this model to enhance the performance of the FCC unit.

Materials and Methods

Materials

This research work includes Tables 1 & 2, which present data on reacting species, catalysts, feedstock, and physical characteristics of the products. Table 3 displays the geometrical specifications for the fluid catalytic cracker's reactors.

Table 1. FCC feed and product properties [15]

Component	API Gravity	Specific Gravity	Flow Rate (kg/hr)
Gas oil feed	21.20	0.9270	244090
Fuel Gas	-	-	13180
C3(LPG)	-	-	15388
C4(LPG)	-	-	26118
Gasoline	60.00	0.7390	112037
Light cycle oil	14.00	0.9730	43448
Bottoms	0.50	1.0720	21480
Coke	-	-	12448

Table 2. Physical properties of reacting species and catalyst [15]

Parameter	Value
	9.520
Liquid density at 288°K ($kg.m^{-3}$)	924.80
Specific heat (gas) ($kj.kg^{-1}.\ K^{-1}$)	3.30
Specific heat (liquid) ($kj.kg^{-1}.\ K^{-1}$)	2.670
Heat of vaporization ($kJ.kg^{-1}$)	156.00
Vaporization temperature (°K)	698.00
Catalyst Particle size (m)	75×10^{-6}
Specific heat capacity ($kj.kg^{-1}.\ K^{-1}$)	1.120
Mass flowrate from riser to regenerator ($KJ.kg^{-1}K^{-1}$)	1,729,750
Bulk density ($kg.m^{-3}$)	975.00
Fresh catalyst ($kg.hr^{-1}$)	139.8
Hold in the regenerator (kg)	5000-70000

Table 3. FCC industrial riser reactor dimensions [15]

Parameters	Value (m)
Riser Length	22.900
Riser Diameter	2.900
Regenerator Length	35.450
Regenerator Diameter	9.800
Cyclone Height	14.240
Cyclone Diameter	1.500
Disengager Height	24.500

Simulation Methods

The research utilizes Aspen HYSYS V10 as its industrial simulation software package. Aspen HYSYS Petroleum Refining utilizes the 21-lump kinetic model from Aspen Technology Inc. for simulating intricate cracking kinetics in the riser-regenerator of this FCC unit [16]. The 21-lump model demonstrates the capability to solve various types of feed oils and catalysts, such as heavy feedstock (boiling point above 510 °C), which the ten-lump model from Jacob et al. [11] fails to handle. Table 4 presents the representation of the 21-lump kinetic scheme. The visualization of the FCC plant reaction regeneration and fractionation system performance is shown in Fig. 1. The Aspen HYSYS Petroleum Refining FCC model operates through interconnected sub-models that both analyze operational units independently and maintain heat stability in riser sections and regenerators. The complete functional model incorporates the riser-reactor system together with feed supply, stripper, regenerator, feed vaporization valves, and cyclones [17].

A configuration of the FCC model utilizing plant data allowed researchers to validate product properties and yields by testing operational parameters. The simulation began with the intrinsic values of kinetic parameters, using operating parameter values collected from the industrial facility.

Table 4. Summary of 21-lump kinetics [18]

Boiling-point Range	Lumps
<C5	Light gaseous aggregates
C5 – 221 °C	Gasoline
221-343°C (VGO)	Light paraffin (PL)
	Light naphthene (NL)
	Light aromatics with side chains (Als)
	One-ring light aromatics (ALr1)
	Two-ring heavy aromatics (ALr2)
343 -510 °C (Heavy VGO)	Heavy paraffin (PH)
	Heavy naphthene (NH)
	Heavy aromatics with side chains (AHs)
	One-ring heavy aromatics (Ahr1)
	Two-ring heavy aromatics (Ahr2)
	Three-ring heavy aromatics (Ahr3)
510+ °C (Residue)	Residue paraffin (PR)
	Residue naphthene (NR)
	Residue aromatics with side chains (ARs)
	One-ring Residue aromatics (ARr1)
	Two-ring Residue aromatics (ARr2)
	Three-ring Residue aromatics (ARr3)
Coke	Kinetic coke (produced by reaction scheme)
	Metal coke (produced by metal activity on the catalyst)

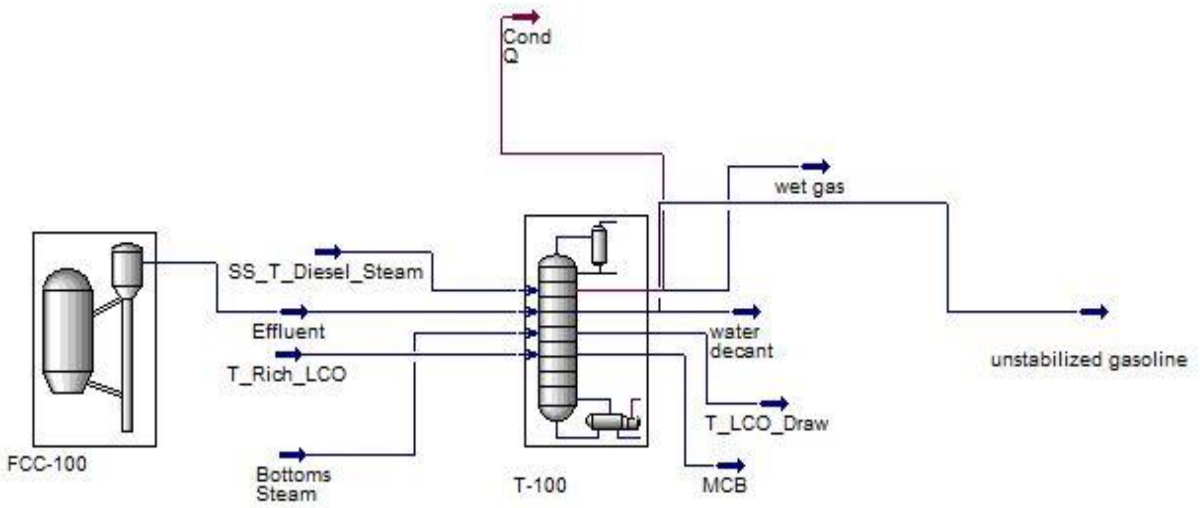

Fig. 1. Simulation diagram of Fluid Catalytic Cracking Unit

Reactors Dimensions, Feedstock, and Catalyst Properties

Tables 5 & 6 provide the New Port Harcourt Refinery Company’s dimensions for the riser and regenerator reactors, as well as the characteristics of the feedstock and end products.

Table 5. Distilled-off Gas-oil percentage and corresponding temperature-cuts [15]

Parameters	Value
Raw oil feed temp (°K)	505
Riser steam rate (kg.hr^{-1})	1,225
Bottom stripping steam rate (kg.hr^{-1})	2,915
Reactor pressure (kg.cm^{-2})	1.76
Regenerator pressure (kg.cm^{-2})	2.11

Table 6. Major operating conditions for reactor/regenerator

Percentage Distilled-off	°C	°C
Initial Point	271	544
10%	349	622
30%	421	694
50%	449	722
70%	483	756
90%	531	804
End Point	602	875

Results and Discussion

Data obtained from the simulated study to examine gas-oil catalytic cracking kinetics using process kinetics appear in Tables 7 & 8. The model predictions for gas oil conversion and product yields align with the experimental values derived from an industrial riser reactor, as shown in Table 7. Table 8 illustrates the comparison between model predictions and plant data for the regenerator-reactor.

Table 7. Comparison of plant-measured and model-predicted data in the riser-reactor

Parameters	Plant Measured	Model Predicted	% Deviation
Gas Oil (wt.%)	26.6	26.3	1.13
Gasoline (wt.%)	45.9	41.87	8.78
LPG (wt.%)	17.8	20.8	16.85
Dry Gas(wt.%)	5.4	4.8	11.11
Coke(wt.%)	5.1	5.65	10.78

Table 8. Comparison between model predictions and plant data for the riser and regenerator

Parameters	Plant Measured	Model Predicted
Outlet Temperature of Riser (K)	797	797
Regenerator Temperature (K)	1017	1017
Gasoline RON	94	94
Conversion (%)	73.4	73.33
O_2 (mol.%)	3	3
CO_2 (mol.%)	16	14.86
CO (mol.%)	0.00	0.070

The comparisons shown in each Table validate that predicted values match plant measurements accurately. The validated model is used to analyze various case studies and examine flexibility capabilities.

Sensitivity Analysis

The sensitivity analysis section examines how specific process variables influence the behavior patterns of the process output. The procedure serves crucial purposes for optimizing and controlling processes. Mass yields received examination when the riser outlet temperature and feed flow rate were modified.

Effect of Riser Outlet Temperature (ROT) on Key Product Slates

The ROT represents an essential functional aspect for FCC riser models because it governs reactor performance. The Case Studies tool in HYSYS was used for conducting this analysis. Fig. 2 shows the variation of the ROT with different species.

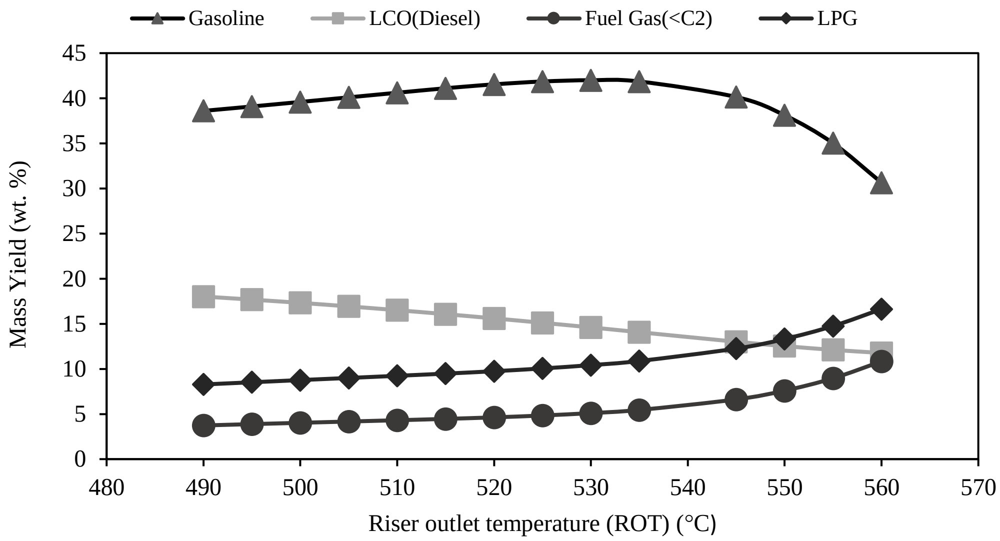

Fig. 2. Variation of product species with riser outlet temperature (ROT)

The changes in product mass yield from the catalytic cracking process with riser outlet temperature (ROT) are shown in Fig. 2. Fig. 2 shows that the yield of gasoline (naphtha) increases with an increase in the riser outlet temperature (ROT) up to 530°C. After that, the gasoline yield decreases, and the production of light gases increases sharply. Fig. 2's trend for the yield of gasoline is typical since an increase in ROT favors reactions that break the aromatic chain and increase the yield of C5+ components [1]. Diesel, another valuable product, declines rapidly as ROT is increased. The reduction in LCO yield and increase in fuel gases (C1-C2) are caused by excessive thermal cracking and catalyst deactivation as the ROT increases. This is obviously an undesirable outcome. Operating at an ROT that takes the maximum gasoline into account is therefore not ideal; instead, an ROT that considers other premium products is optimum.

Effect of Riser Outlet Temperature on Coke Yield

Coke is an essential by-product deposited on the catalyst as cracking proceeds. The exothermic reaction that occurs when burning off the coke in the regenerator reaction provides the heat for the cracking reaction [1].

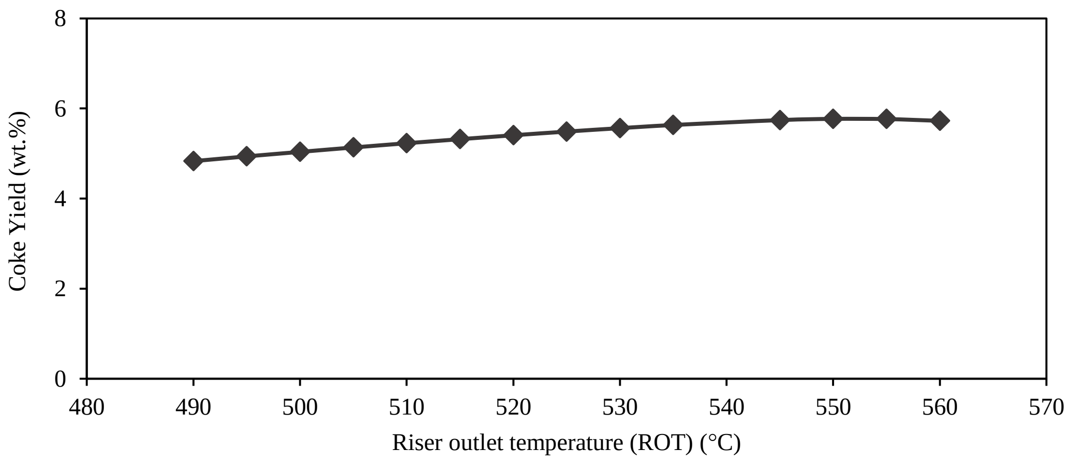

Fig. 3. Variation of coke with riser outlet temperature (ROT)

As a key function of ROT, Fig. 3 displays the amount of coke on the catalyst as it leaves the riser. Fig. 3 illustrates the direct correlation between the coke yield and the riser output temperature. Increased coke deposits in the riser and subsequent catalyst deactivation result in a higher coke yield. Higher coke deposits in regenerating catalysts increase the amount of energy needed to regenerate the coke to the same activity. These side effects constrain the permissible range of values for the riser reactor's ROT.

Effect of Riser Outlet Temperature on Combined Mass Yields

Despite the refiner's intention to produce the most gasoline possible, as was previously indicated. The choice of a riser outlet temperature (ROT) is not solely based on this factor. To better comprehend this operational ROT of this refiner, two additional high-end products from the catalytic cracking reaction are considered alongside gasoline.

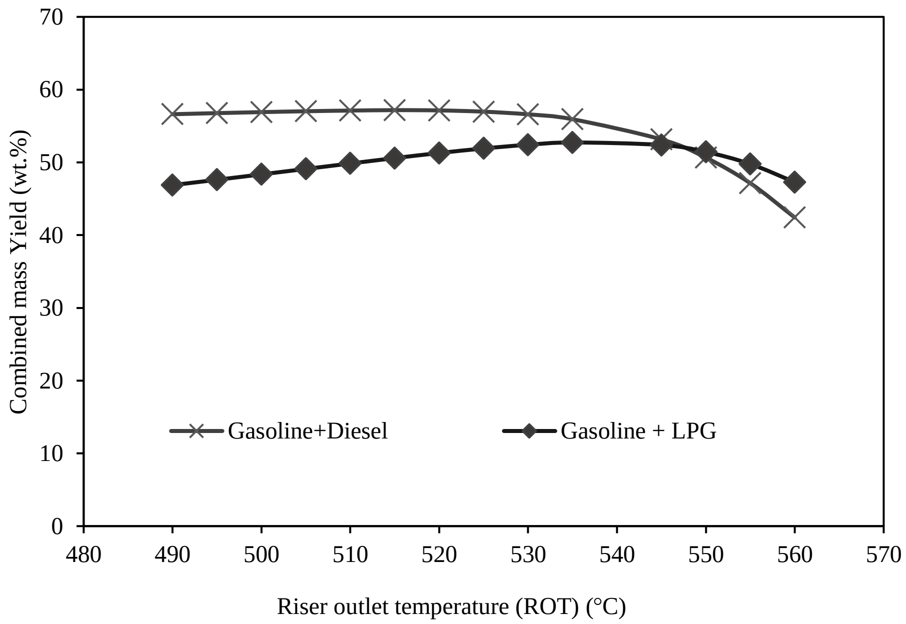

Fig. 4. Variation of combined mass yields with riser outlet temperature

Fig. 4 illustrates two hypothetical scenarios in which the refiner may attempt to maximize the output of gasoline and diesel, or gas and LPG, as a function of the riser outlet temperature (ROT). As seen in Fig. 4, each of the many examples has its own ideal ROT values. The maximum temperature for the manufacture of gasoline and diesel is between 510 and 515 °C, while the maximum temperature at which gas and LPG can be produced is between 524 and 535 °C (this temperature range verifies the refiner's choice, which was obtained from the FCC of the case-study refinery).

Effect of Change in Feed Flow Rate on Yields of Products

Optimizing gasoline production can also be achieved by increasing the unit's throughput. Generally speaking, the refiner will instead process as much feedstock as possible rather than use less feed to achieve optimal conversion rates. According to Sadeghbeigi [1], it is a path that is not profitable. The most valued product (gasoline) should continue to have the exact bulk yield.

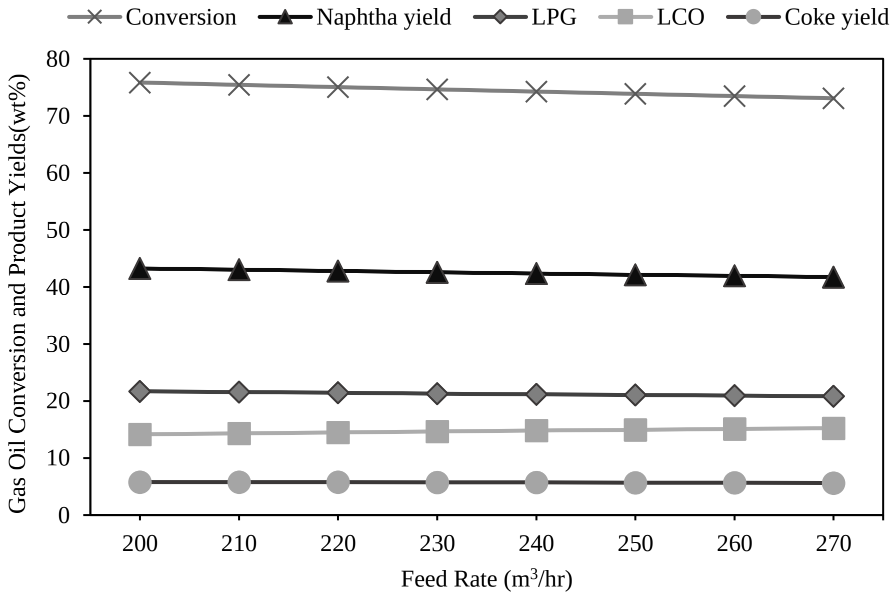

Fig. 5. Variation of gas oil conversion and product yields with feed flow rate

At a constant riser output temperature, Fig. 5 illustrates how changes in feed rate affect conversion and product yield. In Fig. 5, as the rate of feed oil increases to the unit, the conversion and the majority of product yields—aside from the LCO cut yield—show a negative trend. Because conversion fluctuates inversely with stream rates due to the limited reactor size available for cracking, the riser's shorter reaction time may be the cause of this overall reduction [19].

Effect of Feed Flow Rate and ROT on Gasoline Yield

Reactions are categorized according to how the reactor's temperature changes during the reaction. Due to the nature of catalytic cracking reactions, the effect of reactor temperature is readily observable; therefore, catalytic cracking of gas oil is not an exception. Catalytic cracking is an endothermic process, meaning that as the reaction proceeds, the reactor temperature decreases because the reaction mixture absorbs heat from the reactor. Feedstock conversion increases with reactor temperature, primarily due to an increase in the cat/oil ratio and a faster reaction rate for the endothermic cracking reaction [19].

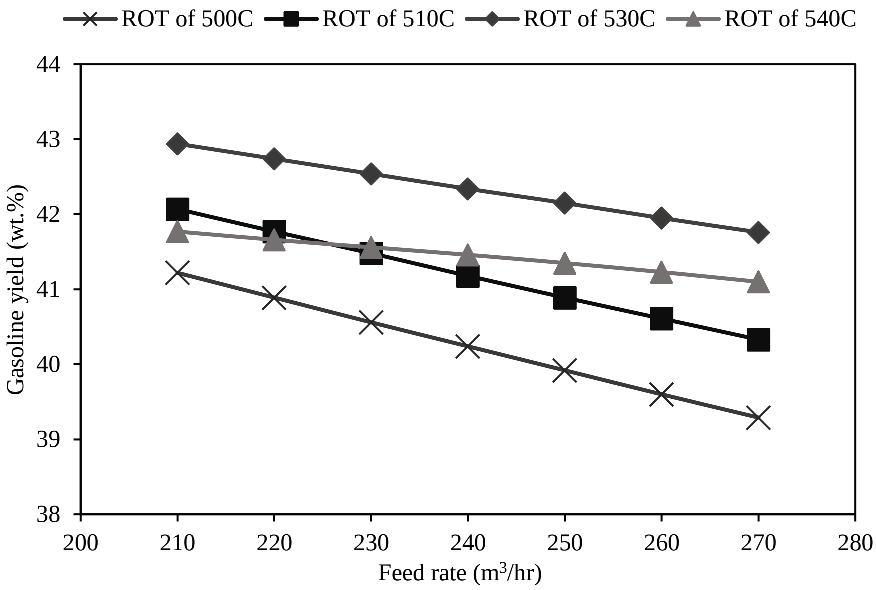

Fig. 6. Variation of gasoline yield with feed flow rate and riser outlet temperature (ROT)

Fig. 6 displays the gasoline yield as a function of riser output temperature and gas-oil rate. Fig. 6 shows that when both the feed flow rate and the reactor's ROT are increased, the gasoline production rises. However, at an ROT between 530°C and 540°C, the gasoline output begins to decrease. This shows that the reactor temperature is currently higher than the fluid catalytic cracking unit's ideal conversion point, also known as the over-cracking point. The picture also shows that a higher gasoline output, accompanied by an increase in throughput, is favoured by an ROT of 530°C.

Conclusion

To provide the best gasoline possible, this effort utilizes a computer program that simulates the operation of a fluid catalytic cracking unit. For this simulation, the Aspen HYSYS Petroleum Refining model was used, which incorporates the 21 lump kinetic model schemes created by Aspen Tech to account for the chemical reactions occurring within the reactor section, as well as additional sub-models for the regenerator, catalyst transfer, and riser reactor sections to depict the integrated nature of contemporary FCC units. Key process output variables, including product yields and characteristics, were accurately predicted by the steady-state model's results, which were compared with data from an industrial plant.

This article addresses the previous limitation of using more complex kinetic models for the FCC unit simulation, which was caused by mathematical difficulties in the modelling processes and a lack of industrial or experimental data to validate the models. It suggests that a sensitivity analysis be conducted to demonstrate that functional parameters, such as the feed flow rate and ROT, have a significant impact on the FCCU's performance. Additionally, the ROT's optimal control range, with pertinent products as the primary output, was achieved. ROT should be between 524-535 °C for gasoline and LPG, and between 510-515 °C for petrol and diesel to maximize the overall production of these fuels. The ROT must be adjusted to 530°C to boost gasoline yield and output simultaneously.

References

[1] Sadeghbeigi R. Fluid Catalytic Cracking Handbook: Design, Operation, Troubleshooting of FCC Facilities. 2000. https://doi.org/10.1016/B978-0-88415-289-7.X5000-8

[2] Radu S, Ciuparu D. Modelling and Simulation of an Industrial Fluid Catalytic Cracking Unit. 2014. https://bch.ro/pdfRC/RADU%20S.pdf%201%2014.pdf

[3] Ogbuigwe A. Refining in Nigeria: history, challenges and prospects. Applied Petrochemical Research. 2018. https://doi.org/10.1007/s13203-018-0211-z

[4] Economist Intelligence Unit. (2023). Fossil fuel demand to continue expanding this decade.

[5] Ogunro J. Nigeria's population time bomb. The Cable. 2023. https://www.thecable.ng/nigerias-population-time-bomb/

[6] PWC. Nigeria's refining revolution. PWC Nigeria. Insights and Publications. 2017. https://www.pwc.com/ng/en/assets/pdf/nigerias-refining-revolution.pdf

[7] Yadav P, Garg RK. Modeling and Simulation of Fluidized Catalytic Cracking Riser Reactor Using Pseudo Reaction Kinetics: A Review. International Journal of Engineering and Technology. 2017. https://doi.org/10.21817/ijet/2017/v9i3/170903017

[8] Kumar S, Chadha A, Gupta R, Sharma R. *CATCRAK*: A Process Simulator for an Integrated FCC-Regenerator System. 1995; 3737–3748. https://doi.org/10.1021/ie00038a009

[9] McFarlane R, Reineman R, Bartee J, Georgakis C. Dynamic Simulator for a Model IV Fluid Catalytic Cracking Unit. Computers Chem.Eng, 1993; 275-300. https://doi.org/10.1016/0098-1354(93)80021-E

[10] Arbel A, Huang Z, Rinard IH. Dynamic and Control of Fluidized Catalytic Crackers. 1. Modeling of the Current Generation of FCC's. 1996; 1228–1243. https://doi.org/10.1021/ie00043a027

[11] Jacob S M, Gross B, Voltz S, Weekman V. A Lumping and Reaction Scheme for Catalytic Cracking. AlChE, 1976; 701. https://doi.org/10.1002/aic.690220412

[12] Fernandes JL, Pinheiro CIC, Oliveira NMC, Ramo F. Model Development and Validation of an Industrial UOP Fluid Catalytic Cracking Unit with a High-Efficiency Regenerator. 2008; 850–866. https://doi.org/10.1021/ie071035b

[13] Dagde KK, Puyate YT. Modelling And Simulation of Industrial FCC Unit: Analysis Based on Five-Lump Kinetic Scheme for Gas-Oil Cracking. Ijera, 2012; *2*(5), 698–714.

[14] Dasila PK, Choudhury I, Saraf D, Chopra S. Dalai A. Parametric Sensitivity Studies in a Commercial FCC Unit. Advances in Chemical Engineering and Science, 2012; *02*(01), 136–149. https://doi.org/10.4236/aces.2012.21017

[15] Comerint. (1987). *NPHRC*, "New Port Harcourt Refinery Training Project: Specific for Junior Staff, Area 3, Process Description". https://doi.org/10.24018/ejeng.2016.1.5.189

[16] Bhutani N, Ray AK, Rangaiah GP. Modeling, simulation, and multi-objective optimization of an industrial hydrocracking unit. Industrial and Engineering Chemistry Research, 2006; *45*(4), 1354–1372. https://doi.org/10.1021/ie050423f

[17] Aspen FCC 2006.5. (2007). User's guide, Aspen Technology. Burlington, USA. https://jchpe.ut.ac.ir/article_101533_2f5c4a636c049b37f73fa0e45a271465.pdf

[18] Hsu C, Robinson P. *Practical Advances in Petroleum Processing:* 2006; *Volume 1 and 2.* New York: Springer. https://doi.org/10.1007/978-0-387-25789-1

[19] Speight J. *The Refinery of the Future.* Elsevier Inc. 2020. https://www.sciencedirect.com/book/monograph/9780128169940/the-refinery-of-the-future

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