RVS COLLEGE OF ENGINEERING AND TECHNOLOGY

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(Approved by AICTE,NewDelhi & Affiliated to Anna University, Chennai)
NAAC Accredited and ISO 21001:2018 certified Institution

DEPARTMENT OF PETROCHEMICAL ENGINEERING

List of students undertaking Project work for the ACADEMICYEAR 2022-2023

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37	712819139502	PRAVEEN KUMAR R

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DEPARTMENT OF PETROCHEMICAL ENGINEERING

Academic Year: 2022-2023

BATCH: 2019-2023

PROJECT LIST

BATCH NO.	REGISTER NUMBER	NAME OF THE STUDENT	NAME OF THE GUIDE	TITLE OF PROJECT
1	712819139005	ARUN KUMAR M	Dr. B. VIJAY KUMAR	Natural gas processing plant simulation using ASPEN HYSYS.
	712819139021	SANTHOSH KUMAR A		
	712819139023	SEETHAPATHI.P		
	712819139024	SITHARTHAN V		
2	712819139001	AKHIL KM	Dr. A. S. ARUN PRASAD	Production of biodiesel from *Pungamia Pinnata* using magnetic nano Fe_3O_4 - CaO - ZrO_2 catalyst.
	712819139003	ANAND A		
	712819139009	INBASAGARAN RS		
	712819139025	SRIRAM V		
3	712819139028	VASANTH S	Dr. R. KANNAN	Textile Effluent sludge to bricks manufacturing
	712819139701	MOHAMMED RASUL S		
	712819139012	MOULISWARAN R		
	712819139009	PRAVEEN KUMAR P		
4	712819139004	ANANDU P	Dr.A.SAKTHI SARAVANAN	Production of fuel Efficiency enhancer for Petrol.
	712819139007	GEORGE G SAM		
	712819139026	SURYA PRASAD E P		
	712819139703	ADWAITH ANIL K		
5	712819139017	PAUL SOLOMON X	Ms. B. SINDHU	ASPEN HYSYS Simulation of maleic anhydride production from n-butane via partial oxidization
	712819139020	SALMAN A		
	712819139022	SARAVANA KISHORE S		
	712819139019	RATHISH K		
6	712819139016	NOUFAL N	Dr. B. VIJAY KUMAR	Biodiesel production from waste cooking oil using nano catalyst.
	712819139704	ASHIK JIJI		
	712819139706	SARATH KUMAR T S		
	712819139008	GUNASEKAR K		
7	712819139010	MICHEAL SAJIN J	Dr. R. KANNAN	Design comparison of triethylene and monoethylene Glycol dehydration unit.
	712819139011	MOHAMED AASHIK H		
	712819139029	VIGNESH.R		
	712819139702	SATHIKAHAMED S		
8	712819139002	AKSHAY SEKHAR RR	Ms. A. SILVIYA	Oil production forecasting using machine learning.
	712819139013	MUHAMMED SALMAN A		
	712819139705	ATHUL KRISHNA K		
9	712819139006	BALAMURUGAN	Dr. A. S. ARUN PRASAD	Fluid catalytic cracking unit using ASPEN HYSYS.
	712819139014	NANDHA KISHORE M		
	712819139015	NAYAGASUDHAN G		
	712819139027	SURYA RAJESHWARAN D		
10	712819139501	HARIPRASATH R	Dr. B. VIJAY KUMAR	Synthesis of Nano catalyst for biodiesel production from non-edible oil
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NATURAL GAS PROCESSING PLANT SIMULATION USING ASPEN HYSYS

A PROJECT REPORT

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INTERNAL EXAMINER

EXTERNAL EXAMINER

Abstract

Natural gas is playing a growing energy role. The scale of its reverse and its environmental advantages favour its use, for fast growing activities such as the precision industries and the generation of electricity. The natural gas produced into the mainline gas transportation system must need specific quality measure in order for the pipeline grid to operate properly. Consequently, natural gas produced at the wellhead, which in most cases contains contaminates and natural gas liquids, must be processed, i.e., cleaned, before it can be safely delivered to high-pressure, long-distance pipe lines that transport the product to consuming public. Flowsheet development of the natural gas processing plant having capacity of 20MMSCFD which was undertaken using the Aspen HYSYS process simulator. The Simulation has been performed both in summer and winter cases. The steady state simulation of the gas processing plant shall be performed based on both the design and physical property data of the plant.

PRODUCTION OF BIODIESEL FROM *Pongamia pinnata* OILUSING NANO MAGNETIC ZrO2/CaO-Fe_3O_4 CATALYST

A PROJECT REPORT

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22/5/23

INTERNAL EXAMINER

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ABSTRACT

Biodiesel production from *Pongamia pinnata* oil provides an alternative energy for various uses. Fe_3O_4 was prepared by co-precipitation method under 60°C and 400 rpm until it reaches a thick consistency and dried in hot air oven for 6 hrs maintaining the temperature at 150˚C. The CaO was prepared from the mussel shells by calcination method under 300°C to 800°C in muffle furnace for 4 hrs. The nano-magnetic catalyst $ZrO_2/CaO-Fe_3O_4$ was prepared by doping. The prepared catalyst was characterized by FTIR, SEM, XRD and Particle size analyser to study their catalytic activity. It was transesterified using the $ZrO_2/CaO-Fe_3O_4$ catalyst at various experimental conditions: 5% (w/w) catalyst concentration, 12:1% of methanol to oil molar ratio, 65°C of reaction temperature and 50 min of reaction time which a maximum biodiesel yield of 98.11 wt% was obtained. The fuel properties were analysed of using ASTM D6751 standard. The prepared nano catalyst seems to be highly active in terms of quality and efficiency.

Keywords: *Pongamia pinnata* oil; Co-precipitation; Magnetic nano catalyst; Transesterification; Doping.

TEXTILE WASTE SLUDGE REUSING FOR FLY ASH BRICK MANUFACTURING

A Project Report

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

ABSTRACT

The fundamental purpose of this study was to evaluate the technical feasibility of incorporating fly ash (FA) and dyeing sludge (DS) in the production of brick. An attempt was taken to replace 10% to 100% clay by DS and FA in brick-making by volume. A brick firing kiln was used to burn the uniform-shaped bricks after replacing clay with Dyeing Sludge and Fly Ash. Size and shape, hardness, soundness, water absorption, efflorescence, dry density, loss of ignition, firing shrinkage, specific gravity, compressive strength, and leaching tests were carried out to study the properties of these bricks.

The compressive strength of the brick ranged from 6.25 MPa to 0.33 MPa and indicates a decreasing pattern in strength with the increase in the volume of Dyeing Sludge and Fly Ash. Only 18.8% water absorption capacity was found in control bricks without Dyeing Sludge and Fly Ash, while a maximum absorption of 40.19% was found for a particular combination of Dyeing Sludge and Fly Ash. Similarly, dry density decreased with the increase in the volume of Dyeing Sludge and Fly Ash. Besides, efflorescence in bricks was found within the allowable limits for certain combinations of Dyeing Sludge and Fly Ash, which exceeded the allowable limits for other combinations. The presence of heavy metals (Ni, Zn, Cr, Cu, and Pb) in the extraction solution was insignificant. Based on the results of this study, we recommend that up to 10% clay can be substituted with Dyeing Sludge and Fly Ash without substantially affecting the quality of bricks. With an increase interest in recycling and reusing waste, there is need to carry out our research on exploring ways. Even to analyze the sludge generation can be studied way to transform industrial waste into construction materials. Textile sludge was incorporated with fly ash brick manufacturing.

INVESTIGATING THE IMPACT OF FUEL ADITIVES ON SPARK-IGNITED PETROL INTERNAL COMBUSTION ENGINES

A PROJECT REPORT

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INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

Fuel additives have widespread global use and serve various purposes such as enhancing fuel efficiency, reducing emissions, minimizing the likelihood of knocking, and modifying storage and handling characteristics. Given the significant contribution of internal combustion engines to overall fossil fuel consumption worldwide, fuel additives that enhance the efficiency of these engines can have a substantial impact on global fossil fuel usage and greenhouse gas emissions. In this particular study, the influence of different fuel additive on spark-ignited petrol internal combustion engines was investigated. The main focus of the research was to explore the potential of fuel additives in extending the lean limit, decreasing the propensity for knocking, and increasing power. The experiments were conducted using a single-cylinder internal combustion engine with adjustable compression ratio, capable of running on both gaseous and liquid fuels. The liquid fuel system used a naturally aspirated carburetor. Cylinder pressure data were collected using a high-speed piezoelectric pressure transducer, enabling the calculation of indicated power, peak pressure, and quantification of engine knock. The study specifically examined petrol additives, aiming to determine whether they could enhance engine power, reduce knocking (indicated by an increase in the octane number), or extend the lean limit. This study investigated the possibilities of enhancing the quality of the petrol so that the consumption and the carbon emission caused by the combustion of petrol can be stabilized Most of the fuel efficiency enhancers are manufactured by blending chemicals/petrochemicals or by refining the existing fuel to enhance the octane level and for better combustion by adding alcohol. This study investigated the possibilities of enhancing the quality of the petrol so that the consumption and the carbon emission caused by the combustion of petrol can be stabilized Most of

the fuel efficiency enhancers are manufactured by blending chemicals/petrochemicals or by refining the existing fuel to enhance the octane level and for better combustion by adding alcohol.The results indicated that the additives improved engine efficiency and decreased the likelihood of knocking.

SIMULATION OF MALEIC ANHYDRIDE PRODUCTION VIA PARTIAL OXIDATION OF N-BUTANE USING ASPEN HYSYS

A PROJECT REPORT

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INTERNAL EXAMINER

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ABSTRACT

The documentation of the various technologies both correct and outdated for the production of maleic anhydride was performed the first place afterwards the modelling and simulation of a maleic anhydride process plant was carried out in this dissertation maleic anhydride is produced via n-butane partial oxidation the software used for the simulation is Aspen HYSYS. Technical data were collected from various sources such as patents and manuals

Throughout the simulation, there have been temperature restrictions concerning liquid mixtures of water and maleic anhydride in order to prevent reactions that lead maleic acid and fumaric acid gaseous mixtures and organic solvent interaction are considered as ideal mixtures. The production capacity of this plant is roughly 1,80,000metric tonnes per year.

The percentages higher than the 99% concerning product purity and recuperation were obtained as well as reactive losses of about 20%.

PRODUCTION OF BIODIESEL FROM WASTE COOKING OIL USING NANO CATALYST ($MgO/Fe_3O_4/Cs_2O$)

A PROJECT REPORT

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INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

Biodiesel, which is produced through transesterification from a cost-effective feedstock (waste cooking oil) using a Nano catalyst and a short chain alcohol. The Nano catalyst ($MgO/Fe_3O_4/Cs_2O$) was synthesized via co-precipitation method and its characterization is examined for identifying the morphological behaviour through various analytical methods such as SEM, XRD, and FTIR. The activity of the catalyst was identified through transesterification reaction. The biodiesel yield increase with increase in catalyst concentration in the given methanol to oil ratio. The optimal biodiesel yield of 97% was achieved at optimized reaction conditions i.e., WCO to methanol molar ratio of 18:1, 6 wt. % of $MgO/Fe_3O_4/Cs_2O$ nano-catalyst, 50°C reaction temperature and 90 minutes reaction time. The effect of temperature is that at high temperature the reaction is faster and the maximum yield is achieved at 60°C. Further increase in temperature leads to slight decrease in yield of biodiesel because some portion of methanol is in vapour phase. A maximum methyl ester yield of 97% was reached at the molar methanol to oil molar ratio of 18:1. Further increase in methanol did not promote the reaction owing to formation of methanol cloud on the liquid surface by high sonic energy. The produced biodiesel is characterized to match with the ASTM fuel standard.

Key words: Biodiesel, Waste cooking oil, Transesterification, Co-precipitation

DESIGN COMPARISON OF ETHYLENE GLYCOL AND TRI ETHYLENE GLYCOL DEHYDRATION

A Project Report

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

ABSTRACT

Glycol dehydration is a widely used method for the removal of water from natural gas, using glycol as a solvent to absorb water from the gas stream. The presence of water will promote the occurrence of corrosion and hydrate formation along the gas pipelines. Tri-Ethylene Glycol (TEG) is commonly used as the solvent for glycol dehydration. The main environmental concern of this TEG process is the emission of benzene, toluene, ethylbenzene, and xylene (BTEX) compounds to the atmosphere.

This study will be using Mono-Ethylene Glycol (MEG) as the solvent, where the objectives are to compare the performance of MEG with TEG, mainly in reducing the amount of BTEX emissions. The scopes of this study are the simulation of three glycol dehydration technologies which are basic, Stahl, and Drizo. MEG will be used as the dehydrating agent in this study, and optimization of operating conditions is done in order to have an optimized process operation of MEG.

The data and results are obtained by process modeling using the Aspen Hysys simulation package. Performance of MEG is evaluated and compared with TEG. Based on our analysis we can see that the usage of MEG significantly reduced the amount of BTEX emissions without any need of equipment addition for the same glycol dehydration technology, where the amount of emission is almost zero. However, usage of MEG will result in higher amount of glycol losses. If MEG is used, it must be determined if the cost of glycol replacement is less than the cost of treating the BTEX emissions.

OIL PRODUCTION FORECASTING USING MACHINE LEARNING

A PROJECT REPORT

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INTERNAL EXAMINER

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ABSTRACT

Oil production forecasting is a critical task in the petroleum industry, as accurate predictions can lead to better decision-making and higher profits. In recent years, machine learning (ML) techniques have been increasingly applied to this field due to their ability to process vast amounts of data and identify complex patterns. The dataset used in this study is a time series dataset that contains production data from Volve Field oil wells. The dataset was preprocessed to remove outliers and missing values, and features were engineered to capture the underlying trends and patterns.

The dataset was splitted and trained (70%) and evaluated (30%) on the with ML models linear regression and polynomial regression. The models were evaluated using R^2 performance metrics. The results showed that the polynomial regression correlates better than linear regression model, achieving an R^2 of around 0.95. This study demonstrates the potential of ML models in predicting oil production. Further research could explore the use of more advanced ML techniques, such as deep learning, and investigate the application of ML models to larger and more complex datasets.

The sample size of the oil production forecasting model has an effect on its performance. Larger samples are preferable to build a data driven model, as they can cover the feature space and increase the predicted performance. Machine learning analysis can also benefit from more data to strengthen the trained model's dependability.

Keywords: *Oil Production Prediction, Machine Learning, Linear Regression, Polynomial Regression, R-square value, Volve Field Data*

FLUID CATALYTIC CRACKING UNIT SIMULATION USING ASPEN HYSYS

A PROJECT REPORT

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INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

The Fluid Catalytic Cracking (FCC) unit is a crucial process in the petroleum refining industry for converting heavy hydrocarbon feedstock into valuable lighter products. Simulation plays a vital role in understanding and optimizing the performance of the FCC unit. This abstract provides an overview of simulating an FCC unit using Aspen HYSYS, widely used process simulation software. The simulation of an FCC unit in Aspen HYSYS involves creating a process flow diagram (PFD) that represents the unit's various components and their interconnections. The PFD includes the reactor, regenerator, fractionator, cyclones, separators, and other equipment. The catalyst and hydrocarbon feedstock properties are specified, and appropriate thermodynamic models and kinetic reactions are selected to accurately represent the cracking reactions and catalyst behavior. The kinetic models account for catalyst deactivation, coke formation, and regeneration reactions. The PFD is further configured with heat exchangers, pumps, compressors, and other utilities required for energy integration and efficient operation. Stream properties, operating conditions, and equipment specifications are defined based on plant data or design requirements. Once the PFD is set up, the simulation is performed by solving the mass and energy balance equations using rigorous numerical methods. The simulation results provide valuable insights into key performance parameters such as product yields, catalyst activity, temperatures, pressures, and other process variables. Sensitivity analyses can be conducted to evaluate the effects of different operating conditions, catalyst properties, or feedstock compositions on the FCC unit's performance. Optimization techniques within Aspen HYSYS can be employed to maximize desired product yields, minimize energy consumption, or meet specific product specifications. Simulation using Aspen HYSYS enables engineers and operators to understand the complex interactions within the FCC unit, assess the impact of process changes, and identify opportunities for improvement. It aids in troubleshooting operational issues, optimizing catalyst usage, and evaluating the economic feasibility of process modifications. In conclusion, simulation of the Fluid Catalytic Cracking unit using Aspen HYSYS provides a comprehensive tool to model and analyze the unit's performance. It facilitates process optimization, enhances understanding of the unit's behavior, and assists in decision-making for improving efficiency, product quality, and profitability in the FCC process.

Keywords: Aspen HYSYS, FCC Unit, Simulation, Fractionator, Reactor

MAKING GREASE FROM USED ENGINE OIL

A PROJECT REPORT

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INTERNAL EXAMINER	**EXTERNAL EXAMINER**
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ABSTRACT

Grease from the early Egyptian or Roman eras is thought to have been prepared by combine lime with olive oil.

The lime saponifies some of the triglyceride that comprises oil to give calcium grease. In the middle of the 19th

century, soaps were intentionally added as thickeners to oils. Over the centuries, all manner of material has been

employed as greases, for example black slugs Arionater were used as axle grease to lubricate wooden axel trees or

cars in Sweden.

Keywords –Additives, Apparent Viscosity, Consistency, Grease, Lubrication, Oil, Temperature, Saponify. Petroleum-derived products, such as lubricant oils, are non-renewable resources that, after use, must be collected and processed properly to avoid negative environmental impacts. A circular economy of used oils requires the re-refining and reuse of the same. Similar to most countries in Latin America, the management of used oils in Ecuador is still incipient and few cities collect and treat this material properly. In Cuenca, the ETAPA company collects ~1344 t/year of used oils, which are subjected to pretreatment operations prior to their use as fuel in a cement factory. However, combustion generates polluting gases and disallows the adding of value to the used oils. The lack of studies on the characterization and methods utilized for recovering used oils under the conditions found in medium-size Latin-American cities (e.g., Cuenca), alongside a lack of government policies, have hindered the adoption of re-refining operations. The objective of this work is to characterize the used lubricant oils in Cuenca, to compare them with the properties of used oils from other countries, and to suggest some re-refining technologies for oils with similar properties. Used oil samples were collected from mechanic shops and car-lubricating shops for characterization. Its physicochemical properties and metal contents are comparable to the used oils in other countries globally

Specifically, the flash point, kinematic viscosity, TBN, and concentrations of Zn, Cd, and Mg are similar to the properties of used oils in Iraq, Egypt, and the United Arab Emirates. Based on these results, the best re-refining option for used oils in Cuenca is extraction with solvents in which sedimentation and dehydration (already conducted in Cuenca) is followed by a solvent reaction process, a vacuum distillation process, a finishing process with bentonite, and a final filtration step.