Final Year Project Showcase Batch 2020
Year 2024

Department: Polymer & Petrochemical Engineering Programme: Polymer & Petrochemical Engineering	
1	**Project Title** Prediction of CO_2 in Natural Gas Sweetening Process Using ANN
2	**Project Idea** The idea of this study is to improve the understanding and efficiency of acid gas removal processes, particularly focused on capturing carbon dioxide from natural gas. By using Artificial Neural Networks (ANN) for modeling and simulation, the research aims to analyze and optimize the performance of absorption systems involved in gas processing. The outcomes of this study are expected to provide valuable insights that can enhance the operational efficiency of these systems, leading to more sustainable and eco-friendly gas processing technologies. The findings could also have practical applications in industries where CO_2 removal is critical, such as natural gas processing and environmental management.
3	**Process** Aspen Plus software is used to simulate the amine sweetening process utilizing the standard parameters for the process, aiming to produce goods meeting exact quality standards at the lowest cost. After the completion of simulation the data was generated by variating several parameters. Once the data has been generated, an orthodox model is needed to validate simulations for accurately predicting CO_2 content in sweet gas. In this project, ANN models was generated using Python, and model was trained and tested using the data generated from simulation.
4	**Outcome** This study underscores the potential of using ANN as a modeling tool for forecasting CO_2 concentrations in the oil and gas industry. It advances the application of ANN in predicting CO_2 levels in sweet gas.
5	**Evidence (Theoretical Basis)** This study highlights the effectiveness of Artificial Neural Networks (ANN) in estimating CO_2 concentrations in sweet gas, a crucial aspect for safety and design considerations. The study utilizes temperature, pressure, and MDEA concentration as input variables, with CO_2 concentration in sweet gas as the output, to develop ANN model for accurate CO_2 prediction. Researchers investigated various transfer functions, neuron quantities, and learning strategies to determine the optimal model. The most accurate model, featuring the lowest Mean Absolute Error (MAE) of 0.0026 and 0.0003, and Root Mean Square Error (RMSE) of 0.0033 and 0.0004, utilized three input parameters from Dataset 7, incorporating MDEA and pressure, and employed an SGD optimizer with Swish activation function and Extreme Gradient Boosting algorithm.
6	**Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over a competitor. In summary, any striking aspect of the project that compels the industry to invest in FYP or purchase it. Some detailed description is required in terms of how, why when what. You can select one or more from the following dropdown and delete the rest of them). Please keep relevant options, delete the rest of them, and correct the sequence
a	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region)

	Treating acidic gas enhances the safety and quality of natural gas, making it a cleaner energy source and supporting the goal of ensuring universal access to affordable and sustainable energy (SDG 7). Moreover, it contributes to SDG 13 by reducing climate change impacts through improved gas processing efficiency and lower emissions of greenhouse gases and pollutants. These technologies help lower overall emissions, boost climate resilience, and aid in achieving global climate targets. Advancements in cleaner production techniques and enhanced energy security are facilitated by optimizing gas sweetening technology, easing the transition to a sustainable energy system in a carbon-constrained world.	
b	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.).. This study contributes in reducing and controlling the carbon emissions.	
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7	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service Petroleum and gas processing Industries	
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