

- Experienced in process modeling and optimization, process equipment design, and Techno-Economic Analysis for **Front End Engineering Design** and Pilot Plant Testing of chemical separation technologies.
- Experienced in SOP development, planning and troubleshooting and problem solving in **Pilot Plant Tests**.
- Experienced in building and maintaining lab scale reactors, and liquid and gas sample analyses.
- Effectively presented and communicated research at international conferences, regional technical meetings, and semi-annual research review meetings for research sponsors.
- Delivered **quarterly progress reports** to, provided **consulting** for, and collaborated with technical and business management professionals from US-DOE-NETL, oil and gas players, and engineering consulting firms.
- Broad research background encompassing **both modeling & simulation and experimental experience**.
- Mission-oriented individual with excellent verbal and written communication skills, time management, leadership skills, high energy level and sense of urgency.
- Ability to handle multiple priorities of variety of tasks.

RESEARCH EXPERIENCE

Graduate Research Assistant

Gary Rochelle Research Group

Aug 2018-now

Pilot Plant Data Driven Process Modeling of the Piperazine Advanced Stripper (PZAS)

- Conceptually modeled the effect of heat loss on energy performance of stripper columns at the pilot scale
- Coordinated and developed test plans to measure energy performance, heat loss, and heat & mass balances in CO₂-PZ stripping systems at the pilot plant
- Troubleshot two-phase flow meters and incorporated temperature, pressure and density in flow measurements
- Validated thermo and mass transfer models in Aspen Plus using measured data from pilot plant results
- Built MATLAB scripts for identifying steady state intervals in pilot plant data and data reconciliation and extraction
- Built a principal components-based decision tree regression model for predicting energy consumption ahead of pilot test
- Used DBSCAN machine learning clustering technique for pattern recognition in pilot plant data

Front End Engineering Design for CO₂ Capture on a 465 MW NGCC plant

- Proposed an innovative stripper configuration – “PZAS with Hot Rich Bypass” and demonstrated **energy savings of 5-8%** compared to 4 other state-of-the-art stripping systems used in industry
- Served as the lead researcher to develop a base case design for the PZAS system and scale up columns and heat exchangers to suit a 465 MW **commercial design**
- **Collaborated** with process engineers and heat exchanger specialists from Trimeric Corporation to navigate around practical design challenges associated with multiphase flow through valves and heat exchanger pressure drops
- Optimized key process variables using non-linear surrogate models in MATLAB Optimization Toolbox
- Rated design to evaluate energy performance at fluctuating plant loads and high ambient temperatures
- Addressed challenges related to field-fabrication of large-diameter columns by modifying stripper train design

Heat and Mass Transfer Enhancement by Boiling in Pilot Stripper Columns

- **Developed the concept** of super-pressure and super-heat for boiling in strippers at pilot-plant conditions
- **Built a rigorous, generalized methodology** to optimize effective wetted area of packing to account for boiling
- Incorporated boiling effects in a stripper model to improve heat and mass transfer in the column by 14-30 %
- Identified **economically optimum capital and energy costs** for strippers with boiling

Graduate Research Assistant - Gary Rochelle and Desmond Lawler Labs

Dec 2017-19

- Developed kinetic model for emulsified sulfur-sulfite reactions applied to Wet Flue Gas Desulfurization
- **Built and maintained lab-scale reactor** and developed a 94 % accurate kinetic rate-law model
- Established the effect of process variables such as feed temperature and ionic strength on reaction rate
- Developed **Standard Operating Procedures (SOP)** for over 1000 hours of pilot plant test
- Mentored and transferred project knowledge to one younger undergraduate engineer
- **Lab techniques used:** Ion Chromatography, DLS, ICP-OES, Turbidimetry, NO₂/ CO₂ analysis

Undergraduate Research Assistant - Reaction Engineering Lab, Anna University

2013-2017

- Designed bench scale experiments using **DOE principles** to study the effect of process variables on biodegradability of azo complexes in batch reactors
- Used lab measurements to build an accurate surrogate degradation model for optimization of process variables
- **Published** two peer reviewed journals and **presented** paper at a regional conference

Summer Research Fellow - Council for Scientific and Industrial Research, CSIR

May-Aug 2016

- Characterized crystal structures and conducted lab tests to measure hydration kinetics, compressive strength and temperature and pressure resistance of iron-based construction materials (as an alternative to concrete)
- **Lab techniques used:** Powder XRD, LASER diffraction, XRF spectrometry and Isothermal Conduction Calorimetry

INDUSTRIAL EXPERIENCE

Techno-Economic Analysis - Membrane Technology and Research, CA

Aug 2018-19

- Completed techno-economic analysis using custom costing methods and Aspen Economic Analyzer for hybrid carbon capture systems and **demonstrated savings in the order of 17 MMS**
- **Provided consulting** in absorber, stripper and compressor design and optimization for CO₂ capture at high gas concentrations
- **Supervised and mentored** undergraduate student teams that provided assistance on the project

Process Improvements Project - City of Austin / Austin Water, TX

Jan-May '18

- **Lead** a 4-member student consulting group on the design of reverse osmosis systems and membrane bioreactors (using GPS-X) for the Walnut Creek Wastewater Treatment Plant in Austin
- Completed CAPEX and OPEX estimation for the design using CapdetWorks and delivered ultrapure water (99.9%) at lower costs by replacing tertiary treatment unit operations with RO and MBR

Summer Energy Consultant – Market Research at Frost and Sullivan

May-Aug '17

- **Forecasted** market growth rates, industry dynamics and competitive landscape for speciality-chemicals and energy efficient chemical water treatment technologies for clients in oil and gas and chemicals
- **Presented** findings and submitted deliverables on-time to the clients and the Vice President of the department

Downstream Separations Internship - Lotte Chemical Company

Dec-Feb '15

- Conducted breakthrough studies, investigated the effect of packing volume, temperature and pH on adsorption of tartrazine on activated carbon in bench-scale packed bed columns
- Modeled experimental data according to various adsorption isotherm models

SKILLS

Software / Programming Languages: Aspen Plus/HYSYS, Hydromantis GPS-X, MS Office, Visio Drawing Tool, Minitab, CapdetWorks Costing Software, Python, MATLAB, Fortran (basic), **Lean Six Sigma Green Belt, OSHA safety training**

Data Science and Machine Learning Skillset: Working knowledge of packages ScikitLearn and Pandas on Python for machine learning, data science, and knowledge discovery from large datasets (regression, classification, clustering), dimensionality reduction, principal component analysis, ensemble learning and gradient boosting for sequential learning

GitHub repository - <https://github.com/asb20>

RECENT PUBLICATIONS AND ORAL PRESENTATIONS

Capital and Operating Cost Reduction in CO₂ Stripping by Boiling of Solvent (2020). **Research Experience in Carbon Sequestration 2020. Washington DC. (Oral Presentation)**

Mass transfer enhancement by boiling in strippers (2020). **Process Science and Technology Center Fall Meeting 2020. Austin, TX. (Oral Presentation)**

Modeling effect of heat loss on energy performance of the Piperazine Advanced Stripper under pilot plant conditions, University of Texas Carbon Capture and Sequestration Conference 5, **Austin, TX, 2020. (Oral Presentation)**

Modeling energy performance of the NCCC pilot plant using the Piperazine Advanced Stripper and 5 m PZ, Post Combustion Capture Conference 5, **Kyoto, Japan, 2019. (Oral Presentation)**

Measured and modeled energy performance of the Piperazine Advanced Stripper at NCCC with 4% and 12% CO₂ (2020). **National Carbon Capture Center Work Supported by Carbon Capture Project 4.**

Economic optimization of the Advanced Flash Stripper using the Framework for Optimization, Quantification of Uncertainty and Surrogates (FOQUS) (2020). **2020 AIChE Annual Meeting. (Paper Submitted, Co-Author)**

Energy performance with heat loss analysis in the pilot plant test of the Piperazine Advanced Stripper, 15th Greenhouse Gas Technologies Conference, **Abu Dhabi, 2020. (Accepted for poster presentation and paper)**

EDUCATION

The University of Texas at Austin

Ph.D. in Chemical Engineering

May, 2023

M.S. in Chemical / Environmental Engineering

Aug, 2019

GPA: 3.8/4

Anna University

June, 2017

B.S. in Chemical Engineering with Distinction, IASc Research Fellow, Top 5% of graduating class

GPA: 9/10