

- 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 operations 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 communication, time management, and leadership skills.

RESEARCH EXPERIENCE

Graduate Research Assistant

Gary Rochelle Research Group

Aug 2017-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
- Used machine learning techniques for supplemental knowledge discovery from large datasets

Front End Engineering Design for CO₂ Capture on a 465 MW NGCC plant in Denver City, Texas

- 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**
- 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 Labs

Aug 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 for 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 MM\$**
- **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 for 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

Downstream Separations Internship, Lotte Chemical Company

Chennai, IN 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)

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

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

RECENT PUBLICATIONS AND ORAL PRESENTATIONS

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)**

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)**

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)**

Evaluation of concentration piperazine for CO₂ capture from flue gas (2019). DOE-URS Report. URS, Texas.

EDUCATION

The University of Texas at Austin

Ph.D. in Chemical Engineering

May, 2022

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