Process Simulation & Modeling Expert

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Date of Birth: 23rd February 1976

Total Years of Experience: **24** years

Education:

Masters *in Chemical Engineering*, University Department of Chemical Technology (UDCT), Mumbai, India (Aug 1997- Aug 1999)
B. E. *Chemical Engineering,* Bharti Vidyapeeth College of Engineering**,** University of Mumbai, Mumbai, India (Aug 1993-Jul 1997)

Summary of core competencies and professional skill-set:

- Process Design, Process Technology & Engineering, Process Improvement & Optimization, Equipment design, PFD, PID
- Process Simulations/Modeling (Steady state & Dynamic) using ASPEN, HYSYS, PROII, Unisim, VMGSim, PetroSim, ProMax, ProSIM, ICARUS (Aspen Process Economic Analyzer, Capital Cost Estimator)
- Heat exchanger Design/Models using HTFS, HTRI, EDR
- Furnace/Fired heaters models using FRNC
- Process data analysis using TotalPlant (PHD), PI, ASPEN Process Explorer (IP21)
- Statistical analysis using MINITAB, MATLAB, Root Cause Analysis
- Preparation of technical proposals for simulation projects
- Process Design package (PDP) & Basic Engineering package (BEP)
- Debottlenecking, Feasibility, Capex, Pinch/Energy studies
- Remote monitoring of operating plants
- Petrochemicals, Refinery, Oil & gas (NGL, LNG), Specialty chemicals, oleo chemicals, Gas Sweetening, Olefins, Ethylene, EDC, VCM, Chlor-Alkali, Electrochemical processes technologies, EO/PO, Polymers
- Project Lead, Team Lead, Project Management
- Process Technologies: KBR, Stone-Webster, ABB, Lummus, Technip, UOP

Experience & Summary of Industrial Projects

Expert – Process Simulation & Modelling at Borealis Finland (April 2024 Onwards)

- Working as Process Simulation & Modelling expert in Borealis Finland

July 2024

- Developing models/simulations for Borealis petrochemical and polymer plants as a part of digital twin program

Senior Optimization Engineer at Qatar Energy (June 2023-April 2024)

- Worked as Process optimization expert in Qatar Energy
- Technical support to Oil and Gas plants of Qatar Energy

Lead Process Development- Process Modelling at Neste Finland (Apr 2022-April 2023)

- Worked as Process Modelling & Simulation Expert in Neste Finland
- Developed models for Diesel hydrodesulphurization, Residue hydrocracker, Mild hydrocracking units in AspenPlus
- Developed conceptual process model and flow scheme for bio-propylene production

Assistant General Manager (AGM) – Process Simulation & Modeling at Ingenero,Inc.(Dec 2004-March 2022)

- **Developed HYSYS models for Six Ethylene plants:** The models involved simulation of quench column, cracked gas compressor train (CGC), Demethanizer, Deethanizer, Chilling train, Cold box, Acetylene reactor, C2-Splitter, Depropanizer, C3-Splitter, Fuel gas compressor & expander, Ethylene refrigeration compression, Propane/Propylene refrigeration compression.

- **Developed ASPEN models for two Ethylene plants:** Models include Quench oil tower, Quench water tower, LFO & HFO strippers, Distillate stripper, Caustic tower, HP Deethanizer & Rectifier, LP Deethanizer Stripper, Depropanizer, Secondary Deethanizer, Debutanizer, C3-Splitter, CGC train, Propylene refrigeration loop, C2, C3, C4 & Py-Gas hydrogenation.
- All these Hysys & Aspen models are validated with the operating plant data & are being used to identify the optimum operating parameters/process optimization on daily basis for efficient plant operation & to perform special studies related to Ethylene plant Debottlenecking/Performance Improvement/Capex studies.

- **Simulations of various Refinery operations in Hysys, PetroSim, ProMax & PROII:**
  Process modeling & optimization of various refinery units for multiple refineries including Reactor models with calibration.
  Crude Distillation Units (CDU) & Vacuum Distillation Units (VDU) with crude preheat train & heat integration studies.
  Naphtha reformers (CCR) & stabilizers, Hydrotreaters (NHT), Isomerization units, Gasoline fractionators, Aromatics recovery units, FCC unit, Delayed coker unit, Hydrogen Unit, Visbreaker, Hydrocracker Unit .
  These refinery models were used for debottlenecking & process improvement studies.
  Prepared design & operating case FRNC models for the furnaces used in Refinery operations,

and checked their adequacy/usability at higher throughput.

- **Aspen Plus & Hysys models for Butadiene/Butenes extraction process:** Model development & validation with operating plant data. Modifications in the model for different configurations. Performed simulations for various scenarios (change in feed conditions, product specifications etc.), heat integration, process optimization

- **Modeling of Oleo-chemicals Process:** Developed model in ASPEN for Oil to Esters, Ester to alcohol process which involved Unit Operations like Esterification reactors, Hydrogenation reactors, Ester & Alcohol Distillation columns, several heat exchangers. This model is used to identify maximum possible oil flows for different oil blends, equipment limitations and case studies. Prepared User Manual & reports on Modeling work.

- **Process Design Package for C4 Isomerization process:** Development & optimization of process model in Aspen Plus. Preparation of HMB, design documents. Design of heat exchangers. Preparation of equipment datasheets for drums, vessels, compressors, columns.

- **Process Modeling & design of multiple VCM (Vinyl Chloride) plants:**
  Model development in AspenPlus including OHC reactors, LP EDC reactors, Chloral, EDC purification, VCM Purification, Quench column
  Equipment design of heat exchangers, distillation columns, pumps & vessels.

- **Process Modeling and optimization for multiple NGL & LNG plants in Hysys**

- **Dynamic Simulation & Modeling**
  Steam network analysis for different scenarios
  Model building & dynamic testing of various distillation columns like Crude distillation unit, Demethanizer, Deethanizer, C2-Splitter, C3-Splitter, Debutanizer, Depropanizer

- **Feed Validation Project:** Model development in HYSYS, Reports preparation, Adequacy check of equipments like heat exchangers, drums, columns, vessels, pumps

- **Design of two NHT heaters & five CCR heaters (Fired Heaters):** Preparation of Data Verification report. Development of fired heater models in FRNC. Case studies using the FRNC models for several scenarios. Preparation of API datasheets for NHT & CCR heaters

- **Simulations for Pressure Safety Valve studies:** Preparation of simulations for base case, various scenario cases and to identify the controlling case for Pressure Safety Valve (PSV) design or adequacy check.

- **Capacity Expansion (Capex) Study of Fatty Alcohols Plant:** Developed simulations for various scenarios to identify the bottlenecks at different throughput conditions & suggested actions for debottlenecking. Adequacy check of equipments

- **Remote Monitoring of Operating Plants:** Daily process surveillance, Root Cause Analysis for performance degradation and suggested corrective actions to improve process efficiency, increase production & reduce losses. Preparation of daily, weekly & monthly reports, Preparation

of special reports, waterfall charts. Preparation of tools, scripts for data automation.
Developed tools and methodology to predict the failure of ashlock, coallock & jacket of a Gasifier for a Gasification plant.

- **Heat Exchanger Design & Modeling**: Developed models for a large number of heat exchangers including shell & tube, air cooled, double pipe exchangers in HTRI & HTFS. Preparation of TEMA datasheets, adequacy check of exchangers.

- **Process development for HCL & SO2 recovery from waste stream in ProMax**
Conceptual design, process model development for 30% HCL solution & Sodium metabisulphite (SMBS) preparation from waste flue gas stream

- **Model development for Gas-sweetening processes which involve H2S & CO2 absorption in Amines, Caustic in ProMax**

- **Polymer process models for PE , PP, PIB in Aspen PolymerPlus**

- **Process modeling of Batch Distillation in Aspen BatchPlus**
SYMTET (Tetrachloropyridine) purification from a mixture of pyridine compounds.
CTCMP (2-chloro,5-trichloro methyl pyridine) purification from a mixture of pyridine compounds.
Process development, prepared basic engineering package for the above two systems.

- **Debottlenecking study of TFE (Tetrafluoroethylene) plant:** Developed process model, Identified equipments, lines limiting at higher throughput conditions and provided recommendations to remove bottlenecks.

- **Ionic Equilibrium model (IEM):** Developed Ionic Model for crude column overhead system which predicts hydrocarbon dew point, dew point pH & salt deposition temperature.

- **Development of ionic models:** For Electrochemical processes such as Chlor-Alkali, Caustic, Chlorine production processes

- **Biodiesel Plant Modeling:** The model includes drying section, reactors & separators, Methanol column & biodiesel distillation column

- **Hot oil network Study for a Petrochemical plant**
Development of Hysys model for hot oil network, hydraulic study, identified bottlenecks for multiple cases. Provided recommendations for all cases.

- **Training on Simulators:** Conducted 3 to 5 days training sessions (Basic & Advanced) on HYSYS, ASPEN, HTRI, PROII, ProMax for a group of chemical engineers in few MNCs in USA, Gulf, South Africa, India.

 Senior Engineer at Invensys, Hyderabad (Jun 2002-Dec 2004)

- Preparation of functional spec, design spec documents, Code development, unit testing, bug fixing, addition of new features for steady state simulator PROII

- Technical support for Simsci products

- Worked on coding and testing for a new unit operation 'Air-cooled exchanger' in PROII.

Engineer at GE Technology Center, Bangalore (Oct 2000-Jun 2002)

- **Troubleshooting**: Styrene-Acrylonitrile (SAN) copolymer plant was producing a side product known as "Black Specks". The factors leading to black speck formation in the plant were identified The approach for the problem was, process data analysis using AIMS, LAB experiments, analysis of the plant samples & plant EVOP. Based on this work, recommendations were given to the plant for operating SAN polymerization process with 50% less black speck formation. By operating hot oil inlet temperature at about 65^0F lower value, almost 70% reduction in black speck has been achieved.

- **Monomer Recovery Scheme:** The plant was interested in the scheme to recover Styrene, Acrylonitrile, and Ethylbenzene from the purge stream. Using ASPEN, a feasible scheme was proposed which fulfills all the objectives like 96% monomer recovery, less than 1% Cumene in recovered stream.

- **Capex Study:** Lexan-LX plant was interested in stretching the plant capacity initially by 25% & then by 50%. The main objective was to study the feasibility of all the equipments in different sections of the plant for the stretch conditions. Several major equipments in BPA (Bisphenol-A) & Polymer sections of the plant such as columns, heat exchangers, pumps, control valves etc. were rated for the stretch conditions. A report was prepared indicating adequacy/non adequacy of each equipment with recommendations.

Summary of Computer skills

- Operating systems: Windows
- Languages, Packages and libraries:
- ASPEN Plus, HYSYS, PROII, UNISIM, PetroSIM, ProSIM, ProMax
- HTFS, HTRI, HEXTRAN, FRNC
- At a Glance (AIMS), TotalPlant PHD, PI, IP21
- VISIO, LIMS, MINITAB, MATLAB
- C, Fortran 77, Visual Basic, HTML, ASP, SQL
- CM Synergy, VSS, WInrunner

Research Projects

Studies in Sonochemistry and Cavitation Phenomenon

Sonochemical effects at different intensities and frequencies were studied using energy analysis of a single cavity. Higher frequencies & lower intensities are favorable for optimum operation of a sonochemical reactor. Similarly optimum conditions were obtained for hydrodynamic conditions from experiments. Velocity profile in acoustic cavitation can be determined using mixing time analysis. This could in principle be used to identify the transient location of the traveling cavity and the variation in the surrounding pressure field responsible for it's dynamic behavior. The theoretical and experimental study performed in this project has outlined the possible optimization route for a variety of cavitational transformations

<u>Publications</u>

July 2024

- Optimization of Hydrodynamic Cavitation using a Model Reaction, **Chemical Engineering & Technology**, 23(8), 683-690, August 2000
- Mixing Time Analysis of a Sonochemical Reactor, **Ultrasonics Sonochemistry**, 23-33, 8(1), 2001
- Energy Analysis in Acoustic Cavitation, **Industrial & Engineering Chemistry Research** 1480-1486, 39(5) May 2000
- *Cavitation Reactors: Efficiency Assessment Using a Model Reaction***, AIChE Journal**, *2526-2538,47(11), November 2001*

Awards/Other Accomplishments:

- Green Belt Certification in Six Sigma Quality Program

- Received award for Artemis Biotech Best Masters Thesis in Chemical Engineering/Technology for the Year 2001 from Indian Institute of Chemical Engineers (IIChE)

- Received Best Masters Thesis Award in Chemical Engg. from Indian National Academy of Engineers (INAE)

- Achieved "Prof. O.P.Narula award for the best M.Chem.Engg. Thesis".

- Sixth All India Rank in GATE-97 with 99.48 percentile.

- Secured second rank in second, third and final year of engineering in the class.

- Secured second rank in M.Chem.Engg. Examination in Mumbai University