

Versatile Process Research Engineer

Technical Advisor for commissioning and startup of modular gas to liquids (GTL) unit. This in-house design by INFRA GTL technology with a CAPEX of 12 MM\$ presented cost effective, easily transportable retrofit option for monetizing stranded gas and refinery flared off-gas.

Production Engineer for Ammonia units. Implemented capacity enhancement projects to increase front end load to near 150% and productivity by 20% (from 750 KT to 930 KT/annum). Safe operation of new ammonia unit with a capacity of 2800 tons/day.

Award winning experience in the field. Excellent experience in FEED and reviewing of P&ID's/PFD and other process engineering aspects of both design and operations. Optimized units using HYSYS and Promax simulation in short time.

Conducted HAZOP, LOPA-SIL rating etc.

Developed an award-winning biomass to liquids process as a part of doctoral research. This technology won US DOE phase 1 and phase-2 grants and innovation awards from OAK-RIDGE National Lab.

Professional Experience:

Two Gulfs Incorporation

2019-Present

Consultant

- Providing Guidance on designing solar surveillance tower for standalone quick deployment application.
- Responsible for designing a networking system for remote access of PLC and mod-bus data for remote health monitoring of solar panels.

Gerson Lehman Group: GLG

2019-Present

Consultant

- Providing expertise on operations of bio-fuels processes and Fischer Tropsch synthesis process.

INFRA GTL TECHNOLOGY, Houston, TX

2015-2018

Technology Manager

- Successfully brought on-stream the steam methane reformer (SMR), CO₂ absorption system, all rotating equipment (pumps and compressors) and membrane purification.
- Trained operations staff on best practices and procedures. Wrote all startup-shutdown procedures, emergency response manual and hot startup (after a recent shutdown) guidelines.
- Performed root cause analysis using 5 why's technique to rectify issues leading to repeat shutdowns. The major causes include (i) incorrect rating of furnace ID fan VFD drive leading to fan trip at high load (ii) surge in auxiliary boiler level due to non-availability of three element control and (iii) piping design issue leading to cross contamination and forced shutdowns (iv) reliance on grid power with no back-up.
- Established KPI's to assess (a) process reliability based on (i) planned shutdown (ii) unplanned shutdowns (iii) extent on rework (MOC's generated for modifications) (b) equipment reliability based on (i) maintenance work-orders (ii) repeat work orders (iii) quality loss (i.e. scrap or replacement) and mean time between failures.

- Designed a synthetic-crude upgrading unit, in collaboration with UOP and Haldor-Topsoe, for the recovery of cracker-grade naphtha and drop in diesel fuel from Fischer Tropsch product. Later, prepared a commercial proposal in collaboration with Haldor-Topsoe.
- Developed variant models on HYSYS, of INFRA's GTL process, for CAPEX reduction of future projects. Modifications included (i) use of Auto-thermal reformer (ii) use of POX-partial oxidation process and (iii) no amine unit etc.
- Carried out SIL determination of process control network, to evaluate the requirement of SIS based emergency Shut-down system (ESD).
- As a part of FEED study, developed base case for 1000 BBL/day unit using CHEMCAD. Performed heat and material balance of the unit. In collaboration with Audubon engineering participated in 3D model development, thermal rating of heat exchanger bank and relief system sizing and selection after API-520/521.
- Proposed an innovative dry reforming process (patent issued), to increase carbon capture in synthetic oil by 15%. Initial plant design was modified to recycle bi-product CO₂ back into SMR. This change was successfully tested during the startup.
- Designed and tested a novel single stream "heating-cooling" system for Fischer Tropsch reactor using vapor-liquid equilibrium (VLE) for ramping (increase/decrease) the temperature through coolant pressure.

UNIVERSITY OF HOUSTON –SHELL TECHNOLOGY CENTRE, Houston, TX

2013-2015

Lead Catalysis & Reaction Engineering Scientist

- Palladium based proprietary catalyst powder samples, developed by shell technology center, tested in a pilot scale reactor to deduce kinetic parameters for total methane oxidation process.
- Based on pilot test results, a coupled kinetic-hydrodynamic simulation developed using MATLAB to design a monolithic catalyst for commercial exhaust clean-up applications.
- In-line with modeling results, actual catalyst monoliths was developed tested in a test rig to evaluate the catalyst performance in a real-time natural-gas vehicles exhaust service.
- Further, expanded this study to model the catalytic partial oxidation (POX) process for synthesis gas generation.
- Set-up a lab-scale partial oxidation unit in order to verify the modeling result and future industrial application to replace conventional steam methane reformer (SMR) for tight control of synthesis gas (H₂:CO) ratio.

ENGRO CHEMICAL PAKISTAN LIMITED (Present Engro Corporation)

2001-2007

Production Engineer- Ammonia Haber process

- Safe operation of 1000 KT ammonia plant designed on Haber process. Plant start-up in record time.
- For plant capacity and reliability improvement, led terrace wall (Foster wheeler design) furnace revamp project which included: (i) bottom leaking pigtails replacement, (ii) installation of new turbine drive for furnace draft and heat distribution improvement and (iii) addition of heat recovery coils in convection section for plant load increment.
- Re-evaluated the design of carbon dioxide absorption tower, using Exxon design practices, to identify bottleneck at top tunnel cap trays that was causing hang-up in the tower. Later, these trays were found chocked with amine solution.

- Modified the design of steam ejectors installed on amine semi-lean flash vessel to create the required differential head across the vessel, thus resulting in flow. This project was part of 500 KW energy conservation project.
- Carried out safety & environment improvement projects: (i) designed of inline-inductor system for fire-suppressant foam injection in petro-chemical storage tanks and (ii) Cooling tower chromate system (carcinogenic) replacement with zinc-phosphate system.
- Prepared the budget of ammonia unit consecutively, maintained custodian of monthly OPEX reports and quarterly presented to management in management committee meeting.
- Experience of four major Ammonia turnarounds, the major projects were (i) catalyst replacement for low temperature shift convertor (ii) addition of solar gas turbine for boosting natural gas battery limit pressure (iii) change-over of ammonia converter basket from S-200 to S-300.

Education:

Ph.D. in Chemical Engineering

University of South Florida (USF)

Received outstanding student award **Aug 2013**

M.S. in Chemical Engineering

University of South Florida (USF)

3.92/4.0 **Aug 2010**

B.Sc. in Chemical Engineering:

University of Engineering and Technology, Lahore, Pakistan.

3.50/4.0 **Dec 2001**

Certifications

- Process for Hazardous Analysis (PHA) by E.I. DuPont de Nemours.
- Managing Safety: Technique that work for Line Supervisors with auditing by E.I DuPont de Neumors.
- Principles of Liquefied Gas Safety (LNG and LPG) by Quest Consultant Inc. Norman, Oklahoma USA.
- ISO 14001:2004 IRCA Lead Auditor certification.