

Summary

Years of Experience

16+

Office of Employment

NA

Industries

- Oil and Gas
- Process
- Upstream
- Onshore
- Offshore

Types of Facilities

- Production Facilities
- Upstream/Downstream
- Onshore/Offshore Pipelines
- Process Platforms
- Chemical Process Industries

Areas of Expertise

- Flow Assurance
- Conceptual Studies
- Detailed Engineering
- FEED
- Process Engineering
- Topsides Dynamics
- Heat exchanger Design

Professional Summary

Worked as a **Senior Flow Assurance consultant**-Flow Assurance & Process Optimization from June 2014-Mar 2018 in Wood.

Currently Working as a **Staff Consultant**-Flow Assurance & Process Optimization from April 2018 till date in Wood.

Qualifications

Education

M.Tech in Chemical Engineering, NITK Surathkal, India 2003-2005

B.E. in Chemical Engineering, BIET, Davanagere, India 1997-2001

Registrations / Certifications / Licenses

Member of Society of Petroleum Engineers

Publications / Presentations

Presented Flow Assurance case study organized by SPT Group in Mumbai, India

Software / Skills

- OLGA, PIPESIM, SPS, TLNET & PIPENET
- PVTsim / Multiflash / GUTS (MSiK'S PVT package)
- HYSYS-Steady State & Dynamics, FLARENET, HTRI
- MATLAB (Simulink)

Languages

- English
- Hindi
- Kannada

Experience

Kantharaja has total of 16 years of experience with chemical process/upstream Oil & Gas industries.

Kantharaja KG served as Senior Flow Assurance Consultant/Staff consultant for WGK India, leading Flow Assurance team for pipeline projects. Kantharaja KG currently involved in projects from proposal stage till the execution of the flow assurance projects. He is involved in the preparation of proposals for pipeline transient studies and actively involved in the flow assurance projects; review of Flow assurance design basis, study reports and interaction with clients on technical aspects of the projects. Kantharaja KG worked as a Lead-Consultant for more than 35 flow assurance projects includes liquid surge analysis, HIPPS dynamics study, pipeline thermal transient analysis & Subsea-Topside interface studies & HYSYS dynamic studies. Kantharaja worked as Process Lead for upstream offshore involved in Pipelines thermal-hydraulic analysis, line sizing, fluid characterization, pipeline network modeling, liquid slugging analysis, hydrate study in pipelines, verifying the existing equipment design and recommend slug mitigation methods and endorse adequacy of the pipelines selected in FEED stage. Worked as a process Lead & successfully executed Detailed engineering process deliverables for project ADMA NASR.

Kantharaja had hands on experience in designing Shell & Tube Heat exchanger as per TEMA standards, exchanger design in forced circulation evaporators (heat exchanger as external equipment), design of thermosyphons, condensers, chiller efficiency based on heat & mass balance for the entire network of heat exchangers. Recommendations for improving tube side heat transfer coefficients based on the heat load analysis across the chillers/cooling tower.

Performing HYSYS process simulation studies for topsides, process piping line sizing & equipment sizing to suit the operations over field life. Topsides blow down studies using FLARENET software to verify/size flare header. To explore various depressurization scenario to limit the flare header size and flare boom length. Adequacy check for line sizing for process lines and optimizing pipe inlet size for PSV & Orifice line. Preparation and review of P&ID (Well Head & Process Platforms), PFD, Design Basis, control philosophy and process simulation report. Review of process equipment/instrument data sheets. Providing adequate data to interdisciplinary department and third party consultants.

Experience

Staff Consultant (Wood, Intelligent Operations, Chennai)

Safaniya Water Injection System – Pre-FEED – Flow Assurance Studies using SPS – Saudi Aramco (Ongoing)

Working as a Project lead and ongoing flow assurance study comprises of detailed hydraulic and transient surge analysis for Safaniya Water Injection Facility using SPS. The objective of the study is to optimize pipeline sizes to meet the injection pressure at respective WHP and perform a complete flow assurance analysis (steady state and transient) to ensure that the new Water Injection network will meet the maximum design flow rate and does not exceed the pipeline/piping MAOP.

Manifa Water Injection System – Pre-FEED – Flow Assurance Studies using SPS – Saudi Aramco (Ongoing)

Working as a project lead and ongoing flow assurance study will determine the capacity of existing water injection pipeline networks for additional flow as well as the sizes of the new water injection pipeline networks. The objective of this study is to confirm the existing and new water injection flowlines/pipelines/trunk/flanks sizes for the complete water injection networks. In addition, the pressure Surge Analysis Study for the selected Steady State Hydraulic Model is to be performed considering the impact on existing as well as new water injection pipeline networks. The flow assurance studies shall cover the full range of the 30 years forecast.

Safaniya Water Injection System – Conceptual Phase – Flow Assurance Studies using SPS – Saudi Aramco

Worked as a Flow Assurance Lead. The functional requirement of Safaniya project was to inject the produced water to a level be compatible for oil reservoir then to be used to maintain the pressure of the field. This was to be met by providing injection platforms facilities, tie-platforms, as well as trunklines and flowlines. It was proposed to transport aquifer water from a new pump in the SAFANIYAH AH CPF to the new offshore WI platforms via several flank lines and tie-in platforms via tie lines. Several options were being considered for a new network. The entire network of pipelines from onshore to all WI wellhead platforms was to be developed under this project with focus on estimating the preliminary line sizes of the pipelines within the water injection network at this study stage of the project in compliance with Saudi Aramco Standards. SPS was used for the same.

Mainfa Water Injection System – Conceptual Phase – Flow Assurance Studies using SPS – Saudi Aramco

Worked as a Flow Assurance lead. Manifa program was intended to provide an expansion of current facilities to ultimately allow for producing, processing and transporting the additional crude oil. The project was to provide required water to offshore facilities by installing the required water injection wellhead platforms, tie-in platforms, trunklines and flowlines. It was proposed to connect some of the new offshore WI platforms to this existing offshore network. Furthermore, additional onshore drill sites (Increment) are added and existing offshore as well as onshore WI Manifa drill site WI flowrates are to be increased. Various route configurations were analyzed in order to achieve the required pressure at the injection platforms and to keep the fluid velocities within the limits of Aramco Standards while considering the pipeline specifications as a constraint. The steady state simulations were modelled and studied using SPS.

Revalidation Study for Marjan Field Development, Saudi Aramco

Worked as Flow Assurance lead for Revalidation study directly awarded from Saudi Aramco. The study was to evaluate back pressure at offshore, liquid accumulation rate, hydrate formation analysis (for steady-state operation) and required scraping frequency for max design rate with multiple options scenarios during summer and winter operating conditions. Further, sensitivity cases for TEG performance at offshore and onshore water load of various ranges and evaluated the hydrate formation conditions using design gas compositions.

Flow assurance study for Rich Gas, Lean gas & MEG Network System-Marjan PKG 4-Saudi Aramco

Worked as a Lead engineer for Marjan PKG4 for single phase & multiphase systems. Each of the system comprises of flowline network associated with multiple well heads. The multiphase Study comprises of steady state hydraulics, HIPPS dynamic study, initial well start up, scraping, turndown and ramp up operations. MEG steady state & transient hydraulics is one among the other systems under PKG4. The MEG hydraulics was performed as the rich gas production system anticipated hydrate formation during normal operations. Rigorous calculations were performed for MEG estimation based on the hydrate curves and worst operating conditions for the entire filed of production years. Calculated hydrate inhibitor (MEG) flowrates were used for MEG steady state hydraulics. The system comprises of storage tank, centrifugal pumps, flow control valves, trunkline and flowlines. The MEG flow distributed from trunklines to respective WHP (7 Nos) & required flow for each of WHP controlled by respective Flow Control Valve (FCV). The steady state hydraulics was performed to confirm the no. of pumps required covering entire

field life of production and pipeline size verification based on velocity and pressure limitations criteria. Worst scenario in terms of the maximum flow/max pressure at pump discharge among all steady state results were used for pressure surge analysis. The analysis was carried out for pressure surge in the event of inadvertent valve closure (12 scenarios) & pump start up while low pressure/vacuum during pump trip scenario. Recommendations for one pump or two pump operation based on the production flow scenarios (Year wise) were provided for optimum operating cost.

AGOC Simulation studies for Gas Export Facilities

Worked as Flow Assurance lead for 16" Pipeline steady state analysis. The objective of AGOC project was to determine the suitability of 16" pipeline to carry two-phase fluid. Aramco Gulf Operations Company (AGOC) was supposed to receive higher share of NGL which needs to be transported to Saudi Aramco facility. As the existing 4" NGL pipeline was not designed to transport the anticipated volume flow rate, it was proposed to inject the additional quantity of NGL into 16" Gas pipeline. Steady state simulations were performed in OLGA to determine the suitability of 16" pipeline to carry two-phase fluid. Adequacy of the system was checked in terms of velocity, EVR and pipeline inlet pressure and design pressure restrictions. Slugging potential and slug catcher adequacy, Compressor acceptability to receive higher gas rate, pump and piping capacities etc. were analyzed as part of receiving facility adequacy check.

Steady State & Transient Flow Assurance Study for Khursaniyah Upstream Pipeline Network System- KBR-Saudi Aramco

Served as a Lead Flow Assurance consultant for a network system of 22 wells associated with flowlines receiving at remote header & subsequent to that the distribution well flow from remote header to gas gathering manifold through trunklines & from gathering manifold to FGP plant through transmission lines.

Study was carried out for steady state thermal-hydraulic analysis of the Khursaniyah pipeline network to validate the various line sizes, fluid temperatures and pressure profiles, and to estimate any liquid surge volumes expected during the various steady state operations required for the Khursaniyah gas pipelines.

Further transient analysis namely cold start, turndown, ramp up, pigging, shutdown, restart, depressurization studies were carried out & hydrate study & check if there is any possibility of hydrate formation during steady state operations and to estimate the MEG injection rate required wherever there is risk of hydrate formation for all steady state & transient operations. The flowrates from each of the wells were recommended to client considering the factors of erosion of the flowlines/trunklines & hydrate formation issues. Further, sequence of well start-ups were recommended based on the warm up time & hydrate formation temperature.

Hydraulic Study for Dorra gas pipeline – Saudi Aramco, Saudi Arabia

The objective of the study is to recommend optimum size of the pipeline among 30, 32, 34 & 36 inch pipelines. Various parameters like max allowable pipeline inlet pressure, erosional velocity criteria, max/min gas velocity & liquid content in the pipelines. Simulations were carried out for maximum & minimum gas flowrates to address all the parameters & recommend optimum pipeline size without losing the production.

Elliott Group, HYSYS Dynamic simulation study for Flash Gas compressor and Propane compressor for the South Ghawar Project of Saudi Aramco – Current Project

Worked as a Project Lead for HYSYS dynamic study. Project scope includes dynamic simulation study using ASPEN HYSYS for the flash gas compressor and propane compressor system. The scope of the study are to perform the following transient analysis

- a. Compressor **Shutdown scenario** to estimate the coast down surge and to verify the adequacy of the anti-surge valve. The shutdown scenario includes emergency shutdown, normal shutdown and emergency shutdown with blowdown.
- b. Compressor **startup scenario** to confirm the motor torque requirement to start the compressor from the worst settle out pressures in the compressor system.
- c. **Process upset** scenario to create pressure disturbance in the compressor discharge system to evaluate the robustness of the model.

Dynamic simulation study for ROO RUMAILA PROJECT – Iraq, Ongoing project

Worked as Project Lead for the HYSYS dynamic study. The scope of the project is to perform dynamic simulation for the 1st stage and 2nd stage three phase separators along with all controllers, produce water system and analyze the gas blowby scenario effects from one stage to other. The project includes various work packs with similar scope of dynamic simulations.

The scope also includes

1. Verifying the adequacy of the PSVs
 - a. Considering credit of the control systems
 - b. Without credit of the control systems
2. Verifying the adequacy of flare system including flare knock out drum.
3. Determine the duration of liquid filling in the subsequent separator before the gas seal breaks and determining the impact of adjusting the pressure of the separator in case the PSVs are inadequate to handle the flow rate.

Detailed Design – Khafji to Tanajib Sour Gas Compression & Export – Saudi Aramco

Saudi Aramco has decided to utilize the AGOC share of gas from Khafji and Ratawi that is being currently flared. The system consists of a 104 km pipeline from Khafji-Ratawi compression unit to Tanajib, 2 new 1X100% compressor trains and a new 1.5 km compressor discharge header connected to existing Tanajib-Berri gas pipeline. Study involved verification of line sizes, estimation of hydraulic capacity, compressor pressure requirements, slug catcher adequacy for various steady state and transient events and preliminary hydrate risk assessment. Further, study also considers steady state hydraulic and transient liquid surge analysis of the pipeline from Tanajib-Berri pipeline, in order to establish the hydraulic & thermal behavior of the system and to optimize the transient operations such that the liquid handling capacity of the available slug catcher is not exceeded.

Detailed Design for JPS1-1 Pipeline for Arabian Heavy Delivery – SPS

The purpose of new facilities under this project is to transport 732 MBOD of Arabian Heavy crude oil from pumping station to storage facility through existing and new pipelines. Scope of work involved validating the available model and performing steady state analysis. This model encompasses on cross country pipeline of 1200 Kms along with 10 intermediate pumping station. Simulation model involved in the was one of the complex models ever build on SPS. The model consisted of nearly 600 valves, 1000 controllers of various types, several operating control logics, storage tanks, centrifugal pumps and flow control valves.

The steady state hydraulics was performed to confirm the no. of pumps and pump combinations required for several operating conditions for different ambient conditions. Also pressure adequacy was studied for

each scenario. PCV set point at the receiving terminal had to be determined to avoid vacuum generation at the highest point in the pipeline route for all the operating scenarios.

Steady State & Hydraulics for NGL Pipeline using SPS- AGOC

Worked as a Lead consultant for NGL pipeline steady state analysis. AGOC's existing 4" pipeline is designed to transport required BPD of Natural Gas Liquids (NGL). As part of the study to increase throughput through the pipeline, DRA injection was proposed. DRA reduces turbulence in the pipeline which leads to reduced pressure drop and increased flow capacity of the pipeline. Synergy Pipeline Simulator (SPS) was used to perform the proposed study. Various concentrations of DRA and DRA degradation coefficients were studied to see the impact of DRA in increasing flow through the pipeline. The results from this study indicate that it is possible to increase the pipeline capacity by usage of suitable DRA. The magnitude of the increase depended on the concentration and the degradation coefficient of the chemical.

Markazia 3rd Stage & 4th Stage K2 Compressor Project - Markazia Pipeline Hydraulics And Liquid Surge Analysis

Worked as a Flow Assurance lead. The aim of the project was to minimize flaring by installing new compressor units in their Compression Stations. The flow assurance analysis consisted of steady state and transient analysis for 16" pipeline of 800 m starting downstream of the compressor cooler carrying fluid until the new slug catcher. Steady state simulations were performed in PIPESIM to establish normal operating conditions and verify the pipeline size. Transient simulations were performed in OLGA to study the liquid handling management during transient events (piggings, turndown, ramp-up, shutdown and restart).

Basrah Gas Company: Feed, Export And Broadcut Pipelines - Flow Assurance Study

The purpose of this flow assurance study was to reconfirm the pipeline diameters of the three Basrah pipelines and to provide recommendations for the liquid management philosophy at BNGL for the Feed Gas pipeline. Steady state and transient simulations were carried out for Feed Gas, Export Gas and Broadcut pipelines. For all three pipelines, steady state simulations were performed in PIPESIM to establish normal operating conditions of the pipeline and verify line sizes. For Feed gas handling pipeline, simulations were performed in OLGA to study the adequacy of the liquid handling facilities during steady state and transient events. For Broadcut pipeline, pressure surge analysis was performed in PIPENET to ensure pipeline integrity is maintained during inadvertent valve closure.

Pressure Surge analysis for CBA 300/150 Pipeline using SPS-ExxonMobil Australia

Worked as a lead consultant for CBA 300/150 pipeline system. Steady state and transient pressure surge analysis was performed for CBA 300/150 Pipeline. Transient pressure surge was performed by closure of SDV at the outlet of the pipeline to check the peak pressure surge for the flexible pipeline and optimize the speed of MOL pump at the inlet of the pipeline to achieve a desired flow conditions.

Basrah Gas Company; Qurainat Pipeline Hydraulics and Liquid Surge Analysis, Iraq

Lead the team to perform line sizing analysis for pipeline using OLGA. Carried out transient study using OLGA to provide recommendations for liquid management.

Basrah Gas Company; Markazia Pipeline Hydraulics and Liquid Surge Analysis, Iraq

Worked as a Lead consultant for liquid surge analysis.

The study involves line sizing analysis for pipeline using PIPESIM and recommended the most suitable option based upon liquid holdup, back pressure limitations and fluid velocities. Carried out transient study using OLGA to provide recommendations for liquid management. Transient studies include ramp up, turndown, shutdown, restart and pigging operations. Analyzed the slugging potential and risk of hydrate formation during worst case scenarios.

Basrah Gas Company; Import, Export and Broadcut Pipelines Flow Assurance Study, Iraq

Worked as a Lead consultant for import, export & Broad cut pipelines.

Study involves PIPESIM study to verify line sizes of the pipelines and establish the normal operating conditions. Analyzed the pressure surge during transient events using PIPENET to establish valve closure times that will ensure pipeline integrity is maintained. Performed OLGA transient study to check the adequacy of the liquid handling facilities during steady state and transient events (Turndown, Ramp up, start-up & pigging analysis) subsequent to that recommend operational philosophy for various identified transient events to limit the liquid surge within the allowable limit.

Sagar Pragati Pipeline System Liquid Surge Analysis (L&T /ONGC, India)

Served as a Lead providing guidance for Flow assurance analysis & responsible for delivering report. The scope of work involves liquid surge analysis of the pipeline system connecting the C-series platforms to MOPU to estimate the slugging potential and consequent surge volumes during various steady state and transient operations and provide suitable operating philosophy to minimize the surge volumes.

Latif to Sawan Flowlines Liquid Surge Analysis (OMV Pakistan)

Served as a Sr. Flow Assurance consultant for Gas field lines to identify bottle necks in the system and provide operational/engineering solutions and verified liquid surge analysis for adequacy of Slug catcher sizing. Various transient operations like steady state simulations, field data comparison, turn down, Ramp up, shutdown, restart & Pigging operations. Various scenarios and engineering operations explored to optimize pigging frequency for trunk line. Liquid surge analysis was carried out for optimum operation of slug catcher without tripping system. Optimized pigging frequencies were recommended against frequent pigging operation.

Rumaitha Shanayel Phase III Development Pressure Surge Analysis using PIPENET (ADCO/Dodsal)

Involved in steady state hydraulics & Transient pressure surge analysis for Rumaitha & Shanayel Phase-III Development water injection & oil export system separately. Transient analysis summarizes the peak surge pressures for various transient events such as specified valve closure times, pump trips & pump restarts and further recommendations are provided to restrict the surge pressures below the maximum allowable surge pressure when ever found to be exceeding.

Rumaitha Shanayel Phase III Development- Liquid Surge Analysis using OLGA (ADCO/Dodsal)

Steady state hydraulics and transient liquid surge analysis was carried out for the Rumaitha and Shanayel Phase III Development Oil Gathering system that handles flow from both Rumaitha and Shanayel clusters and connect through CPP. OLGA study includes pipeline size adequacy check and adequacy check for slug catcher for various transient simulations like turndown study, Shutdown conditions, restart and pigging simulations

ONGC N.B.Prasad Field Pipeline Liquid Surge Analysis using OLGA-UNISIM integrated model (Bumi Armada/ONGC)

Served as Lead Engineer for integrated Flow Assurance/Process Dynamics study using OLGA-UNISIM integrated model for Subsea & FPSO system. The topside system is associated with slug catcher, compressor system, LP separators, flare system, heat exchangers and pumping systems. Study was conducted for impact of subsea pipeline liquid slugs on the compressor operating conditions (frequent trip of compressor for High & low pressure conditions and subsequent to that produced gas used to be flared through the pressure control valve) in topside system and the dynamic response of topside system for instantaneous change in liquid slugs from subsea system. Integrated simulation model was tuned to match with current field operating conditions and various recommendations were provided for smooth operation of topside compressor system without flaring the gas during continuous operation. Primary recommendations; incorporation of globe valve on one of the risers for slug mitigations, modifications for set point of pressure control valve on vent line to the flare, level set points for HP separator etc.

HYSYS Steady state & Dynamics simulations for GC-31 Platform- KOC, Kuwait

Worked as a lead consultant for Dynamic simulations for GC-31 platform. Steady state and dynamic analysis for GC-31 platform comprises of 3 train separators, Dual crude, wet crude & dry storage tanks, 1st stage & 2nd stage Desalter units, LP compressor trains, booster and export pumping systems. Pseudo steady state simulations were performed for entire topside platform with all associated controller systems. Further, simulations were performed for various operating conditions (GOR 600, GOR 581, GOR 400 & Turndown flowrates). Transient operations have been performed for each of the steady state cases which involve Emergency Shutdown (ESD) with Level-1,2,3 &4, Normal shutdown, normal start up, compressor blockage case scenario, variation in gas rate to the compressors, throttle valve failure, variation of gas molecular weight & compressor air cooler discharge failure. Further, controller tunings parameters (P,I,D) have been recommended for smooth operation of each of the system. The system response during various transient scenarios have been analysed and recommendations provided for smooth operation of systems.

Rumaitha Shanayel Phase III Development : HIPPS Dynamic Study using OLGA (ADCO/Dodsal)

Served as a Lead-Flow Assurance Consultant for HIPPS Dynamics study for oil gathering manifold & gas letdown stations for different clusters and recommend HIPPS closure time for safe operation of the downstream system within the design pressure limit. Study focusses on impact of sudden opening of choke from production well to downstream of HIPPS system during valve closure and estimation of Process safety time (The period of time between failure occurring and the occurrence of the hazardous event if the HIPPS is not performed)

NASR Phase-II Field Development : Thermal Transient Analysis (ADMA OPCO/NPCC)

Served as Lead Flow Assurance consultant for Thermal transient analysis for Well fluid, export & gas lift pipeline system. Scope of the study involved for generating pressure & temperature profile along the length of each pipeline for steady state & transient scenarios for Global buckling & walking Analysis of the pipelines. Governing cases were selected from entire field of the production profile by considering Heating & cooling cycles for shutdown, restart & depressurization scenarios. Results were obtained for frequent time point for accurate analysis of global buckling & walking analysis.

B-127 Cluster Pipeline Project: Slugging Analysis Report (Nauvata/ONGC)

Served as a Senior Flow Assurance Consultant for the Liquid Surge Analysis of the pipelines from B-55 & B-55-5 to BCPA pipeline. Steady state & various transient operations like turndown, shutdown, re-start and pigging were performed for liquid surge for Slug catcher at BCPA. The available hold-up volume in slug catcher was not sufficient to handle liquid slugs from the pipeline system and subsequent to that passive slug control valve (SCV) at the inlet of slug catcher was recommended to mitigate slugs for pigging operations. Operating philosophy was prepared for the operation (throttling/opening) of SCV for different transient operations.

Flow assurance study for a Trunk line (with associated flowlines) hook up with HP Front End Compressor (FEC) at 500 psig - OMV Pakistan

Served as a Lead consultant for liquid surge analysis of pipeline network system. OMV intends to get the flow assurance study to be carried out whereby the reception of Latif gas at Sawan is fixed at 500psig which is hooked to HP compressor. The objective of study is to determine new technical cut off limit of Latif-Sawan trunkline where compressor on receiving end should operate smoothly(without gas fluctuations) & limit the liquid surge volume of the slug catcher for all the transient operations. Steady state & transient operations (Ramp-up, shutdown, restart & pigging) were carried out and operating philosophies were established such that maximum allowable surge volume should not exceed the limit for all the transient cases analyzed. Recommendation of optimum gas flowrate through a trunkline to compressor such that flowrate at the suction of the compressor is within the acceptable operating limits & hence smooth operation of compressor at the receiving end.

Pressure Surge Analysis for oil export & treated water pipeline network system- KOC-Kuwait

Served as a Lead-consultant for oil export & treated water pipeline network pressure surge analysis. Study focusses on the peak surge pressures obtained during the transient operations like valve trips, pump trips and pump trip/restart scenarios. Steady state & transient simulations were analyzed and recommendations for valve closure & pump trip/start time for those scenarios where the estimated surge pressure is higher than max allowable operating pressure.

Hydraulic Study for Dora gas pipeline- Saudi Aramco-Saudi Arabia

Worked as a Lead-consultant for hydraulic study for Dora gas & condensate pipeline. The objective of the study is to recommend optimum size of the pipeline among 30,32,34 & 36 inch pipelines. Various parameters like max allowable pipeline inlet pressure, erosional velocity criteria, max/min gas velocity & liquid content in the pipelines. Simulations were carried out for maximum & minimum gas flowrates to address all the parameters & recommend optimum pipeline size without losing the production.

Zirku Island 7th Crude Storage Tank Pressure Surge Analysis (ZADCO)

Involved in project which covers the results of the steady state analysis performed for the piping system consisting of various liquid lines connecting to the new 7th crude oil storage tank in Zirku Island. Various flow scenarios were evaluated to report the hydraulic capacity of the system and hence establish the operating conditions. Various scenarios for pump trip, pump start, shutdown valve closure were performed to check within the pipeline peak pressure surge. Optimize valve size closure time to limit pressure surge within acceptable criteria, further recommendations are provided to restrict the surge pressures below the maximum allowable surge pressure when ever found to be exceeding.

Pipeline with associated flowlines Flow Assurance study for HOEC Gas Field Development Project-HOEC/Technip India

Served as a Lead –consultant for flow assurance analysis for production pipeline system consisting of 5 well flowlines. To perform Flow Assurance Analysis for production pipeline system consisting of 5 well flowlines connecting to GGS and main trunkline transporting the production from GGS further to GPP. The main intent of the study is to evaluate the slugging potential of the system to size the slug catcher at GPP and verify if the system will operate in hydrate formation conditions during normal and transient operations. Steady state & transient operations were performed to recommend max allowable surge volume & drain rate of oil & water from the slug catcher. Ramp-up, shutdown, restart, pigging & depressurization operations were carried and hydrate management study was performed for all the scenarios analyzed. Minimum metal design temperature for downstream & upstream of blowdown valve during depressurization has been established by considering max allowable peak rate for a flare header & recommendations on selection of MOC.

SIBA Filed Development Project-Flow Assurance study-MOTT McDonald/Kuwait Energy, Kuwait.

Served as a Lead-Flow assurance consultant for flow assurance study for 19 well flow lines gathering system and subsequent to that flow is distributed across 4 trunklines. Study was conducted for the estimation of liquid surge analysis at the receiving facilities & hydrate study for all the flowlines/trunklines. Study mainly focusses on estimation of liquid surge at the outlet of trunklines for various transient operations like turndown, ramp up, planned and unplanned shutdown, restart, pigging and depressurization scenarios. Additionally hydrate study has been performed for transient operation and initial start of the well. Operating philosophy has been made for all the transient operation and hydrate/ minimum metal temperature mitigation methods.

Steady state & Transient Flow assurance study for liquid surge analysis for CPP to NMS pipeline- Dodsai-ADCO, Abhudhabi

Served as a Lead flow assurance consultant for steady state & transient operations (turndown, ramp-up, shutdown, restart, pigging & depressurization). Study involves the liquid surge analysis for various transient operations & recommend the optimum flowrates for the effective pigging operation for the pipeline & further recommend pipeline operating conditions for various transient operations for the effective pipeline operations.

North Field Production Sustainability Investment-1 – Intra-Field Pipeline Transient Hydraulic Study & Slug Loading Analysis & estimation of fluid momentum & forces developed on the pipeline receiving topside piping during slug delivery – McDermott/RasGas, Qatar

To perform the Transient Multi-phase Hydraulic Analysis for the NFPS project. The main objective of this study was to perform transient flow assurance analysis for the WHP-12 to WHP-4, WHP-13 to WHP-7 & WHP-14 to WHP-6 new intra-field pipelines and also evaluate the slugging potential as well as thermal performance of the pipelines during various steady state and transient operations which include steady state, shutdown, depressurization, pigging. Further, a hydrate management philosophy was devised which included determination of the MEG injection requirements for planned shutdown operations and necessary safe guards/mitigation measures were recommended to operate the system safely during various transient conditions. Performed pigging simulations to estimate slug loading at the receiving of the pipeline & estimated fluid momentum & force calculation during slug delivery.

Mangala Development Pipeline Operations- Steady state hydraulics for Rageshwari to Bhogat Gas pipeline (550 km)-Cairn Energy, India

The objective of study is to perform steady State hydraulics analysis (using PIPESIM) for the Rageshwari to Bhogat Gas pipeline 8-inch along with the combination of optimal compressors usage suited to ensure smooth flow and also for augmentation taking future expansion in to scope.

HYSYS dynamics study to understand behavior of split flow controllers for various transient operations - McDermott-RasGas

The model is associated with choke valves, production header, subsea pipelines for WHPQ10/11 platforms. Further, combined fluid is received at PRQ1 platform through 3 split flows (via split flow control valves) & joined correspondingly to each of the 3 trains. Each train is associated with inlet separator, intermediate separator, coalescer & GDU systems. Pseudo steady state simulations were performed for identified cases until all the controller for each of the equipment is stable subsequent to that transient simulation namely ramp up operation for one of the platforms while the other one is flowing at normal operating conditions, closure of ESDV for one train, two train, riser shutdown valves etc have been performed & subsequent to that control response for each of the system along with flow split controllers have been performed & results were analysed accordingly. Recommendations with regards to change of valve Cv, PID controller set points, equipment operating pressure is provided. Additionally, study was carried out by taking all controllers off mode to study the impact of pressure surge during various ESDV valve closure scenarios.

HYSYS dynamics study for MadDog2 field of the Gulf of Mexico- BP

Worked as a Lead-Consultant for topsides dynamic study. HYSYS model is associated with inlet separators, liquid handling equipment, VRU, LP, HP & export compressor systems. The objective of the study is to examine the efficacy/appropriateness of selected/proposed control parameters and set points in dealing with normal process operating conditions and preventing unnecessary process shutdowns. This will include

- d. Confirm the adequacy of the pressure control scheme of the HP Separators (the stability of the pressure control loop in case of process upset as an overpressure at the riser top or liquid slugs) and to confirm the adequacy of liquid level control scheme (for the case of a very large slug).
- e. Assess the interactions between the operation of the Topsides, the subsea flow lines and the subsea pipe lines using the simplified subsea flowline models or the detailed OLGA models provided by COMPANY.
- f. Confirmation of the adequacy of the control systems with respect to dealing with startup/shutdown (non-emergency) scenarios.
- g. Confirmation that the pressure and level control systems on the HP Separator are capable of dealing with process upsets (within the gamut of operational states) such as slug flow.

LP Gas Pipeline Network System Liquid Surge Analysis - KOC, Kuwait

Study focusses on the flow assurance analysis of the LP gas pipeline network system in which 3 pipelines from GC29, GC30 and GC31 transport low pressure gas to the respective tie-in points. The purpose of the study is to estimate the pipeline inlet pressures for various operating flow rates and thus verify the hydraulic capacity of the lines by comparing against the available pressure limitations. Further, study also involves evaluation of the slugging potential of each pipeline and estimation of the maximum liquid surge volumes generated at the outlet of the lines

ADNOC Onshore MOL Replacement TLNET Study

Lead for MOL replacement steady state & pressure surge analysis. Objective of the study includes Develop TLNET model for entire ADNOC onshore oil pipeline network, perform steady state hydraulic analysis for the validating the adequacy of existing and new facilities. Perform transient analysis to check the adequacy of the pipeline design in case of transient events like valve closure, pump trip and restart.

ESSO MOL Pipeline Pressure Surge Analysis, Australia

The Objective of this pressure surge study includes the following:

Developing SPS model for steady state and transient analysis. Steady state simulation of the CBA 300/150 pipeline system for the maximum expected flow rate before the surge event. Transient simulation to determine the maximum pressure surge in the 6" flexible for the sudden closure of DN300 FVO valve at HLA Platform.

Detailed Design of JPS1-1 For Arabian Heavy Delivery and Pressure Surge Study, Saudi Aramco

The objective of this project was to perform Steady state Hydraulic analysis and pressure surge analysis for the JPS1-1 Pipeline of Saudi Aramco, which transports Arabian Heavy Crude from Jumayah Tank forms to East West Pipeline corridor. The project scope includes

- Fluid characterization using HYSYS assay and validation of hydraulic model in SPS for steady state analysis.
- Estimated the pipeline operating conditions & verified the hydraulic capacity of the system during normal operations for a range of augmented liquid flow scenarios.
- Suggest HIPPS and surge relief unit's pressure settings.

Senior Process & Flow Assurance Engineer (L&T Valdel Engineering Pvt Ltd, India)

Worked as a Lead Engineer-Process for Sagar Pragati-Mobile Offshore Process Unit (MOPU).

Lead engineer involved in performing Flow assurance studies, Process simulation using HYSYS, extraction of H&MB from HYSYS & reviewing Process Design Basis, Philosophy documents, PFD, P&ID, Line sizing and equipment sizing report, PDS for Equipment & instruments. Performing sizing for critical instruments for Flow Orifice, PSV and blow down valve. Optimization of Flare header using Vent, flare & depressurization study through Flare net software. Modelling & review of Fire water network systems & preparation of deluge valve data sheets.

Reviewing of vendor packages namely Produced water conditioning skid & Fuel gas conditioning skid. Resolving interface issue with other disciplines. Actively participated in HAZOP workshop to bring out technical issues for further improvement on process design.

RD Platform Modification Project (Cairn India Ltd, India)

Scope of work involves feasibility study to drill few wells in future considering existing pipeline. Study is performed to analyze the reduction in back pressure at Well head platform by removal of water from Production.

Lead engineer involved in Characterization of Well fluid using PVTsim. Building Pipeline Model in OLGA and finding out the back pressure with & without water separation for existing scenario and to find out reduction in back pressure by removing water which shall be considered for drilling of more wells in future.

NASR Phase-1 Development Project (ADMA OPCO, Abu Dhabi)

- Process Lead for ADMA OPCO Well Head Platform involving various requirements with respect to utilities, equipment, man power & monitoring overall project operations for ensuring timely completion in compliance with ISO quality systems of the company.
- Preparing the EPC & engineering sub-contractors scope of work; facilitating in technical clarifications as well as bid evaluation of the EPC bids in accordance with EPC project specifications.
- Leading, mentoring & monitoring the performance of the team members to ensure efficiency in process operations. Maintaining quality standards, ensuring stringent adherence to quality standards, norms & practices, identifying gaps & taking corrective action.
- Planning & scheduling to ensure execution of projects within time & budgetary parameters by close monitoring.
- Checking and reviewing of PFD, P&ID, MSD, cause & effect matrix & safe charts, line sizing, shutdown philosophy, PSV sizing calculations, simulation model, process design basis, design philosophy & Pump hydraulics.
- Performed Pipeline Transient Analysis for network model, slug volume estimation, adequacy of separator size for slug accommodation, separator Level & drain rate control within acceptable limit using PID(Proportional, integral Derivative) control in OLGA model. Performing operational scenarios namely pigging(Estimation of Pigging velocity, time required for pig to reach pipeline end & back pressure estimation at the source of pipeline , ramp up, Turndown flow, Shutdown & depressurization, Optimization of depressurization time using different RO sizes by considering the limitation of max flare capacity. Optimization of Alarm set points to avoid hydrate formation in the pipelines. Actively participated in HAZOP workshop to bring out technical issues for further improvement on process design.

Process Engineer (P. J. Project Engineering Pvt Ltd, India)**P.J. Margo Pvt Ltd, Tumkur**

Process engineer involved in Process Design for Multiple Effect Evaporating system, Design of Shell & Tube Heat exchangers as per TEMA standards, design of thermosyphons, Pump hydraulics, NASHa calculation, Heat & Mass balance for process chemical industries.

Process Engineer (Biozeen India Pvt Ltd, India)

Process Engineer involved in Design & Process Control for Automatic Fermenter (Bioreactors) skids for various Biopharmaceutical industries, Optimization methods for Pilot scale to Production Fermenters, Preparation of Techno-commercial offers for Automatic and semi-automatic Bioreactors for Biopharmaceutical industries

Lecturer (PESIT Engineering College, India)

Handling chemical engineering subjects namely Unit operations of Chemical engineering, Process calculations, Bioprocess and control & Heat Transfer & chemical engineering application using MATLAB

Production Officer (Sami Labs Pvt Ltd, India)

Worked as a Shift in charge for production activities namely Fermentation, scale up studies, sterilization and Drying units

Professional History

- Wood, Chennai, India, Engineering Manager- Flow Assurance & Process (May 2018-present)
- Wood, Chennai, India, Staff consultant - Flow Assurance & Process (April 2018-May 2018)
- Wood Group Kenny India Pvt Ltd, Chennai, India, Senior Flow Assurance Consultant (2014 – 2018)
- L&T Valdel Engineering Pvt Ltd, Bangalore, India, Senior Process Engineer (2010 – 2014)
- P. J. Project Engineering Pvt Ltd, Bangalore, India, Process Engineer (2009 – 2010)
- Biozeen India Pvt Ltd, Bangalore, India, Process Engineer (2008 – 2009)
- People Education Society Institute of Technology, Bangalore, India, Lecturer (2006 – 2008)
- Sami Labs Pvt Ltd, Bangalore, India, Production Officer (2005 – 2006)