Madanagopal P

Staff Consultant

Summary

Years of Experience

17

Industries

- Oil and Gas
- Upstream/Midstream
- Onshore
- Offshore

Types of Facilities

- Production Facilities
- Upstream/Downstream
- Subsea Pipelines
- Process Platforms
- Onshore Pipelines
- FPSO
- LNG loading/unloading

Areas of Expertise

- Flow Assurance
- Steady State and Dynamic modeling
- Pipeline Management Systems (Real time Monitoring, Virtual metering systems & Tuning)
- Process control
- DCS Integration and Checkout
- Operator Training simulators
- Process Simulations
- Site Installation
- Operational Support
- Front End Engineering
- Multiphase Flows
- Project Management
- Client Management/Contracts

Qualifications

Education

Bachelor of Technology (Chemical) With First Class, Anna University, India. 2001-05

Master of Business Administration (Operations Management), Madras University Distance Education. 2013-15

Software / Skills

- HYSYS (Steady State & Dynamics)
- UniSim (Link with OLGA)
- OLGA (Special Modules Comp Track, Wax, Inhibitor, SingleComponent, Pumps & Slug Tracking)
- PVTSim,Multiflash, GUTS
- Flowmaster/Pipenet/SPS
- PIPESIM/Ledaflow
- K-Spice, D-Spice, ASSETT, Virtuoso, ProSimulator
- Integrated Solutions with OLGA/Ledaflow

Languages

- English
- Tamil
- Telugu

Experience Summary

Madanagopal provides technical service support for flow assurance issues and process solutions.

- He has overall 17 years of working experience in oil and gas industry which consists of his initial 7+ years of dynamic simulation experience for building operator training simulators and real time monitoring systems and virtual metering systems and DCS logics verification through simulations.
- He involves in the sale leads to successful bidding and finalizing the technical/commercial proposals. He works as client interface/focal point for flow assurance and process projects using OLGA, PIPESIM, PIPENET, Aspen HysysDynamics with OLGA and UNISIM with OLGA. Further, interface multi discipline activities such as CFD and FIVs.
- He has worked in all areas of work scopes starting from defining the scope, writing technical proposals, configuration of the simulation model with full fledge control loops, parameterization and tuning the plant models, integration of the sub-models, OPC configuration with DCS, etc.
- He has been involved in integrated solutions with multiphase flow simulation tools such as OLGA and LedaFlow with process tools such as K-Spice, D-Spice and UNISIM. He is also an experienced user of process engineering tools K-Spice, D-SPICE and ASSETT. He has worked as a lead engineer mentoring the junior engineers and troubleshooting their simulation work. Expert in real time solutions and operator training simulators. Gave training to operation training instructors.
- Have an overall experience about various digital solutions for Oil and Gas operations. Real-time systems, Virtual metering systems, Leak Detection Systems, Equipment monitoring systems, Operator training simulators, Emulated/Simulated solutions and DCS integration and verification.

Currently leading multiple divisions within Wood Applied Intelligence Group.

- Project Lead for Real time solutions (Virtual metering, Inventory Management, Leak Detection Systems and Operator Training Simulators)
- Project Lead for Digital Solutions & Integration (Machine Learning applications and Environmental related dashboards)

Project Management / Client Interface for various dynamic deliverables.

- Flow Assurance (OLGA, PIPESIM) – Interface as well as Lead
- Dynamic Simulation (OLGA with Aspen HYSYSDYNAMICS) – Interface as well as Lead
- CFD (Interface between EPC contractor and Vendor)
- FIV (Interface between EPC contractor and Vendor)
- Corrosion Integrity Management (Interface between EPC contractor and Vendor)

Experience

Key Projects Summary:

WOOD GROUP KENNY INDIA

April 2012 – Present

Evaluate the existing configurations for increased capacity and evaluate the addition of GGM in Khursaniyah Field, Wood/Saudi Aramco - Ongoing

- Performed a series of simulations to identify the bottleneck of the existing pipeline network which limits the end-user required production.
- Developed a OLGA network models for four new configurations and establish the operational envelope within the operating criteria (pressure, temperature and velocity considerations). Choose the best configuration among the four proposed new configuration.
- Establish the maximum potential from the best configuration such that keep the flow assurance risks within the limit (hydrate formation, liquid surges, depressurization limits).

Wood Real Time Solutions & Digital Solutions

- Interface with global offices and support the team of engineers to perform various tasks
- Resource allocation and troubleshooting
- Tracking sale leads for Indian Subcontinent and Malaysia

Oben Phase II update, Nigeria

- As part of the phase II update, configuration of new wells in the existing network in virtuoso.
- Generate the logics and tags related for the update
- Developed HMI screens for phase II update

Barzan Project maintenance, Qatar

- As part of maintenance, tuning performed to reduce the simulated results against field data.
- Generate logics to reduce leak detection false alarm

New Main Gas Line from ZWSC to Das Island Project - Pipeline Transient Study

- As a project flow assurance lead, be part of client questions on the flow assurance scope.
- Troubleshoot the OLGA model configurations and provided an optimal orifice size for depressurization limits and operate the transient scenarios within the available receiving facility surge volumes.
- Simulations were carried out for production network consisting of 34” NMGL Pipeline, 46” IGL pipeline, 46” MGL pipeline and 18” MGL pipeline up to receiving facilities (IGD-E and CTU separators. Steady state simulations were carried out for a range of flowrates for two operational (EPS and LTDP) phases and two operational (Ring and Island) modes. Two seasons (summer and winter ambient conditions) considered for analysis. Transient simulations pigging, shutdown and restart simulations were performed to assess slug catcher adequacy at receiving facilities. Packing and depressurization simulations were performed to limit the orifice D/S temperature to MDMT.

YME Leak Detection Study, Norway

- Processed the leak detection scenario results
- Wrote the Leak Detection report to address the leak detection performance with respect to size and location accuracy.

Engineering Assessment of Internally FBE Coated Flowlines in Karan Field, KBR-AMCDE/Saudi Aramco

- Developed OLGA network models for four FBE Coated pipelines. Perform steady state simulations to cover the minimum, maximum production ranges for different reservoir combinations. Estimated the various operational output parameters for other engineering discipline studies such as Pipeline, CFD and Corrosion teams.

DCS Upgrade Support for Malampaya VMS, Shell Philippines

- Involved in iFAT and Pre-FAT for installing the Virtual metering system (VMS) in client server
- Configured OPC for the data transfer between VMS and field DCS
- Wrote the tuning report for comparing the last three months data

Virtuoso LITMUS Testing, USA

- Tested the configured pipeline networks, Separator configuration, Pump configuration and compressor configuration for virtuoso development team.
- Troubleshoot the configuration and reported the deviations.

Virtuoso Maintenance Project Support, USA

- Extract the data from the live machines and export the data to offline in-house model to monitor the live machine status for an year.

Safaniyah Water Injection Pre-FEED Phase Studies

- Project executed and lead a team of engineers to perform the study.
- The study objective is to perform steady state and transient simulations for Safaniyah Water Injection Network to recommend line sizes for the new pipeline network.
- Various years were analyzed/simulated based on the water injection rates over the years. The best option/configuration will be recommended based on simulation studies carried out using **Synergi Pipeline Simulator (SPS).**
- Line size recommendation will be subjected to constraints fixed by Saudi Aramco standards for velocity, design pressure and pressure requirement at the well head platforms.

Pluto Maintenance Support, Australia

- Involved in writing remote connectivity report for client to highlight the Virtuoso real-time system health and observations from field data to simulated data for an year.
- Data processing carried out from the OLGA network model, which is used to develop the Virtuoso process model for sales bid.
- Tuned the real-time system to match the field data over a period of time.

GKPI – Field Data Benchmarking and Troubleshooting operational problems, Gulf Key Stone, Iraq

- Developed the simulation models based on the latest information, PVT modeling, benchmarking the existing pipeline field data against the simulation model
- Tuned the simulation model and provide the input to sub-surface team and improved the field set-point due to unplanned shutdown
- Developed the simulation models and used the existing field production data as well as PVT data, provided an operational envelope for the new uninstalled pipelines.
- Demonstrated the GOR, Water cut and ambient sensitivities on the pressure requirement for the high viscous production fluid

Zubair Field – Slug Catcher Requirement for Scraper operations, EMIL, Iraq

- Developed the simulation models and analyzed various production mixtures for two different reservoir tie-ins.
- Developed the methodology to operate the field with existing capacities (without slug catcher)

Ichthys Phase 2a Development, McDermott, KL/Perth

- Act as a deputy lead in all flow assurance issues/deliverables and CFD and FIV deliverables.
- Interface and provide the input to engineering discipline and represented flow assurance/CFD activities in the multi-disciplinary functions. Provided inputs to other disciplines and created the operational methodology.
- Development of steady state models in PIPESIM and transient models in OLGA

Khursaniya Operational Support, Aramco

- Interface with engineering team and understand the operational constraints for initial start-up of two wells.
- Developed the operational plan to overcome the given constraints and discussed with operations team.
- Provided the necessary inputs for operational team to have smooth start-up

Shwe Phase 2 Development, McDermott, KL

- Act as a primary focal point of contact in all flow assurance issues/deliverables and CFD deliverables.
- Interface and provide the input to engineering discipline and represented flow assurance/CFD activities in the multi-disciplinary functions. Provided inputs to other disciplines and created the operational methodology.
- Development of steady state models in PIPESIM and transient models in OLGA (including well tubing)
- Lead a team engineers to develop a process model for integrated solution (subsea part developed using OLGA and topside part developed using HYSYS Dynamics) to evaluate the subsea impact on topside systems..
- Development of operational strategies as per the simulation outcomes.

OMV, Flow Assurance Study for Water Injection Network, Norway

- Development of steady state model in Flow Master to compare the results with PIPESIM. Performed sensitivity analysis for transient simulations with parameters such as well tubing size, valve closure time, injectivity indices

Leak Management Strategy, Melbourne, APA

- Developed a Leak Management Strategy for 80 km long Ethane transportation pipeline. It included inventory management which comprised of pipeline pigging followed using water as the motive fluid, followed by Flaring to ensure minimum time to reduce the pipeline inventory and minimize the leak.

RasGas NFPS Project - QG-1 Looping Project (McDermott/RasGas)

- Acted as client interface for the flow assurance analysis for both steady state and Transient study for the subsea pipelines to finalize the configurations for intra-field pipelines and trunklines. Additionally, estimate the insulation and inhibitor requirements to keep the conditions away from hydrate formation. Liquid surge analysis performed for both steady state and transient operations. Optimized the ramp-up durations and multiple pigging options such as bypass pigging and inlet valve throttling to limit the incoming liquid surges.

Deep Panuke (Encana) – Operational Support

- Performed the operational procedure for long shut-in well conditions to overcome the operational issues and estimated the minimum metal design temperature of the wall layers for the pressurized condition of the shut-in well and thus verify the integrity of the production wells along with riser pipelines.
- Provided the input for revising the operational procedures for well restart plan.

Berri Production Network study (KBR/Saudi Aramco)

- Lead the flow assurance team responsible for carrying out line sizing for a large network system consisting of four TPs, two major trunk lines, three headers, and three transmission lines. The complex production network contains multiple reservoir well head streams connected to offshore platforms and onshore production platforms in addition to three headers and transmission lines that connect to GOSP. Selection of representative years that will cover the worst case scenarios in terms of liquid, gas and water production was analyzed. A complex mixing strategy was used to ensure that a true representation of the fluid was achieved within each branch. Line sizing of the network taking into account two possible routing options was estimated.
- Carried out transient analysis for the large network model to estimate the sizing of the liquid handling equipment at shore. The scenarios that were analyzed included scraper operations, turndown, ramp up, planned/unplanned shutdown and restart. Recommendation for the operating philosophies to be used to limit the liquid surge were estimated. HIPPS study carried out to estimate the PAHH within the PST

MAD-DOG2 (WG MUSTANG/BP)

- As an adviser for process modeling in Aspen HYSYS dynamics for the topside system which include production and test manifolds, separation system, oil treatment system, oil export system, vapor recovery unit, gas compression system, gas treatment and gas export system.

Design and Operational Procedure for commissioning/startup (VM/EPPC)

- Acted as technical lead and client interface for the flow assurance analysis for steady state and transient analysis for propane/propene transport system via subsea pipeline. Provided operational requirement for unloading operation and pressure surge analysis to verify the pressure limitations and safety system. And part of HAZOP discussions.

N.B.Prasad Field Dynamic Simulation Study (ONGC/Bumi-Armada)

- Acted as a lead engineer as well as built a dynamic simulation model in UNISIM and integrated with OLGA. Subsea pipelines with risers are modeled in OLGA and topside (FPSO) oil and gas separation units are modeled in UNISIM. Integrated model is used for analyzing the slugging potential of the subsea pipelines to the FPSO and the corresponding pressure/flow fluctuations at the topside and further causes compressor trips. Provide the recommendation for smooth operations with different controller set points and minor modifications at the FPSO. Multiple scenarios were carried out for client requirements and provide the operational philosophy to get rid of the liquid slugging issue and pressure fluctuations at the topsides.

RasGas NFPS Project - QG-1/2 study (McDermott/QatarGas)

- Acted as technical lead and client interface for the flow assurance analysis for both steady state and Transient study for the subsea pipelines to estimate the hydrate requirements and liquid surge volumes during ramp-up and pigging operations.

Deep Panuke (Encana) – Post Start-up Support

- Estimated the minimum metal design temperature of the wall layers for the pressurized condition of the shut-in well and thus verify the integrity of the production wells along with riser pipelines
- Tuned to match the shut-in condition for the long shut-in well and performed the field restart scenario to estimate the liquid surge volumes at the receiving facility.

KOC Production Gathering Network Study (GulfSpic/KOC)

- Acted as technical lead for the project and stayed in Kuwait (Seconded to GulfSpic for three months) interfaced with KOC for technical discussion related to the requirements and results of the study.
- Total four production network (30 wells network and three 18 wells network) which connects to the respective trunkline. Performed the steady state simulations for verification of the new trunkline capacity and further estimated the liquid surge volumes for various transient scenarios which include turndown, ramp-up and pigging simulations. Performed multiphase pumping requirements for one of the production network and performed pressure surge study for one of the production network.

SIBA Field Development FA Study (Petrocil/MOTT/KEIL)

- Steady state and dynamic study carried out for SIBA Field Development, which consists of flowlines connected to four HUB's and the following trunklines are comingled at CPF. The study deals with size verification for all the chosen line sizes and verify the surge capacity for all the steady state and transient operations. In addition to that hydrate inhibition study carried out and analyzed the inhibition requirement for all the steady state and transient operations and recommended the methanol dosage rates. Provided the hydraulic requirements for methanol network.

Mardankhel Pipeline Network Line Sizing & Liquid Surge Estimation (MOL Pakistan)

- Steady state and transient simulation study carried out for Mardankhel pipeline network; CPF/GPF Slug catchers received production from Mardankhel east and west production along with Maramzai, Mamikhel and Manzalai Production. All the available options were analyzed for production distribution between CPF and GPF slug catchers. Verified the line sizing and recommended the flow distribution which will limit the liquid surges.

Rumaitha Shanayel Phase III Development (ADCO/Dodsal)

- **Oil Export System:** Pressure surge analysis carried out for oil export system which consists of booster and export pumps and following the pipelines with multiple valves. Valve closure and pump trip scenarios carried out using PIPENET. Instantaneous surge pressures are estimated and recommended the valve closure times to restrict the surge pressures below the maximum allowable surge pressure.
- **Water Supply and Injection Network System:** Pressure surge analysis carried out for water supply and injection network system which consists of supply and injection pumps and following the pipelines which ends to clusters or wells. Various valves closure and pump start/restart/trip scenarios carried out using PIPENET. Instantaneous surge pressures are estimated and recommended minimum valve closure times and pump trip and start times for surge pressure limits.
- **Oil Gathering System:** Flow assurance study carried out for Oil Gathering System which consists for five trunklines and connected to the central processing platform. Steady state hydraulic simulations carried out by confirming the pipeline sizes from FEED study and slug catcher adequacy verified for all the transient operations which includes turndown, shutdown, restart and pigging operations.

Deep Panuke (Encana) – Post Start-up Support

- Responsible for flow assurance analysis of Deep Panuke gas development consisting of 4 wells individual tie-ins to the platform and an export pipeline which involves remote start-up support and post start-up analysis. Performed transient analysis for the production and export systems to provide key time driven solutions during start-up of the field. Tuned the design OLGA models to match the operational data for initial start-up and cold restart and normal operating conditions and further used the tuned models to predict cooldown times during shutdown and warm-up times for restarts. Methanol injection requirements for current production. Minimum wall

temperature analysis while depressurizing the line to flare. Optimal methanol requirements for various production scenarios.

Virtuoso Network Model Improvement (MSiK-Process)

- Steady state hydraulic analysis carried out for a network model which includes more than 20 source inputs and 150 branches and compared against the field data. Same model built in standard tool and compared the merits and demerits of Virtuoso model.

Abqaiq Trunklines Liquid Surge Analysis (Saudi Aramco)

- Steady state hydraulic analysis carried out for seven Abqaiq plant incoming trunk lines including more than 25 GOSPs and multiple interconnections making it a complicated oil gathering network to analyze. The scope of work includes operational data matching and evaluation of slugging potential of the trunklines during normal, turndown and pigging operations.

Cairn N-I Field Development (Cairn India)

- Steady state and thermal analysis for revised Bhagyam field with/without the N-I field. Line Sizing and pressure/thermal recommendations for N-I spur line which interconnected to Bhagyam MPT pipeline. Simulation carried out for calculating cool-down time and warm-up time for gel breakage and restart pressure recommendation.

Rajasthan N-E Field Development (Cairn India)

- Feasibility study of export pipeline which connects NE field to MPT pipeline. Line Sizing and pressure/thermal recommendations for export pipeline. Impact of water injection on pressure/temperature requirements and heat tracing recommendations. Simulation carried out for calculating cool-down time and warm-up time for gel breakage and restart pressure recommendation.

Musandam Gas Project pre-FEED / FEED Flow Assurance (OOCEP, Oman)

- Steady state analysis using PIPESIM for different bathymetries with various insulation options and provided the thermal and hydraulic requirements of MIGP pipeline. OLGA analysis included line sizing, shutdown and depressurization analysis for export gas pipeline.

Hydrate Formation Potential for NASR field (Larsen & Toubro Limited)

- Steady state and transient analysis for well restart scenarios to overcome from hydrate formation and remediation.

Detailed design for the Kanowit Subsea Production facility (PETRONAS Malaysia)

- Steady state and transient analysis for commissioning scenarios, Created a start-up procedures to overcome the hydrate issues, turn-down scenarios and various tripping scenarios, Depressurization and restart scenarios for prolonged shutdown.

Multiphase Network Transient Analysis (PDO, Oman)

- Steady state analysis for the network of pipelines which connects to the existing pipeline and proposed new pipeline and maximum possible flow through each network and interaction other networks and surge analysis carried out and recommendations for trip setting for existing and new pipeline.

Mangala Augmentation Project (Cairn India)

- Thermo-hydraulic analysis of a very waxy crude pipeline to estimate the position of intermediate pumping stations for increased capacity and DRA impact of DRA on pressure profile and the impact of increased flow rate on pressure surges.

Senior Process/Simulation Engineer (Kongsberg, India)

KGD6 Production Simulator (Reliance Industries)

- Dynamic simulation model configuration by using D-Spice and integrated with OLGA. Complex OLGA network modeled (Production from 18 wells with 6 manifolds connected to transmission lines via DWPLEM and riser platform reaches to onshore topside facilities which contains slug catchers and MEG regeneration units and dehydration units)
- Real time online monitoring solution which includes all the subsea part and simplified onshore part.
- Modelling included ramp-up with and without MEG injection, slug tracking, pig tracking, corrosion and erosion monitoring. Lining up of wells and well network for various production scenarios and hydrate remediation scenario modelling.
- Developing the user interface graphics to show the comparative values between actual plant and simulation
- Created an offline model by changing the necessary parameters from online model and built a look-ahead model by changing the necessary parameter from online model, which was used to find the onshore upsets by ramping up the wells.
- Configured the Look-ahead interface and even driven look-ahead functionality.
- Created complete gas inventory balance and MEG inventory in the model
- Involved in installation of production simulator at site and configuration of OPC
- Tag to tag verification with OPC server to simulation model
- Involved as a tester in site acceptance test
- Online tuning to match the actual plant data
- Carried out analysis for lining up of new wells to the current production
- Customer support to the client queries and continuous monitoring of Production simulator performance

Maria Pipeline Management System Project (British Gas, UK)

- Worked in all the phases of the project starting from model building in K-Spice and shadow Ledaflow models to interface with K-Spice in Pre-FAT.
- Modelling included start-up and shutdown simulations for individual wells with and without gas lift, smart well model and hydrate monitoring and slugging.
- Emulated graphical interface for real time and planning system

Snohvit (StatOil)

- Client support for DCS Integration.
- Travelled to the Site and given necessary support to the Client for making the ABB DCS integration.

BigFoot Engineering Studies (Chevron-USA)

- Dynamic simulation study of the BigFoot process facilities.
- Project involved model building, input of vendor data, P&ID mark-ups, matching of dynamic steady state to H&MB data, tuning of model, etc.

Pazflor Overall Flow Metering System (Total, France)

- Overall Flow metering System is a newly developed advance Pipeline Management system on K-Spice integrated with OLGA model for Pazflor field.
- Involved in creating the user interface and model testing.

Cascade and Chinook DOFT (Petrobras America Inc.)

- Pipeline Management system on D-SPICE integrated with OLGA model for Cascade and Chinook field.
- Created the emulated FMC graphics for Operator User Interface and tested model.

Multiple Projects (Njord A OTS upgrade & Statfjord OTS (Statoil Hydro, Norway)

- As process engineer on the project, incorporated the latest P&ID changes in the model and added the extra scope requested by the Client
- As a process engineer on the project, built the dynamic simulation model based on vendor information in ASSETT for the heating medium section, fuel gas system and tested functionality.
- Matched dynamic steady state information to steady state H&MB.

Fujian PMS Project (CNOOC – Fujian Site, China)

- Site Installation/Commissioning and Tuning of Pipeline Management System that used D-SPICE.

Bohai FPSO (ConocoPhillips, China)

- As process engineer on the project, built the Dynamic Simulation Model for the topsides in D-SPICE. Matched dynamic steady state information to steady state H&MB.

Akpo FPSO (Total/Technip)

- As process engineer on the project, gas compression system was built using D-SPICE and further modeled the anti-surge control loops and compressor load sharing logics
- Integrated the oil section sub model to the gas system and verify the usability as single dynamic model
- Evaluated the dynamic model steady state results against client provided H&MB.

Professional History

- Wood, India (April 2012 - Present) – Global support for APM and FA Projects
- Kongsberg Oil and Gas Technologies, India (Mar 2006- Mar 2012)
- Siminfosystems, India (June 2005 - Dec 2007), which included seconded to Kongsberg till Dec 2007