

We're your flow assurance everything.

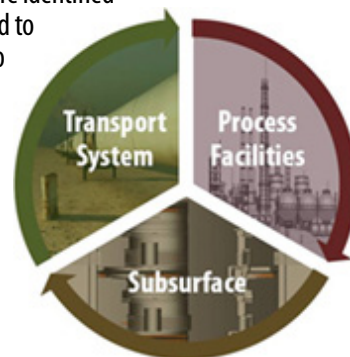
The delivery of hydrocarbons to processing and transportation infrastructure is a critical element of the field development life cycle. At Knowledge Reservoir, we use our 20 plus years of industry experience and the latest simulation technologies to analyze the critical flow assurance aspects of a project and develop production solutions that take into consideration the performance of the subsurface and surface assets as an integrated system.

This holistic approach is facilitated by our comprehensive subsurface asset modeling group capabilities, which allows incorporation of recoverable reserve and reservoir performance considerations into the design of the transport system and promotes the development of concepts that are technically and economically viable. This in-house "reservoir to pipeline" capability is unmatched in the industry.

Our Process

Upon establishment of field production profiles for oil, water, and gas from reservoir analysis, the critical flow assurance aspects are identified and a design integration approach is followed to address each of the challenges. The goal is to develop a production strategy and field architecture that satisfies the requirements of all the system components.

- Reservoir/wells
- Subsea umbilicals, risers, and flow lines (SURF)
- Export pipelines
- Topsides/onshore processing facilities



Depending on the fluid properties and operating conditions some or all of the following analyses may be performed:

Production Chemistry Studies

- PVT laboratory test review
- Hydrates
- Wax
- Scale
- Emulsions
- Gelling
- Sand production
- Chemical injection requirements

Multiphase Flow Analysis

- Gas, oil, water, and solids transport dynamics
- Line sizing and deliverability
- Artificial lift
- Insulation/heating requirements
- Hydrodynamic and terrain induced slugging
- Corrosion/erosion potential
- Cool down/blowdown/start up

Single Phase Flow Analysis

- Pipeline planning and design
- Deliverability
- Leak detection and upset analysis
- Liquid hammer

Process Facilities Studies

- Slug catcher sizing
- HIPPS studies
- Flare system performance
- Pump/compression requirements

Integrated System Studies

- Coupled reservoir, transport system, and process facilities
- Multi-field analysis
- System optimization
- Operability assessment

Deliverables

Typical deliverables from our analyses include design specifications, production strategies, operating procedures, and specialized subject matter reports. We can customize our reports and document control procedures to adhere to our clients' specific quality assurance and control requirements.



Simulation Tools

We use the latest available industry software for PVT analysis, pipeline simulation, and process modeling, supplemented by proprietary utilities to streamline the execution of parametric studies and support our quality control process. The following are some of the commercial simulation packages we use on a regular basis:

- PVTsim (fluid properties and phase behavior modeling)
- OLGA (dynamic multiphase pipeline flow simulator)
- PipeSim (steady state multiphase pipeline flow simulator)
- Pipeline Studio (single phase oil / gas pipeline flow simulator)
- Natasha (liquid hammer analysis)
- HYSYS (chemical process modeling)

Experience

We have been solving flow assurance problems for more than 20 years and our consultants have hands-on experience in virtually all regions of the world. The following is a sample list of the flow assurance projects we have conducted over the past two decades.

1988	Department of Energy – UK	Analysis of Piper Alpha pipeline system
1988	Dow Chemical – Holland	Pipeline leak detection study
1990	Unocal – UK	Pipeline riser rupture analysis
1990	BP/Britoil – UK	Pipeline riser rupture analysis
1990	Shell Expro – UK	Brent pipeline system safety analysis
1991	Shell BP Todd – New Zealand	Pipeline hydrate dynamic analysis
1992	PTT – Thailand	Transient pipeline system analysis
1993	Aramco – Saudi Arabia	Zuluf pipeline system analysis
1993	Arco – Indonesia	Multiphase pipeline system analysis
2001	Murphy E and P - GoM	Liquid dropout analysis
2001	El Paso Corporation - GoM	Dynamic liquid dropout analysis
2002	El Paso Corporation - GoM	Dynamic liquid dropout analysis - network
2003	Murphy E and P - GoM	North Medusa subsea tie-back engineering and analysis
2004	Government of Papua New Guinea	Training in gas processing, transportation, and regulation
2005	Murphy E and P - GoM	Front Runner well flow assurance
2005	Murphy E and P - GoM	Thunderhawk subsea tie-back engineering and analysis
2005	PetroQuest – GoM	Vermillion subsea tie-back engineering and analysis
2005	Husky Energy – Canada	White Rose blow down simulation
2005	Plains Exploration – GoM	Flow assurance analysis
2006	EDG (Chevron) – Africa	Cabinda – South Nemba flow assurance analysis
2006	EDG (CNR) – Africa	Olowi flow assurance analysis
2007	EDG (VSP – Hoan Vu) - Vietnam	Hoan Vu field development project
2007	Murphy E and P - GoM	Flow assurance analysis
2008	EDG (Chevron)- Africa	Cabinda – Malembo flow assurance analysis
2008	Noble Energy – Africa	Benita flow assurance analysis
2009	Noble Energy – GoM	Swordfish flow assurance analysis
2009	Murphy E and P – GoM	Thunderhawk flow assurance analysis
2009	Interoil – New Guinea	Elk / Antelope flow assurance analysis
2009	Noble Energy – Africa	Belinda flow assurance analysis
2010	Interoil – New Guinea	Elk / Antelope field PVT study

analysis

Why Knowledge Reservoir?

1. Our in-house capabilities to analyze the entire production system from the subsurface resources to the downstream facilities. This integrated asset and production modeling capability (IAM or IPM) with an in-depth analysis of each of the system components is unmatched in the industry.
2. Our systems-oriented approach to flow assurance comes from our experience in working in integrated design teams with clients and contractors at all stages of the development cycle from concept selection to detailed design. This approach leads to solutions that satisfy the operability, reliability, and deliverability requirements of the entire production system.
3. The average level of industry experience of our flow assurance engineers is over 15 years. This allows us to provide fit-for-purpose practical solutions while minimizing cost and superfluous effort.
4. We provide complete flow assurance solutions as well as consultants to lead, supplement, and complement our client's project teams

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