Integrated Reservoir Management.

Course Description

This course provides detailed discussions and hands-on training for understanding the Integrated Reservoir Management methodology, main workflows, processes, and sub-processes normally used to optimize production, and maximize recovery factor from oil and gas fields. The training course will provide fundamental and advanced knowledge of the Integrated Reservoir Management (IRM) process which include reservoir surveillance, data acquisition plan, improved oil recovery processes, opportunity identification, and a road map from lab experiments to full field implementation and production optimization. The benefits of implementing IRM will be also extensively explain trough case studies, conferences, and SPE papers.

Participants will learn how conduct IRM projects to achieve production goals and maximize recovery factors under different scenarios. Novel workflows, diagrams, and a framework for thoroughly analyzing and optimizing reservoir performance to achieve production/injection targets will also be presented. The capability maturity model approach will be implemented to define the level of maturity of IRM projects.

Participants will also gain the knowledge and skills to identify the best IOR/EOR process to be implemented in the reservoir to maximize recovery factor, improve sweep efficiency, minimize water breakthrough, and improve the project economy. A clear road map from lab studies to full field implementation will be presented to maximize reserve extraction plan by using multi scenario evaluation approach.

The course will be supplemented by practical class project example problems, group exercises and interactive group discussion designed to consolidate and reinforce learning, and identify and offer solutions to specific problems associated with integrated reservoir management of oil and gas fields. In addition to the core case studies built specifically to drive home the techniques and tools taught during the training sessions, other cases will be drawn from integrated asset modeling and optimization value chain as the workshop proceeds.

Who Should Attend?

This course is designed for reservoir, geologist, and project engineers; assets managers; reservoir managers; project managers from oil and gas government regulatory authorities; joint venture oil and gas operators; joint venture non-operators, and others.

What You Will Gain:

- Understanding the benefits of the Integrated Reservoir Management (IRM).
- Understanding the IRM road map
- Recognizing the use and application of the capability maturity model to measure the current state of the IRM process.
- Learning how IOR and EOR processes can be properly articulated with IRM to maximize oil recovery
- Understanding the benefits of Digital Oil Fields (DOF) over the IRM process and decision making
- Understanding the objective of a Field Integrated Laboratory Evaluation and sector model review projects
- Defining key performance indicators for reservoir management
- Understanding the importance of reservoir simulation models quality to perform production forecast
- Understanding the impact of risk and uncertainty analysis over IRM strategies and decision-making process
- Understanding the added value of smart well completions on IRM
- Understanding the value of data and information in the decision-making process
- Learning best practices and lesson learned from world class integrated reservoir management case studies.

Training Methodology

The training course will combine lectures (30%) with workshop/work presentations (30%), interactive practical exercises and case studies (20%), supported by video material, software and general discussions (20%)

Course Content

Day 1. Integrated Reservoir Management Overview

- Definition of IRM
- History of IRM, process evolution
- Importance of Team Approach
- IRM Goals, IRM strategic intent
- IRM expected Benefits
- IRM Framework, Processes, input data, output data, organizations
- Main IRM workflows, processes and tools
- Importance of IRM project governance
- Change management
- IRM People values, roles and responsibilities
- IRM Key Performance Indicators (KPIs)
- Capability Maturity Model for IRMM Processes and Workflows

- Integrated Asset Modeling (IAM) and IRM relationship
- Importance of IRM road map
- Case study discussion

Day 2. Reservoir Surveillance. Part-1

- Introduction to reservoir surveillance
  - Importance of reservoir surveillance
  - Goals of reservoir surveillance
  - Data acquisition plan. Data acquisition justification, amount and frequency of data gathering, type of data.
  - Data acquisition, validation and reconciliation process
  - Workflow of asset strategy with work processes
  - Fundamentals of Value of Information (VOI)
  - Quality of Information
  - Perfect and Imperfect Information
- Reservoir monitoring
  - Pressure, flow rates trend analysis
  - Voidage replacement factor. Calculations, interpretation and scenario analysis.
  - Sweep efficiency. Vertical, lateral, displacement, and volumetric seep efficiency, recovery factor.
  - Viscous fingering
  - Tracers
  - Monitoring of chemistry of production water, stiff diagrams interpretation
  - Hall plots (evaluation of injector wells performance)
  - Water and gas coning
  - Reservoir monitoring through seismic and magnetotellurics methods

Day 3. Reservoir Surveillance. Part-2

- Well Monitoring
  - Cement Integrity
  - Fluid sampling (oil, water, and gas)
  - BHP, PLT, measurements
  - Hydraulic fracture productivity life
  - Thief zones and channels identification
  - Skin factor analysis with time
  - Water cut versus time
  - Well Testing Applications for reservoir surveillance. Examples and class exercises.
- Transient tests, Build-up, Draw-down, interference test
  - Principle of Well testing
  - Well test types

- Flow regime analysis
- Pressure buildup testing
- Formation damage identification

Day 4. Reservoir simulation, Opportunity Identification and Scenario Evaluations

- Identification of opportunities based on well and reservoir performance monitoring
- Base case definition. Definition of normal production decline curve
- Additional or incremental oil rate definition. Well jobs / workover justification
- Reservoir simulation. Types of reservoir simulation models, reservoir simulation workflows, initialization, history matching, use of reservoir simulation to estimate production profiles, common constraints, fine grid reservoir simulation versus coarse grid reservoir simulation models, grid size effect over production/injection profile interpretations, fundamentals of geostatistics (vertical proportion curve, variograms, kriging), importance of detail facies modeling on production profiles. Interpretation of simulations outputs.
- Risk Management
  - Risk Category
  - Risk Type
  - Risk Description
  - Mitigation Plan
  - Risk statistics
  - SWOT (Strengths, Weakness, Opportunities, Threats) Analysis
- Opportunity and Scenario ranking. Economic evaluation of scenarios (well scale and reservoir scale), efficiency frontier method for scenario ranking.
- Production optimization. Variables to maximize or minimize, decision variables, optimization exercises.
- What Is optimization under uncertainty?, uncertainty definition, Uncertainties vs. Risk, uncertainty analysis, Descriptive and Inferential Statistics application in risk and uncertainty analysis.
- Monte Carlo simulation. Basis for Monte Carlo simulation, uses, examples in oil and gas projects
- Case studies discussions

Day 5. Improved and enhanced oil recovery, Integrated Field Laboratory Evaluation, Sector model Review Approach, Technologies

- IOR and EOR definition
- Why considering IOR/EOR processes in reservoir management
- Screening of IOR/EOR methods
- Overview or EOR processes, SPE definition
- Injection Patterns, mobility ratio and sweep efficiencies.
- Average recovery factor of IOR/EOR processes

- EOR road map. From lab design to full field applications
- Integrated laboratory evaluation
    - What is an integrated laboratory evaluation?
    - Objective of a IOR/EOR pilot project?
    - Variable to be monitored, logs, tracers
    - Lab results versus pilot results analysis
    - Reservoir heterogeneity estimation. Dykstra Parsons Coefficient, Lorentz Coefficient.
    - Reservoir heterogeneity and recovery factor relationship
    - Criteria for full field expansion
- Sector Model Review
    - Geological model review, facies modeling, facies continuity
    - Reservoir compartmentalization studies, geological and seismic cross-section review
    - Well types, completion types
    - Sweep efficiency calculations, action to improve sweep efficiency.
    - Voidage replacement factor estimation, analysis and action plan
    - Bubble map analysis, diagnostic plots
    - Hall plot generation and analysis
    - Saturation measurements
    - Production / Injection performance dashboards

- Overview of intelligent wells
- Main components of a smart or intelligent well completion
    - Sliding sleeves
    - Inflow control devices (ICDs)
    - Inflow control valves (ICVs)
    - Active flow control devices (AFCDs)
    - What ICDs, AICDs and ICVs can solve?
    - Functionalities of the ICDs, AICDs and ICVs
    - ICV, ICD examples
- Benefits of smart wells and fields (digital oilfield technologies)
- Applications of smart wells and fields (digital oilfield technologies)

    - Case Studies

Class Exercises

- Vertical, Lateral, and volumetric sweep efficiency calculations
- Dysktra Parsons coefficient calculations
- Discussion and analysis of IRM case studies
- Hall plot and voidage replacement factor
- Well performance modeling and analysis
- Decision making process with and without IRM