



THE CHEMICAL ENGINEERING MAJOR

Production Optimization and Artificial Lift System

Website: www.btsconsultant.com

Email: info@btsconsultant.com

Telephone: 00971-2-6452630



Production Optimization and Artificial Lift System

Why You Should Attend:

The first objective of this course is to introduce the concept of NODAL analysis as a tool in production optimization and hence enhancement. Each learner will be exposed to the analysis of various components of the producing system and their effect on the performance of the total production system.

- Every oil and gas well requires a lift mechanism at some time-point. Often times during a well's life cycle, changing conditions, necessitate switching from one to another lift method. Each lift system's applicability often overlaps with other lift systems and it is important to understand when to use one and why not to use another. This course while providing instructions at awareness level will arm attendees with sufficient details to participate in informative decision making process

Who Can Benefit?

The course is designed for, but not limited to those involved in the production optimization and Artificial Lift System design:

- Production Technologists
- Production Engineers

- Operations Engineers
- Field Technicians
- Reservoir Engineers

Course Objectives:

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on the inflow & outflow performance and the system analysis in subsurface production operations
- Apply the latest methodology on artificial lift selection to lower the producing bottom hole pressure (BHP) on the formation to obtain higher production from the well
- Describe artificial lift selection and the operation of gas lift installation
- Define what is an electrical submersible pump (ESP) and have an understanding of ESP system components and accessories, operation, ESP system selection and performance calculations, installation and handling and maintenance and trouble shooting
- Explain hydraulic pumping in oil wells including its operation, accessories & surface equipment's
- Possess the skills needed to select and design an artificial lift system, plan its operation, monitor, analyze and optimize its performance.
- Be able to manage and control the production of artificial lift wells and fields
- Be able to study and compare the cost between artificial lift systems.

- Real Time data gathering and interpretation.

Course Outlines:

Day 1

- Basics in reservoir and production engineering
- Overview on nodal analysis of well production system
- Well and reservoir flow coupling
- WELL INFLOW PERFORMANCE
- Darcy's Law
- Radial Flow Theory for Incompressible Fluids
- Steady State-Radial Flow of an Incompressible Fluid
- Semi Steady State Radial Flow of a Slightly Compressible Fluid.
- Radial Flow Theory for Compressible Fluids
- Steady State Radial Flow for a Gas System
- Multiphase Flow Within The Reservoir
- Non Darcy Flow
- Productivity Index
- PI for Steady State Incompressible Flow
- PI for Semi-Steady State Incompressible Flow
- Perturbations from Radial Flow Theory for Single Phase Flow

Day 2

TUBING PERFORMANCE

- Fundamental Derivation of Pipe Flow Equation
- Principle of Conservation of Energy
- The Friction Factor
- Single Phase Flow Characteristics
- Dry Gas Flow
- Single Phase Liquid Flow - Oil or Water
- Multiphase Flow Concepts in Vertical and Inclined Wells
- Flow Characteristics in Vertical Wells
- Multiphase Flow Characteristics in Inclined Wells
- Fluid Parameters in Multiphase Flow
- Single Phase Flow Performance Predictions
- Single Phase Liquid Flow

- Multiphase Flow Models
- Correlations which consider neither Slippage nor Flow Regimes
- Correlations which include Phase Slippage but not Flow Patterns
- Correlations which consider both Slippage and Flow Regime
- Correlation for Inclined Wells
- Use of Vertical Well Pressure Loss Correlations
- Inclined Flow Correlations
- Gradient Curves
- Optimization of Tubing Flow
- Effects of GLR
- Effects of Tubing Size
- The Effects of Water-Oil Ratio
- FLOWLINE CHOKES
- Functions of Flowline Chokes
- Choke Equipment
- Positive or Fixed Choke
- Valve Seat with Adjustable Valve Stem
- Rotating Disc Choke
- Choke Flow Characteristics
- Flow Behaviour and Distribution
- Critical Flow through Chokes
- Choke Flow Correlations
- Single Phase Flow
- Multiphase Flow through Choke
- COMPLETION FLOW PERFORMANCE AND OPTIMISATION
- Matching the Inflow and Tubing Performance

Day 3

Artificial lift methods:

- Introduction and selection criteria
- The need for artificial lift
- Review of artificial lift techniques
- Current status of the role of Artificial lift in field development
- Artificial list selection,
 - Gas Lift Systems
 - ESP systems
 - Progressive cavity pump

- Jet pump
- Hydraulic piston pump
- Sucker rod pump

Gas Lift Design and Optimization

- Overview of Gas Lift
- Understanding fluid mechanics, fluid properties and gas lift principles
- Installation Types
- Total Systems
- Optimum Design
- Valve Mechanics
- Fluid Operated Valves vs Casing Pressure Operation
- Gas Lift Operations
- Continuous Flow
- Intermittent Lift
- - Troubleshooting
- CASE STUDY / EXERCISES

DAY 4:

Electric Submersible Pumping (ESP) Design and Optimization

The objective is to get extended running times and optimum production rates. Well Design is critical, and governs ESP performance, for either undersized or oversized pump installation.

- ESP Systems
- ESP Components
- Multisensors
- Applications
- Design and Selection using Artificial Lift Design Software
- Installation / Operation
- Operational issues
- Solids
- Scale
- Corrosion
- CASE STUDY / EXERCISE
- ESP Diagnostics and Real Time Well Operations and Optimization
- ESP Diagnostics

- Monitoring
- Trend analysis case studies
- Exercise
- Real Time Well Operations and Optimization
- Overview
- Surveillance Methodology
- Architecture and Control
- Workflow GUI Integration
- Integrated Asset Optimization
- CASE STUDY / EXERCISES

DAY 5:

- Jet Pump:
- Main Components and Operating Mechanisms,
- Pump Types,
- Performance Curves and Pump Selection,
- Required Power Fluid Rate,
- Surface Pressure and Horse Power,
- Design of a Jet Pump System
- New Technology in Artificial Lift Systems
- The Progressing Cavity Electric Submersible Pump (PCESP)
- Cable Deployed Pumping System
- Artificial Lift Offshore and Advanced Artificial Lift Systems
- Artificial Lift Offshore
- Production Chemistry
- Planning
- Inventory
- Redundancy
- Logistics
- Lead-out